Gordon Site

MacLellan Site

LYNN LAKE GOLD PROJECT

ENVIRONMENTAL IMPACT STATEMENT

MAY 2020

VOLUME 1:

EIS

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Alamos Gold Inc.

Stantec

Lynn Lake Gold Project
Environmental Impact Statement
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Prepared by:

Stantec Consulting Ltd.

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Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
Part 1 - Key Considerations		
1.0 Introduction	The purpose of this document is to identify for the proponent the minimum information requirements for the preparation of an Environmental Impact Statement (EIS) for a designated project1 to be assessed pursuant to the Canadian Environmental Assessment Act, 2012 (CEAA 2012). This document specifies the nature, scope and extent of the information required. Part 1 of this document defines the scope of the environmental assessment (EA) and provides guidance and general instruction that must be taken into account in preparing the EIS. Part 2 outlines the information that must be included in the EIS. Section 5 of CEAA 2012 describes the environmental effects that must be considered in an EA, including changes to the environment and effects of changes to the environment. The factors that are to be considered in an EA are described under section 19 of CEAA 2012. The Canadian Environmental Assessment Agency (the Agency) or a review panel will use the proponent's EIS and other information received during the EA process to prepare a report that will inform the issuance of a decision statement by the Minister of Environment and Climate Change. Therefore the EIS must include a full description of the changes the project will cause to the environment that may result in adverse effects on areas of federal jurisdiction (i.e. section 5 of CEAA 2012) including changes that are directly linked or necessarily incidental to any federal decisions that would permit the project to be carried out. The EIS must also include a list of key mitigation measures that the proponent proposes to undertake in order to avoid or minimize any adverse environmental effects of the project. It is the responsibility of the proponent to provide sufficient data and analysis on potential changes to the environment to ensure a thorough evaluation of the environmental effects of the project by the Agency or review panel.	
2.0 Guiding Principles		
2.1 Environmental Assessment as a Planning and Decision Making Tool	Environmental assessment (EA) is a process to predict environmental effects of proposed projects before they are carried out. An EA: • identifies potential adverse environmental effects; • proposes measures to mitigate adverse environmental effects; • predicts whether there will be significant adverse environmental effects, after mitigation measures are implemented; and • includes a follow-up program to verify the accuracy of the EA and the effectiveness of the mitigation measures.	EIS Chapter 4, Section 4.2.1
2.2 Public Participation	One of the purposes identified in CEAA 2012 is to ensure that opportunities are provided for meaningful public participation during an EA. CEAA 2012 requires that the Agency provide the public with an opportunity to participate in the EA. For EAs led by the Agency the public has an opportunity to comment on the draft EA report. For EAs by a review panel, CEAA 2012 requires that the review panel hold a public hearing. Additional opportunities for participation may also be provided. Meaningful public participation is best achieved when all parties have a clear understanding of the proposed project as early as possible in the review process. The proponent is required to provide current information about the project to the public and especially to the communities likely to be most affected by the project.	EIS Chapter 3, Section 3.4, Section 3.4.1 and Appendix 3A EIS Chapter 4, Section 4.2.1
2.3 Engagement with Indigenous Groups	A key objective of CEAA 2012 is to promote communication and cooperation with Indigenous peoples which includes First Nations, Inuit and Métis. The proponent is expected to engage with potentially affected groups, beginning as early as possible in the project planning process. The proponent shall provide potentially affected groups with opportunities to learn about the project and its potential effects and to make their concerns known about the project's potential effects and discuss measures to mitigate those effects. The proponent is strongly encouraged to work with each potentially affected group separately or together (should more than one group propose to engaged together), to establish an engagement approach. The proponent will make reasonable efforts to integrate Aboriginal traditional knowledge into the assessment of environmental effects and provide evidence of all efforts. For more information on incorporating Aboriginal traditional knowledge, refer to Part 1, Section 4.2.2 of these guidelines.	EIS Chapter 3, Section 3.3, Section 3.3.1 EIS Chapter 4, Section 4.2.1
	In order to fulfill the Crown's constitutional obligations to consult with potentially impacted groups, the Agency integrates its legal obligation for consultation and accommodation in the EA process. The information gathered by the proponent during its engagement with groups helps to contribute to the Crown's understanding of any potential adverse impacts on potential or established Aboriginal or treaty rights protected under section 35 of the Constitution Act, 1982 ("section 35 Aboriginal rights") including title and related interests, and the effectiveness of measures proposed to avoid or minimize those impacts.	EIS Chapter 3, Section 3.3, Section 3.3.6 and Appendix 3A and 3B
2.4 Application of the Precautionary Approach	In documenting the analyses included in the EIS, the proponent will demonstrate that all aspects of the project have been examined and planned in a careful and precautionary manner in order to avoid significant adverse environmental effects.	EIS Chapter 4, Section 4.2.1

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
3.0 Scope of the Environmental Assessment		
3.1 Designated Project	On July 4, 2017, Alamos Gold Inc., the proponent of the Lynn Lake Gold Project, provided a project description to the Agency. Based on this project description, the Agency has determined that an EA is required under CEAA 2012 and will include the construction, operation, decommissioning and abandonment of the following project components: – Open pits – Ore, low grade ore, waste rock, overburden, top soil stockpile/storage areas – Tailings management facility Guidelines for the Preparation of the Environmental Impact Statement – Water management facilities (potable and process) – Central ore milling and processing plant – Explosive storage and manufacturing – Effluent treatment – Site clearing, earthmoving, leveling, drilling and blasting activities – Transportation corridor construction or improvement – Ore and concentrate transportation – Water supply (industrial and drinking) – Wastewater treatment – Power supply, including any new powerlines to the facility and related electrical supply infrastructure) – Borrow areas – Ancillary infrastructure (security, parking areas, mine truck and vehicle maintenance shops, administrative offices, warehouses, laboratories, and vehicle fueling and maintenance facilities) – On-site and off-site accommodations – Diversion channel adjustments	EIS Chapter 2, Section 2.3; Section 2.4; Section 2.7
3.2 Factors to be Considered	Scoping establishes the parameters of the EA and focuses the assessment on relevant issues and concerns. Part 2 of this document specifies the factors to be considered in the EA, including the factors listed in subsection 19(1) of CEAA 2012: – environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other physical activities that have been or will be carried out; − the significance of the effects referred to above; − comments from the public; − mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project; − the requirements of the follow-up program in respect of the project; − the purpose of the project; − alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means; − any change to the project that may be caused by the environment; and – the results of any relevant regional study pursuant to CEAA 2012.	EIS Summary EIS Chapter 1 EIS Chapter 2, Section 2.9 EIS Chapter 3 EIS Chapter 4, Section 4.2.4 EIS Chapter 20 EIS Chapter 21 EIS Chapter 22 EIS Chapter 23
3.2.1 Changes to the Environment	Environmental effects occur as interactions between actions (the carrying out of the project or decisions made by the federal government in relation to the project) and receptors in the environment, and subsequently between components of the environment (e.g. change in water quality that may affect fish). Under CEAA 2012, an examination of environmental effects that result from changes to the environment as a result of the project being carried out or as a result of the federal government exercising any power duty or function that would allow the project to be carried out must be considered in the EIS. In scoping the potential changes to the environment that may occur, the proponent should consider any potential changes in the physical environment such as changes to air quality, water quality and quantity, and physical disturbance of land that could reasonably be expected to occur.	EIS Summary EIS Chapter 4, Section 4.3 EIS Chapter 5, Section 5.1 , 5.2, and 5.3 EIS Chapters 6 through 12

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Guideline Section	Guideline Description	Application Section where Manner Addressed
3.2.2 Valued Components to be Examined	Valued components (VCs) refer to environmental biophysical or human features that may be impacted by a project. The value of a component not only relates to its role in the ecosystem, but also to the value people place on it. For example, it may have been identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance.	EIS Chapter 4, Section 4.3.1.1
	The proponent must conduct and focus its analysis on VCs as they relate to section 5 of CEAA 2012, including the ones identified in Section 6.2 (Part 2) of these guidelines that may be affected by changes in the environment, as well as species at risk and their critical habitat as per the requirement outlined in section 79 of the Species at Risk Act. Section 5 of CEAA 2012 defines environmental effects as:	EIS Summary EIS Chapter 4, Section 4.3 EIS Chapter 5, Section 5.3.4
	– a change that may be caused to fish and fish habitat, marine plant and migratory birds;	EIS Summary EIS Chapter 4, Section 4.3.1 EIS Chapter 5, Section 5.3 EIS Chapter 10, Section 10.1 EIS Chapter 11; Section 11.1 EIS Chapter 12; Section 12.1
	– a change that may be caused to the environment on federal lands, in another province or outside Canada;	EIS Chapter 1, Section 1.1.2 EIS Chapter 4, Section 4.3.1.1, Appendix 4D, Table 4D-1 EIS Chapter 6, Section 6.6, 6.7.2 EIS Chapter 7, Section 7.6, 7.7.2 EIS Chapter 8, Section 8.6, 8.7.2 EIS Chapter 9, Section 9.6, 9.7.2 EIS Chapter 10, Section 10.6, 10.7.2 EIS Chapter 11, Section 11.6, 11.7.3 EIS Chapter 12, Section 12.6, 12.7.3 EIS Chapter 13, Section 13.6, 13.7.3 EIS Chapter 14, Section 14.6, 14.7.3 EIS Chapter 15, Section 15.2.2, Section 15.6, 15.7.3 EIS Chapter 16, Section 16.6, Section 16.7.2 EIS Chapter 17, Section 17.6, Section 17.7.3 EIS Chapter 18, Section 18.6, Section 18.7.2 EIS Chapter 19, Section 19.6, Section 19.7.3
	– with respect to Aboriginal peoples, an effect of any change that may be caused to the environment on: – health and socio-economic conditions; – physical and cultural heritage; – the current use of lands and resources for traditional purposes; or – any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.	EIS Summary EIS Chapter 4, Section 4.3.1 EIS Chapter 16, Section 16.1 EIS Chapter 17, Section 17.1 EIS Chapter 19, Section 19.1
	– for projects requiring a federal authority to exercise a power or perform a duty or function under another Act of Parliament:	EIS Chapter 1 and EIS Chapter 10
	– a change, other than the ones mentioned above, that may be caused to the environment and that is directly linked or necessarily incidental to the exercise of the federal power or the performance of a duty or function; and	EIS Chapter 10, Section 10.1
	– the effect of that change, other than the effects mentioned above, on: – health and socio-economic conditions, – physical and cultural heritage, or – any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.	EIS Summary EIS Chapter 13, Section 13.1 EIS Chapter 14, Section 14.1 EIS Chapter 16, Section 16.1 EIS Chapter 20, Section 20.1, Appendix 20A-1
	The list of VCs presented in the EIS will be completed according to the evolution and design of the project and reflect the knowledge acquired through public consultation and engagement with Indigenous groups. The EIS will describe what methods were used to predict and assess the adverse environmental effects of the project on these valued components.	EIS Chapter 4, Section 4.3; Section 4.3.1.1

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	The VCs will be described in sufficient detail to allow the reviewer to understand their importance and to assess the potential for environmental effects arising from the project activities. The EIS will provide a rationale for selecting specific VCs and for excluding any VCs or information specified in these guidelines. Challenges may arise regarding particular exclusions, so it is important to document the information and the criteria used to justify the exclusion of a particular VC or piece of information. Justification may be based on, for example, primary data collection, computer modelling, literature references, public participation or engagement with Indigenous groups, or expert input or professional judgement. The EIS will identify those VCs, processes, and interactions that either were identified to be of concern during any workshops or meetings held by the proponent or that the proponent considers likely to be affected by the project. In doing so, the EIS will indicate to whom these concerns are important (i.e. the public or Indigenous groups) and the reasons why, including environmental, cultural, historical, social, economic, recreational, and aesthetic considerations, and traditional knowledge. If comments are received on a component that has not been included as a VC, these comments will be summarized and the rationale for excluding the component will address the comments.	EIS Summary, Section 5 EIS Chapter 3, Section 3.3.6 EIS Chapter 4, Section 4.3.1.1 EIS Chapter 5, Section 5.2; Section 5.3; Section 5.4 EIS Chapter 6, Section 6.0; Section 6.1 EIS Chapter 7, Section 7.0; Section 7.1 EIS Chapter 8, Section 8.0; Section 8.1 EIS Chapter 9, Section 9.0; Section 9.1 EIS Chapter 10, Section 10.0; Section 10.1 EIS Chapter 11, Section 11.0; Section 11.1 EIS Chapter 12, Section 12.0; Section 12.1 EIS Chapter 13, Section 13.0; Section 13.1 EIS Chapter 14, Section 14.0; Section 14.1 EIS Chapter 15, Section 15.0; Section 15.1 Chapter 16, Section 16.0; Section 16.1 EIS Chapter 17, Section 17.0; Section 17.1 EIS Chapter 18, Section 18.0; Section 18.1 EIS Chapter 19, Section 19.0; Section 19.1
3.2.3 Spatial and Temporal Boundaries	The spatial and temporal boundaries used in the EA may vary depending on the VC and will be considered separately for each VC, including for VCs related to the current use of lands and resources for traditional purposes by Aboriginal peoples, or other environmental effects referred to under paragraph 5(1)(c) of CEAA 2012. The proponent is encouraged to consult with the Agency, federal and provincial government departments and agencies, local government and Indigenous groups, and take into account public comments when defining the spatial and temporal boundaries used in the EIS. The EIS will describe the spatial boundaries, including local and regional study areas, of each VC to be used in assessing the potential adverse environmental effects of the project and provide a rationale for each boundary. Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Aboriginal traditional knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations.	EIS Chapter 4, Section 4.3.2 EIS Chapter 6, Section 6.1.4 EIS Chapter 7, Section 7.1.4 EIS Chapter 8, Section 8.1.4 EIS Chapter 9, Section 9.1.4 EIS Chapter 10, Section 10.1.4 EIS Chapter 11, Section 11.1.4 EIS Chapter 12, Section 12.1.4 EIS Chapter 13, Section 13.1.4 EIS Chapter 14, Section 14.1.4 EIS Chapter 15, Section 15.1.4 Chapter 16, Section 16.1.4 EIS Chapter 17, Section 17.1.5 EIS Chapter 18, Section 18.1.4 EIS Chapter 19, Section 19.1.4
	The temporal boundaries of the EA will span all phases of the project determined to be within the scope of this EA as specified under section 3.1 above. Temporal boundaries will be defined taking into account effects predicated after project decommissioning and reclamation, and community knowledge and Aboriginal traditional knowledge. If impacts are predicted after project decommissioning, this should be taken into consideration in defining boundaries. Community knowledge and aboriginal traditional knowledge should factor into decisions around defining temporal boundaries. If the temporal boundaries do not span all phases of the project, the EIS will identify the boundaries used and provide a rationale.	EIS Chapter 2, Section 2.6 EIS Chapter 4, Section 4.3.2 EIS Chapter 6, Section 6.1.4 EIS Chapter 7, Section 7.1.4 EIS Chapter 8, Section 8.1.4 EIS Chapter 9, Section 9.1.4 EIS Chapter 10, Section 10.1.4 EIS Chapter 11, Section 11.1.4 EIS Chapter 12, Section 12.1.4 EIS Chapter 13, Section 13.1.4 EIS Chapter 14, Section 14.1.4 EIS Chapter 15, Section 15.1.4 Chapter 16, Section 16.1.4 EIS Chapter 17, Section 17.1.5 EIS Chapter 18, Section 18.1.4 EIS Chapter 19, Section 19.1.4

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Guideline Section	Guideline Description	Application Section where Manner Addressed
4.0 Preparation and Presentation of the Environmental Impact Statement		
4.1 Guidance	The proponent is encouraged to consult relevant Agency policy and guidance on topics to be addressed in the EIS, and to liaise with the Agency during the planning and development of the EIS. The proponent is also encouraged to consult relevant guidance from other federal departments.	EIS Chapter 3, Section 3.5
	In planning for a mine proposal and in developing the EIS and technical support documentation, the proponent is advised to consider the "Environmental Code of Practice for Metal Mines", published by Environment and Climate Change Canada in 2009. The recommended practices in the Code include the development and implementation of environmental management tools, the management of wastewater and mining wastes, and the prevention and control of environmental releases to air, water and land. In addition, the parameters and approach of the Environmental Effects Monitoring program under the Metal Mining Effluent Regulations (MMER) should be considered when developing a baseline monitoring program for the aquatic environment. For projects requiring the use of natural water bodies frequented by fish for the disposal of mine waste, including tailings and waste rock and for the management of process water, the MMER would need to be amended to add the affected water bodies to Schedule 2 to designate them as tailings impoundment areas. This regulatory process will not be initiated until a detailed assessment of alternatives for mine waste disposal has been undertaken by the proponent. Conducting this robust and thorough assessment of alternatives during the EA will streamline the overall regulatory review process and minimize the time required to proceed with the MMER amendment process. It also facilitates a thorough and transparent review of the assessment of alternatives as part of the EA process. For further guidance, the proponent should consult Environment and Climate Change Canada's Guidelines for the Assessment of Alternatives for Mine Waste Disposal (2011). In the event that the proponent chooses not to conduct an assessment of alternatives for mine waste disposal during the EA stage pursuant to the MMER requirements, the EA under CEAA 2012 will continue. In these circumstances, the proponent should discuss with Environment and Climate Change Canada how the information requirements and consultation associated with the MMER amendment process can be addressed through other means. Submission of regulatory and technical information necessary for federal authorities to make their regulatory decisions during the conduct of the EA is at the discretion of the proponent. Although that information is not necessary for the EA decision, the proponent is encouraged to submit it concurrent with the EIS. While the EIS must outline applicable federal authorizations required for the project to proceed, the proponent must provide information relevant to the regulatory role of the federal government. It should be noted that the issuance of these other applicable federal legislative, regulatory and constitutional requirements are within the purview of the relevant federal authorities, and are subject to separate processes post EA decision.	EIS Chapter 3, Section 3.5.4.1 EIS Chapter 8, Section 8.1.1 and 8.1.2 EIS Chapter 9, Section 9.1.1 and 9.1.2 EIS Chapter 10, Section 10.1.1 and 10.1.2 Volume 4, Appendices G, H, I Volume 5, Appendices D, E, F, and G
4.2 Use of Information		
4.2.1 Government Expert Advice	Section 20 of CEAA 2012 requires that every federal authority with specialist or expert information or knowledge with respect to a project subject to an EA must make that information or knowledge available to the Agency or the review panel. The Agency will advise the proponent of the availability of pertinent information or knowledge or expert and specialist knowledge received from other federal authorities or other levels of government so that it can be incorporated into the EIS.	EIS Chapter 3, Section 3.5.4
4.2.2 Community Knowledge and Aboriginal Traditional Knowledge	Sub-section 19(3) of CEAA 2012 states that "the environmental assessment of a designated project may take into account community knowledge and Aboriginal traditional knowledge". For the purposes of these guidelines, community knowledge and Aboriginal traditional knowledge are types of knowledge acquired and accumulated by a local community or an Indigenous group. The proponent will incorporate into the EIS the community knowledge and Aboriginal traditional knowledge to which it has access or that is acquired through public participation and engagement with Indigenous groups, in keeping with appropriate ethical standards and obligations of confidentiality. Community knowledge and Aboriginal traditional knowledge should be reported as separate types of knowledge in the EIS. The proponent should verify Aboriginal traditional knowledge in the EIS with the affected Indigenous group. The proponent will integrate Aboriginal traditional knowledge into all aspects of its assessment including both methodology (e.g. establishing spatial and temporal boundaries, defining significance criteria) and analysis (e.g. baseline characterization, effects prediction, development of mitigation measures, conducting a Human Health Risk Assessment). Agreement should be obtained from Indigenous groups regarding the use, management and protection of their existing traditional knowledge information during and after the EA. Where existing, the proponent should apply available Indigenous' group written policy or protocol for the collection and sharing of Aboriginal traditional knowledge. If policies or protocols for the collection and sharing of Aboriginal traditional knowledge are not available, the proponent should undertake appropriate practices. For more information on how Aboriginal traditional knowledge can be obtained and incorporated in the preparation of the EIS, please refer to the Agency's reference guide entitled "Considering Aboriginal traditional knowledge in environmental assessments conducted under the Canadian Environmental Assessment Act, 2012".	EIS Chapter 3, Section 3.3 and Appendix 3B EIS Chapter 6, Section 6.1.2 EIS Chapter 7, Section 7.1.2 EIS Chapter 8, Section 8.1.2 EIS Chapter 9, Section 9.1.2 EIS Chapter 10, Section 10.1.2 EIS Chapter 11, Section 11.1.2 EIS Chapter 12, Section 12.1.2 EIS Chapter 13, Section 13.1.2 EIS Chapter 14, Section 14.1.2 EIS Chapter 15, Section 15.1.2 Chapter 16, Section 16.1.2 EIS Chapter 17, Section 17.1.2, Section 17.2.14, and Appendix 17A EIS Chapter 18, Section 18.1.2 EIS Chapter 19, Section 19.1.2

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Guideline Section	Guideline Description	Application Section where Manner Addressed
4.2.3 Existing information	In preparing the EIS, the proponent should consider existing information and previously completed studies relevant to the project, including pre-development, development, closure, reclamation, and post-closure monitoring studies related to the previous construction and operations of mines at the Gordon and MacLellan sites and all their associated developments. When relying on existing information to meet requirements of the EIS Guidelines, the proponent will either include the information directly in the EIS or clearly direct the reader to where it may obtain the information (i.e. through cross-referencing). When relying on existing information, the proponent will also comment on how the data were applied to the project, separate factual lines of evidence from inference, and state any limitations on the inferences or conclusions that can be drawn from the existing information.	EIS Summary EIS Chapter 5 EIS Chapter 6, Section 6.2 EIS Chapter 7, Section 7.2 EIS Chapter 8, Section 8.2 EIS Chapter 9, Section 9.2 EIS Chapter 10, Section 10.2 EIS Chapter 11, Section 11.2 EIS Chapter 12, Section 12.2 EIS Chapter 13, Section 13.2 EIS Chapter 14, Section 14.2 EIS Chapter 15, Section 15.2 EIS Chapter 16, Section 16.2 EIS Chapter 17, Section 17.2 EIS Chapter 18, Section 18.2 EIS Chapter 19, Section 19.2 Volume 4 - Appendices A through R
4.2.4 Confidential Information	In implementing CEAA 2012, the Agency is committed to promoting public participation in the EA of projects and providing access to the information on which EAs are based. All documents prepared or submitted by the proponent or any other stakeholder in relation to the EA are included in the Canadian Environmental Assessment Registry and made available to the public on request. For this reason, the EIS will not contain information that: – is sensitive or confidential (i.e. financial, commercial, scientific, technical, personal, cultural or other nature), that is treated consistently as confidential, and the person affected has not consented to the disclosure; or – may cause substantial harm to a person or specific harm to the environment through its disclosure. The proponent will consult with the Agency regarding whether specific information requested by these guidelines should be treated as confidential.	Alamos acknowledges that documents prepared or submitted by Alamos or other stakeholders may be made available to the public.
4.3 Study Strategy and Methodology	The proponent is expected to respect the intent of these guidelines and to consider the environmental effects that are likely to arise from the project (including situations not explicitly identified in these guidelines), the technically and economically feasible mitigation measures that will be applied, and the significance of any residual effects. Except where specified by the Agency, the proponent has the discretion to select the most appropriate methods to compile and present data, information and analysis in the EIS as long as they are justifiable and replicable.	EIS Summary EIS Chapter 1, Section 1.0 EIS Chapter 4, Section 4.2.1
	It is possible these guidelines may include matters which, in the judgement of the proponent, are not relevant or significant to the project. If such matters are omitted from the EIS, the proponent will clearly indicate it, and provide a justification so the Agency, federal authorities, Indigenous groups, the public and any other interested party have an opportunity to comment on this decision. Where the Agency or the review panel disagrees with the proponent's decision, it will require the proponent to provide the specified information.	The EIS addresses all items in the EIS Guidelines. EIS Summary EIS Chapter 4, Section 4.1
	The assessment will include the following general steps:	EIS Chapter 4, Section 4.2.3
	– identifying the activities and components of the project;	EIS Chapter 2 EIS Chapter 4, Section 4.2.3
	– predicting potential changes to the environment;	EIS Chapter 4, Section 4.2.3
	– predicting and evaluating the likely effects on identified VCs;	EIS Chapter 4, Section 4.2.3
	– identifying technically and economically feasible mitigation measures for any significant adverse environmental effects;	EIS Chapter 4, Section 4.2.3
	– determining any residual environmental effects;	EIS Chapter 4, Section 4.2.3
	– considering cumulative effects of the project in combination with other physical activities that have been or will be carried out; and	EIS Chapter 4, Section 4.2.3
	– determining the potential significance of any residual environmental effect following the implementation of mitigation measures.	EIS Chapter 4, Section 4.2.3

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	For each VC, the EIS will describe the methodology used to assess project-related effects. The EIS could include an analysis of the pathway of the effects of environmental changes on each VC. The EIS will document where and how scientific, engineering, community knowledge and Aboriginal traditional knowledge were used to reach conclusions. Assumptions will be clearly identified and justified. All data, models and studies will be documented such that the analyses are transparent and reproducible. All data collection methods will be specified. The uncertainty, reliability, sensitivity and conservativeness of models used to reach conclusions must be indicated.	EIS Chapter 4, Section 4.2.2; 4.2.3 EIS Chapter 6, Section 6.1.2; Section 6.1.3; Section 6.2 EIS Chapter 7, Section 7.1.2; Section 7.1.3; Section 7.2 EIS Chapter 8, Section 8.1.2; Section 8.1.3; Section 8.2 EIS Chapter 9, Section 9.1.2; Section 9.1.3; Section 9.2 EIS Chapter 10, Section 10.1.2; Section 10.1.3; Section 10.2 EIS Chapter 11, Section 11.1.2; Section 11.1.3; Section 11.2 EIS Chapter 12, Section 12.1.2; Section 12.1.3; Section 12.2 EIS Chapter 13, Section 13.1.2; Section 13.1.3; Section 13.2 EIS Chapter 14, Section 14.1.2; Section 14.1.3; Section 14.2 EIS Chapter 15, Section 15.1.2; Section 15.1.3; Section 15.2 EIS Chapter 16, Section 16.1.2; Section 16.1.3; Section 16.2 EIS Chapter 17, Section 17.1.3; Section 17.1.4; Section 17.2 EIS Chapter 18, Section 18.1.2; Section 18.1.3; Section 18.2 EIS Chapter 19, Section 19.1.2; Section 19.1.3; Section 19.2 Volume 4, Appendices A to R Volume 5, Appendices A to H
	The EIS will identify all significant gaps in knowledge and understanding related to key conclusions, and the steps to be taken by the proponent to address these gaps. Where the conclusions drawn from scientific, engineering and technical knowledge are inconsistent with the conclusions drawn from Aboriginal traditional knowledge, the EIS will present each perspective on the issue (including documentation of Indigenous groups' input) and a statement of the proponent's conclusions.	EIS Chapter 3, Appendix 3A EIS Chapter 4, Section 4.3.4.6 EIS Chapter 6, Section 6.8 EIS Chapter 7, Section 7.8 EIS Chapter 8, Section 8.8 EIS Chapter 9, Section 9.8 EIS Chapter 10, Section 10.8 EIS Chapter 11, Section 11.8 EIS Chapter 12, Section 12.8 EIS Chapter 13, Section 13.8 EIS Chapter 14, Section 14.8 EIS Chapter 15, Section 15.8 EIS Chapter 16, Section 16.8 EIS Chapter 17, Section 17.8 EIS Chapter 18, Section 18.8 EIS Chapter 19, Section 19.8
	The EIS will include a description of the environment (both biophysical and human), including the components of the existing environment and environmental processes, their interrelations as well as the variability in these components, processes and interactions over time scales appropriate to the likely effects of the project. The description will include scientific and Aboriginal traditional knowledge and be sufficiently detailed to characterize the environment before any disturbances to the environment due to the project and to identify, assess and determine the significance of the potential adverse environmental effects of the project. These data should include results from studies done prior to any physical disruption of the environment due to initial site clearing activities. The information describing the existing environment may be provided in a stand-alone EIS Chapter of the EIS or may be integrated into clearly defined sections within the effects assessment of each VC. This analysis will include environmental conditions resulting from historical (e.g. previous mining) and present activities in the local and regional study areas. If the baseline data have been extrapolated or otherwise manipulated to depict environmental conditions in the study areas, modelling methods and equations will be described and will include calculations of margins of error and other relevant statistical information, such as confidence intervals and possible sources of error. The proponent will provide the references used in creating their approach to baseline data gathering, including identifying where appropriate, the relevant federal or provincial standards. The proponent is encouraged to discuss the timeframe and considerations for its proposed baseline data with the Agency and affected Indigenous groups prior to submitting its EIS.	EIS Chapter 4, Section 4.2.2; 4.2.3 EIS Chapter 5 EIS Chapter 6, Section 6.2 EIS Chapter 7, Section 7.2 EIS Chapter 8, Section 8.2 EIS Chapter 9, Section 9.2 EIS Chapter 10,Section 10.2 EIS Chapter 11, Section 11.2 EIS Chapter 12, Section 12.2 EIS Chapter 13, Section 13.2 EIS Chapter 14, Section 14.2 EIS Chapter 15, Section 15.2 EIS Chapter 16, Section 16.2 EIS Chapter 17, Section 17.2 EIS Chapter 18, Section 18.2 EIS Chapter 19, Section 19.2 Volume 4, Appendices A to R Volume 5, Appendices A to H

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	In describing and assessing effects to the physical and biological environment, the proponent will take an ecosystem approach that considers both scientific and community knowledge and Aboriginal traditional knowledge and perspectives regarding ecosystem health and integrity. The proponent will consider the resilience of relevant species populations, communities and their habitats.	EIS Chapter 4 EIS Chapter 10, Section 10.2; Section 10.4 EIS Chapter 11, Section 11.2; Section 11.4 EIS Chapter 12, Section 12.1; Section 12.4
	The assessment of environmental effects on Aboriginal peoples, pursuant to paragraph 5(1)(c) of CEAA 2012, will undergo the same rigor and type of assessment as any other VC (including setting of spatial and temporal boundaries, identification and analysis of effects, identification of mitigation measures, determination of residual effects, identification and a clear explanation of the methodology used for assessing the significance of residual effects and assessment of cumulative effects). The proponent will consider the use of both primary and secondary sources of information regarding baseline information, changes to the environment and the corresponding effect on health, socio-economics, physical and cultural heritage and the current use of lands and resources for traditional purposes. Primary sources of information include traditional land use studies, socio-economic studies, heritage surveys or other relevant studies conducted specifically for the project and its EIS. Often these studies and other types of relevant information are obtained directly from Indigenous groups. Secondary sources of information include previously documented information on the area, not collected specifically for the purposes of the project, or desk-top or literature-based information.	EIS Summary EIS Chapter 3, Section 3.3 EIS Chapter 17, Section 17.2.13 and 17.2.14 Chapter 19
	The proponent will provide Indigenous groups reasonable opportunity to review and provide comments on the information used for describing and assessing effects on Aboriginal peoples, prior to submitting the EIS (further information on engaging with Indigenous groups is provided in Part 2, Section 5 of this document). Where there are discrepancies in the views of the proponent and Indigenous groups on the information to be used in the EIS, the EIS will document these discrepancies and the rationale for the proponent's selection of information.	EIS Summary EIS Chapter 3, Section 3.3 and Appendix 3B EIS Chapter 4, Section 4.3 EIS Chapter 17, Section 17.8 EIS Chapter 19, Section 19.10
	The assessment of the effects of each of the project components and physical activities, in all phases, will be based on a comparison of the biophysical and human environments between the predicted future conditions with the project and the predicted future conditions without the project. In undertaking the environmental effects assessment, the proponent will use best available information and methods. All conclusions will be substantiated and predictions will be based on clearly stated assumptions. The proponent will describe how each assumption has been tested. With respect to quantitative models and predictions, the EIS will document the assumptions that underlie the model, the quality of the data and the degree of certainty of the predictions obtained. For all predictions related to effects on Indigenous groups, the proponent will document Indigenous group involvement.	EIS Chapter 3, Section 3.3 EIS Chapter 4, Section 4.3.4 EIS Chapters 6 through 19 EIS Chapter 20 EIS Chapter 25
4.4 Presentation and Organization of the Environmental Impact Statement	To facilitate the identification of the documents submitted and their placement in the Canadian Environmental Assessment Registry, the title page of the EIS and its related documents will contain the following information: – project name and location; – title of the document, including the term "environmental impact statement"; – subtitle of the document; – name of the proponent; and – date of submission of the EIS.	Title Page
	The EIS will be written in clear, precise language. A glossary defining technical words, acronyms and abbreviations will be included. The EIS will include charts, diagrams, tables, maps and photographs, where appropriate, to clarify the text. Perspective drawings that clearly convey the various components of the project will also be provided. Wherever possible, maps will be presented in common scales and datum to allow for comparison and overlay of mapped features.	A glossary has been provided within the EIS Summary. Tables of acronyms and abbreviations have been provided following the table of contents of each of the EIS Chapters 1 through 25. Charts, diagrams, tables, maps and photographs have been provided throughout the EIS Chapters and in appendices as appropriate. Relevant maps are provided immediately following EIS EIS Chapters and are listed in the Table of Contents of each Chapter. A Master Table of Contents for the entire submission - including table of contents for each EIS Chapter and the supporting document volumes is provided.

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	For purposes of brevity and to avoid repetition, cross-referencing is preferred. The EIS may make reference to the information that has already been presented in other sections of the document, rather than repeating it. Detailed studies (including all relevant and supporting data and methodologies) will be provided in separate appendices and will be referenced by appendix, section and page in the text of the main document. The EIS will explain how information is organized in the document. This will include a table of content with a list of all tables, figures, and photographs referenced in the text. A complete list of supporting literature and references will also be provided. A table of concordance, which cross references the information presented in the EIS with the information requirements identified in the EIS Guidelines, will be provided. The proponent will provide copies of the EIS and its summary for distribution, including paper and electronic version in an unlocked, searchable PDF format, as directed by the Agency.	Cross referencing has been employed throughout the EIS document. Technical Data Reports are provided in Volume 4 and Technical Modelling Reports are provided in Volume 5. These reports have been cross referenced in the relevant EIS Chapters. A comprehensive table of contents has been provided, as well as individual tables of contents in each EIS Chapter. Lists of supporting literature and references have been provided in each EIS Chapter. A table of concordance has been provided. An unlocked, electronic (searchable PDF) copy of the EIS (total of five volumes) has been provided for distribution. Paper copies of the EIS will be available on request per discussion with IAAC.
4.5 Summary of the Environmental Impact Statement	The proponent will prepare a summary of the EIS in both of Canada's official languages (French and English) to be provided to the Agency at the same time as the EIS that will include the followings:	EIS Summary provided in English and in French
	– a concise description of all key components of the project and related activities;	EIS Summary, Section 2.3; Section 2.4
	– a summary of the engagement with Indigenous groups, as verified by each group, and the participation of the public and government agencies, including a summary of the issues raised and the proponent's responses;	EIS Summary, Section 4
	– an overview of expected changes to the environment;	EIS Summary, Section 5
	– an overview of the key environmental effects of the project, as described under section 5 of CEAA 2012, and proposed technically and economically feasible mitigation measures;	EIS Summary, Section 5
	– an overview of how factors under paragraph 19(1) of CEAA 2012 were considered;	EIS Summary, Sections 6 and 7
	– the proponent's conclusions on the residual environmental effects of the project, and the significance of those effects, after taking into account the mitigation measures.	EIS Summary, Section 5
	The summary is to be provided as a separate document and should be structured as follows:	-
	1. Introduction and EA context	EIS Summary, Section 1
	2. Project overview	EIS Summary, Section 2
	3. Alternative means of carrying out the project	EIS Summary, Section 3
	4. Public participation	EIS Summary, Section 4 (Section 4.2)
	5. Engagement with Indigenous Groups	EIS Summary, Section 4 (Sections 4.2 and 4.3)
	6. Summary of environmental effects assessment for each valued component, including: a. description of the baseline	EIS Summary, Section 5
	b. anticipated changes to the environment	EIS Summary, Section 5
	c. anticipated effects	EIS Summary, Section 5
	d. mitigation measures	EIS Summary, Section 5
	e. significance of residual effects	EIS Summary, Section 5
	7. Follow-up and monitoring programs proposed	EIS Summary, Section 9
	The summary will have sufficient details for the reader to understand the project, any potential environmental effects, proposed mitigation measures, and the significance of the residual effects. The summary will include key maps illustrating the project location and key project components.	The EIS summary document has been prepared to contain sufficient details for the reader to understand the project, any potential environmental effects, proposed mitigation measures, and the significance of the residual effects. The EIS Summary Document includes key maps illustrating the project location and key project components.

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
Part 2 - Content of the Environmental Impact Statement		
1.0 Introduction and Overview		
1.1 The Proponent	In the EIS, the proponent will:	
	provide contact information (e.g. name, address, phone, fax, email)	EIS Chapter 1, Section 1.2
	identify itself and the name of the legal entity(ies) that would develop, manage and operate the project	
	describe corporate and management structures	
	specify the mechanism used to ensure that corporate policies will be implemented and respected for the project	
	identify key personnel, contractors, and/or sub-contractors responsible for preparing each section of the EIS	
1.2 Project Overview	The EIS will describe the project, key project components and associated activities, scheduling details, the timing of each phase of the project and other key features. If the project is part of a larger sequence of projects, the EIS will outline the larger context.	EIS Summary, Section 2 EIS Chapter 1, Section 1.1 EIS Chapter 2
	The overview is to identify the key components of the project, rather than providing a detailed description, which will follow in Part 2, Section 3 of this document.	
1.3 Project Location	*The EIS will contain a description of the geographical setting in which the project will take place. This description will focus on those aspects of the project and its setting that are important in order to understand the potential environmental effects of the project. The following information will be included:*	EIS Summary, Section 2.1 EIS Chapter 2, Section 2.1 EIS Chapter 5, Section 5.1
	the Universal Transverse Mercator (UTM) projection coordinates of the main project site	EIS Chapter 1, Section 1.1.1
	current land use in the area	EIS Chapter 1, Section 1.1, EIS Chapter 5, Section 5.4.7.1, EIS Chapter 15, Section 15.2
	distance of the project facilities and components to any federal lands	EIS Chapter 1, Table 1-1
	the environmental significance and value of the geographical setting in which the project will take place and the surrounding area	EIS Chapter 5, Section 5.1
	environmentally sensitive areas, such as national, provincial and regional parks, ecological reserves, wetlands, estuaries, and habitats of federally or provincially listed species at risk and other sensitive areas	EIS Chapter 5 EIS Chapter 22, Maps 22-1 and 22-2 EIS Chapter 15, Section 15.2
	description of local communities	EIS Chapter 5, Section 5.4, EIS Chapter 14, Section 14.2.2
	traditional territories and/or consultation areas, treaty lands, Indian Reserve lands and Métis harvesting regions, locals, and/or settlements (seasonal or permanent)	EIS Chapter 5, Section 5.4.8 EIS Chapter 15, Section 15.2
	traditional and commercial land uses by Indigenous peoples and the significance of the geographical setting to their culture and rights-based practices and role in their cultural landscape	EIS Chapter 5, Section 5.4.8 EIS Chapter 15, Section 15.2 EIS Chapter 17, Section 17.2.14 and Section 17.4
1.4 Regulatory Framework and the Role of the Government	*The EIS will identify:*	
	any federal power, duty or function that may be exercised that would permit the carrying out (in whole or in part) of the project or associated activities	EIS Chapter 1, Section 1.4.2
	legislation and other regulatory approvals that are applicable to the project at the federal, provincial, regional and municipal levels	EIS Chapter 1, Section 1.4
	government policies, resource management plans, planning or study initiatives pertinent to the project and/or EA and their implications	EIS Chapter 1, Section 1.4 EIS Chapter 6, Section 6.1.1 EIS Chapter 7, Section 7.1.1 EIS Chapter 8, Section 8.1.1 EIS Chapter 9, Section 9.1.1 EIS Chapter 10, Section 10.1.1 EIS Chapter 11, Section 11.1.1 EIS Chapter 12, Section 12.1.1 EIS Chapter 13, Section 13.1.1 EIS Chapter 14, Section 14.1.1 EIS Chapter 15, Section 15.1.1 EIS Chapter 16, Section 16.1.1 EIS Chapter 17, Section 17.1.1 EIS Chapter 18, Section 18.1.1 EIS Chapter 19, Section 19.1.1 and 19.9.1.1

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	any treaty, self-government or other agreements between federal or provincial governments and Indigenous groups that are pertinent to the project and/or EA	EIS Chapter 17, Section 17.1.2 and Section 17.2.14 EIS Chapter 19, Section 19.9.2
	any relevant land use plans, land zoning, or community plans (including Indigenous plans)	EIS Chapter 3, Section 3.3.3 EIS Chapter 15, Section 15.1.1.2, Section 15.1.1.3, Section 15.2.2 EIS Chapter 17, Section 17.1.1 and Section 17.2.14 EIS Chapter 19, Section 19.2.2 and 19.9.2
	regional, provincial and/or national objectives, standards or guidelines that have been used by the proponent to assist in the evaluation of any predicted environmental effects	EIS Chapter 6, Section 6.1.1 EIS Chapter 7, Section 7.1.1 EIS Chapter 8, Section 8.1.1 EIS Chapter 9, Section 9.1.1 EIS Chapter 10, Section 10.1.1 EIS Chapter 11, Section 11.1.1, Section 11.2.1.3 EIS Chapter 12, Section 12.1.1 EIS Chapter 13, Section 13.1.1 EIS Chapter 14, Section 14.1.1 EIS Chapter 15, Section 15.1.1 EIS Chapter 16, Section 16.1.1 EIS Chapter 17, Section 17.1.1 EIS Chapter 18, Section 18.1.1 EIS Chapter 19, Section 19.1.1 and Section 19.9.1.1
2.0 Project Justification and Alternatives Considered		
2.1 Purpose of the Project	The EIS will describe the purpose of the project by providing the rationale for the project, explaining the background, the problems or opportunities that the project is intended to satisfy and the stated objectives from the perspective of the proponent. If the objectives of the project are related to broader private or public sector policies, plans or programs, this information will also be included.	EIS Summary, Section 2.2 EIS Chapter 1, Section 1.1 and Section 1.3
	The EIS will also describe the predicted environmental, economic and social benefits of the project. This information will be considered in assessing the justifiability[4] of any significant adverse residual environmental effects as defined in section 5 of CEAA 2012, if such effects are identified	EIS Summary, Section 9 EIS Chapter 24
2.2 Alternative Means of Carrying out the Project	The EIS will identify and consider the environmental effects of alternative means of carrying out the project that are technically and economically feasible. The proponent will complete the assessment of alternative means in accordance with the Agency's Operational Policy Statement entitled "Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012".	EIS Summary, Section 3 EIS Chapter 2, Section 2.9
	In its alternative means analysis, the proponent will address, at a minimum, the following project components:	
	– ore and concentrate transportation (means and routing considered),	EIS Chapter 2, Section 2.9.3.1
	– access to the project site,	EIS Chapter 2, Section 2.9.3.2
	– location of key project components (open pits, pipelines, explosives storage, tailings management facility, central ore milling and processing plant (including consideration of a processing facility at each mining site) ore, low grade ore, waste rock, overburden, top soil stockpiles/storage areas, etc.),	EIS Chapter 2, Section 2.9.3.3
	– ore processing methods/technologies,	EIS Chapter 2, Section 2.9.3.4
	– fuel storage and distribution,	EIS Chapter 2, Section 2.9.3.5
	– power supply,	EIS Chapter 2, Section 2.9.3.6
	– management of water supply and waste water,	EIS Chapter 2, Section 2.9.3.7
	– water management and location of the final effluent discharge points,	EIS Chapter 2, Section 2.9.3.8
	– workforce accommodations and transportation,	EIS Chapter 2, Section 2.9.3.9
	– diversion channel adjustments, and	EIS Chapter 2, Section 2.9.3.10
	– mine waste disposal and final effluent discharge (methods and sites considered).	EIS Chapter 2, Section 2.9.3.11
	The Agency recognizes that projects may be in the early planning stages when the EIS is being prepared. Where the proponent has not made final decisions concerning the placement of project infrastructure, the technologies to be used, or that several options may exist for various project components, the proponent shall conduct an environmental effects analysis at the same level of detail for each of the various options available (alternative means) within the EIS.	EIS Chapter 2, Section 2.9

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Guideline Section	Guideline Description	Application Section where Manner Addressed
3.0 Project Description		
3.1 Project Components	*The EIS will describe the project, by presenting the project components, associated and ancillary works, and other characteristics that will assist in understanding the environmental effects. This will include:*	EIS Summary, Section 2.3 EIS Chapter 2, Section 2.2, Section 2.3, and Section 2.4
	maps, at an appropriate scale, of the project location, the project components, boundaries of the proposed site with UTM coordinates, the major existing infrastructure, adjacent land uses and any important environmental features	EIS Chapter 2 Maps 2-1 and 2-2
	tailings management facility (footprint, location and preliminary designs)	EIS Chapter 2, Section 2.3.2.2 and Map 2-2
	waste rock, overburden, topsoil, low grade ore storage and stock piles (footprint, locations, volumes, development plans and design criteria)	EIS Chapter 2, Section 2.3.1.1, Section 2.3.2.1 and Maps 2-1 and 2-2
	open pits (footprint, location, development plans including pit phases)	EIS Chapter 2, Section 2.3.1.1, Section 2.3.2.1 and Maps 2-1 and 2-2
	crusher, milling, and processing facilities (footprint, technology, location)	EIS Chapter 2, Section 2.3.2.1, Appendix 2A, and Map 2-2
	water management facilities proposed to control, collect and discharge surface drainage and groundwater seepage to the receiving environment from all key components of the mine infrastructure (e.g. pit water and/or underground mine water, mine effluent)	EIS Chapter 2, Section 2.3.1.4 and Section 2.4.2.4 and Maps 2-1 and 2-2
	permanent and temporary linear infrastructures (road, railroad, pipelines, power supply), identifying the route of each of these linear infrastructures, the location and types of structure used for stream crossings	EIS Chapter 2, Section 2.3.1.2 and Section 2.3.2.3 and Maps 2-1 and 2-2
	storage areas for fuels, explosives, and hazardous wastes	EIS Chapter 2, Section 2.3.1.2 and Section 2.3.2.3 and Maps 2-1 and 2-2
	drinking and industrial water requirements (source, quantity required, need for water treatment)	EIS Chapter 2, Section 2.3.1.2 and Section 2.3.2.3 and Maps 2-1 and 2-2
	energy supply (source, quantity)	EIS Chapter 2, Section 2.3.1.2 and Section 2.3.2.3 and Maps 2-1 and 2-2
	waste disposal (types of waste, methods of disposal, quantity)	EIS Chapter 2, Section 2.3.1.3, Section 2.3.2.2, and Section 2.8
3.2 Project Activities	*The EIS will include descriptions of the construction, operation, decommissioning and abandonment associated with the proposed project. This will include:*	EIS Summary, Section 2.3 and Section 2.4 EIS Chapter 2
	descriptions of the activities to be carried out during each phase, the location of each activity, expected material inputs and outputs and an indication of the activity's magnitude and scale	EIS Chapter 2, Section 2.6 and Section 2.7
	The EIS will include a summary of the changes that have been made to the project since originally proposed, including the benefits of these changes to the environment, Indigenous groups, and the public.	EIS Chapter 2, Section 2.9 EIS Chapter 24, Section 24.1
	The EIS will include a schedule including time of year, frequency, and duration for all project activities.	EIS Chapter 2, Section 2.6
3.2.1 Site Preparation and Construction	*The information will include a description of:*	
	removal and use of existing industrial buildings and materials from historic mining	EIS Chapter 2, Section 2.3.1 and Section 2.3.2
	site clearing/grading and excavation	EIS Chapter 2, Section 2.7.2
	explosives manufacture and storage (location and management)	EIS Chapter 2, Section 2.3.1.2, Section 2.3.2.3 and Map 2-2
	blasting (frequency and methods)	EIS Chapter 2, Section 2.7.2.1
	construction of access roads	EIS Chapter 2, Section 2.3.1.2, Section 2.3.2.3, and Section 2.7.2
	any adjustments required to the Provincial Road 391	EIS Chapter 2, Section 2.3.2.3
	borrow materials requirement (source and quantity)	EIS Chapter 2, Section 2.4.1
	water management, including water diversions, stream alterations, watercourse realignments, dewatering or deposition activities required (location, methods, timing)	EIS Chapter 2, Section 2.3.1.4, Section 2.3.2.4, and Section 2.7.2
	equipment requirements (type, quantity) and installation	EIS Chapter 2, Section 2.7.2.1
	administrative buildings, garages, other ancillary facilities	EIS Chapter 2, Section 2.3.1, Section 2.3.2, and Section 2.7.2
	construction camp (location, capacity, wastewater treatment)	EIS Chapter 2, Section 2.3.2.3
	characterization of the workforce, including the number and transportation of employees, work schedules, and workforce accommodations	EIS Chapter 2, Section 2.5, Section 2.3.2.3, and Section 2.9.3.9
	storage and management of hazardous materials, fuels and residues	EIS Chapter 2, Section 2.3.1.3, Section 2.3.2.2, and Section 2.3.2.3
	construction of the tailings management facility	EIS Chapter 2, Section 2.3.2.1
	power supply	EIS Chapter 2, Section 2.3.2.3, Section 2.4.2

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Guideline Section	Guideline Description	Application Section where Manner Addressed
3.2.2 Operation	mining plan, ore production, ore stockpiling, concentrate production	EIS Chapter 2, Section 2.3.1.1, Section 2.3.2.1, and Appendix 2A
	storage, handling, and transport of materials	EIS Chapter 2, Section 2.3.1.1 and Section 2.3.2.1
	effluent management and treatment (quantity, quality, treatment requirement, and release point)	EIS Chapter 2, Section 2.3.1.4, Section 2.3.2.4, Section 2.8.2, Section 2.9.3.8, and Section 2.9.3.11
	explosives manufacture, storage and use (storage location and management)	EIS Chapter 2, Section 2.3.1.2, Section 2.3.2.3 and Map 2-2
	drilling and blasting (frequency and methods)	EIS Chapter 2, Section 2.7.3
	contribution to atmospheric emissions, including emissions profile (type, rate, and source)	EIS Chapter 2, Section 2.8.1
	water management on the project site including mine water, storm water, process water, wastewater, water recycling and effluent treatment (quantity, quality, treatment requirements, withdrawal and release point(s))	EIS Chapter 2, Section 2.8.2
	ore extraction, ore crushing and treatment	EIS Chapter 2, Section 2.3.1.1 and Section 2.3.2.1
	storage, handling, and transportation of reagents, petroleum products, chemical products, hazardous materials and residual materials	EIS Chapter 2, Section 2.3.1.2 and Section 2.3.2.3
	characterization and management of ore, waste rock, low grade ore, overburden and tailings (storage, handling and transport of the volumes generated, mineralogical characterization, potential for metal leaching and acid rock drainage)	EIS Chapter 2, Section 2.3.1.1 and Section 2.3.2.1
	waste management and recycling (other than mine waste such as tailings and waste rock)	EIS Chapter 2, Section 2.7.2.3 and Section 2.7.3
	characterization of the workforce, including the number and transportation of employees, work schedules, and workforce accommodations	EIS Chapter 2, Sections 2.5, Section 2.9.3.11 EIS Chapter 13, Section 13.4.2 EIS Chapter 14, Sections 14.4
3.2.3 Decommissioning and Abandonment	any progressive reclamation and monitoring planned	EIS Chapter 2, Section 2.6 and Section 2.7.4
	the preliminary outline of a decommissioning and reclamation/closure plan for any components associated with the project, including treatment of pre-existing infrastructure, timing, and unplanned premature closure	EIS Chapter 2, Section 2.7.4 EIS Chapter 23, Section 23.5.18 and Appendix 23B
	the ownership, transfer and control of the different project components	EIS Chapter 2, Section 2.7.4
	the responsibility for monitoring and maintaining the integrity of the remaining structures	EIS Chapter 2, Section 2.7.4 EIS Chapter 23, Section 23.5.18 and Appendix 23B
	for permanent structures, a conceptual discussion on how decommissioning and abandonment could occur	EIS Chapter 2, Section 2.7.4 EIS Chapter 23, Section 23.5.18 and Appendix 23B
4.0 Public Participation and Concerns		
	The EIS will describe the ongoing and proposed public participation activities that the proponent will undertake or that it has already conducted on the project. It will provide a description of efforts made to distribute project information and provide a description of information and materials that were distributed during the consultation process.	EIS Summary, Section 4.2 EIS Chapter 3, Section 3.4
	The EIS will indicate the methods used, where the consultation was held, the persons and organizations consulted, the concerns voiced and the extent to which this information was incorporated in the design of the project as well as in the EIS.	EIS Chapter 3, Section 3.2, Section 3.3, Section 3.4, and Tables 3-8, 3-9, and 3-10
5.0 Engagement with Indigenous Groups and Concerns Raised		
	For the purposes of developing the EIS, the proponent will engage with Indigenous groups that may be affected by the project, to obtain and incorporate their views on:	EIS Summary, Section 4.3 EIS Chapter 3, Section 3.3 and Appendix 3B EIS Chapter 4, Section 4.2.2 EIS Chapter 19, Section 19.2.2
	effects of changes to the environment on Aboriginal peoples (health and socio-economic conditions, physical and cultural heritage, including any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, and current use of lands and resources for traditional purposes) pursuant to paragraph 5(1)(c) of CEAA 2012	EIS Chapter 3, Section 3.3.5, Section 3.3.6, and Appendix 3B EIS Chapter 17 EIS Chapter 19
	potential adverse impacts of the project on potential or established section 35 rights, including title and related interests, in respect of the Crown's duty to consult, and where appropriate, accommodate Aboriginal peoples	EIS Chapter 17, Section 17.4, Section 17.5, Section 17.7 EIS Chapter 19, Section 19.9
	With respect to potential adverse impacts of the project on potential or established section 35 rights, including title and related interests, the EIS will document for each group identified in Part 2, Section 5.1 of these guidelines (or in subsequent correspondence from the Agency):	
	potential or established section 35 rights, including title and related interests, when this information is directly provided by a group to the proponent, the Agency or is available through public records, including: geographical extent, nature, frequency and timing of the practice or exercise of the right, and maps and data sets (e.g., fish catch numbers)	EIS Chapter 3, Appendix 3B EIS Chapter 17, Section 17.2.14 and Appendix 17A EIS Chapter 19, Section 19.9
	characterization of changes to date on potential or established section 35 rights	EIS Chapter 19, Section 19.9
	potential adverse impacts of each of the project components and physical activities, in all phases, on potential or established section 35 rights, including title and related interests. This assessment is to be based on a comparison of the exercise of the identified rights, title and related interests between the predicted future conditions with the project and the predicted future conditions without the project. Include the perspectives of potentially impacted groups and document Indigenous groups' involvement	EIS Chapter 17, Section 17.4, Section 17.5, Section 17.7 EIS Chapter 19, Section 19.5, Section 19.6, Section 19.7, and Section 19.9

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	measures identified to accommodate potential adverse impacts of the project on the potential or established section 35 rights, including title and related interests. These measures will be written as specific commitments that clearly describe how the proponent intends to implement them, and may go beyond mitigation measures that are developed to address potential adverse environmental effects	EIS Chapter 17, Section 17.4 EIS Chapter 19, Section 19.5, Section 19.6, Section 19.7, Section 19.9, Section 19.10, and Section 19.11
	potential adverse impacts on potential or established section 35 rights, including title and related interests that have not been fully mitigated or accommodated as part of the EA and associated engagement with Indigenous groups. The proponent will also take into account the potential adverse impacts that may result from the residual and cumulative environmental effects. Include the perspectives of potentially affected groups where these were provided to the proponent by the groups	EIS Chapter 17, Section 17.4, Section 17.5, and Section 17.7 EIS Chapter 19, Section 19.5, Section 19.6, Section 19.7, and Section 19.9
	VCs suggested by Indigenous groups for inclusion in the EIS, whether they were included, and the rationale for any exclusions	EIS Chapter 3, Section 3.3.5 and Section 3.3.6 EIS Chapter 19, Section 19.1.2 The issues raised during Indigenous engagement have been covered in the proposed list of VCs.
	specific suggestions raised by Indigenous groups for mitigating the effects of changes to the environment on Indigenous peoples or accommodating potential adverse impacts of the project on existing Aboriginal and Treaty rights	EIS Chapter 3, Section 3.3.6 EIS Chapter 19, Sections 19.4
	In terms of gathering views from potentially affected groups with respect to both environmental effects of the project and the potential adverse impacts of the project on potential or established section 35 rights, including title and related interests, the EIS will document:	
	VCs and related spatial and temporal boundaries suggested by groups for inclusion in the EIS, whether they were included, and the rationale for any exclusions	EIS Chapter 3, Section 3.3.5, Section 3.3.6, and Section 3.3.7 EIS Chapter 4, Section 4.3.2
	specific suggestions raised by each group for mitigating the effects of changes to the environment on Aboriginal peoples or accommodating potential adverse impacts of the project on potential or established section 35 rights, including title and related interests	EIS Chapter 3, Section 3.3.5 and Section 3.3.6 EIS Chapter 19, Section 19.4, 19.9
	views expressed by each group on the effectiveness of the mitigation or accommodation measures	EIS Chapter 3, Section 3.3.5, Section 3.3.6, and Section 3.3.7; Appendix 3A
	from the proponent's perspective, any potential cultural, social and/or economic impacts or benefits to each group identified that may arise as a result of the project. Include the perspectives of potentially affected groups where these were provided to the proponent by the groups	EIS Chapter 3, Section 3.4.4.3 EIS Chapter 13, Section 13.4.2, Section 13.4.3, and Section 13.4.4 EIS Chapter 14, Section 14.4.5 EIS Chapter 19, Section 19.4.4 EIS Chapter 24
	any other comments, specific issues and concerns raised by potentially affected groups and how they were responded to or addressed	EIS Chapter 3, Section 3.3.6 EIS Chapter 6, Section 6.1.2 EIS Chapter 7, Section 7.1.2 EIS Chapter 8, Section 8.1.2 EIS Chapter 9, Section 9.1.2 EIS Chapter 10, Section 10.1.2 EIS Chapter 11, Section 11.1.2 EIS Chapter 12, Section 12.1.2 EIS Chapter 13, Section 13.1.2 EIS Chapter 14, Section 14.1.2 EIS Chapter 15, Section 15.1.2 EIS Chapter 16, Section 16.1.2 EIS Chapter 17, Section 17.1.3 EIS Chapter 18, Section 18.1.2 EIS Chapter 19, Section 19.1.2 EIS Chapter 21, Section 21.1.1 EIS Chapter 22, Section 22.3 EIS Chapter 23, Section 23.4
	changes made to the project design and implementation directly as a result of discussions with potentially affected groups	
	where and how Aboriginal traditional knowledge was incorporated into the environmental effects assessment (including methodology, baseline conditions and effects analysis for all VCs) and the consideration of potential adverse impacts on potential or established section 35 rights, including title and related interests, and related mitigation measures	
	any additional issues and concerns raised by potentially affected groups in relation to the environmental effects assessment and the potential adverse impacts of the project on potential or established section 35 rights, including title and related interests	
	The EIS will include a tracking table of key issues raised by each group, including the concerns raised related to the project, proposed mitigation measures, and where appropriate, a reference to the proponent's analysis in the EIS. Information provided related to potential adverse impacts on potential or established section 35 rights will be considered by the Crown in meeting its common law duty to consult obligations as set out in the Updated Guidelines for Federal Officials to Fulfill the Duty to Consult (2011)	EIS Chapter 3, Section 3.3.6 and Table 3-8
5.1 Indigenous Groups and Engagement Activities	*With respect to engagement activities, the EIS will document:*	EIS Summary, Section 4 EIS Chapter 3
	the engagement activities undertaken with each group prior to the submission of the EIS, including the date and means of engagement (e.g. meeting, mail, telephone)	EIS Chapter 3, Section 3.3 and Appendix 3B (engagement logs)
	any future planned engagement activities	EIS Chapter 3, Section 3.3.7 and Appendix 3A (Ongoing Engagement Plan)
	how engagement activities by the proponent allowed groups to understand the project and evaluate its effects on their communities, activities, potential or established section 35 rights, including title and related interests	EIS Chapter 3, Section 3.3 and Appendix 3B (engagement logs) EIS Chapter 19, Section 19.9
	In preparing the EIS, the proponent will ensure that groups have access to timely and relevant information on the project and how the project may adversely impact them. The proponent will structure its engagement activities to provide adequate time for groups to review and comment on the relevant information. Engagement activities are to be appropriate to the groups' needs, arranged through discussions with the groups and in keeping with established consultation protocols, where available	EIS Chapter 3, Section 3.3.4 and Appendix 3B
	The EIS will describe all efforts, successful or not, taken to solicit the information required from groups to support the preparation of the EIS	EIS Chapter 3, Section 3.3.4 and Appendix 3B

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	The proponent will ensure that views of groups are recorded and that groups are provided with opportunities to validate the interpretation of their views. The proponent will keep detailed tracking records of its engagement activities, recording all interactions with groups, the issues raised by each group and how the proponent addressed the concerns raised. The proponent will share these records with the Agency	EIS Summary, Section 4.2 and Section 4.3 EIS Chapter 3, Section 3.3.4, Appendix 3A and 3B EIS Chapter 19, Section 19.1.1.3
	For the groups expected to be most affected by the project, the proponent is expected to strive towards developing a productive and constructive relationship based on on-going dialogue with the groups in order to support information gathering and the effects assessment. These groups include:	
	Marcel Colomb First Nation	EIS Chapter 3, Section 3.3.5.1 and Appendix 3B
	Mathias Colomb Cree Nation	EIS Chapter 3, Section 3.3.5.2 and Appendix 3B
	Nisichawayasihk Cree Nation	EIS Chapter 3, Section 3.3.5.3 and Appendix 3B
	O-Pipon-Na-Piwin Cree Nation	EIS Chapter 3, Section 3.3.5.4 and Appendix 3B
	Manitoba Metis Federation	EIS Chapter 3, Section 3.3.5.5 and Appendix 3B
	Peter Ballantyne Cree Nation	EIS Chapter 3, Section 3.3.5.6 and Appendix 3B
	Barren Lands First Nation	EIS Chapter 3, Section 3.3.5.7 and Appendix 3B
	For the above groups, the proponent will strive to use primary data sources and hold face-to-face meetings to discuss concerns. The proponent will facilitate these meetings by making key EA summary documents (baseline studies, EIS, key findings, plain language summaries) accessible in advance. The proponent will ensure there are sufficient opportunities for individuals and groups to provide oral input in the language of their choice. Upon receipt, the proponent should consider translating information for these groups into the appropriate Indigenous languages(s) in order to facilitate engagement activities during the EA	
	For groups that may also be affected by the project, but to a lesser degree, the proponent will ensure these groups are notified about key steps in the EIS development process and of opportunities to provide comments on key EA documents and/or information to be provided regarding their community. The proponent will still ensure these groups are reflected in the baseline information and assessment of potential effects or impacts in the EIS. These groups include:	
	Métis Nation – Saskatchewan Northern Region 1	EIS Chapter 3, Section 3.3.5.8 and Appendix 3B
	Métis Nation – Saskatchewan Eastern Region 1	EIS Chapter 3, Section 3.3.5.9 and Appendix 3B
	Hatchet Lake First Nation	EIS Chapter 3, Section 3.3.5.10 and Appendix 3B
	Northlands Denesuline First Nation	EIS Chapter 3, Section 3.3.5.11 and Appendix 3B
	Sayisi Dene First Nation	EIS Chapter 3, Section 3.3.5.12 and Appendix 3B
	Pickerel Narrows Cree Nation	EIS Chapter 3, Section 3.3.2
	The groups referenced above may change as more is understood about the environmental effects of the project and/or if the project or its components change during the EA. The Agency reserves the right to alter the list of groups that the proponent will engage as additional information is gathered during the EA. Upon receipt of knowledge or information of potential effects or adverse impacts to a group not listed above, the proponent shall provide that information to the Agency at the earliest opportunity	EIS Chapter 3, Section 3.3, Appendix 3A and Chapter 19, Section 19.1.1.3
6.0 Effects Assessment		
6.1 Project Setting and Baseline Conditions	Based on the scope of the project described in Section 3 (Part 1), the EIS will present baseline information in sufficient detail to enable the identification of how the project could affect the VCs and an analysis of those effects. Include the consideration of historical mining activities at the Project sites (e.g. historical mine tailings and contamination, its management, and contribution as a source of environmental impacts). Should other VCs be identified during the conduct of the EA, the baseline condition for these components will also be described in the EIS. To determine the appropriate spatial and temporal boundaries to describe the baseline information, refer to Section 3.2.3 (Part 1) of these guidelines. As a minimum, the EIS will include a description of the following environmental components	EIS Chapter 5, Section 5.2, Section 5.3, Section 5.4 EIS Chapter 6, Section 6.2 EIS Chapter 7, Section 7.2 EIS Chapter 8, Section 8.2 EIS Chapter 9, Section 9.2 EIS Chapter 10, Section 10.2 EIS Chapter 11, Section 11.2, 11.2.2 EIS Chapter 12, Section 12.2, 12.2.2.5 EIS Chapter 13, Section 13.2 EIS Chapter 14, Section 14.2 EIS Chapter 15, Section 15.2 EIS Chapter 16, Section 16.2 EIS Chapter 17, Section 17.2 EIS Chapter 18, Section 18.2 EIS Chapter 19, Section 19.2 Volume 4, Appendices A through R (Baseline (2017) TDRs and Baseline TDR Validation (2020) Reports

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
6.1.1 Atmospheric Environment	a baseline survey of ambient air quality in the project areas and in the airshed likely to be affected by the project, for the mine sites, by identifying and quantifying emission sources for, but not limited to, the following contaminants in concentration units comparable to guidelines (i.e. $\mu g/m^3$):	EIS Summary, Section 5.4 EIS Chapter 5, Section 5.2.2 EIS Chapter 6, Section 6.2.1, Section 6.2.1.2, and Section 6.2.2 Volume 4, Appendix A - Air Quality Baseline TDRs
	total suspended particulates, fine particulates smaller than 2.5 microns (PM2.5), respirable particulates of less than 10 microns (PM10), diesel particulate matter, carbon monoxide (CO), sulphur oxides (SOx), nitrogen oxides (NOx), and volatile organic compounds (VOCs)	EIS Summary, Section 5.4 EIS Chapter 5, Section 5.2.2 EIS Chapter 6, Section 6.2.1.2 and Section 6.2.2.2 Volume 4, Appendix A - Air Quality Baseline TDRs
	identify and quantify existing greenhouse gas emissions by individual pollutant measured as kilotonnes of CO2 equivalent per year in the project study areas	EIS Summary, Section 5.4.1 EIS Chapter 5, Section 5.2.2 EIS Chapter 6, Section 6.2.2.3, 6.4.1.2, Table 6-13 through Table 6-20 Volume 5, Appendix A
	direct and indirect sources of air emissions	EIS Chapter 5, Section 5.2.2 EIS Chapter 6, Section 6.2.2.2, Volume 4, Appendix A - Air Quality Baseline TDRs
	current provincial/territorial/federal limits for greenhouse gas emission targets	EIS Chapter 5, Section 5.2.2 EIS Chapter 6, Section 6.1.1.2
	current ambient day-time and night-time noise and vibration levels at key receptor points (e.g. Indigenous groups or communities) or priority areas as described by Indigenous groups, including the results of a baseline ambient noise survey. Information on typical sound sources, geographic extent and temporal variations will be included	EIS Chapter 5, Section 5.2.3 EIS Chapter 7, Section 7.2
	existing ambient night-time light levels at the project site and at any other areas where project activities could have an effect on light levels. The EIS will describe night-time illumination levels during different weather conditions and seasons	EIS Chapter 5, Section 5.2.4 Volume 4, Appendix B - Ambient Lighting Baseline TDRs Volume 5, Appendix B
	historical records of relevant meteorological information (e.g. total precipitation (rain and snow), mean, maximum and minimum temperatures, and typical wind speed and direction)	EIS Chapter 5, Section 5.2.1 EIS Chapter 6, Section 6.2.2.1, Tables 6-5 and 6-6 Volume 4, Appendix C - Climate and Meteorology Baseline TDRs
6.1.2 Geology and Geochemistry	the bedrock and host rock geology of the deposit, including a table of geologic descriptions, geological maps and cross-sections of appropriate scale	EIS Summary, Section 5.1 EIS Chapter 5, Section 5.2.5 EIS Chapter 8, Section 8.2.2.1 Volume 4, Appendix E - Soil and Terrain Baseline TDRs Volume 4, Appendix H - Hydrogeology Baseline TDRs
	the geomorphology, topography and geotechnical characteristics of areas proposed for construction of major project components	EIS Chapter 5, Section 5.2.5 EIS Chapter 8, Section 8.2.2.1 Volume 4, Appendix E - Soil and Terrain Baseline TDRs Volume 4, Appendix H - Hydrogeology Baseline TDRs
	the geochemical characterization of expected mine material such as waste rock, ore, low grade ore, tailings, overburden and potential construction material in order to predict metal leaching and acid rock drainage including oxidation of primary sulphides and secondary soluble sulphate minerals	EIS Chapter 5, Section 5.2.6 EIS Chapter 8, Section 8.4.3.3 Volume 4, Appendix F - Geochemistry Baseline TDRs Volume 5, Appendices D and E
	geological hazards that exist in the areas planned for the project facilities and infrastructure, including:	
	history of seismic activity in the area	EIS Summary, Section 6.2 EIS Chapter 21, Section 21.4.2.1 and Figure 21A-1
	isostatic rise or subsidence	EIS Chapter 21, Section 21.4.2 Volume 4, Appendix E - Soil and Terrain Baseline TDRs (Sections 4.2.1.3, 5.1.1)
	landslides, slope erosion and the potential for ground and rock instability, and subsidence during and following project activities	EIS Chapter 5, Section 5.2.5.3 EIS Chapter 21, Section 21.4.2 Volume 4, Appendix E - Soil and Terrain Baseline TDRs (Sections 4.2.1.2, 5.1.1)
	baseline concentrations of contaminants of concern within the local, regional and downstream receiving environments	EIS Chapter 8, Section 8.2.2.6 EIS Chapter 9, Section 9.2.2.2
	geochemical characterization of leaching potential, including, but not limited to, contaminants of concern from waste rock, pit walls, ore stockpiles, and tailings	EIS Chapter 5, Section 5.2.6 EIS Chapter 8, Section 8.4.3.3 EIS Chapter 9, Section 9.2.2.2 Volume 4, Appendix F - Geochemistry Baseline TDRs Volume 5, Appendices D and E

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Guideline Section	Guideline Description	Application Section where Manner Addressed
6.1.3 Topography and Soil	baseline mapping and description of landforms and soils (including soil chemistry), within the local and regional project areas	EIS Summary, Section 5.1 EIS Chapter 5, Section 5.2.5 Volume 4, Appendix E - Soil and Terrain Baseline TDRs (Appendix A)
	maps depicting soil depth by horizon and soil order within the mine site areas to support soil salvage and reclamation efforts, and to outline potential for soil erosion	EIS Chapter 5, Section 5.2.5 Volume 4, Appendix E - Soil and Terrain Baseline TDRs (Appendix A, Appendix B)
	suitability of topsoil and overburden for use in the rehabilitation of disturbed areas	EIS Chapter 5, Section 5.2.5.4 EIS Chapter 23, Appendix 23B Volume 4, Appendix E - Soil and Terrain Baseline TDRs (Section 4.2.2.2.2, Appendix A)
	permafrost conditions including distribution of frozen and unfrozen ground, thermal conditions	EIS Chapter 5, Section 5.2.5 Volume 4, Appendix E - Soil and Terrain Baseline TDRs (Section 4.2.1.3)
	(ground temperatures), ground ice, thaw sensitivity and active layer thickness	EIS Chapter 5, Section 5.2.5.3 Volume 4, Appendix E - Soil and Terrain Baseline TDRs (Section 4.2.1.3)
	maps depicting permafrost conditions within the local and regional study areas, including transport routes to be used by the project	EIS Chapter 5, Section 5.2.5 and Maps 5-5 and 5-6 Volume 4, Appendix E - Soil and Terrain Baseline TDRs (Appendix A, Maps 10-12)
	the potential for thaw settlement and terrain instability associated with ground thawing	EIS Chapter 5, Section 5.2.5.3 and Maps 5-5 and 5-6 Volume 4, Appendix E - Soil and Terrain Baseline TDRs (Section 4.2.1.3)
6.1.4 Riparian, Wetland and Terrestrial Environments	characterization of soils in the excavation area, in terrestrial and riparian environments, with a description of their past use	EIS Chapter 5, Section 5.2.5.4
	topography, drainage, geology and hydrogeology, and the physicochemical characteristics of potential on-land sediment or soil disposal sites	EIS Chapter 5, Section 5.2.5.4
	characterization of the shoreline, banks, current and future flood risk areas, and wetlands (fens, marshes, peatlands, mudflats and eelgrass beds, etc.), including the location and extent of wetlands likely to be affected by project activities according to their size, type (class and form), the description of their ecological function (ecological, hydrological, wildlife, socioeconomic, etc.) and species composition[10]	EIS Chapter 9, Section 9.2.2.1 EIS Chapter 10, Section 10.2.2.2
	plant and animal species (abundance, distribution and diversity) and their habitats, with a focus on species at risk or with special status that are of social, economic, cultural or scientific significance, as well as invasive alien species and species used for traditional purposes by Indigenous groups	EIS Chapter 11, Section 11.2.2 EIS Chapter 12, Section 12.2.2 EIS Chapter 17, Section 17.2.14
6.1.5 Groundwater and Surface Water	*hydrogeology, including:*	
	hydrogeological context (e.g., hydrostratigraphy with aquifers and aquitards, major faults, etc.), including the delineation of key stratigraphic and hydrogeologic boundaries	EIS Summary, Section 5.6 EIS Chapter 5, Section 5.2.7 EIS Chapter 8, Section 8.1.4, 8.2.2 Volume 4, Appendix H - Hydrogeology Baseline TDRs Volume 5, Appendices F and G
	physical properties of the hydrogeological units (e.g. hydraulic conductivity, transmissivity, saturated thickness, storativity, porosity, specific yield)	EIS Chapter 8, Section 8.2.2 Volume 4, Appendix H - Hydrogeology Baseline TDRs Volume 5, Appendices F and G
	groundwater flow patterns and rates	EIS Chapter 8, Section 8.2.2.4 Volume 4, Appendix H - Hydrogeology Baseline TDRs Volume 5, Appendices F and G
	a discussion of the hydrogeologic, hydrologic, geomorphic, climatic and anthropogenic controls on groundwater flow	EIS Chapter 8, Section 8.2.2.4, Section 8.4.2 Volume 4, Appendix H - Hydrogeology Baseline TDRs Volume 5, Appendices F and G
	temporal changes in groundwater flow (e.g. seasonal and long term changes in water levels)	EIS Chapter 8, Section 8.2.2.4,Section 8.4.2 Volume 4, Appendix H - Hydrogeology Baseline TDRs (Figures 1 and 4) Volume 5, Appendices F and G
	a delineation and characterization of groundwater - surface water interactions including temperature and the locations of groundwater discharge to surface water and surface water recharge to groundwater	EIS Chapter 8, Section 8.2.2.4, Section 8.2.2.5, and Section 8.4.2.3 EIS Chapter 9, Section 9.4.2 Volume 4, Appendices G and H - Hydrology and Hydrogeology Baseline TDRs Volume 5, Appendices F and G
	temperature changes in surface water as a result of groundwater-surface water interactions	EIS Chapter 9, Section 9.4.1 and Section 9.4.2
	changes to surface water quality, including seasonal changes in runoff entering watercourses	EIS Chapter 8, Section 8.4.3 EIS Chapter 9, Section 9.4.2
	in permafrost regions, describe configuration of frozen ground and taliks and the influence on groundwater flow	EIS Chapter 5, Section 5.2.5.3 EIS Chapter 8, Section 8.2.2.4

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	hydrogeological maps and cross-sections for the mine area to outline the extent of aquifers and aquitards, including bedrock fracture and fault zones, locations and depths of wells and strainers, groundwater types springs, surface waters, and project facilities. Groundwater levels, potentiometric contours, flow directions, groundwater divides and areas of recharge and discharge should be included	EIS Chapter 8, Maps 8-1 and 8-2 Volume 4, Appendix H - Hydrogeology Baseline TDRs Volume 5, Appendices F and G
	all groundwater monitoring wells, including their location, in respect to the project area, including geologic, hydrostratigraphic, piezometric and construction data (e.g. depths of surficial rock and bedrock, bedrock quality, fracture zones, piezometric levels, hydraulic conductivity, diameter and screen depth and intercepted aquifer unit)	EIS Chapter 8, Section 8.2.2 and Section 8.4 Volume 4, Appendix H - Hydrogeology Baseline TDRs
	monitoring protocol for collection of existing groundwater and surface water data	EIS Chapter 8, Section 8.2.1 EIS Chapter 9, Section 9.2.1 Volume 4, Appendix H - Hydrogeology Baseline TDRs
	an appropriate hydrogeologic model for the project area, which discusses the hydrostratigraphy and groundwater flow systems, a sensitivity analysis will be performed to test model sensitivity to climatic variations (e.g. recharge) and hydrogeologic parameters (e.g. hydraulic conductivity)	EIS Chapter 8, Section 8.1.4.1 and Section 8.2.1.2 Volume 5, Appendices F and G
	groundwater quality, including lab analytical results for metals, major ions and physical parameters, including temperature, with the interpretation of results for any anomalous values and for contaminants of concern	EIS Chapter 8, Section 8.2.2.6 Volume 4, Appendix H - Hydrogeology Baseline TDRs
	graphs or tables indicating the seasonal variations in groundwater levels, flow regime, and quality	EIS Chapter 8, Section 8.2.2.4 Volume 4, Appendix H - Hydrogeology Baseline TDRs
	local and regional potable groundwater supplies, including their current use and potential for future use	EIS Chapter 8, Section 8.2.2.2
	bedrock fracture sizes and orientations in relation to groundwater flow	EIS Chapter 8, Section 8.2.2.3 Volume 4, App. H Hydrogeology Baseline TDR and Validation TDR
	the delineation of drainage basins, at appropriate scales (water bodies and watercourses), including intermittent streams, flood risk areas and wetlands, boundaries of the watershed and subwatersheds, overlaid by key project components	EIS Chapter 9, Section 9.1.4 EIS Chapter 11, Maps 11-3a, 11-3b, and 11-3c
	hydrological regimes, including monthly, seasonal and annual water flow (discharge) data	EIS Chapter 9, Section 9.2.1 Volume 4, Appendix G - Hydrology Baseline TDRs
	for each affected water body, the total surface area, bathymetry, maximum and mean depths, water level fluctuations, type of substrate (sediments)	EIS Chapter 9, Section 9.2.2 EIS Chapter 10, Section 10.2.2.2 Volume 4, Appendix K - Sediment Quality and Lower Trophic Community Baseline TDRs Volume 4, Appendix G - Hydrology Baseline TDRs
	seasonal surface water quality, including analytical results (e.g. water temperature, turbidity, pH, dissolved oxygen profiles, metals, major ions, and nutrients) and interpretation for representative tributaries and water bodies including all sites to receive mine effluents or runoff	EIS Chapter 9, Section 9.2.2 Volume 4, Appendix G - Hydrology Baseline TDRs Volume 5, Appendices D and E
	any local and regional potable surface water resource	EIS Chapter 9, Section 9.4.1.1
	sediment quality analysis (e.g. total metals, particle size, and total organic carbon content) for key sites likely to receive mine effluents	EIS Chapter 10, Section 10.2.2 Volume 4, Appendix K - Sediment Quality and Lower Trophic Community Baseline TDRs
6.1.6 Fish and Fish Habitat	*For potentially affected surface waters:*	
	a characterization of fish populations on the basis of species and life stage, abundance, distribution, and movements, including information on the surveys carried out and the source of data available (e.g. location of sampling stations, catch methods, date of catches, species, catch per-unit effort)	EIS Summary, Section 5.8 EIS Chapter 5, Section 5.3.1 EIS Chapter 10, Section 10.2.2.3 Volume 4, Appendix J - Fish, Fish Habitat and Fish Tissue TDRs
	a description of primary and secondary productivity of aquatic resources (e.g. benthic communities, feeder species, aquatic plants) in terms of abundance and distribution in affected water bodies with a characterization of season variability	EIS Chapter 10, Section 10.2.2.3 Volume 4 - Appendices J and K - Fish and Sediment Baseline TDRs
	a list of any fish or invertebrate species at risk that are known to be present	EIS Chapter 10, Section 10.2.2.5 Volume 4, Appendices J and K - Fish and Sediment Baseline TDRs
	a description of the habitat by homogeneous section, including the length of the section, width of the channel from the high water mark (bankful width), water depths, type of substrate (sediments), aquatic and riparian vegetation, habitat types and functions, cover components, and photos	EIS Chapter 10, Section 10.2.1 Volume 4, Appendix J - Fish, Fish Habitat and Fish Tissue TDRs
	a description of natural obstacles (e.g. falls, beaver dams) or existing structures (e.g. water crossings) that hinder the free passage of fish	EIS Chapter 10, Section 10.2.2.2.2
	a description of any existing effects associated with previous or current activities (e.g. culvert installation, historic mine activities, angling pressures)	EIS Chapter 10, Section 10.2.2.2.2
	maps, at a suitable scale, indicating the surface area of potential or confirmed fish habitat for spawning, rearing, nursery, feeding, overwintering, migration routes, etc. Where appropriate, this information should be linked to water depths (bathymetry) to identify the extent of a water body's littoral zone	EIS Chapter 10, Section 10.2.2, and Maps 10-4 through 10-18
	the description and location of suitable habitats for fish species at risk that appear on federal and provincial lists and that are found or are likely to be found in the study area	EIS Chapter 10, Section 10.2.2.5
	Note that certain intermittent streams or wetlands may constitute fish habitat or contribute indirectly to fish habitat. The absence of fish at the time of the survey does not irrefutably indicate an absence of fish habitat	EIS Chapter 10, Section 10.2.1.2 and 10.2.2.2

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Guideline Section	Guideline Description	Application Section where Manner Addressed
6.1.7 Migratory Birds and Their Habitat	birds and their habitats that are found or are likely to be found in the study area. This description may be based on existing sources, but supporting evidence is required to demonstrate that the data used are representative of the avifauna and habitats found in the study area. The existing data must be supplemented by surveys, as appropriate, to ensure current data for the project area	EIS Chapter 12, Section 12.2.2.1 Volume 4, Appendix N - Bird Baseline TDRs
	abundance, distribution, and life stages of migratory and non-migratory birds (including waterfowl, raptors, shorebirds, marsh birds and other land birds) likely to be affected in the project area based on existing information, or surveys, as appropriate, to provide current field data for the project area	EIS Chapter 12, Section 12.2.2.1, Appendix 12A Volume 4, Appendix N - Bird Baseline TDRs
	characterization of various ecosystems found in the project area, likely to be affected, based on existing information (land cover types, vegetation)	EIS Chapter 11, Sections 11.2.2, Appendix 11A, EIS Chapter 12, Section 12.2.2 Volume 4, Appendices L, M, N, and O - Vegetation, Mammal, Bird and Amphibian TDRs
	year-round migratory bird use of the area (e.g. winter, spring migration, breeding season, fall migration), based on preliminary data from existing sources and surveys, as appropriate, to provide current field data	EIS Chapter 12, Section 12.2.2.1 Volume 4, Appendix N - Bird Baseline TDRs
6.1.8 Species at Risk	a list of all potential or known Species at Risk Act listed species at risk (fauna and flora) that may be affected by the project, using existing data and literature as well as surveys to provide current field data	EIS Summary, Section 5.8, Section 5.9, and Section 5.10 EIS Chapter 10, Section 10.2.2.5 EIS Chapter 11, Section 11.2.2 EIS Chapter 12, Section 12.2.2.2, Table 12-8 Volume 4, Appendix L - Vegetation Baseline TDR (Table 4-1)
	a list of all species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as extirpated, endangered, threatened or of special concern, using existing data and literature as well as surveys to provide current field data	EIS Chapter 10, Section 10.2.2.5 EIS Chapter 11, Section 11.2.2.2 EIS Chapter 12, Table 12-8 Volume 4 - Appendices M, N, and O - Mammal, Bird and Amphibian TDRs
	any published studies that describe the regional importance, abundance and distribution of species at risk including recovery strategies or plans. The existing data must be supplemented by surveys, as appropriate, to provide current field data	EIS Chapter 10, 10.2.2.5 EIS Chapter 11, Section 11.2.2 EIS Chapter 12, Table 12-4 Volume 4 - Appendices M, N, and O - Mammal, Bird and Amphibian TDRs
	information on residences, seasonal movements, movement corridors, habitat requirements, key habitat areas, identified critical habitat and/or recovery habitat (where applicable) and general life history of species at risk that may occur in the project area, or be affected by the project	EIS Chapter 10, Section 10.2.2.5 EIS Chapter 12, Section 12.2.2
6.1.9 Indigenous Peoples	*With respect to potential effects of changes to the environment caused by the project on Indigenous peoples and the related VCs, baseline information will be provided for each group identified in Section 5 (Part 2) of these guidelines (and any groups identified after these guidelines are finalized).*	EIS Summary, Section 5.15 and Section 5.17 EIS Chapter 19, Section 19.2
	Baseline information will describe and characterize the elements in paragraph 5(1)(c) of CEAA 2012 based on the spatial and temporal scope selected for the EA according to the factors outlined in Part 1, Section 3.3.3 of this document.	EIS Summary, Section 5.15 and Section 5.17 EIS Chapter 19, Section 19.1.3, Section 19.1.4, and Section 19.3
	Baseline information will characterize the regional context of each of the elements of paragraph 5(1)(c) of CEAA 2012 to support the assessment of project related effects and cumulative effects.	EIS Chapter 19, Section 19.2
	Baseline information will be sufficient to provide a comprehensive understanding of the current state of each VC.	EIS Chapter 19, Section 19.2
	Baseline information for current use of lands and resources for traditional purposes will focus on the traditional activity (including hunting, fishing, trapping, plant gathering, and cultural practices) and include a characterization of the attributes of the activity that may be affected by project-related changes to the environmental and socio-economic change. This includes not only identifying species of importance, but also assessing the quality and quantity of preferred traditional resources and locations, timing (e.g. seasonality, access restrictions, distance from community), ambient/sensory environment (e.g. noise, air quality, visual landscape, presence of others) and cultural environment (e.g. historical/generational connections, preferred areas). Specific aspects that will be considered include, but are not limited to:	
	location of traditional territory (including maps where available)	EIS Chapter 3, Section 3.3.2 EIS Chapter 19, Section 19.2 EIS Chapter 17, Section 17.2.14 and Map 17-2
	traditional uses currently practiced or practiced in living memory or as identified by Aboriginal traditional knowledge passed down through generations	EIS Chapter 17, Section 17.2
	location of reserves and communities	EIS Chapter 3, Section 3.3.2, Map 3-1 EIS Chapter 17, Section 17.2 and Section 17.2.14
	location of hunting camps, cabins and traditional gathering or teaching grounds	EIS Chapter 3, Section 3.3.2 EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2
	fish, wildlife, birds, plants or other natural resources of importance for traditional use	EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2
	places where fish, wildlife, birds, plants or other natural resources are harvested, including places that are preferred	EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2
	access and travel routes for conducting traditional practices	EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2
	frequency, duration or timing of traditional practices	EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2
	cultural values associated with the area affected by the project and the traditional uses identified	EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	Baseline information for health and socio-economic conditions will include the functioning and health of the socio-economic environment, encompassing a broad range of matters that affect communities in the study area in a way that recognizes interrelationships, system functions and vulnerabilities. Specific aspects that will be considered include:	EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2
	sites or areas that are used by Indigenous people either for permanent residences or on a seasonal/temporary basis and the number of people that use each site or area identified	EIS Chapter 17, Section 17.2 and Section 17.2.14
	drinking and recreational use water sources (permanent, seasonal, periodic, or temporary)	EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2
	consumption of country foods (also known as traditional foods) including food that is trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes, outside of the commercial food chain	EIS Chapter 17, Section 17.2 and Section 17.2.14
	which country foods are consumed by which groups, how frequently, and where these country foods are harvested	EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2
	commercial activities (e.g. fishing, trapping, hunting, forestry, outfitting), and – recreational uses	EIS Chapter 17, Section 17.2 and Section 17.2.14 EIS Chapter 19, Section 19.2
	Baseline information for physical and cultural heritage (including any site, structure or thing of archaeological, paleontological, historical or architectural significance) will consider all elements of cultural and historical importance to groups in the area and is not restricted to artifacts considered under provincial heritage legislative requirements. Specific aspects that will be considered include:	
	burial sites	EIS Chapter 16, Section 16.2 and Section 16.4 EIS Chapter 17, Section 17.2 EIS Chapter 19, Section 19.2
	cultural landscapes	EIS Chapter 16, Section 16.2 and Section 16.4 EIS Chapter 17, Section 17.2
	sacred, ceremonial or culturally important places, objects or things	EIS Chapter 16, Section 16.2 and Section 16.4 EIS Chapter 17, Section 17.2 EIS Chapter 19, Section 19.2
	archaeological potential and/or artifact places	EIS Chapter 16, Section 16.2 and Section 16.4 EIS Chapter 19, Section 19.2
	Any other baseline information that supports the analysis of predicted effects of project-related changes to the environment on Indigenous peoples will be included as necessary. The EIS will also indicate how input from Indigenous groups, including Aboriginal traditional knowledge, was used in establishing the baseline conditions related to health and socio-economics, physical and cultural heritage and current use of lands and resources for traditional purposes	EIS Chapter 17, Section 17.1.3 and Section 17.2 EIS Chapter 19, Section 19.2 and Section 19.9.2
	Baseline information for the following species or habitats of particular importance to health and socioeconomic conditions, physical and cultural heritage, or current use of lands and resources for traditional purposes should be provided, including:	EIS Chapter 17, Sections 17.2, 17.2.14
	areas of concentration of migratory animals, such as breeding, denning and/or wintering areas	EIS Chapter 17, Sections 17.2, 17.2.14
	ungulates, furbearers, amphibians, small mammals, and their habitat	EIS Chapter 17, Sections 17.2, 17.2.14
	existing or proposed protected areas, special management areas, Indigenous groups' management or priority areas, and conservation areas in the regional study area	EIS Chapter 17, Sections 17.2, 17.2.14 EIS Chapter 19, Section 19.2
	key plant communities and animals, both terrestrial and aquatic, that are potentially affected by the project	EIS Chapter 11, Section 11.2.1.4 EIS Chapter 17, Section 17.2.6, 17.2.8, 17.2.9, 17.2.10, and 17.2.14 EIS Chapter 19, Section 19.2
6.1.10 Other Changes to the Environment Arising as a Result of a Federal Decision or due to Changes on Federal Lands, in Another Province or Outside Canada	Should there be the potential for a change to the environment arising as a result of a federal decision(s), or on federal lands, lands in another province or lands outside Canada, the EIS will include baseline information on the environmental component likely to be affected (if this information is not already covered in other subsections of these guidelines). For example, if an authorization provided under the Fisheries Act was to result in the flooding of key wildlife habitat, baseline information should be provided on the wildlife species likely to be affected	EIS Chapter 4, Section 4.3.1.1, Appendix 4D, Table 4D-1 EIS Chapter 6, Section 6.6 and Section 6.7.2 EIS Chapter 7, Section 7.6 and Section 7.7.2 EIS Chapter 8, Section 8.6 EIS Chapter 9, Section 9.6 EIS Chapter 10, Section 10.6 EIS Chapter 11, Section 11.6 and Section 11.7.3 EIS Chapter 12, Section 12.6 and Section 12.7.3 EIS Chapter 13, Section 13.6 and Section 13.7.3 EIS Chapter 14, Section 14.6 and Section 14.7.3 EIS Chapter 15, Section 15.2.2, Section 15.6, and Section 15.7.3 EIS Chapter 16, Section 16.6 and Section 16.7.2 EIS Chapter 17, Section 17.6 and Section 17.7.3 EIS Chapter 18, Section 18.6 and Section 18.7.2 EIS Chapter 19, Section 19.6 and Section 19.7.3 EIS Chapter 20, Section 20.1
6.1.11 Human Environment	the rural and urban settings likely to be affected by the project	EIS Summary, Section 5.11, Section 5.12, and Section 5.13 EIS Chapter 5, Section 5.4 EIS Chapter 13, Section 13.2.2 EIS Chapter 14, Section 14.2.2 EIS Chapter 15, Section 15.4

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	any federal lands, lands located outside the province or Canada that may be affected by the project	EIS Summary, Section 5.11 EIS Chapter 1, Section 1.1.1 EIS Chapter 4, Section 4.3.1.1, Appendix 4D, Table 4D-1 EIS Chapter 6, Section 6.6 and Section 6.7.2 EIS Chapter 7, Section 7.6 and Section 7.7.2 EIS Chapter 8, Section 8.6 EIS Chapter 9, Section 9.6 EIS Chapter 10, Section 10.6 EIS Chapter 11, Section 11.6 and Section 11.7.3 EIS Chapter 12, Section 12.6 and Section 12.7.3 EIS Chapter 13, Section 13.6 and Section 13.7.3 EIS Chapter 14, Section 14.6 and Section 14.7.3 EIS Chapter 15, Section 15.2.2, Section 15.6, and Section 15.7.3 EIS Chapter 16, Section 16.6 and Section 16.7.2 EIS Chapter 17, Section 17.6 and Section 17.7.3 EIS Chapter 18, Section 18.6 and Section 18.7.2 EIS Chapter 19, Section 19.6 and Section 19.7.3 EIS Chapter 20, Section 20.1
	the current use of land in the study area, including a description of hunting, recreational and commercial fishing, trapping, gathering, outdoor recreation, use of seasonal cabins, outfitters	EIS Chapter 15, Section 15.2.2 EIS Chapter 17, Section 17.2.14
	current use of all waterways and water bodies that will be directly affected by the project, including recreational uses, where available	EIS Summary, Section 5.11 EIS Chapter 15, Section 15.2.2 EIS Chapter 17, Section 17.2.14
	location of and proximity of any permanent, seasonal or temporary residences or camps	EIS Summary, Section 5.11, Section 5.12, Section 5.13, and Section 5.15 EIS Chapter 14, Section 14.2.2 EIS Chapter 15, Section 15.2.2 EIS Chapter 17, Section 17.2.14
	health and socio-economic conditions, including the socio-economic determinants of health, the functioning and health of the socio-economic environment, encompassing a broad range of matters that affect communities in the study area in a way that recognizes interrelationships, system functions and vulnerabilities (for example effects on sub-populations such as workers/job seekers and their families, youth, elders, women, service providers, economically marginalized members of the community, etc.)	EIS Summary, Section 5.11, Section 5.12, Section 5.16, and Section 5.17 EIS Chapter 5, Section 5.4 EIS Chapter 13, Section 13.2.2 EIS Chapter 14, Section 14.1.3, Section 14.5.5 EIS Chapter 18, Section 18.2, Section 18.4.2 EIS Chapter 19, Section 19.4.3, Section 19.4.4
	physical and cultural heritage, including structures, sites or things of historical, archaeological, paleontological or architectural significance	EIS Summary, Section 5.14 EIS Chapter 5, Section 5.4.9 EIS Chapter 16, Section 16.2.2 and Section 16.4 EIS Chapter 17, Section 17.2.14
6.2 Predicted Changes to the Physical Environment	*The EA will include a consideration of the predicted changes to the environment as a result of the project being carried out or as a result of any powers, duties or functions that are to be exercised by the federal government in relation to the project. These predicted changes to the environment are to be considered in relation to each phase of the project (construction, operation, decommissioning, and abandonment) and are to be described in terms of the magnitude, geographic extent, duration and frequency, and whether the environmental changes are reversible or irreversible. For each predicted change, the proponent will identify all sensory and observable change indicators (e.g. smells, noise, smoke) adopted as a result of traditional knowledge in relation to each VC. As changes to various parts of the physical environment, listed below, may be inter-related as part of an ecosystem, the EIS will explain and describe the connections between the changes described.*	EIS Summary, Section 5 EIS Chapter 4 EIS Chapter 5
6.2.1 Changes to the Atmospheric Environment	changes in air quality (including sulfur oxides (SOx), nitrous oxides (NOx), total suspended particulates, fine particulates smaller than 2.5 microns (PM2.5), respirable particulates of less than 10 microns (PM10) and diesel particulates presented in concentration values comparable to guidelines (i.e. $\mu g/m^3$))	EIS Summary, Section 5.4 EIS Chapter 6, Section 6.4.1.4 and Table 6-21 Volume 5, Appendix A
	justify dispersion modeling methods and include relevant input and output files	EIS Chapter 6, Section 6.1.2.3 and 6.4.1.1 Volume 5, Appendix A
	an estimate of the direct greenhouse gas emissions associated with all phases of the project as well as any mitigation measures proposed to minimize greenhouse gas emissions. This information is to be presented by individual pollutant and should also be summarized in CO2 equivalent per year	EIS Chapter 6, Section 6.4.2, Section 6.4.2.4, Table 6-23, and Table 6-24
	justify all estimates and emission factors used in the analysis,	EIS Chapter 6, Section 6.4.1.1, Section 6.4.1.4, and Section 6.4.2.1
	provide the methods and calculations used for the analysis,	EIS Chapter 6, Section 6.4.1.1, Section 6.4.1.4, and Section 6.4.2.1 Volume 5, Appendix A
	compare and assess the level of estimated emissions of greenhouse gases to the regional, provincial and federal emission targets	EIS Chapter 6, Section 6.2.2.3 and Section 6.4.2.4 Volume 5, Appendix A
	changes in ambient day-time and night-time noise and vibration levels at key receptor locations	EIS Chapter 7, Section 7.4.1, Table 7-7, Table 7-8, Table 7-9, and Table 7-10 Volume 4, Appendix D - Acoustic Baseline TDRs Volume 5, Appendix C

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	changes in night-time light levels	EIS Chapter 5, Section 5.2.4 Volume 4, Appendix C - Ambient Lighting Baseline TDRs Volume 5, Appendix B
6.2.2 Changes to Groundwater and Surface Water	changes to groundwater flow patterns, fluxes, and divides based on the results of groundwater flow modelling that incorporates changes related to mining	EIS Summary, Section 5.6 and Section 5.7 EIS Chapter 8, Section 8.4.2 Volume 5, Appendices F and G
	changes to turbidity, oxygen level, water temperature, ice regime, water quality	EIS Chapter 9, Section 9.4.1.4 and Section 9.4.2 EIS Chapter 9, Section 9.4.2 Volume 5, Appendices D and E
	changes in surface water quality associated with any mine effluent releases or surface runoff	EIS Chapter 9, Section 9.4.2
	changes to the hydrological and hydrometric conditions	EIS Chapter 9, Section 9.4.1 Volume 5, Appendices D and E
	changes to groundwater recharge/discharge areas and any changes to groundwater infiltration areas	EIS Chapter 8, Section 8.4.2 Volume 5, Appendices F and G
	changes to groundwater quality associated with storage or release of any mine effluents or drainage including surface runoff	EIS Chapter 8, Section 8.4.3 Volume 5, Appendices D and E Volume 4, Appendix F - Geochemistry TDRs
	changes to water quality attributed to acid rock drainage and metal leaching associated with the storage of waste rock, ore, low grade ore, tailings, overburden and potential construction material, including:	EIS Chapter 2, Section 2.3 EIS Chapter 5, Section 5.2.6 EIS Chapter 8, Section 8.4.3 EIS Chapter 9, Section 9.4.2 Volume 4, Appendix F - Geochemistry TDRs Volume 5, Appendices D and E
	short term metal leaching properties	EIS Chapter 2, Section 2.3 EIS Chapter 5, Section 5.2.6 Volume 4, Appendix F - Geochemistry TDRs
	longer term rates of acid generation (if any) and metal leaching	EIS Chapter 2, Section 2.3 EIS Chapter 5, Section 5.2.6 Volume 4, Appendix F - Geochemistry TDRs
	estimates of the potential for mined materials (including waste rock, tailings and low grade ore) to be sources of acid rock drainage or metal leaching	EIS Chapter 2, Section 2.3 EIS Chapter 5, Section 5.2.6 EIS Chapter 8, Section 8.4.3 Volume 4, Appendix F - Geochemistry TDRs Volume 5, Appendices D and E
	estimates of potential time to the onset of acid rock drainage or metal leaching	EIS Chapter 2, Section 2.3 EIS Chapter 5, Section 5.2.6 Volume 4, Appendix F - Geochemistry TDRs
	quantity and quality of leachate/effluent from samples of tailings, waste rock, and ore	EIS Chapter 2, Section 2.3 EIS Chapter 5, Section 5.2.6 EIS Chapter 8, Section 8.4.3 Volume 4, Appendix F - Geochemistry TDRs Volume 5, Appendices D and E
	quantity and quality of effluent to be released from the site into the receiving waters	EIS Chapter 2, Section 2.3 EIS Chapter 5, Section 5.2.6 EIS Chapter 2, Section 2.9.3.8, 2.9.3.10 EIS Chapter 9, Appendix 9E Volume 5, Appendices D and E
	quality of humidity cell or column test liquid from acid rock testing	EIS Chapter 2, Section 2.3 EIS Chapter 5, Section 5.2.6 Volume 4, Appendix F - Geochemistry TDRs
	sensitivity analysis to assess the effects of imperfect segregation of waste rock	EIS Chapter 2, Section 2.3 EIS Chapter 5, Section 5.2.6 EIS Chapter 8, Section 8.4.3 Volume 4, Appendix F - Geochemistry TDRs
	pit water chemistry during operation and decommissioning and abandonment (post closure), and pit closure management measures (e.g. flooding). This will include geochemical modelling of pit water quality in the post-closure period	EIS Chapter 9, Section 9.4.2, EIS Chapter 9, Appendix 9E Volume 4, Appendix F - Geochemistry TDRs Volume 5, Appendices D and E

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	surface and seepage water quality from the waste rock dumps, tailings/waste rock impoundment facility, stockpiles and other infrastructure during operation and post closure	EIS Chapter 8, Section 8.4.2 Volume 5, Appendices D and E
6.2.3 Changes to Riparian, Wetland and Terrestrial Environments	overall description of changes related to landscape disturbance	EIS Summary, Section 5.1, Section 5.9, and Section 5.13 EIS Chapter 11, Sections 11.3 and Section 11.4.2 EIS Chapter 12, Section 12.4.2
	changes to the habitat of migratory and non-migratory birds, with a distinction made between the two birds category, including losses, structural changes and fragmentation of riparian habitat of terrestrial environments and wetlands frequented by birds (types of cover, ecological unit of the area in terms of quality, quantity, diversity, distribution and functions)	EIS Chapter 12, Section 12.4.2
	changes to critical habitat for federally listed species at risk (Species at Risk Act) and/or important habitat for species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (for listing on Schedule 1 of the Species at Risk Act)	EIS Chapter 12, Section 12.4.2.2
	changes to key habitat for species important to current use of lands and resources for traditional purposes	EIS Chapter 11, Section 11.2.2, and Table 11-4 EIS Chapter 11, Section 11.4.4.3 EIS Chapter 12, Section 12.4.2 EIS Chapter 17, Section 17.4.2
6.3 Predicted Effects on Valued Components	*Based on the predicted changes to the environment identified in section 6.2, the proponent is to assess the environmental effects of the project on the following VCs. All interconnections between VCs and between changes to multiple VCs will be described:*	
6.3.1 Fish and Fish Habitat	*the identification of any potential adverse effects to fish and fish habitat as defined in subsection 2(1) of the Fisheries Act, including the calculations of any potential habitat loss or alterations (temporary or permanent) in terms of surface areas (e.g. spawning grounds, fry-rearing areas, feeding), and in relation to watershed availability and significance. The assessment will include a consideration of:*	
	the geomorphological changes and their effects on hydrodynamic conditions and fish habitats (e.g. modification of substrates, dynamic imbalance, silting of spawning beds)	EIS Chapter 10, Section 10.4.1.4
	the modifications of hydrological and hydrometric conditions on fish habitat and on the fish species' life cycle activities (e.g. reproduction, fry-rearing, movements)	EIS Chapter 10, Section 10.4.1
	potential effects on riparian areas that could affect aquatic biological resources and productivity taking into account any anticipated modifications to fish habitat	EIS Chapter 10, Section 10.4.1
	changes to water and sediment quality identified in changes to groundwater and surface water, and their potential effects on fish and fish habitat	EIS Chapter 10, Section 10.4.2
	any potential imbalances in the food web in relation to baseline conditions	EIS Chapter 10, Section 10.4.1
	effects on the primary and secondary productivity of water bodies and how mine-related effects may affect fish food sources	EIS Chapter 10, Section 10.4.1.4
	the effects of changes to the aquatic environment, including those identified under changes to groundwater and surface water, on fish and their habitat, including:	
	the anticipated changes in the composition and characteristics of the populations of various fish species, including shellfish and forage fish	EIS Chapter 10, Section 10.4.1 and Section 10.4.2
	any modifications in migration or local movements (upstream and downstream migration, and lateral movements) following the construction and operation of works (physical and hydraulic barriers)	EIS Chapter 10, Section 10.4.1
	any reduction in fish populations as a result of potential overfishing due to increased number of people in the project area	EIS Chapter 10, Section 10.4.1
	any modifications and use of habitats by federally or provincially listed fish species	EIS Chapter 10, Section 10.4.1.4
	a discussion of how project construction timing correlates to key fisheries windows for freshwater and anadromous species, and any potential effects resulting from overlapping periods	EIS Chapter 10, Section 10.4.1
	a discussion of how vibration caused by blasting may affect fish behaviour, such as spawning or migrations	EIS Chapter 10, Section 10.4.1 and Section 10.4.2
	calculate any potential habitat offset/compensation works related to fish and fish habitat in terms of the amount of habitat being offset/compensated, as well as the spatial location of the offsetting/compensation habitat	EIS Chapter 10, Section 10.4.1, Section 10.4.2, and Section 10.4.3.1
6.3.2 Migratory Birds	*direct and indirect adverse effects on migratory birds, including population level effects that could be caused by all project activities, including, but not limited to:*	
	site preparation	EIS Chapter 12, Section 12.4.2.2
	deposit of harmful substances in waters that are frequented by migratory birds (e.g. tailing impoundment area)	EIS Chapter 12, Section 12.3 and Section 12.4.4.4
	collision risk of migratory birds with any project infrastructure and vehicles	EIS Chapter 12, Section 12.2.2.4 and Section 12.4.3.1
	indirect effects caused by increased disturbance (e.g. noise, light, presence of workers), relative abundance movements, and losses or changes in migratory bird habitat, considering the critical breeding and migration periods for the birds	EIS Chapter 12, Section 12.4.2.1, Section 12.4.2, and Section 12.4.2.4
6.3.3 Species at Risk	the potential adverse effects of the project on Species at Risk Act listed species and, where appropriate, its critical habitat, i.e. direct and indirect effects on the survival or recovery of Species at Risk Act listed species (e.g. common nighthawk, olive-sided flycatcher, rusty blackbird, yellow rail, short-eared owl, horned grebe, little brown myotis, northern myotis, northern leopard frog, and boreal woodland caribou)	EIS Summary, Section 5.10 EIS Chapter 10, Section 10.2.2.5 and Section 10.4.1.4 EIS Chapter 11, Section 11.2.2 EIS Chapter 12, Section 12.4 and Section 12.5
	the potential adverse effects of the project on species assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as extirpated, endangered, threatened, or of special concern (e.g. barren ground caribou, wolverine, bank swallow, and barn swallow)	EIS Chapter 10, Section 10.2.2.5 , 10.4.1.4 EIS Chapter 11, Section 11.2.2, Section 11.4.3 EIS Chapter 12, Section 12.4.2, Section 12.4.3, Section 12.4.4, Section 12.5.2

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Guideline Section	Guideline Description	Application Section where Manner Addressed
6.3.4 Indigenous Peoples	Current Use of Lands for Traditional Purposes: With respect to Indigenous peoples, a description and analysis for each group of how changes to the environment caused by the project will affect the following activities exercised by each Indigenous group:	EIS Summary, Section 5.15 EIS Chapter 19, Section 19.2 EIS Chapter 17, Section 17.4
	This assessment will characterize the effects (including cumulative effects) on the use or activity (e.g. hunting, fishing, trapping, plant gathering, and cultural practices) as a result of the underlying changes to the environment (i.e. how will the activity change if the project proceeds). The underlying changes to the environment will also be described, including, but not limited to:	EIS Chapter 17, Section 17.3, Section 17.4 and Section 17.5
	any changes to the availability or quality of resources (fish, wildlife, birds, plants or other natural resources) used for traditional purposes (e.g. hunting, fishing, trapping, collection of medicinal plants, use of sacred sites)	EIS Chapter 17, Section 17.4.2 and Section 17.4.3
	any changes to access and perceived access into areas used for traditional purposes, including development of new roads, deactivation or reclamation of access roads and changes to waterways that affect navigation, and how this may affect continued knowledge of the area, financial capacity to access and desirability to access	EIS Chapter 17, Section 17.4.2 and Section 17.4.3 EIS Chapter 19, Section 19.4.4, Section 19.4.5, and Section 19.4.6
	any changes to the environment that affect cultural value or importance associated with traditional uses or areas affected by the project (e.g. values or attributes of the area that make it important as a place for inter-generational teaching of language or traditional practices, communal gatherings, integrity of preferred traditional practice areas)	EIS Chapter 17, Sections 17.4 EIS Chapter 19, Section 19.4.5 and Section 19.8
	how timing of project activities (e.g. construction, blasting, discharges) have the potential to interact with the timing of traditional practices, and any potential effects resulting from overlapping periods	EIS Chapter 17, Section 17.4
	consideration of the regional context for traditional use, and the value of the project area in that regional context, including alienation of lands from traditional use	EIS Chapter 17, Section 17.2 and Section 17.4
	any changes to environmental quality (e.g. air, water, soil), the sensory environment (e.g. noise, light, visual landscape)	EIS Chapter 17, Sections 17.4 EIS Chapter 18, Section 18.4 EIS Chapter 19, Section 19.4.3 Volume 5, Appendix B
	consideration of sacred, ceremonial or culturally important places, objects or things	EIS Chapter 11, Section 11.2.2, and Table 11-4 EIS Chapter 17, Section 17.4
	any changes that could detract from use of the area or lead to avoidance of the area as a result of real and perceived disturbance of the environment (e.g. observation of and fear of contamination of water or country foods)	EIS Chapter 17, Section 17.4.2, Section 17.4.5, and Section 17.5.5
	any changes to the environment resulting from the presence of worker or increased access to the area by non-Indigenous peoples (e.g. noise, competition for or pressure on resources)	EIS Chapter 11, Section 11.4 EIS Chapter 12, Section 12.4 EIS Chapter 13, Section 13.4 EIS Chapter 14, Section 14.4 EIS Chapter 17, Section 17.4
	an assessment of the potential to return affected areas to pre-project conditions to support traditional practices (including the identification of end land use goals)	EIS Chapter 17, Section 17.4
	human health, focusing on effects on health outcomes or risks in consideration of, but not limited to, potential changes in air quality, noise exposure and effects of vibration from blasting, current and future availability of country foods, and water quality (drinking, recreational and cultural uses). When risks to human health due to changes in one or more of these components are predicted, a complete Human Health Risk Assessment (HHRA) examining all exposure pathways for pollutants of concern may be necessary to adequately characterize potential risks to human health. Where adverse health effects are predicted, any incidental effects such as effects on current use of lands and resources for traditional purposes will also be assessed. The proponent must provide a justification if it determines that an assessment of the potential for contamination of country foods is not required or if some contaminants are excluded from the assessment, – socio-economic conditions, including, but not limited to:	EIS Chapter 18
	the use of navigable waters (including any water used for Indigenous transport)	EIS Chapter 15, Section 15.4.3.1 EIS Chapter 17, Section 17.4.3 EIS Chapter 18, Section 18.4.2
	forestry and logging operations	EIS Chapter 15, Section 15.2.2.3, Section 15.4.4.2
	commercial fishing, hunting, trapping, and gathering activities	EIS Chapter 15, Section 15.4.4 EIS Chapter 17, Section 17.4.2 EIS Chapter 18, Section 18.4.2
	commercial outfitters	EIS Chapter 15, Section 15.4.5.4.3 EIS Chapter 17, Section 17.4.5
	recreational use	EIS Chapter 15, Section 15.4.3 EIS Chapter 17, Section 17.4.5 EIS Chapter 18, Section 18.4.2
	food security	EIS Chapter 18, Section 18.4
	changes at the community level that affect socio-economic conditions for Indigenous peoples as result of increased population, economic activity, cost of living, among other factors	EIS Chapter 13 EIS Chapter 14, Section 14.4 EIS Chapter 19, Section 19.4.4 and Section 19.8
	non commercial / trade economy	EIS Chapter 19, Section 19.2.2
	physical and cultural heritage, and structures, sites or things of historical, archaeological, paleontological or architectural significance to groups, including, but not limited to:	EIS Chapter 16 EIS Chapter 17, Section 17.4.4

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Guideline Section	Guideline Description	Application Section where Manner Addressed
	the loss or destruction of physical and cultural heritage	EIS Chapter 16, Section 16.5 EIS Chapter 17, Section 17.4.4 EIS Chapter 19, Section 19.4.5
	changes to access to physical and cultural heritage	EIS Chapter 16, Section 16.4 EIS Chapter 17, Section 17.4.3 EIS Chapter 19, Section 19.4.5
	changes to the cultural value or importance associated with physical and cultural heritage	EIS Chapter 16, Section 16.4 EIS Chapter 17, Section 17.4.5 EIS Chapter 19, Section 19.4.5
	changes to sacred, ceremonial or culturally important places, objects, or things	EIS Chapter 16, Section 16.4 EIS Chapter 17, Section 17.4.4 EIS Chapter 19, Section 19.4.5
	changes to visual aesthetics over the life of the Project	EIS Chapter 17, Section 17.4.2, Section 17.4.4
	Other effects of changes to the environment on groups should be reflected as necessary	EIS Chapter 17, Section 17.4, Section 17.5
6.3.5 Other Valued Components that may be Affected as a Result of a Federal Decision or Due to Effects on Federal Lands, Another Province or Outside Canada	*If there is potential for the project to result in environmental changes on federal lands, lands in a province other than Manitoba, or outside of Canada as a result of the project, descriptions of effects will include, but are not limited to, a consideration of:*	EIS Chapter 5, Section 5.2, Section 5.3, and Section 5.4 EIS Chapter 20, Section 20.1
	changes to ambient air quality on federal lands that may be affected by the project, including any changes in the concentration of the following contaminants, as relevant: total suspended particulates, fine particulates ($PM_{2.5}$), particulate matters up to 10 micrometers in size (PM10), sulfur oxides (SOx), volatile organic compounds (VOCs), nitrogen oxides (NOx), and diesel particulates presented in concentration values comparable to guidelines (i.e. $\mu g/m^3$)	EIS Chapter 5, Section 5.2.2 EIS Chapter 6, Section 6.4.1 and Section 6.6 EIS Chapter 18, Section 18.4.2
	changes to interprovincial wildlife, including any changes to the Manitoba North Range (MB9) boreal woodland caribou and the Beverly and Qamanirjuaq barren-ground caribou populations, habitat, movement or migratory corridors	EIS Chapter 5, Section 5.3.3 EIS Chapter 12, Section 12.4.2.4 Volume 4, Appendix M - Mammal Baseline TDRs
	an estimate of the direct greenhouse gas emissions associated with all phases of the project in a regional, provincial, national and international context, as well as any mitigation measures proposed to minimize greenhouse gas emissions. This information is to be presented by individual pollutant and should also be summarized in CO2 equivalent per year	EIS Chapter 6, Section 6.4.2
	If there is the potential for a change to the environment arising as a result of a federal decision(s), for example an authorization under section 35 of the Fisheries Act, the EIS should include a description of the specific project components for which a federal authorization/decision is required, and an assessment of any other valued components (not already covered in other subsections of these guidelines) that may be affected by the changes to the environment caused by these specific project components. Such an assessment may include a consideration of the following:	
	changes to the use of waterways and water bodies	EIS Chapter 15, Section 15.4.3
	effects to water quality, wetlands and aquatic invertebrate species at risk	EIS Chapter 10, Section 10.4.1.4
	changes to recreational navigation	EIS Chapter 15, Section 15.4.3
	effects to commercial trapping	EIS Chapter 15, Section 15.4.3
6.4. Mitigation Measures	*Every EA conducted under CEAA 2012 will consider measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project. Under CEAA 2012, mitigation measures includes measures to eliminate, reduce or control the adverse environmental effects of a designated project, as well as restitution for damage to the environment through replacement, restoration, compensation or other means. Measures will be specific, achievable, measurable and verifiable, and described in a manner that avoids ambiguity in intent or commitment, interpretation and implementation*	EIS Chapter 4, Section 4.3.4.2 EIS Chapter 6, Section 6.4.1.3 and Section 6.4.2.3 EIS Chapter 7, Section 7.4.1.3 and Section 7.4.2.3 EIS Chapter 8, Section 8.4.2.2 and Section 8.4.3.2 EIS Chapter 9, Section 9.4.1.3 and Section 9.4.2.3 EIS Chapter 10, Section 10.4.1.3 and Section 10.4.2.3 EIS Chapter 11, Section 11.4.2.2, Section 11.4.3.2, Section 11.4.4.2, and Section 11.4.5.2 EIS Chapter 12, Section 12.4.2.3, Section 12.4.3.3, and Section 12.4.4.3 EIS Chapter 13, Section 13.4.2.2, Section 13.4.3.2, and Section 13.4.4.2 EIS Chapter 14, Section 14.4.2.2, Section 14.4.3.2, Section 14.4.4.2, and Section 14.4.5.2 EIS Chapter 15, Section 15.4.2.2, Section 15.4.3.2, and Section 15.4.4.2 EIS Chapter 16, Section 16.4.2.2 EIS Chapter 17, Section 17.4.2.2 and Section 17.4.3.2 EIS Chapter 18, Section 18.4.2.2 EIS Chapter 19, Section 19.4.3.2, Section 19.4.4.2, and Section 19.4.5.2 EIS Chapter 20, Appendix 20A, Table 20A-1 and Appendix 20B, Table 20B-1
	Mitigation measures may be considered for inclusion as conditions in the EA decision statement and/or in other compliance and enforcement mechanisms provided by other authorities' permitting or licensing processes. As a first step, the proponent is encouraged to use an approach based on the avoidance and reduction of the effects at the source. Such an approach may include the modification of the design of the project or relocation of project components.	EIS Summary, Section 5.2 EIS Chapter 2, Section 2.9 EIS Chapter 4, Section 4.3.4.2

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	The EIS will describe the standard mitigation practices, policies and commitments that constitute technically and economically feasible mitigation measures and that will be applied as part of standard practice regardless of location	EIS Chapter 4, Section 4.3.4.2 EIS Chapter 6, Section 6.4.1.3 and Section 6.4.2.3 EIS Chapter 7, Section 7.4.1.3 and Section 7.4.2.3 EIS Chapter 8, Section 8.4.2.2 and Section 8.4.3.2 EIS Chapter 9, Section 9.4.1.3 and Section 9.4.2.3 EIS Chapter 10, Section 10.4.1.3 and Section 10.4.1.3 EIS Chapter 11, Section 11.4.2.2, Section 11.4.3.2, Section 11.4.4.2, and Section 11.4.5.2 EIS Chapter 12, Section 12.4.2.3, Section 12.4.3.3, and Section 12.4.4.3 EIS Chapter 13, Section 13.4.2.2, Section 13.4.3.2, and Section 13.4.4.2 EIS Chapter 14, Section 14.4.2.2, Section 14.4.3.2, Section 14.4.4.2, and Section 14.4.5.2 EIS Chapter 15, Section 15.4.2.2, Section 15.4.3.2, and Section 15.4.4.2 EIS Chapter 16, Section 16.4.2.2 EIS Chapter 17, Section 17.4.2.2 and Section 17.4.3.2 EIS Chapter 18, Section 18.4.2.2 EIS Chapter 19, Section 19.4.3.2, Section 19.4.4.2, and Section 19.4.5.2 EIS Chapter 20, Appendix 20A, Table 20A-1 and Appendix 20B, Table 20B-1
	The EIS will then describe the project's environmental protection plan and its environmental management system, through which the proponent will deliver this plan. The plan will provide an overall perspective on how potentially adverse effects would be minimized and managed over time	EIS Chapter 23, Section 23.1 and Section 23.5
	The EIS will further discuss the mechanisms the proponent would use to require its contractors and sub-contractors to comply with these commitments and policies and with auditing and enforcement programs	EIS Chapter 2, Section 2.2.3 EIS Chapter 6, Section 6.4.1.3, Section 6.4.2.3 EIS Chapter 7, Section 7.4.1.3, Section 7.4.2.3 EIS Chapter 8, Section 8.4.2.2, Section 8.4.3.2 EIS Chapter 9, Section 9.4.1.3, Section 9.4.2.3 EIS Chapter 10, Section 10.4.1.3, Section 10.4.2.3 EIS Chapter 11, Section 11.4.2.2, Section 11.4.3.2, Section 11.4.4.2, Section 11.4.5.2 EIS Chapter 12, Section 12.4.2.3, Section 12.4.3.3, Section 12.4.4.3 EIS Chapter 13, Section 13.4.2.2, Section 13.4.3.2, Section 13.4.4.2 EIS Chapter 14, Section 14.4.2.2, Section 14.4.3.2, Section 14.4.4.2, Section 14.5.5.2 EIS Chapter 15, Section 15.4.2.2, Section 15.4.3.2, Section 15.4.4.2 EIS Chapter 16, Section 16.4.2.2 EIS Chapter 17, Section 17.4.2.2, Section 17.4.3.2 EIS Chapter 18, Section 18.4.2.2 EIS Chapter 19, Section 19.4.3.2, Section 19.4.4.2, Section 19.4.5.2 EIS Chapter 23, Section 23.5
	The EIS will then describe mitigation measures that are specific to each environmental effect identified. Mitigation measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation measure is designed to address. The EIS will identify and describe mitigation measures to avoid, or lessen potential adverse effects on species and/or critical habitat listed under the Species at Risk Act. These measures will be consistent with any applicable recovery strategy and action plans.	EIS Chapter 4, Section 4.3.4.2 EIS Chapter 6, Section 6.4.1.3, Section 6.4.2.3 EIS Chapter 7, Section 7.4.1.3, Section 7.4.2.3 EIS Chapter 8, Section 8.4.2.2, Section 8.4.3.2 EIS Chapter 9, Section 9.4.1.3, Section 9.4.2.3 EIS Chapter 10, Section 10.4.1.3, Section 10.4.2.3 EIS Chapter 11, Section 11.4.2.2, Section 11.4.3.2, Section 11.4.4.2, Section 11.4.5.2 EIS Chapter 12, Section 12.4.2.3, Section 12.4.3.3, Section 12.4.4.3 EIS Chapter 13, Section 13.4.2.2, Section 13.4.3.2, Section 13.4.4.2 EIS Chapter 14, Section 14.4.2.2, Section 14.4.3.2, Section 14.4.4.2, Section 14.5.5.2 EIS Chapter 15, Section 15.4.2.2, Section 15.4.3.2, Section 15.4.4.2 EIS Chapter 16, Section 16.4.2.2 EIS Chapter 17, Section 17.4.2.2, Section 17.4.3.2 EIS Chapter 18, Section 18.4.2.2 EIS Chapter 19, Section 19.4.3.2, Section 19.4.4.2, Section 19.4.5.2 EIS Chapter 20, Appendix 20A, Table 20A-1, Appendix 20B, Table 20B-1
	The EIS will also identify and describe mitigation measures to avoid or lessen adverse effects on listed COSEWIC species, and species harvested by Indigenous groups	EIS Chapter 10, Section 10.4.1.3 and Section 10.4.2.3 EIS Chapter 11, Section 11.4.2.2, Section 11.4.3.2, Section 11.4.4.2, and Section 11.4.5.2 EIS Chapter 12, Section 12.4.2.3, Section 12.4.3.3, and Section 12.4.4.3 EIS Chapter 17 and Appendix 17A

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	The EIS will specify the actions, works, minimal disturbance footprint techniques, best available technology, best management practices, corrective measures or additions planned during the project's various phases to eliminate or reduce the significance of adverse effects. The EIS will also present an assessment of the effectiveness of the proposed technically and economically feasible mitigation measures. The reasons for determining if the mitigation measure reduces the significance of an adverse effect will be made explicit. The proponent is also encouraged to identify mitigation measures for effects that are adverse although not significant. The EIS will indicate what other technically and economically feasible mitigation measures were considered, and explain why they were rejected. Trade-offs between cost savings and effectiveness of the various forms of mitigation measures will be justified. The EIS will identify who is responsible for the implementation of these measures and the system of accountability. Where mitigation measures are proposed to be implemented for which there is little experience or for which there is some question as to their effectiveness, the potential risks and effects to the environment should those measures not be effective will be clearly and concisely described. In addition, the EIS will identify the extent to which technological innovations will help mitigate environmental effects. Where possible, it will provide detailed information on the nature of these measures, their implementation, management and the requirements of the follow-up program.	EIS Chapter 4, Section 4.3.4.2 EIS Chapter 6, Section 6.4.1.3 and Section 6.4.2.3 EIS Chapter 7, Section 7.4.1.3 and Section 7.4.2.3 EIS Chapter 8, Section 8.4.2.2 and Section 8.4.2.3 EIS Chapter 9, Section 9.4.1.3 and Section 9.4.2.3 EIS Chapter 10, Section 10.4.1.3 and Section 10.4.2.3 EIS Chapter 11, Section 11.4.2.2, Section 11.4.3.2, Section 11.4.4.2, and Section 11.4.5.2 EIS Chapter 12, Section 12.4.2.3, Section 12.4.3.3, and Section 12.4.4.3 EIS Chapter 13, Section 13.4.2.2, Section 13.4.3.2, and Section 13.4.4.2 EIS Chapter 14, Section 14.4.2.2, Section 14.4.3.2, Section 14.4.4.2, and Section 14.4.5.2 EIS Chapter 15, Section 15.4.2.2, Section 15.4.3.2, and Section 15.4.4.2 EIS Chapter 16, Section 16.4.2.2 EIS Chapter 17, Section 17.4.2.2 and Section 17.4.3.2 EIS Chapter 18, Section 18.4.2.2 EIS Chapter 19, Section 19.4.3.2, Section 19.4.4.2, and Section 19.4.5.2 EIS Chapter 20, Appendix 20A, Table 20A-1 and Appendix 20B, Table 20B-1
	Adaptive management is not considered as a mitigation measure, but if the follow-up program (refer to Section 8 below) indicates that corrective action is required, the proposed approach for managing the action (including resources) should be identified	EIS Chapter 23, Section 23.2
	After having established the technically and economically feasible mitigation measures, the EIS will present any residual environmental effects of the project on the VCs identified in Section 6.3 above. All residual effects, even if very small or deemed insignificant will be described.	EIS Chapter 4, Section 4.3.4 EIS Chapter 6, Section 6.4, Section 6.4.3, and Section 6.7 EIS Chapter 7, Section 7.4, Section 7.4.3, and Section 7.7 EIS Chapter 8, Section 8.4, Section 8.4.4, and Section 8.7 EIS Chapter 9, Section 9.4, Section 9.4.3, and Section 9.7 EIS Chapter 10, Section 10.4, Section 10.4.3, and Section 10.7 EIS Chapter 11, Section 11.4, Section 11.4.6, and Section 11.7 EIS Chapter 12, Section 12.4, Section 12.4.5, and Section 12.7 EIS Chapter 13, Section 13.4, Section 13.4.5, and Section 13.7 EIS Chapter 14, Section 14.4, Section 14.4.5, and Section 14.7 EIS Chapter 15, Section 15.4, Section 15.4.5, and Section 15.7 EIS Chapter 16, Section 16.4 and Section 16.7 EIS Chapter 17, Section 17.4, Section 17.4.5, and Section 17.7 EIS Chapter 18, Section 18.4, Section 18.4.3, and Section 18.7 EIS Chapter 19, Section 19.4, Section 19.4.6, and Section 19.7
	The EIS will then provide a detailed analysis of the significance of the residual environmental effects that are considered adverse following the implementation of mitigation measures, using guidance described in Section 4 of the Agency's Operational Policy Statement, Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects under the Canadian Environmental Assessment Act, 2012[16]	EIS Chapter 4, Section 4.3.4 EIS Chapter 6, Section 6.7 EIS Chapter 7, Section 7.7 EIS Chapter 8, Section 8.7 EIS Chapter 9, Section 9.7 EIS Chapter 10, Section 10.7 EIS Chapter 11, Section 11.7 EIS Chapter 12, Section 12.7 EIS Chapter 13, Section 13.7 EIS Chapter 14, Section 14.7 EIS Chapter 15, Section 15.7 EIS Chapter 16, Section 16.7 EIS Chapter 17, Section 17.7 EIS Chapter 18, Section 18.7 EIS Chapter 19, Section 19.7 EIS Chapter 20, Appendix 20A, Table 20A-1

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
6.5 Significance of Residual Effects	After having established the technically and economically feasible mitigation measures, the EIS will present any residual environmental effects of the project on the VCs identified in Section 6.3 above. All residual effects, even if very small or deemed insignificant will be described	EIS Chapter 4, Section 4.3.4 EIS Chapter 6, Section 6.4, Section 6.4.3, Section 6.7 EIS Chapter 7, Section 7.4, Section 7.4.3, Section 7.7 EIS Chapter 8, Section 8.4, Section 8.4.4, Section 8.7 EIS Chapter 9, Section 9.4, Section 9.4.3, Section 9.7 EIS Chapter 10, Section 10.4, Section 10.4.4, Section 10.7 EIS Chapter 11, Section 11.4, Section 11.4.4, Section 11.7 EIS Chapter 12, Section 12.4, Section 12.4.4, Section 12.7 EIS Chapter 13, Section 13.4, Section 13.4.4, Section 13.7 EIS Chapter 14, Section 14.4, Section 14.4.4, Section 14.7 EIS Chapter 15, Section 15.4, Section 15.4.4, Section 15.7 EIS Chapter 16, Section 16.4, Section 16.4.4, Section 16.7 EIS Chapter 17, Section 17.4, Section 17.4.4, Section 17.7 EIS Chapter 18, Section 18.4, Section 18.4.4, Section 18.7 EIS Chapter 19, Section 19.4, Section 19.4.4, Section 19.7
	The EIS will then provide a detailed analysis of the significance of the residual environmental effects that are considered adverse following the implementation of mitigation measures, using guidance described in Section 4 of the Agency's Operational Policy Statement, Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects under the Canadian Environmental Assessment Act, 2012	EIS Chapter 6, Section 6.1.6, Section 6.4, and Section 6.7 EIS Chapter 7, Section 7.1.6, Section 7.4, and Section 7.7 EIS Chapter 8, Section 8.1.6, Section 8.4, and Section 8.7 EIS Chapter 9, Section 9.1.6, Section 9.4, and Section 9.7 EIS Chapter 10, Section 10.1.6, Section 10.4, and Section 10.7 EIS Chapter 11, Section 11.1.6, Section 11.4, and Section 11.7 EIS Chapter 12, Section 12.1.6, Section 12.4, and Section 12.7 EIS Chapter 13, Section 13.1.6, Section 13.4, and Section 13.7 EIS Chapter 14, Section 14.1.6, Section 14.4, and Section 14.7 EIS Chapter 15, Section 15.1.6, Section 15.4, and Section 15.7 EIS Chapter 16, Section 16.1.6, Section 16.4, and Section 16.7 EIS Chapter 17, Section 17.1.6, Section 17.4, and Section 17.7 EIS Chapter 18, Section 18.1.6, Section 18.4, and Section 18.7 EIS Chapter 19, Section 19.1.6, Section 19.4, and Section 19.7 EIS Chapter 20, Appendix 20A, Table 20A-1
	The EIS will identify the criteria used to assign significance ratings to any predicted adverse effects. It will contain clear and sufficient information to enable the Agency or review panel, technical and regulatory agencies, Indigenous groups, and the public to review the proponent's analysis of the significance of effects. The EIS will document the terms used to describe the level of significance	EIS Chapter 4, Section 4.3.4 EIS Chapter 6, Section 6.1.6, Section 6.4.3 and Section 6.7 EIS Chapter 7, Section 7.1.6, Section 7.4.3, and Section 7.7 EIS Chapter 8, Section 8.1.6, Section 8.4.4, and Section 8.7 EIS Chapter 9, Section 9.1.6, Section 9.4.3, and Section 9.7 EIS Chapter 10, Section 10.1.6, Section 10.4.4, and Section 10.7 EIS Chapter 11, Section 11.1.6, Section 11.4.4, and Section 11.7 EIS Chapter 12, Section 12.1.6, Section 12.4.4, and Section 12.7 EIS Chapter 13, Section 13.1.6, Section 13.4.4, and Section 13.7 EIS Chapter 14, Section 14.1.6, Section 14.4.4, and Section 14.7 EIS Chapter 15, Section 15.1.6, Section 15.4.4, and Section 15.7 EIS Chapter 16, Section 16.1.6, Section 16.4.4, and Section 16.7 EIS Chapter 17, Section 17.1.6, Section 17.4.4, and Section 17.7 EIS Chapter 18, Section 18.1.6, Section 18.4.4, and Section 18.7 EIS Chapter 19, Section 19.1.6, Section 19.4.4, and Section 19.7 EIS Chapter 20, Appendix 20A, Table 20A-1
	The following criteria should be used in determining the significance of residual effects: magnitude, geographic extent, timing, duration, frequency, reversibility, ecological and social context, existence of environmental standards, guidelines or objectives for assessing the effect	

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	In assessing significance against these criteria the proponent will, where possible, use relevant existing regulatory documents, environmental standards, guidelines, or objectives such as prescribed maximum levels of emissions or discharges of specific hazardous agents into the environment. The EIS will contain a section which explains the assumptions, definitions and limits to the criteria mentioned above in order to maintain consistency between the effects on each VC	EIS Chapter 6, Section 6.7 EIS Chapter 7, Section 7.7 EIS Chapter 8, Section 8.7 EIS Chapter 9, Section 9.7 EIS Chapter 10, Section 10.7 EIS Chapter 11, Section 11.7 EIS Chapter 12, Section 12.7 EIS Chapter 13, Section 13.7 EIS Chapter 14, Section 14.7 EIS Chapter 15, Section 15.7 EIS Chapter 16, Section 16.7 EIS Chapter 17, Section 17.7 EIS Chapter 18, Section 18.7 EIS Chapter 19, Section 19.7 EIS Chapter 20, Appendix 20A, Table 20A-1
	Where significant adverse effects are identified, the EIS will set out the probability (likelihood) that they will occur, and describe the degree of scientific uncertainty related to the data and methods used within the framework of this environmental analysis	**No significant adverse environmental effects have been identified.**
6.6 Other Effects to Consider	*See all subsections of Section 6.6*	
6.6.1 Effects of Potential Accidents or Malfunctions	The failure of certain works caused by human error or exceptional natural events (e.g. flooding, earthquake, forest fire) could cause major effects. The proponent will therefore conduct an analysis of the risks of accidents and malfunctions across all phases of the Project, determine their effects, and present a preliminary emergency response measures and capacities	EIS Summary, Section 7 EIS Chapter 4, Section 4.3.6 EIS Chapter 22
	Taking into account the lifespan of all different project components and temporal phases, the proponent will identify the probability of potential accidents and malfunctions related to the project, including an explanation of how those events were identified, potential consequences (including the environmental effects as defined in section 5 of CEAA 2012), the plausible worst case scenarios and the effects of these scenarios. Fate and behaviour modelling of potential spills of hydrocarbons, sodium cyanide, and ammonium nitrate to fish-bearing waterways may be considered across all seasons	EIS Chapter 22
	This assessment will include an identification of the magnitude of an accident and/or malfunction, including the quantity, mechanism, rate, form and characteristics of the contaminants and other materials likely to be released into the environment during the accident and malfunction events and would potentially result in an adverse environmental effect as defined in section 5 of CEAA 2012.	EIS Chapter 22
	The EIS will describe the preventative measures and design safeguards that have been established to protect against such occurrences and the contingency and emergency response procedures that would be put in place if such events do occur	EIS Chapter 22, Section 22.5
	Environmental sensitivity mapping, including likely pathways, will identify areas sensitive to accident and malfunction scenarios that are located adjacent to project activities, such as streams and wetland areas frequented by fish and/or migratory birds	EIS Chapter 22, Section 22.4 and Map 22-1 and Map 22-2
6.6.2 Effects of the Environment on the Project	The EIS will take into account how local conditions and natural hazards, such as severe and/or extreme weather conditions and external events (e.g. flooding, drought, ice jams, landslides, avalanches, erosion, subsidence, fire, outflow conditions and seismic events), could adversely affect the project and how this in turn could result in effects to the environment (e.g. extreme environmental conditions that can contribute to and/or complicate malfunctions and accidental events). These events will be considered in different probability patterns (e.g. 5-year flood vs. 100-year flood)	EIS Summary, Section 6 EIS Chapter 4, Section 4.3.5 EIS Chapter 21
	The EIS will provide details of planning, design and construction strategies intended to minimize the potential environmental effects of the environment on the project	EIS Chapter 21, Section 21.4
6.6.3 Cumulative Effects Assessment	The proponent will identify and assess the project's cumulative effects using the approach described in the Agency's Operational Policy Statement entitled Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012 and the guide entitled Technical Guidance for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012[18]	EIS Summary, Section 5.19 EIS Chapter 4, Section 4.3.4.4
	Cumulative effects are defined as changes to the environment due to the project combined with the existence of other past, present and reasonably foreseeable physical activities. Cumulative effects may result if:	EIS Chapter 4, Section 4.3.4.4
	the implementation of the project may cause direct residual adverse effects on the VC, taking into account the application of technically and economically feasible mitigation measures, and, – the same VC may be affected by other past, present and future physical activities. VCs that would not be affected by the project or would be affected positively by the project can, therefore, be omitted from the cumulative effects assessment. A cumulative effect on an environmental component may, however, be important even if the assessment of the project's effects on this component reveals that the effects of the project are minor	EIS Chapter 4, Section 4.2.1, Section 4.3.4.4

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	In its EIS, the proponent will: *identify and provide a rationale for the VCs that will constitute the focus of the cumulative effects assessment, focusing the cumulative effects assessment on the VCs most likely to be affected by the project and other project and activities. To this end, the proponent must consider, without limiting itself thereto, the following components likely to be affected by the project:*	EIS Summary, Section 5.19 EIS Chapter 6, Section 6.5 EIS Chapter 7, Section 7.5 EIS Chapter 8, Section 8.5 EIS Chapter 9, Section 9.5 EIS Chapter 10, Section 10.5 EIS Chapter 11, Section 11.5 EIS Chapter 12, Section 12.5 EIS Chapter 13, Section 13.5 EIS Chapter 14, Section 14.5 EIS Chapter 15, Section 15.5 EIS Chapter 16, Section 16.5 EIS Chapter 17, Section 17.5 EIS Chapter 18, Section 18.5 EIS Chapter 19, Section 19.5
	fish and fish habitat, including salmon and other valued fish species	EIS Chapter 10, Section 10.5
	species at risk	EIS Chapter 10, Section 10.5.1 EIS Chapter 11, Section 11.5 EIS Chapter 12, Section 12.5
	migratory birds	EIS Chapter 12, Section 12.5
	Indigenous peoples	EIS Chapter 19, Section 19.5
	any VCs associated with subsection 5(2) of CEAA 2012	EIS Chapter 10, Section 10.4.2 EIS Chapter 15, Section 15.5 EIS Chapter 17, Section 17.5 EIS Chapter 19, Section 19.4 EIS Chapter 20, Section 20.1, Appendix 20A, Table 20A-1
	given the prior mining history at both sites, consider each VC not only in relation to current conditions, but conditions prior to historic mining, and identify changes/alterations in the interim, relevant to the consideration of cumulative effects	EIS Chapter 4, Section 4.3.4.4 EIS Chapter 8, Section 8.5, Section 8.7 EIS Chapter 9, Section 9.5, Section 9.7 EIS Chapter 10, Section 10.5 EIS Chapter 11, Section 11.5 EIS Chapter 12, Section 12.5 EIS Chapter 13, Section 13.5 EIS Chapter 14, Section 14.5 EIS Chapter 15, Section 15.5 EIS Chapter 17, Section 17.5 EIS Chapter 19, Section 19.5
	identify and justify the spatial and temporal boundaries for the cumulative effect assessment for each VC selected. The boundaries for the cumulative effects assessments will generally be different for each VC considered. These cumulative effects boundaries will also generally be larger than the boundaries for the corresponding project effects	EIS Chapter 4, Section 4.3.2.2, Section 4.3.4.4 EIS Chapter 6, Section 6.1.4 EIS Chapter 7, Section 7.1.4 EIS Chapter 8, Section 8.1.4 EIS Chapter 9, Section 9.1.4 EIS Chapter 10, Section 10.1.4 EIS Chapter 11, Section 11.1.4 EIS Chapter 12, Section 12.1.4 EIS Chapter 13, Section 13.1.4 EIS Chapter 14, Section 14.1.4 EIS Chapter 15, Section 15.1.4 EIS Chapter 16, Section 16.1.4 EIS Chapter 17, Section 17.1.5 EIS Chapter 19, Section 19.1.4

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	identify the sources of potential cumulative effects. Specify other projects or activities that have been or that are likely to be carried out that could cause effects on each selected VC within the boundaries defined, and whose effects would act in combination with the residual effects of the project. This assessment may consider the results of any relevant study conducted by a committee established under section 73 or 74 of CEAA 2012	EIS Chapter 6, Section 6.5.1 EIS Chapter 7, Section 7.5.1 EIS Chapter 8, Section 8.5.1 EIS Chapter 9, Section 9.5.1 EIS Chapter 10, Section 10.5.1 EIS Chapter 11, Section 11.5.1 EIS Chapter 12, Section 12.5.1 EIS Chapter 13, Section 13.5.1 EIS Chapter 14, Section 14.5.1 EIS Chapter 15, Section 15.5.1 EIS Chapter 16, Section 16.5 EIS Chapter 17, Section 17.5.1 EIS Chapter 19, Section 19.5.1
	assess the cumulative effects on each VC selected by comparing the future scenario with the project and without the project. Effects of past activities (activities that have been carried out) will be used to contextualize the current state of the VC. In assessing the cumulative effects on current use of lands and resources for traditional purposes, the assessment will focus on the cumulative effects on the relevant activity (e.g. hunting, fishing, trapping, plant harvesting) and also consider overall effects on Indigenous rights-based activities on their traditional lands and resources and health and socio-economic conditions. Cumulative effects must consider residual effects across multiple VCs	EIS Chapter 6, Section 7.5 EIS Chapter 7, Section 7.5 EIS Chapter 8, Section 8.5 EIS Chapter 9, Section 9.5 EIS Chapter 10, Section 10.5 EIS Chapter 11, Section 11.5 EIS Chapter 12, Section 12.5 EIS Chapter 13, Section 13.5 EIS Chapter 14, Section 14.5 EIS Chapter 15, Section 15.5.2, Section, 15.5.3, Section 15.5.4 EIS Chapter 16, Section 16.5 EIS Chapter 17, Section 17.5 EIS Chapter 19, Section 19.5
	describe the mitigation measures that are technically and economically feasible. The proponent shall assess the effectiveness of the measures applied to mitigate the cumulative effects. In cases where measures exist that are beyond the scope of the proponent's responsibility that could be effectively applied to mitigate these effects, the proponent will identify these effects and the parties that have the authority to act. In such cases, the EIS will summarize the discussions that took place with the other parties in order to implement the necessary measures over the long term	EIS Chapter 4, Section 4.3.4.4 EIS Chapter 10, Section 10.5 EIS Chapter 11, Section 11.5.2, Section 11.5.3, Section 11.5.4, and Section 11.5.5 EIS Chapter 12, Section 12.5.2, Section 12.5.3, and Section 12.5.4 EIS Chapter 13, Section 13.5.2, Section 13.5.3, and Section 13.5.4 EIS Chapter 14, Section 14.5.2, Section 14.5.3, Section 14.5.4, and Section 14.5.5 EIS Chapter 15, Sections 15.5.2, Section 15.5.3, and Section 15.5.4 EIS Chapter 17, Section 17.5.2, Section 17.5.3, Section 17.5.4, and Section 17.5.5 EIS Chapter 19, Section 19.5.2, Section 19.5.3, Section 19.5.4, and Section 19.5.5
	determine the significance of the cumulative effects	EIS Chapter 4, Section 4.3.4.5 EIS Chapter 6, Section 6.5.1 EIS Chapter 7, Section 7.5.1 EIS Chapter 8, Section 8.5.1 EIS Chapter 9, Section 9.5.1 EIS Chapter 10, Section 10.5.1 EIS Chapter 11, Section 11.7.2 EIS Chapter 12, Section 12.7.2 EIS Chapter 13, Section 13.7.2 EIS Chapter 14, Section 14.7.2 EIS Chapter 15, Section 15.7.2 EIS Chapter 16, Section 16.5 EIS Chapter 17, Section 17.7.2 EIS Chapter 18, Section 18.5.1 EIS Chapter 19, Section 19.7.2

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	develop a follow-up program to verify the accuracy of the assessment or to dispel the uncertainty concerning the effectiveness of mitigation measures for certain cumulative effects	EIS Chapter 4, Section 4.3.7 EIS Chapter 6, Section 6.9 EIS Chapter 7, Section 7.9 EIS Chapter 8, Section 8.9 EIS Chapter 9, Section 9.9 EIS Chapter 10, Section 10.9 EIS Chapter 11, Section 11.9 EIS Chapter 12, Section 12.9 EIS Chapter 13, Section 13.9 EIS Chapter 14, Section 14.9 EIS Chapter 15, Section 15.9 EIS Chapter 16, Section 16.9 EIS Chapter 17, Section 17.9 EIS Chapter 18, Section 18.9 EIS Chapter 19, Section 19.10 EIS Chapter 23, Section 23.1, Section 23.6
	The proponent is required to engage with key stakeholders and Indigenous groups prior to finalizing the choice of VCs and the appropriate boundaries to assess cumulative effects	EIS Chapter 3
7.0 Summary of Environmental Effects Assessment	*The EIS will contain a table summarizing the following key information:*	
	potential environmental effects on valued components	EIS Chapter 20, Appendix 20A, Table 20A-1
	proposed mitigation measures to address the effects identified above	EIS Chapter 20, Appendix 20A, Table 20A-1
	potential residual effects and the significance of the residual environmental effects	EIS Chapter 20, Appendix 20A, Table 20A-1
	The summary table will be used in the EA Report prepared by the Agency or will be considered by the review panel. An example of a format for the key summary table is provided in Appendix 1 of this document	EIS Chapter 20, Appendix 20A, Table 20A-1
	In a second table, the EIS will summarize all key mitigation measures and commitments made by the proponent which will more specifically mitigate any significant adverse effects of the project on VCs (i.e. those measures that are essential to ensure that the project will not result in significant adverse environmental effects).	EIS Chapter 20, Appendix 20B, Table 20B-1
8.0 Follow-up and Monitoring Programs	*A follow-up program is designed to verify the accuracy of the effects assessment and to determine the effectiveness of the measures implemented to mitigate the adverse effects of the project. Where there is uncertainty about effects outcomes, the proponent will show evidence of detailed follow-up and monitoring programs to identify change, and identify adaptive management measures that will be applied.* *Considerations for developing a follow-up program include:* *– whether the project will impact the physical environment, environmentally sensitive areas/VCs, or protected areas or areas under consideration for protection,* *– the nature of Indigenous and public concerns raised about the project,* *– the accuracy of predictions,* *– whether there is a question about the effectiveness of mitigation measures or the proponent proposes to use new or unproven techniques and technology,* *– the nature of cumulative environmental effects,* *– the nature, scale and complexity of the program,* *– a description of proposed engagement with Indigenous groups in the planning and implementation of follow-up and monitoring, and* *– identify, with supporting rationale, how long post closure water will need to be managed and monitored, and* *– whether there was limited scientific knowledge about the effects in the EA.* *The goal of a monitoring program is to ensure that proper measures and controls are in place in order to decrease the potential for environmental degradation during all phases of project development, and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety.*	EIS Chapter 23
8.1 Follow-up Program	*The EIS shall present a preliminary follow-up program and shall include:*	
	objectives of the follow-up program and the VCs targeted by the program	EIS Chapter 4, Section 4.3.7 EIS Chapter 23, Sections 23.1 and Section 23.6
	list of elements requiring follow-up	EIS Chapter 4, Section 4.3.7 EIS Chapter 23, Section 23.5 and Section 23.6
	number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.)	EIS Chapter 23, Section 23.5 and Section 23.6

Table i-1. Guidelines for the Preparation of an Environmental Impact Statement Pursuance to CEAA 2012 Lynn Lake Gold Project – November 2017

Guideline Section	Guideline Description	Application Section where Manner Addressed
	intervention mechanism used in the event that an unexpected deterioration of the environment is observed	EIS Chapter 6, Section 6.9 EIS Chapter 7, Section 7.9 EIS Chapter 8, Section 8.9 EIS Chapter 9, Section 9.9 EIS Chapter 10, Section 10.9 EIS Chapter 11, Section 11.9 EIS Chapter 12, Section 12.9 EIS Chapter 13, Section 13.9 EIS Chapter 16, Section 16.9 EIS Chapter 17, Section 17.9 EIS Chapter 18, Section 18.9 EIS Chapter 19, Section 19.10 EIS Chapter 23, Section 23.2
	mechanism to disseminate follow-up results among the concerned populations	EIS Chapter 23, Section 23.3
	accessibility and sharing of data for the general population	EIS Chapter 23, Section 23.3
	opportunity for the proponent to include the participation of Indigenous groups and stakeholders on the affected territory and include Aboriginal traditional knowledge, during the development and implementation of the program	EIS Chapter 23, Section 23.3 and Section 23.4
	involvement of local and regional organizations and Indigenous groups in the design, implementation and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent	EIS Chapter 23, Sections 23.3 and Section 23.4
8.2 Monitoring	*The proponent will prepare an environmental monitoring program for all phases of the project. Specifically, the environmental impact statement shall present an outline of the preliminary environmental monitoring program, including the:*	EIS Summary, Section 8 EIS Chapter 4, Section 4.3.7 EIS Chapter 23, Section 23.5
	identification of the interventions that pose risks to one or more of the environmental and/or valued components and the measures and means planned to protect the environment	EIS Chapter 23, Section 23.5
	identification of regulatory instruments that include a monitoring program requirement for the valued components	EIS Chapter 23, Section 23.6, Table 23-1
	description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required)	EIS Chapter 6, Section 6.9 EIS Chapter 7, Section 7.9 EIS Chapter 8, Section 8.9 EIS Chapter 9, Section 9.9 EIS Chapter 10, Section 10.9 EIS Chapter 11, Section 11.9 EIS Chapter 12, Section 12.9 EIS Chapter 13, Section 13.9 EIS Chapter 14, Section 14.9 EIS Chapter 15, Section 15.9 EIS Chapter 16, Section 16.9 EIS Chapter 17, Section 17.9 EIS Chapter 18, Section 18.9 EIS Chapter 19, Section 19.10 EIS Chapter 23, Section 23.6
	description of the proponent's intervention mechanisms in the event of the observation of noncompliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts	EIS Chapter 6, Section 6.9 EIS Chapter 7, Section 7.9 EIS Chapter 8, Section 8.9 EIS Chapter 9, Section 9.9 EIS Chapter 10, Section 10.9 EIS Chapter 11, Section 11.9 EIS Chapter 12, Section 12.9 EIS Chapter 13, Section 13.9 EIS Chapter 14, Section 14.9 EIS Chapter 15, Section 15.9 EIS Chapter 16, Section 16.9 EIS Chapter 17, Section 17.9 EIS Chapter 18, Section 18.9 EIS Chapter 19, Section 19.10 EIS Chapter 23, Section 23.2 and Section 23.5
	guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities and Indigenous groups concerned	EIS Chapter 23, Section 23.3
	plans to engage Indigenous groups in monitoring, where appropriate	EIS Chapter 23, Section 23.4

Table i-2. Manitoba Environment Act Proposal Report Guidelines

Guideline Section	Application Section and Manner Addressed
INTRODUCTION AND BACKGROUND	
Filling Requirements	
1) Need or rationale for the development, purpose, and alternatives; may include one or more of the following depending on the development:	EIS Summary, Chapter 3 Chapter 1, Section 1.3 Chapter 2, Section 2.9
a) products or services to be provided and process technologies to be used	Chapter 1, Section 1.1, Chapter 2, throughout
b) quantitative information on the volumes or amounts of products or services as applicable	Chapter 1, Section 1.1, Chapter 2, throughout
c) current population trends, if a specified population is to be served by the development	Chapter 13, Section 13.2
d) reference to previous studies and activities relating to feasibility, exploration, or project siting and prior authorization received from other government agencies	Chapter 1, Section 1.1 Chapter 2, Section 2.9.3
DESCRIPTION OF PROPOSED DEVELOPMENT	
Filling Requirements	
1) Certificate of Title showing the owner(s) and legal description of the land upon which the development will be constructed; or, in the case of highways, rail lines, electrical transmission lines, or pipelines, a map or maps at a scale no less than 1:50,000 showing the location of the proposed development	Chapter 1, Section 1.1 Chapter 2, Section 2.1
2) Owner of land upon which the development is intended to be constructed, and of mineral rights beneath the land, if different from surface owner	Chapter 1, Section 1.1
3) Existing land use on the site and on land adjoining it, as well as changes that will be made in such land use for the purposes of the development	Chapter 1, Section 1.1 Chapter 5, Section 5.4.7.1 Chapter 15, Section 15.3
4) Land use designation for the site and adjoining land as identified in a development plan adopted under The Planning Act or The City of Winnipeg Act, and the zoning designation as identified in a zoning bylaw, if applicable	Chapter 15, Section 15.3.2.1
5) Description of proposed development and schedule for stages of the development, including proposed dates for planning, design, construction, commissioning, operation, and decommissioning and/or termination of operation (if known), identifying major components and activities of the development as applicable (e.g. access road, airstrip, processing facility, waste disposal area, etc.)	Chapter 2, Section 2.6
6) Funding, including the name and address of any government agency or program (federal, provincial or otherwise) from which a grant or loan of capital funds have been requested (where applicable)	Chapter 1, Section 1.1.1
7) Other federal, provincial or municipal approvals, licences, permits, authorizations, etc. known to be required for the proposed development, and the status of the project's application or approval. (Information on federal approval requirements may be obtained from the Canadian Environmental Assessment Agency at http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=D75FB358-1.)	Chapter 1, Section 1.4
8) Results of any public consultations undertaken or to be undertaken in conjunction with project planning	Chapter 3, throughout
DESCRIPTION OF EXISTING ENVIRONMENT IN THE PROJECT AREA	
Filling Requirements	
1. The biophysical environment as related to the development, including topographic and base maps and aerial photographs as necessary, as follows:	Chapter 2, Section 2; Appendix 2A Chapter 5, Section 5.2
a. description of the local area and regional setting including important terrain features such as hills, valleys, lakes, rivers, shorelines, etc.	Chapter 2, Section 2.1 Chapter 5, Section 5.2.5
b. description of the prevailing climate and meteorological conditions, and identification of any nearby climate monitoring stations	Chapter 5, Section 5.2.1, Section 5.2.2 Chapter 6, Section 6.2; Volume 4, App. A Air Quality Baseline TDR, Volume 4, App. C Climate and Meteorology Baseline TDR
c. identification and description of local and regional surface waterbodies (lakes, rivers, wetlands, etc.) and description of the regional groundwater conditions including aquifers, recharge areas, quality, wells, etc.	Chapter 5, Section 5.2.7, Section 5.3.2 Chapter 8, Section 8.2.2 Chapter 9, Section 9.2.2 Chapter 11, Section 11.2.2
d. description of the aquatic environment including fish resources, fish habitat, benthic invertebrates, aquatic macrophytes, etc. for each waterbody that could be affected by the proposed development	Chapter 5, Section 5.3.1 Chapter 10, Section 10.2.2
e. description of the terrestrial environment including vegetation, wildlife (mammals, birds, amphibians, reptiles, etc.), wildlife habitat, etc. that could be affected by the proposed development	Chapter 5, Section 5.3.2, Section 5.3.3 Chapter 12, Section 12.2.2
f. identification and description of any rare, threatened or endangered species or any important or sensitive species and/or habitats, particularly if federally and/or provincially protected	Chapter 5, Section 5.3.3 Chapter 10, Section 10.2.2.5 Chapter 11, Section 11.2.2 Chapter 12, Section 12.2.2.2

Table i-2. Manitoba Environment Act Proposal Report Guidelines	
Guideline Section	**Application Section and Manner Addressed**
g. identification and description of the existing land and resource uses in the region including agriculture, forestry, mining, hydroelectric, oil and gas, recreation, tourism, etc.	Chapter 5, Section 5.4.8 Chapter 14, Section 14.2 Chapter 15, Section 15.2.2; Chapter 17, Section 17.1.21
2. The socioeconomic environment as related to the development, including topographic and base maps and aerial photographs as necessary, as follows:	Chapter 5, Section 5.4
a. identification of any existing public safety and human health risks in the development area	Chapter 14, Section 14.2.2.6
b. identification and description of protected areas (e.g. national and provincial parks)	Chapter 15, Section 15.2.2
c. heritage resources (e.g. archaeological and historic sites), etc.	Chapter 16, Section 16.2.2
d. identification of Indigenous communities in the vicinity of the proposed development	EIS Summary, Chapter 4, Section 4.3 Chapter 3, Section 3.3.2 Chapter 17, Section 17.1.20
3. Existing environmental information may come from sources such as site visits, previous studies, environmental databases, baseline data, ecological land classification, and traditional ecological knowledge	Chapter 15, Section 15.2.2
DESCRIPTION OF ENVIRONMENTAL AND HUMAN HEALTH EFFECTS OF THE PROPOSED DEVELOPMENT	
Filling Requirements	
1. Potential impacts of the development on the environment, including, but not necessarily limited to:	
a. impact on biophysical environment, including wildlife, fisheries, surface water, groundwater, and forestry resources	Chapter 4, Section 4.3 Chapter 8, Section 8.4 Chapter 9, Section 9.4 Chapter 10, Section 10.4 Chapter 11, Section 11.4 Chapter 12, Section 12.4 Chapter 15, Section 15.4
b. type, quantity and concentration of pollutants (emissions, effluents and solid wastes) to be released, and the technologies proposed to contain or treat the waste streams	Chapter 6, Section 6.4
c. information on the storage, transportation and disposal of any hazardous wastes that may be produced	Chapter 2, Section 2.3.1.3, Section 2.3.2.2, Section 2.8.3.2
d. identification of any storage of gasoline or associated products (e.g. diesel fuel, used oil, heating oil, aviation gas, solvents, isopropanol, methanol, acetone, etc.)	Chapter 2, Section 2.3.1.2, Section 2.3.2.3
e. impact on heritage resources	Chapter 16, Section 16.4 Chapter 17, Section 17.4 Chapter 19, Section 19.4
f. socio-economic implications resulting from environmental impact	Chapter 13, Section 13.4 Chapter 14, Section 14.4 Chapter 15, Section 15.4 Chapter 17, Section 17.4 Chapter 19, Section 19.4
g. climate change implications including a greenhouse gas inventory calculated according to guidelines developed by Environment Canada (http://www.ghgreporting.gc.ca/GHGInfo/Pages/page15.aspx) and the United Nations (http://www.ipcc-nggip.iges.or.jp/public/index.html.)	Chapter 6, Section 6.4.2; Volume 5, App. A Air Quality TMR
2. Potential impacts of the development on human health and safety, including, but not necessarily limited to:	
a. potential impact on human health and safety resulting from any release of pollutants, including a human health risk assessment	Chapter 18, Section 18.3, Section 18.4
3. Potential impacts of the development on Indigenous communities, including, but not necessarily limited to:	
a. direct impacts on communities in the project area	Chapter 3, Section 3.3.5, 3.3.60 Chapter 13, Section 13.4; Chapter 19, Section 19.4.3
b. resource use, including hunting, fishing, trapping, gathering, etc.	Chapter 15, Section 15.3.2 Chapter 17, Section 17.3.2, 17.3.3
c. cultural or traditional activities in the project area	Chapter 17, Section 17.3.4, 17.3.5

Table i-2. Manitoba Environment Act Proposal Report Guidelines	
Guideline Section	**Application Section and Manner Addressed**
MITIGATION MEASURES AND RESIDUAL ENVIRONMENTAL EFFECTS	
Filling Requirements	
1. Proposed environmental management and risk mitigation practices to be employed to prevent or mitigate adverse implications from the impacts identified above, having regard to, where applicable:	Chapter 4, Section 4.3.4.2 Chapter 6, Section 6.4.1.3; Section 6.4.2.3 Chapter 7, Section 7.4.1.3; Section 7.4.2.3 Chapter 8, Section 8.4.2.2; Section 8.4.3.2 Chapter 9, Section 9.4.1.3; Section 9.4.2.3 Chapter 10, Section 10.4.1.3; Section 10.4.1.3 Chapter 11, Section 11.4.2.2; Section 11.4.3.2; Section 11.4.4.2; Section 11.4.5.2 Chapter 12, Section 12.4.2.3; Section 12.4.3.3; Section 12.4.4.3 Chapter 13, Section 13.4.2.2; Section 13.4.3.2; Section 13.4.4.2 Chapter 14, Section 14.4.2.2; Section 14.4.3.2; Section 14.4.4.2; Section 14.4.5.2 Chapter 15, Section 15.4.2.2; Section 15.4.3.2; Section 15.4.4.2 Chapter 16, Section 16.4.2.2 Chapter 17, Section 17.4.2.2; Section 17.4.3.2 Chapter 18, Section 18.4.2.2 Chapter 19, Section 19.4.3.2; Section 19.4.4.2; Section 19.4.5.2 Chapter 20, Appendix 20A, Table 20A-1; Appendix 20B, Table 20B-1
a. mitigation incorporated at the planning and design stages	Chapter 2, Section 2.2
b. containment, handling, monitoring, storage, treatment, and final disposal of pollutants	Chapter 2, Section 2.3 Chapter 23, Section 23.5
c. conservation and protection of natural or heritage resources	Chapter 16, Section 16.9
d. environmental restoration and rehabilitation of the site upon decommissioning	Chapter 2, Section 2.7.4 Chapter 23, Section 23.5.18, Appendix 23B
e. protection of environment and human health	Chapter 18, Section 18.4
2. Residual environmental effects remaining after the application of mitigation measures, to the extent possible expressed in quantitative terms relative to baseline conditions	Chapter 4, Section 4.3.4 Chapter 6, Section 6.4; Section 6.4.3; Section 6.7 Chapter 7, Section 7.4; Section 7.4.3; Section 7.7 Chapter 8, Section 8.4; Section 8.4.4; Section 8.7 Chapter 9, Section 9.4; Section 9.4.3; Section 9.7 Chapter 10, Section 10.4; Section 10.4.3; Section 10.7 Chapter 11, Section 11.4; Section 11.4.6; Section 11.7 Chapter 12, Section 12.4; Section 12.4.5; Section 12.7 Chapter 13, Section 13.4; Section 13.4.5; Section 13.7 Chapter 14, Section 14.4; Section 14.4.5; Section 14.7 Chapter 15, Section 15.4; Section 15.4.5; Section 15.7 Chapter 16, Section 16.4, Section 16.7 Chapter 17, Section 17.4; Section 17.4.5; Section 17.7 Chapter 18, Section 18.4; Section 18.4.3; Section 18.7 Chapter 19, Section 19.4; Section 19.4.6; Section 19.7
3. Description of control technology as compared to best available control technology	Chapter 2, Section 2.9
FOLLOW-UP PLANS, INCLUDING MONITORING AND REPORTING	
Filling Requirements	
1. Proposed follow-up activities that will be required at any stage of development (e.g. monitoring, inspection, surveillance, audit, etc.)	Chapter 4, Section 4.3.8 Chapter 23, throughout

Lynn Lake Gold Project
Environmental Impact Statement
Chapter 1 - Introduction

Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Acronyms and Abbreviations

Alamos	Alamos Gold Inc.
Ausenco	Ausenco Engineering Canada Inc.
Carlisle	Carlisle Goldfields Limited
CD Regulation	*Classes of Development Regulation*
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
DFO	Fisheries and Oceans Canada
EA	environmental assessment
ECCC	Environment and Climate Change Canada
EIS	environmental impact statement
g	gram(s)
ha	hectares
HADD	harmful alteration, disruption, or destruction (of fish habitat)
IAA	*Impact Assessment Act*
km	kilometer(s)
km^2	square kilometre(s)
L	litre(s)
m	metre(s)
m^2	square metre(s)
m^3	cubic metre(s)
MCC	Manitoba Conservation and Climate
MDMER	Metal and Diamond Mining Effluent Regulations
Mt	million tonne(s)
oz	ounce(s)

Project, the	Lynn Lake Gold Project
Proponent, the	Alamos Gold Inc.
Regulations, the	Regulations Designating Physical Activities
s	second(s)
t	tonne(s)
TDG Act	*Transportation of Dangerous Goods Act, 1992*
TMF	tailings management facility
UTM	universal transverse mercator

1.0 INTRODUCTION

Alamos Gold Inc. (Alamos) proposes to construct, operate, and ultimately decommission two new open pit gold mine sites, a process plant, Tailings Management Facility (TMF), and ancillary facilities at two historical gold mine sites near Lynn Lake, Manitoba (i.e., Gordon and MacLellan sites); collectively known as the Lynn Lake Gold Project (LLGP or the Project).

This Environmental Impact Statement (EIS) is intended to satisfy the federal environmental assessment (EA) process under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and Project-specific requirements contained in the Final Guidelines for the Preparation of an Environmental Impact Statement, pursuant to CEAA, 2012, dated November, 2017 (Federal EIS Guidelines) as well as the requirements set out in the Manitoba Sustainable Development Information Bulletin – Environment Act Proposal Report Guidelines as per *The Environment Act* (see Chapter 4). As described in further detail in Section 1.4.1.1, the LLGP will continue under CEAA 2012, pursuant to the transitional provisions under Section 181 of the *Impact Assessment Act*.

1.1 PROJECT OVERVIEW

1.1.1 Project Background

The Project consists of two primary deposit sites, which are both located near Lynn Lake, Manitoba: the 'Gordon' site (UTM 14U 412400E, 6307800N) and the 'MacLellan' site (UTM 14U 380900E, 6307500N; Map 1-1).

The Gordon site, historically referred to as the Farley Lake site, was formerly operated as an open pit two-pit gold mine between 1996 and 1999 under Black Hawk Mining Inc. and was closed in 1999. The mine produced 214,800 ounces (oz) of gold from 1.7 million tonnes (Mt) of ore during its lifespan. After closure, the site underwent a reclamation process and currently consists of a 15 kilometre (km) gravel access road, a bridge across the Hughes River, two mine rock storage areas and two overburden storage areas that have been capped, and two water-filled open pits. All buildings and infrastructure have been removed, as shown in Photo 1; Appendix 1A, a present-day aerial photograph of the Gordon site.

The Gordon site property was purchased by Carlisle Goldfields Limited (Carlisle) in 2011. In 2014, Carlisle and AuRico Gold Inc. formed a joint venture for the potential redevelopment of this mine site. Alamos subsequently inherited the joint venture when it merged with AuRico Gold Inc. in 2015. Alamos then became the holder of the rights to the existing mining claims and mineral leases through the acquisition of Carlisle in 2016.

The MacLellan site was formerly operated as an underground gold and silver mine, with access underground from a shaft with five-levels to a depth of 448 m and ramp access from the surface to 420 m below ground. The mine was operated by Maskwa Nickel Chrome Mines Limited, a subsidiary of Falconbridge Nickel Mines Limited, between 1986 and 1989 and produced approximately 144,000 oz of gold and 432,000 oz of silver through a 900- to 1,200-tonnes per day (t/day) milling operation. The mine operated under a licence that allowed for the discharge of mine water and sewage-plant effluent into polishing ponds and a marshy area adjacent to the Keewatin River. Ore was trucked to the Black Hawk Mining Inc. mill facility in Lynn Lake for processing.

As shown in a present-day aerial photograph of the MacLellan site (Photo 2, Appendix 1A), the mine was closed due to high operating costs and falling gold prices in 1989 and has been in a 'care and maintenance' phase since then, in anticipation of being reopened, with very little reclamation having been completed (Tetra Tech 2013). The site currently consists of a 4.6 km gravel access road, power line corridor (abandoned pole line), and infrastructure from the former underground mine, such as head frame, hoist house and shaft, access ramp, maintenance and other storage buildings, core shack and core racks, vent raise, and mine water settling ponds.

Although the MacLellan site has not been in operation since 1989, ownership has changed over the years. In 2004, the property was purchased by Carlisle and, through the acquisition of Carlisle in 2016, Alamos gained consolidated ownership of the mining claims, mineral leases, and a surface lease.

Existing land uses in and around the Project mine sites consist of Crown and municipal lands, including the northern urban portion of the Town of Lynn Lake, Black Sturgeon Reserve at Hughes Lake (approximately 2.8 km southwest to the nearest point of the access road to the Gordon site and 19.5 km east of the MacLellan site); treaty entitlement lands located at Barrington Lake, Brooks Island, and Melvin Lake; and remote cottage and recreational areas (e.g., Burge and Zed lakes provincial parks). Chapter 5 provides further details on the Project environmental setting.

1.1.2 Project Components and Activities Overview

Alamos proposes to develop new mine infrastructure at both the MacLellan and Gordon sites. At the MacLellan site, the development will include an open pit, central ore milling and processing plant, associated infrastructure, ore and overburden stockpiles, a mine rock storage area, and a TMF. The existing 4.6 km access road will be upgraded and resurfaced and used for access to the MacLellan site. A new prefabricated single lane steel bridge crossing of the Keewatin River will be constructed alongside the existing single lane concrete bridge to accommodate increased traffic in and out of the site. Existing infrastructure at the MacLellan site will be demolished and removed from the site to accommodate the new open pit. At the Gordon site, new infrastructure will be limited to an open pit, ore and overburden stockpiles, a mine rock storage area, and minor supporting infrastructure for equipment storage and maintenance. The existing 15 km Gordon site access road will also be upgraded. There will be no tailings storage or milling at the Gordon site.

Main Project components and activities are listed, by site, below.

Gordon Site:

- Resource extraction (open pit)
- Ore, overburden, and mine rock stockpiles/storage areas

- Transportation of ore from the Gordon site to the MacLellan site for processing
- Sewage treatment and domestic solid waste handling
- Utilities and infrastructure – water distribution, power generation and distribution, fuel storage and distribution
- Roads, buildings and yards, sight lighting and security, explosives storage
- Water development and control.

MacLellan Site:

- Resource extraction (open pit)
- Mill feed storage area and crushing plant
- Ore milling and processing plant
- Ore, overburden, and mine rock stockpiles/storage areas
- Tailings management facility, sewage treatment, and domestic solid waste handling
- Utilities and infrastructure – water distribution, power distribution, fuel storage and distribution
- Roads and pipelines (potable water and process water)
- Buildings and yards – parking areas, security buildings, administration offices, truck shop, laboratory, plant control room, workshop, warehouse, laydown areas, site lighting and security, explosives storage
- Temporary facilities and infrastructure – construction camp (including sewage storage and/or onsite treatment)
- Water development and control
- Ancillary facilities – borrow sources, substation, and distribution line.

Construction, operation, and decommissioning/closure of mining infrastructure at the Gordon and MacLellan sites are considered a single Project for the purposes of this assessment. The current estimates are for a total Project mine excavation of approximately 222 Mt with an average (nominal) 7,500 t/day design processing rate (maximum 8,250 t/day) and an estimated 13-year Project mine life. The total mineralized material to be mined from the open pits at both sites is estimated to be approximately 34.86 Mt, with an average recoverable grade of 1.73 grams per tonne (g/t) gold and 3.40 g/t silver, resulting in the production of 1,943,000 oz of gold and 3,808,000 oz of silver. The overall Project development schedule will consist of the following phases:

- Construction (i.e., site preparation, physical construction/equipment installation, pre-production, and commissioning), which will be scheduled following regulatory approval and is anticipated to take approximately two years to complete (Year -2, Year -1). Some limited pre-production may occur during this period. Project construction activities will be carried out concurrently at both mine sites.

- Operation (i.e., ore and mine rock extraction, processing, and waste management), which will follow construction and is expected to take approximately 13 years to complete (Years 1 to 13).
  - Mining operations are expected to commence at both sites in Year 1. Mining at the Gordon site will be undertaken for six years (i.e., during Years 1 to 6) while mining at the MacLellan site will be undertaken for the entire life of the Project (i.e., during Years 1 to 13).
  - The ore stockpiled during mine operations (both sites) will provide feedstock to the ore milling and processing plant located at the MacLellan site during the Project.
- Decommissioning/closure will begin at the cessation of operation at each site. Active closure is scheduled to begin in Year 6 at the Gordon site and in Year 14 at the MacLellan site. Active closure is expected to take approximately 5 to 6 years to complete at each site. Active closure will be followed by post-closure, which is the time period during which active reclamation measures are complete, but monitoring is still required. The expected duration for post-closure is approximately 10 years. Pit filling is expected to take 11 years at the Gordon site and 21 years at the MacLellan site under average conditions (Chapter 9, Section 9.4.1). Permanent closure will occur when the site is stable, and monitoring is no longer required.

The Project is not expected to receive financial support from federal authorities, and the use of federal lands is not anticipated to be required in support of the Project. The nearest parcel of federal land to key Project components is associated with Black Sturgeon Reserve, distances between the Project component and Black Sturgeon Reserve are provided in Table 1-1 below.

Table 1-1 Distance from Key Project Components to Nearest Parcel of Federal Land

Key Project Component	Distance to Nearest Parcel of Federal Land (km)	Name of Federal Land Parcel
Gordon Site		
Gordon Footprint	5.6	Black Sturgeon Reserve
Gordon Access Road	2.8	Black Sturgeon Reserve
MacLellan Site		
Project Footprint	19.5	Black Sturgeon Reserve
Tailings Management Facility	20.5	Black Sturgeon Reserve
Permanent Worker Camp	22.4	Black Sturgeon Reserve
Access Road	22.5	Black Sturgeon Reserve

1.2 PROPONENT INFORMATION

Alamos is a Canadian-based intermediate gold producer with diversified production from three operating mines in North America: Young-Davidson and Island Gold mines in northern Ontario, Canada, and Mulatos mine in Sonora, Mexico. Alamos has a leading growth profile with exploration and development projects in Mexico, Turkey, Canada, and the United States (Alamos 2020a).

Financial and planning decisions related to the development of the Project are the responsibility of Alamos. Alamos hired Stantec Consulting Ltd. to carry out the environmental assessment of the Project. Alamos maintains control over decisions related to the planning, design, implementation, construction, operation, and closure of the Project. This includes retaining the required staff, contractors, equipment, and other resources necessary to develop the Project, and providing management direction for Project phases.

The Alamos Board of Directors is responsible for providing governance and stewardship of the company and is required to act in the best interests of the company. The Board of Directors consists of nine directors whose responsibility is to supervise the management of the business and affairs of the Company. Alamos relies on its highly experienced senior management team that has many years of experience developing and operating mining projects in Canada and abroad.

Alamos continually strives to preserve the long-term health and viability of the natural environment affected by Company projects and operations through investment in new initiatives to reduce the environmental footprint. Alamos' objective is to minimize its' operational environmental impacts and offset any impacts that cannot be fully mitigated or rehabilitated (Alamos 2020a).

The Proponent and main Project EA contact information is as follows:

Project Proponent:	Alamos Gold Inc. Address: Brookfield Place, 181 Bay Street, Suite 3910 P.O. Box #823, Toronto, ON M5J 2T3 Website: www.alamosgold.com
Proponent Chief Executive Officer:	John A. McCluskey President and Chief Executive Officer Address: Brookfield Place, 181 Bay Street, Suite 3910 P.O. Box #823, Toronto, ON M5J 2T3 Phone: (416) 368-9932 Email: jmc@alamosgold.com
Main Proponent Contact Regarding the Project:	Paolo Toscano, P.Eng. Director, Projects Address: Brookfield Place, 181 Bay Street, Suite 3910 P.O. Box #823, Toronto, ON M5J 2T3 Phone: (416) 368-9932 Email: PToscano@alamosgold.com

Main Proponent Contact Regarding Environmental Assessment:	Colin Webster VP, Sustainability and External Affairs Address: Brookfield Place, 181 Bay Street, Suite 3910 P.O. Box #823, Toronto, ON M5J 2T3 Phone: (416) 368-9932 Email: CWebster@alamosgold.com
Main Environmental Consultant Contact Regarding EA:	Karen Mathers, P.Geo. PMP Stantec Consulting Ltd., Project Manager Address: 500-311 Portage Avenue Winnipeg, MB R3B 2B9 Phone: (204) 489-5900 Email: Karen.Mathers@stantec.com

The 'Proponent Team' for this Project consists of independent third party consultants that have been engaged to assist Alamos throughout the EA process, including environmental planning, assessment, licensing, and permitting support from Stantec Consulting Ltd.; feasibility and design/engineering support from Ausenco Engineering Canada Inc. (Ausenco); geotechnical engineering support from Golder Associates; mine design support from Q'Pit Inc.; power supply support from BBA Engineering; economic modelling support from Price Waterhouse Cooper; and accommodation assessment support for the Project from RePlan (an ERM Group Company).

Alamos is committed to the principles of sustainable development as first outlined by the Company in 2013. These principles and objectives on sustainable development are critical to all aspects of their business (Alamos Gold Inc. 2020). Alamos' sustainability commitments include:

- "Ensure that every one of our employees, contractors and visitors go *Home Safe Every Day*, and work diligently so our standards are carried into the community to raise broader health and safety outcomes.
- Promote environmental stewardship across the full life cycle of our assets, minimizing our footprint, protecting, and preserving land, air, water, and energy resources to the greatest extent reasonable.
- Engage with project-affected communities on their perspectives about what constitutes Net Benefit and strive to factor their input into investment decisions so as to become known as a development partner of choice.
- Respect the culture, values, and human rights of local populations, including the rights of indigenous peoples.
- Develop open and transparent engagement mechanisms that are meaningful, effective, inclusive, and consultative.
- Develop and implement thoughtful, practical and operations-focused management systems to govern and measure our sustainability performance and ensure that we are making good on our commitments.
- Ensure compliance with all applicable legal and regulatory requirements and periodically evaluate our social and environmental performance by reviewing adherence to this Policy and Corporate.

- Sustainability Standards through independent reviews and audits that continuously improve our management approach.
- Seek to require all employees and business partners, including security providers, contractors, and suppliers to adhere to this Policy as a condition to working on our sites or on our behalf.
- Publicly disclose and report on our sustainability performance, impacts, successes and challenges using internationally recognized reporting standards." (Alamos 2020b).

1.3 PURPOSE OF THE PROJECT

Through exploration work, Alamos identified potential economic opportunities to redevelop the Lynn Lake gold deposits. The purpose of the Project is to develop the Lynn Lake gold deposits for the purpose of extracting gold (doré bullion) to process and sell.

A Project Feasibility Study was undertaken by Ausenco on behalf of Alamos to establish the viability of the Lynn Lake mineral resource, and the proposed approach for extraction based on various factors, including geologic, regulatory, environmental, economic, and community considerations (Ausenco 2018). An update to the Feasibility Study is currently in progress (Ausenco 2019). The Feasibility Study and its update confirm the technical feasibility and economic viability to develop the Lynn Lake gold deposits (the Project) for the purpose of extraction, processing, and sale. No issues have been identified to date that are expected to materially affect the ability of Alamos to extract minerals from the Project.

The Project presents several opportunities, including:

- Positively affecting employment and skills development, through the creation of full-time employment in northern Manitoba for more than 13 years from construction to active closure.
- Contribution to government revenues and economic activity, including:
  - Anticipated generation of payable income and mining taxes of approximately $351 million over its 13-year life.
  - Payment of a third-party royalty in the first two years of production from the Gordon pit of approximately $10.8 million.
  - Anticipated creation of approximately $2,466.8 million in net revenue.
  - Anticipated increase in Gross Domestic Product by approximately $965.0 million for Manitoba ($664 million in the Northern Region of Manitoba).
- Project expenditures on labour income of approximately $684 million regionally over the life of the Project.

1.4 REGULATORY FRAMEWORK

There are several federal and provincial regulatory requirements that may apply to the Project, including EA and other environmental permitting obligations. A single EIS document will be submitted to satisfy federal and provincial EA requirements; however, separate provincial Environment Act Proposal Forms will be required for each site.

1.4.1 Environmental Assessment

1.4.1.1 Federal Requirements

This document is intended to satisfy the federal EA process under CEAA 2012 as well as Project-specific requirements contained in the Federal EIS Guidelines dated November 2017 (Appendix 4A). On August 28, 2019, the *Impact Assessment Act* (IAA) came into force, repealing CEAA 2012. Section 181 of the IAA contains transitional provisions that apply to projects undergoing an EA under CEAA 2012 before the day the IAA came into force. The Notice of Commencement for the Project was posted by the CEA Agency on September 1, 2017 before the IAA came into force; therefore, the Project EIS will continue under CEAA 2012 as if it has not been repealed.

Under CEAA 2012, federal EAs are required for 'designated projects' consisting of one or more physical activities specified in the *Regulations Designating Physical Activities* (the Regulations). The Impact Assessment Agency of Canada (formerly the Canadian Environmental Assessment Agency) is responsible for the administration of federal EAs for metal mines under CEAA 2012.

The most relevant Project activities triggering potential requirements under CEAA 2012 are contained in the following provisions of the Regulations:

> *16. The construction, operation, decommissioning and abandonment of a new*
>
> > *(b) metal mill with an ore input capacity of 4,000 t/day or more.*
> >
> > *(c) rare earth element mine or gold mine, other than a placer mine, with an ore production capacity of 600 t/day or more.*
>
> *17. The expansion of an existing*
>
> > *(c) rare earth element mine or gold mine, other than a placer mine, that would result in an increase in the area of mine operations of 50% or more and a total ore production capacity of 600 t/day or more.*

The maximum ore production capacity for the Project (i.e., total mineralized material to be extracted from the open pits at both sites, excluding overburden and mine rock [waste]) is estimated to be approximately 10,383 t/day (3.8 Mt/year), including material to be stockpiled for future processing. This ore production capacity exceeds the specified threshold to qualify as a designated project under CEAA 2012 of 600 t/day or more.

The overall mining rates (i.e., total ore, overburden, and mine rock) for the Gordon and MacLellan sites will vary by year. The peak mining rate at the Gordon site is estimated to be approximately 43.8 kt/day (16

Mt/year) in Year 2. The peak mining rate at the MacLellan site is estimated to be approximately 76.7 kt/day (28 Mt/year) in Year 6.

The ore milling and processing plant that will be constructed at the MacLellan site for the Project is designed to have an average throughput of 2.74 Mt/year. The average design ore input capacity is 7,500 t/day, with a maximum potential process rate of 8,250 t/day. These ore production and input capacities exceed the thresholds specified under the Regulations. Additional information on mill feed rates and material to be mined are illustrated in Figures 5.1 and 5.2 from the mine plan (Q'Pit 2019) provided in Appendix 1B.

The Project may also be considered an expansion of an existing gold mine under the Regulations because the increase in area of mine operations exceeds the specified threshold of a 50% or more increase in mine area over the areas of both the original (historical) mine operations and current mine site footprints. In addition to the requirement to conduct a federal EA under CEAA 2012, the Project may also be subject to various other federal legislative and regulatory requirements, including several federal environmental regulatory approvals that may be required to carry out the Project. Table 1-2 provides a summary of key potentially relevant federal legislation but is not intended to be an exhaustive list of potential requirements.

Table 1-2 Summary of Key Potentially Relevant Federal Legislation

Legislation	Potentially Applicable Permitting Requirement(s)
Canadian Environmental Assessment Act, 2012 (CEAA 2012)	Federal EAs are required for 'designated projects' consisting of one or more physical activities specified in the *Regulations Designating Physical Activities*, including the construction, operation, decommissioning, and abandonment of a new metal mill or gold mine above certain ore input capacity and ore production thresholds and the expansion of an existing gold mine above certain area increase and ore production thresholds.
Canadian Environmental Protection Act, 1999	A permit may be required under section 185(1)(b) of the *Canadian Environmental Protection Act*, and the associated *Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations*, if the Project involves the import, export, or conveyance in transit of a hazardous waste or hazardous recyclable material or prescribed non-hazardous waste for final disposal.
Explosives Act	The Act requires anyone working with explosives to have a licence, certificate or permit issued by the federal Minister of Natural Resources.
Fisheries Act	Alamos will request a paragraph 35(2)(b) *Fisheries Act* Authorization from DFO for the harmful alteration, disruption, or destruction (HADD) of fish habitat that could result from Project activities. Any *Fisheries Act* Authorization will not be issued by DFO until after the CEAA decision on the Project. The Project is not anticipated to require an amendment to Schedule 2 of the *Metal and Diamond Mining Effluent Regulations* (MDMER) for the deposition of tailings into water frequented by fish. Following discussions with DFO and ECCC in September 2016, the preliminary TMF design was revised to avoid the potential deposition of mine rock or mine tailings into watercourses or waterbodies frequented by fish.

Table 1-2 Summary of Key Potentially Relevant Federal Legislation

Legislation	Potentially Applicable Permitting Requirement(s)
Migratory Birds Convention Act	Based on the current mine plan, the Project is not anticipated to require permitting under section 19 of the *Migratory Birds Regulations.* No collection of migratory birds, nests, or their eggs for scientific purposes is anticipated. Mitigation measures will be implemented to avoid disturbance to breeding birds during vegetation clearing and other Project activities.
Canadian Navigable Waters Act (CNWA)	Powerline crossings of the Hughes and Keewatin rivers, and the water intake/outfall at the Keewatin River may be classed as “minor works” as named by the Minor Works Order under the CNWA. These works do not require an approval if they meet specific terms and conditions of construction, and requirements found in the Minor Works Order. Public notification of the work may also be required. The crossings of the Keewatin and Hughes rivers may be classed as “major works” as named by the Major Works Order. An approval is required if these works substantially interfere with navigation. Public notification of the work is also required.
Species at Risk Act	No permits are expected to be required under section 73(1) of the *Species at Risk Act*. These permits are only granted for scientific research, or if affecting the species is incidental to the carrying out of the activity. They are not typically required for industrial developments if land clearing occurs outside of the bird breeding period.
Transportation of Dangerous Goods Act, 1992 (TDG Act)	Requirements under the TDG Act and Regulations may be applicable with respect to the potential transportation of explosives, cyanide, and other substances and chemicals that may be used in support of the Project. An Emergency Response Assistance Plan must be developed and approved before a person offers for transport or imports certain dangerous goods. If a person wishes to carry on an activity related to transporting dangerous goods in a way that is not technically in compliance with the TDG Regulations, he or she can apply for a permit (Equivalency Certificate) for the activity if it can be shown to provide an equivalent level of safety and compliance with the intent of the regulations.

1.4.1.2 Provincial Requirements

The *Classes of Development Regulation* (CD Regulation) under *The Environment Act* of Manitoba identifies ‘Class 1’, ‘Class 2’ and ‘Class 3’ developments that must undergo a provincial EA and obtain a licence in accordance with the Act prior to construction, alteration, or operation. Section 3(5) of the CD Regulation classifies mines and milling facilities (other than pits and quarries) as Class 2 developments. The Project may also involve one or more activities that are considered Class 2 developments under section 3 of the CD Regulation, such as stream channel alterations that affect fish mobility and fish habitat and a 138 kV-34.5 kV transformer station. The Project has the potential to be upgraded to a Class 3 development if it were to include a water development ‘trigger’ listed under section 4(4) of the CD Regulation. The Project is not expected to involve the water development activities listed as Class 3 development triggers under section 4(4) of the CD Regulation

The Environmental Approvals Branch of Manitoba Conservation and Climate (MCC) has advised that it considers the Project activities at the Gordon and MacLellan sites to constitute separate “developments” that will require separate licences under *The Environment Act* of Manitoba. The Environmental Approvals Branch will allow both sites to be assessed in a single EIS under the provincial EA process; however, separate Environment Act Proposal applications will be required for each site.

In addition to the provincial EA and licensing requirements, the Project is also subject to various other provincial legislative and regulatory requirements, including several provincial environmental regulatory approvals that may be required to carry out the Project. Table 1-3 provides a summary of key potentially relevant provincial legislation but is not intended to be an exhaustive list of potentially applicable requirements.

Table 1-3 Summary of Potentially Relevant Key Provincial Legislation

Legislation	Potentially Applicable Permitting Requirement(s)
The Mines and Minerals Act	A Mineral Lease obtained under the *Mineral Disposition and Mineral Lease Regulation, 1992* pursuant to the Act grants exclusive rights to Crown minerals and is required to work, mine and erect buildings. A Surface Lease obtained under the Act grants rights to use the surface for the efficient and economical performance of mining operations. Potentially applicable permitting requirements under the *Mine Closure Regulation* pursuant to the Act include the obligation to provide notice of expansion, alteration, suspension, or closure, and to file a closure plan.
The Crown Lands Act	Work permits are required under section 7(1)(c) of the Act for work conducted on provincial Crown lands. A lease or permit may also be required under section 7(1)(a) or 7(1)(b) if the use or occupation of Crown lands is proposed in support of the Project. An easement or right-of-way would be required under section 7(1)(e) of the Act for any works upon, over, under, or in respect of Crown lands.
The Dangerous Goods Handling and Transportation Act	Potential Project-related activities that may require licences or permits under the Act and its regulations include the transportation of hazardous wastes, construction or alteration of a petroleum storage tank system, petroleum storage with tanks greater than 230 L, and withdrawal of petroleum storage tanks from service for more than 30 days.
The Endangered Species and Ecosystems Act	Under section 11(1) of the Act, the Minister may issue a permit authorizing a person to kill, take, collect or capture; or collect or capture and hold alive; members of an endangered or threatened species for scientific purposes or for purposes related to the protection, management, or reintroduction of endangered, threatened or extirpated species. Such a permit may be required for baseline or monitoring studies on plants or with respect to species at risk.

Table 1-3 Summary of Potentially Relevant Key Provincial Legislation

Legislation	Potentially Applicable Permitting Requirement(s)
The Environment Act	A licence must be obtained as part of the provincial EA process to allow the construction, operation, or decommissioning of a mine and milling facility. The Environmental Approvals Branch of MCC considers the Gordon and MacLellan sites to be separate “developments” that will require separate licences under *The Environment Act.* It is understood, however, that both sites can be assessed in a single EIS under the provincial EA process. Other potentially applicable permitting requirements under the Act include registration for the construction, installation, siting, locating, replacement, expansion, or modification of an on-site wastewater management system with flow less than 10,000 L/day in accordance with the *On-site Wastewater Management Systems Regulation*. Permits may also be required under the Act and its regulations for potential Project-related activities such as the use of pesticides on Crown land or a right-of-way.
The Fisheries Act	A permit may be required under the Act for the handling or storage of live fish during inventorying, monitoring or salvage operations.
The Forest Act	A permit may be required under the Act if the cutting or removing of timber on Crown land is proposed in support of the Project.
The Heritage Resources Act	The Act stipulates that, if the Minister has reason to believe that heritage resources or human remains that are upon, within or beneath a site are likely to be damaged or destroyed by reason of any work, a Heritage Resource Impact Assessment of the Project may be required. A Heritage Permit is required for searching or excavating in association with an archaeological excavation.
The Public Health Act	The Project may be subject to permitting requirements under various regulations pursuant to the Act, such as the *Collection and Disposal of Wastes Regulation*; *Protection of Water Sources Regulation*; and *Water Works, Sewerage, and Sewage Disposal Regulation*.
The Traffic and Transportation Modernization Act	A permit is required to modify or intensify the use of a Manitoba highway access, or construct, modify/relocate/change or intensify the use of a structure on or across a departmental road or in a controlled area of a Manitoba highway.
The Water Rights Act	A licence to construct water control works is required under section 3(1) of the Act for the construction of any dyke, dam, surface or subsurface drain, drainage, improved natural waterway, canal, tunnel, bridge, culvert, borehole, or contrivance for carrying or conducting water that temporarily or permanently changes flow, level, or direction of flow of water in a waterbody (including a wetland or aquifer). The diversion and use of surface water or groundwater for industrial or other purposes also requires licensing under section 3(1) of the Act.
The Wildfires Act	A Burn Permit may be required for open burning activities in a Burning Permit Area during the wildfire season (April 1 to November 15). A Travel Permit may be required to authorize travel in an area designated in an Area Closure during the period specified in the Order. Such a permit may be necessary to allow continued operation the Project during times of Area Closure as specified by Ministerial Order due to wildfire risk.
The Wildlife Act	Potentially applicable permitting requirements under the Act include authorization to conduct any activities that disrupt a beaver dam (e.g., removal of a dam, installation of a pond leveler, etc.).

Table 1-3 Summary of Potentially Relevant Key Provincial Legislation

Legislation	Potentially Applicable Permitting Requirement(s)
The Workplace Safety and Health Act	Under the *Operation of Mines Regulation* pursuant to the Act, licences are required to authorize aboveground and underground magazines for storing explosives.

1.4.1.3 Federal/Provincial Coordination

The EA scoping and review process has been developed through liaison with the CEA Agency (now Impact Assessment Agency of Canada) and the Environmental Approvals Branch of MCC to address both federal and provincial EA requirements. It is the Proponent's understanding that the federal and provincial authorities for environmental assessment will attempt to coordinate key milestone consultation activities and promote opportunities for Indigenous communities, stakeholders, and the public to be effectively engaged to limit duplication and streamline the review process. The main objective of coordination is to use a single body of information that addresses both provincial and federal EA processes (i.e., federal Guidelines and provincial EAP Guidelines), culminating in one single Final EIS document.

In some cases, specific information requirements or considerations vary from one process to the other; these were combined into this EIS based on similar topics to create an overall narrative of the Project planning and decision-making process. The planning process was refined during the preparation and review of the Final EIS to account for these considerations or requirements.

The preparation of this EIS document was facilitated by aligning key milestones. This included liaison with government agencies and providing engagement opportunities for the public, stakeholders, and Indigenous communities. Following submission of the EIS, the provincial and federal environmental assessment review and decision-making processes will be initiated according to specific federal and provincial requirements.

1.4.2 Other Environmental Regulatory Requirements

In addition to the EA requirements described in Section 1.4.1, key federal, provincial, and municipal permits and approvals potentially required for the Project are listed in Table 1-4 to Table 1-6.

Table 1-4 Key Federal Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project
Authorization for Works Affecting Fish Habitat • Legislation: *Fisheries Act* • Responsible Agency: DFO	• Work that may result in HADD of fish habitat
Metal and Diamond Mining Effluent Regulations (MDMER) • Legislation: *Fisheries Act* • Responsible Agency: ECCC and DFO	• Use of fish bearing waters to deposit mine effluent, waste rock, and tailings. • Environmental effects monitoring program, including discharge of mine effluent.

Table 1-4 Key Federal Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project
Approval of Works in Navigable Waters • Legislation: *Canadian Navigable Waters Act* • Responsible Agency: Transport Canada	• Bridge crossing of Keewatin river (if determined to interfere with navigability).
Explosives Regulations • Legislation: *Explosives Act* • Responsible Agency: Natural Resources Canada	• Manufacturing, use/storage of blasting explosives and transportation of explosives within and between mine sites.
Transportation of Dangerous Goods • Legislation: *Transportation of Dangerous Goods Act* • Responsible Agency: Transport Canada	• Transportation of hazardous materials.

No amendment(s) to Schedule 2 of the MDMER are anticipated to be required for the Project. Project components have been sited outside of and away from fish-bearing watercourses. See Section 2.3.1.4 for further detail.

Alamos will request a paragraph 35(2)(b) *Fisheries Act* authorization from Fisheries and Oceans Canada (DFO) for the HADD of fish habitat that may occur as a result of Project activities, including in the existing diversion channel at the Gordon site and in East Pond at the MacLellan site (discussed in Section 2.3.2.4). Any *Fisheries Act* authorization will not be issued by DFO until after a CEAA approval of the Project.

Table 1-5 Key Provincial Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project
Mine Closure Plan • Legislation: *The Mines and Minerals Act,* Mine Closure Regulation • Responsible Agency: Manitoba Agriculture and Resource Development	• Closure Plan for mine operations.
Permit to Construct or Alter a Public Water System • Legislation: *The Drinking Water Safety Act,* Drinking Water Regulation • Responsible Agency: MCC	• Operation of public water supply.
Licence to Divert and Use Surface Water and/or Licence to Construct a Well and Divert Groundwater (Water Rights Licence) • Legislation: *The Water Rights Act* • Responsible Agency: MCC	• Diverting or using surface water or groundwater for industrial or other purposes.

Table 1-5 Key Provincial Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project
Licence or Registration to Construct Water Control Works • Legislation: *The Water Rights Act* • Responsible Agency: MCC	• Construction of a dike, dam, surface or subsurface drain, drainage, improved natural waterway, canal, tunnel, bridge, culvert, borehole, or contrivance for carrying or conducting water that temporarily or permanently changes flow, level, or direction of flow of water.
On-site Wastewater Management System • Legislation: *The Environment Act,* Onsite Wastewater Management Systems Regulation • Responsible Agency: MCC	• Onsite wastewater management.
Licence to Construct/ Alter a Petroleum Storage Facility • Legislation: *The Dangerous Goods Handling and Transportation Act,* Storage and Handling of Petroleum and Allied Products Regulation • Responsible Agency: MCC	• Construction/alteration of tank system for the purpose of storing petroleum products.
Permit to Operate a Petroleum Storage Facility • Legislation: *The Dangerous Goods Handling and Transportation Act,* Storage and Handling of Petroleum and Allied Products Regulation • Responsible Agency: MCC	• Petroleum storage - all phases - with storage tanks greater than 230 L (e.g., fixed and jobsite storage tanks).
Beaver Removal/Beaver Dam Removal Permit • Legislation: *The Wildlife Act* • Responsible Agency: MCC	• Removal of beaver from construction area, removal of dam, installation of a pond leveler.
General Crown Land Work Permit • Legislation: *The Crown Lands Act* • Responsible Agency: MCC	• Water crossings and road construction / upgrading on Crown Land. • Permits for any additional activities or tenure on Crown land, if required.
Burn Permit • Legislation: *The Wildfires Act* • Responsible Agency: MCC	• Open burning activities.
Travel Permit • Legislation: *The Wildfires Act* • Responsible Agency: MCC	• Possible continued operation of Project during times of area closure as specified by ministerial order due to wildfires.
Quarry Exploration Permit • Legislation: *The Mines and Minerals Act,* Quarry Minerals Regulation, 1992 • Responsible Agency: Manitoba Agriculture and Resource Development	• Exploration for quarries.

Table 1-5 Key Provincial Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project
Application for Quarry Lease • Legislation: *The Mines and Minerals Act,* Quarry Minerals Regulation, 1992 • Responsible Agency: Manitoba Agriculture and Resource Development	• Operation of a quarry.
Application for Surface Lease (Quarry) • Legislation: *The Mines and Minerals Act* • Responsible Agency: Manitoba Agriculture and Resource Development	• Use of surface for quarry lease.
Casual Quarry Permit • Legislation: *The Mines and Minerals Act,* Quarry Minerals Regulation, 1992 • Responsible Agency: Manitoba Agriculture and Resource Development	• Use of quarry resources.
Dead Wild Animal Possession Permit • Legislation: *The Wildlife Act* • Responsible Agency: MCC	• Specimen collection, if required, during baseline studies and assessment.
Wild Animal Capture Permit • Legislation: *The Wildlife Act* • Responsible Agency: MCC	• Baseline studies, and assessment if required.
Species at Risk/Scientific Permit • Legislation: The *Endangered Species and Ecosystems Act* • Responsible Agency: MCC	• Baseline studies on plants or with respect to species at risk for monitoring or assessment.
Live Fish Handling Permit • Legislation: *The Fisheries Act* (Manitoba), Manitoba Fishery Regulations, 1987 • Responsible Agency: MCC	• Handling or storage of live fish during inventorying, monitoring, or salvage operations
Commercial Timber Permit • Legislation: *The Forest Act* • Responsible Agency: MCC	• Cutting of timber on Crown land, if required.
Permit to Construct • Legislation: *The Traffic and Transportation Modernization Act, Controlled Areas and Limited-Access Highways Regulation* • Responsible Agency: Manitoba Infrastructure	• To erect, construct, reconstruct, or make addition to a structure on land, or to change use of land or use to which any structure situated on land is put within a controlled area.
Approval for Access • Legislation: *The Traffic and Transportation Modernization Act* • Responsible Agency: Manitoba Infrastructure	• Modifying or intensifying the use of accesses to provincial roads.
Heritage Permit • Legislation: *The Heritage Resources Act* • Responsible Agency: Sport, Culture, and Heritage	• Archaeological investigations on the project site (background research, walkover, shovel test pitting, excavation, or mitigation).

Table 1-5 Key Provincial Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project
Licence for Surface Magazine • Legislation: *The Workplace Safety and Health Act, Operation of Mines Regulation 212/2011* • Responsible Agency: Workplace Safety and Health	• Storing explosives for blasting, etc.
Licence for an Underground Magazine • Legislation: *The Workplace Safety and Health Act, Operation of Mines Regulation 212/2011* • Responsible Agency: Workplace Safety and Health	• Storing explosives for blasting, etc.

1.4.2.1 Municipal

Table 1-6 Key Municipal Permits / Approvals

Permits / Approvals	Activities Associated with the Project
Zoning By-Law Amendment • Legislation: *Local Government District of Lynn Lake By-law No. 675 in accordance with provisions of The Planning Act, CCSM c. P80* • Responsible Agency: Town of Lynn Lake	• Change to existing zoning provision(s).
Building Permit • Legislation: *Local Government District of Lynn Lake By-law No. 675* • Responsible Agency: Town of Lynn Lake	• Construction of new buildings or structures or use of land for any use other than what is permitted in the district in which the building or structure is located.
Uses Incidental to Construction • Legislation: *Local Government District of Lynn Lake By-law No. 675* • Responsible Agency: Town of Lynn Lake	• Construction camp or other such temporary work camp incidental to construction shall be permitted provided these uses are permitted only for so long as they are necessary.
Development Permit • Legislation: *Local Government District of Lynn Lake By-law No. 675* • Responsible Agency: Town of Lynn Lake	• Construction or placement of any structure; relocation or removal or demolition of any structure; the use of vacant land or buildings.

1.5 REFERENCES

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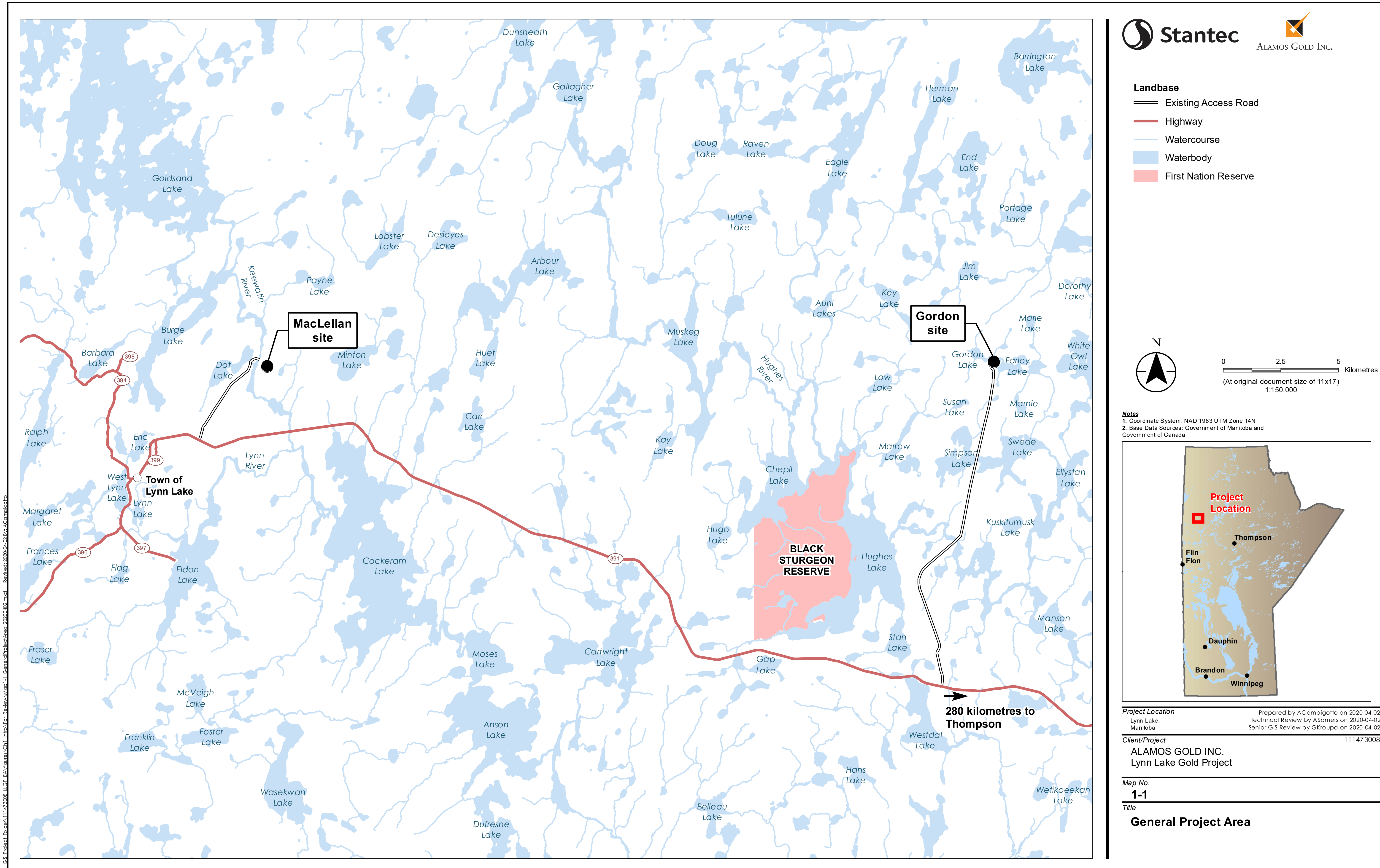
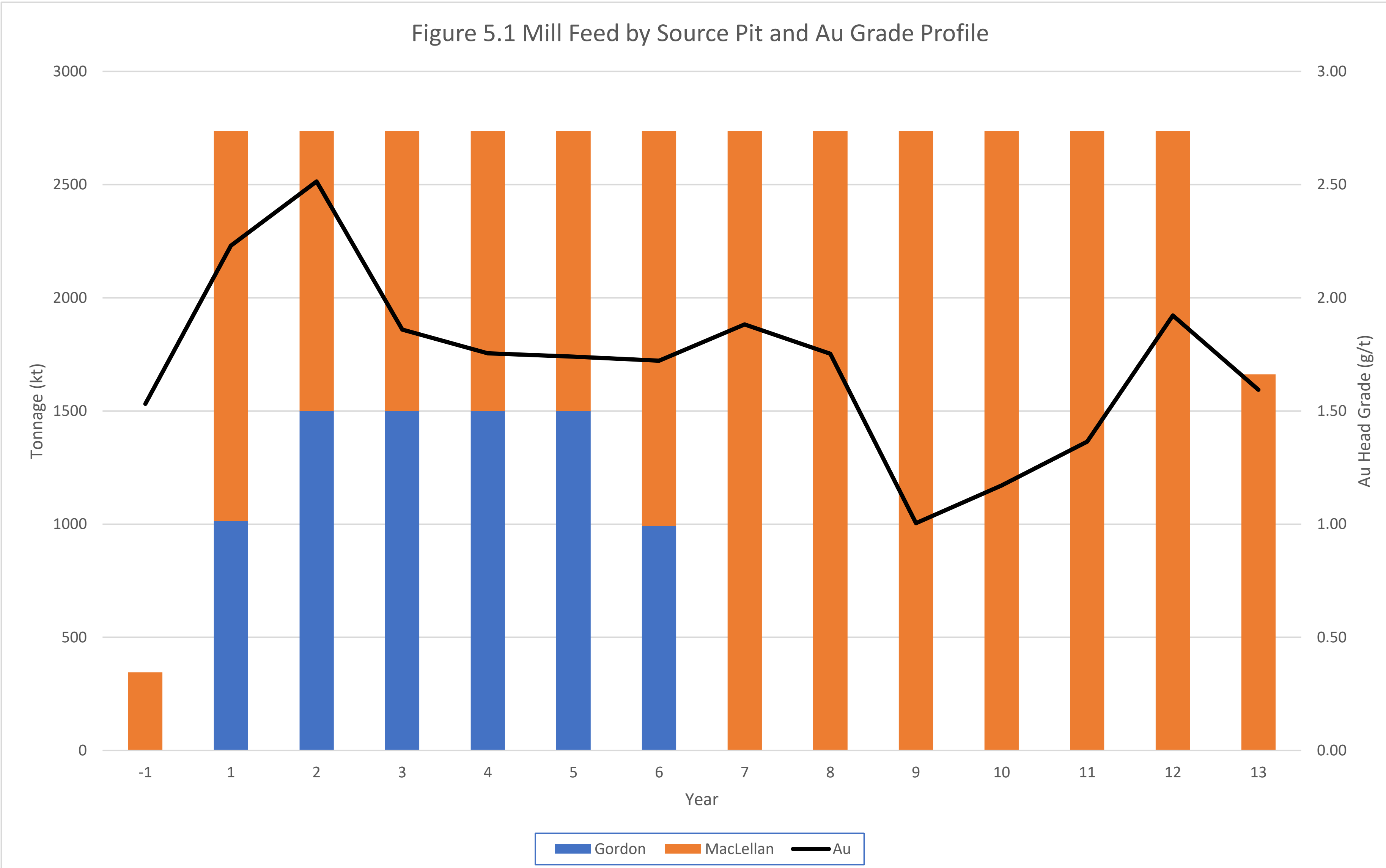

Stantec
Alamos Gold Inc.
Landbase
Existing Access Road
Highway
Watercourse
Waterbody
First Nation Reserve
N
0
2.5
5
Kilometres
(At original document size of 11x17)
1:150,000
Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada
Project Location
Thompson
Flin Flon
Dauphin
Brandon
Winnipeg
Project Location
Lynn Lake, Manitoba
Prepared by ACampigotto on 2020-04-02
Technical Review by ASomers on 2020-04-02
Senior GIS Review by GKroupa on 2020-04-02
Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project
Map No.
1-1
Title
General Project Area
MacLellan site
Gordon site
Town of Lynn Lake
BLACK STURGEON RESERVE
280 kilometres to Thompson
398
394
399
396
397
391
Dunsheath Lake
Gallagher Lake
Barrington Lake
Herman Lake
Doug Lake
Raven Lake
Eagle Lake
End Lake
Goldsand Lake
Portage Lake
Tulune Lake
Lobster Lake
Desieyes Lake
Arbour Lake
Jim Lake
Keewatin River
Payne Lake
Key Lake
Dorothy Lake
Auni Lakes
Marie Lake
Burge Lake
Muskeg Lake
White Owl Lake
Barbara Lake
Minton Lake
Huet Lake
Hughes River
Gordon Lake
Farley Lake
Dot Lake
Low Lake
Susan Lake
Marnie Lake
Carr Lake
Ralph Lake
Eric Lake
Kay Lake
Marrow Lake
Swede Lake
Lynn River
Simpson Lake
Chepil Lake
Ellystan Lake
West Lynn Lake
Lynn Lake
Margaret Lake
Kuskitumusk Lake
Hugo Lake
Frances Lake
Cockeram Lake
Hughes Lake
Flag Lake
Eldon Lake
Manson Lake
Stan Lake
Moses Lake
Cartwright Lake
Fraser Lake
Gap Lake
McVeigh Lake
Anson Lake
Westdal Lake
Franklin Lake
Foster Lake
Hans Lake
Wasekwan Lake
Wetikoeekan Lake
Belleau Lake
Dufresne Lake

Appendix 1A PHOTOGRAPHS

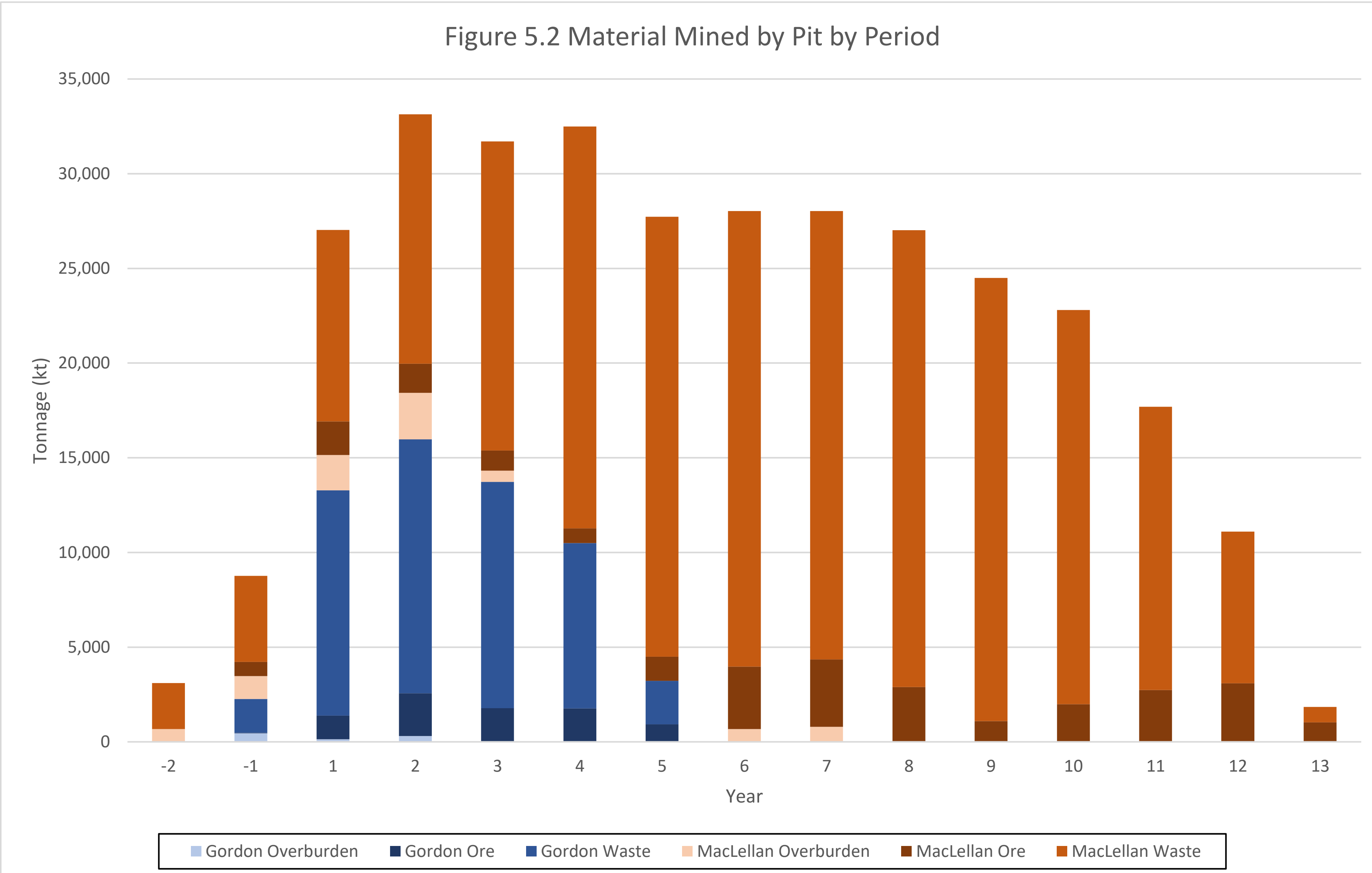
Photo 1 Aerial Photograph of Gordon Site

Photo 2 Aerial Photograph of MacLellan Site

Appendix 1B INFORMATION FROM Q'PIT 2019 MINE PLAN



Source: Q'Pit. 2019. Lynn Lake Project Feasibility Study Update - Pit Limit Design, Mine Planning, and Operating and Capital Cost Estimate for the Gordon and MacLellan Open Pits. Prepared for Alamos Gold Inc. by Q'Pit Inc., Kingston, Ontario.



Source: Q'Pit. 2019. Lynn Lake Project Feasibility Study Update - Pit Limit Design, Mine Planning, and Operating and Capital Cost Estimate for the Gordon and MacLellan Open Pits. Prepared for Alamos Gold Inc. by Q'Pit Inc., Kingston, Ontario.

Lynn Lake Gold Project
Environmental Impact Statement
Chapter 2 - Project Description

Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Acronyms and Abbreviations

ARD	acid rock drainage
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CIP	carbon-in-pulp
DPM	diesel particulate matter
EA	environmental assessment
EIS	environmental impact statement
FTE	full-time equivalent
GHG	greenhouse gas
HC	hydrocarbons
km	kilometre(s)
kt	kilotonnes
kV	kilovolt(s)
L/day	litre(s) per day
M	million
m	metre(s)
m^2	square metre(s)
m^3	cubic metre(s)
MDMER	Metal and Diamond Mine Effluent Regulations
ML	metal leaching
MRSA	mine rock storage area
Mt	million tonnes
MVA	mega-volt-ampere

NAG	non-acid generating
NO_X	oxides of nitrogen
PAG	potentially acid generating
PAHs	polycyclic aromatic hydrocarbons
PM	particulate matter
PR	Provincial Road
ROM	run-of-mine
SO_2	sulphur dioxide
t	tonnes
t/day	tonnes/day
TMF	tailings management facility
µm	micrometre(s)

2.0 PROJECT DESCRIPTION

The Lynn Lake Gold Project consists of two sites, the Gordon site and the MacLellan site, located in northwestern Manitoba (Chapter 1, Map 1-1). As described in Chapter 1, both sites are located at historical mine sites. The Project includes the development of new mine infrastructure at the MacLellan site, including an open pit, central ore milling and processing plant, associated infrastructure, ore and overburden stockpiles, a mine rock storage area (MRSA), and a Tailings Management Facility (TMF). New infrastructure at the Gordon site will be limited to an open pit, ore and overburden stockpiles, a MRSA, and minor supporting infrastructure for equipment storage and maintenance. There will be no tailings storage or milling at the Gordon site.

This section provides details regarding the Project location; Project components and activities; scheduling; and the potential emissions, discharges, and wastes that are likely to result from Project activities. Alternative means of carrying out the Project are also described.

2.1 PROJECT LOCATION

The Gordon site is located 55 kilometres (km; by vehicle) east of the town of Lynn Lake (14U 412400E 6307800N), and the MacLellan site is located 8 km (by vehicle) northeast of Lynn Lake (14U 380900E 6307500N). The distance between the Gordon and MacLellan sites is approximately 30 km (57 km by vehicle). Lynn Lake is located approximately 820 km (1,083 km by vehicle) northwest of Winnipeg. The proposed preliminary layouts for the redeveloped Gordon and MacLellan sites are shown on Maps 2-1 and 2-2, respectively.

Through the acquisition of Carlisle Goldfields Limited, Alamos has obtained the rights to existing mining claims and provincial leases issued by the Mines Section of the Manitoba Mines and Geological Survey Branch of the Resource Development Division of Agriculture and Resource Development (formerly Manitoba Growth, Enterprise, and Trade). The proposed Project infrastructure at the Gordon and MacLellan sites, excluding a portion of the Gordon access road and a portion of the MacLellan access road, will be located within the boundaries of those mining claims and leasehold lands, which are registered with the provincial Mines Branch in the name of Carlisle Goldfields Limited, a wholly-owned subsidiary of Alamos (Maps 2-3 and 2-4). Alamos has obtained road permits for the Gordon and MacLellan access roads, which grant exclusive rights for usage of these roads to Alamos.

2.2 PROJECT PLANNING AND MANAGEMENT STRATEGIES

Environmental protection and management measures will be adopted to guide the planning, design, construction, operation, and decommissioning/closure of the Project.

2.2.1 Design Standards and Codes

The Project will:

- Adhere to regulated standards for air and water emissions, for handling, storage or disposal of solid wastes and hazardous materials, and for handling and storage of fuel.
- Adhere to regulated and/or industry design and management standards to address environmental risks such as seismicity, unusual weather events, flooding, and erosion.
- Project activities will be aligned with the International Cyanide Management Code.
- Follow the Canadian Dam Association Dam Safety Guidelines (CDA 2013, 2014) for design of containment structures for the TMF.

2.2.2 In-Design Mitigation

Initial design has incorporated mitigation measures to reduce Project-related interactions, including:

- Siting facilities to avoid sensitive areas such as watercourses, wetlands, important habitat types, areas of high archaeological potential, and areas of importance identified by Indigenous communities; and where unavoidable, the size and number of natural features that may be affected has been reduced (see Maps 22-1 and 22-2).
- Siting facilities within, instead of across, watershed boundaries, where possible, to reduce the number of potentially affected waterbodies.
- Reducing the ‘footprint’ of Project facilities and activities, to the extent practical, to reduce the amount of disturbed land and disturbed water resources.

2.2.3 Environmental Protection, Mitigation and Management

Where avoidance of sensitive areas as described in Section 2.2.2 is not possible, mitigation measures will be developed in liaison with the applicable regulatory authorities and Indigenous communities. The implementation of these mitigation measures will be the responsibility of Alamos. Environmental protection, mitigation, and management components include:

- Preparing an Environmental Protection Plan for construction activities that is included in, and enforced through, construction contracts.
- Preparing and implementing an Environmental Management Plan for ongoing monitoring and management of, for example, land and soil resources, water, air and water quality, noise and vibration, hazardous materials and waste, and occupational and community health and safety.
- Preparing and maintaining an Emergency Response Plan for the Project.

- Planning the mine for closure and having a Conceptual Closure Plan (Appendix 23B), including the provision of security to the provincial Crown for performance of rehabilitation work.
- Planning and financing activities to offset or compensate for unavoidable adverse effects on environmental resources such as aquatic habitats.
- Implementing a public, stakeholder and Indigenous engagement program. Alamos has commenced engagement activities, as summarized in Chapter 3. These efforts have been ongoing throughout Project planning and will continue through the permitting phase and implemented throughout construction, operation, and eventual decommissioning/closure with the objective of:
  - Addressing public, stakeholder, and Indigenous community concerns to the extent possible during the design, construction, operation, and closure of the Project.
  - Promoting local benefits, including employment and business opportunities, to the extent practical.

2.3 PROJECT ACTIVITIES AND COMPONENTS

The key activities and components associated with each site are described below.

2.3.1 Gordon Site

After closure of the historical Farley Lake mine, the Gordon site underwent a reclamation process. It currently consists of a 15-km gravel access road, a bridge across the Hughes River, two MRSAs and two overburden storage areas that have been capped, and two water-filled open pits (see Map 2-5). Buildings and infrastructure from the historical operations have been removed and will not be re-used.

The existing 15-km site access road from Provincial Road (PR) 391 is expected to be upgraded to safely accommodate Project-related traffic, including the bridge crossing of the Hughes River. These upgrades are included in the scope of the Project to be assessed. The infrastructure at the Gordon site will be limited to the open pit, three ore stockpiles and one overburden stockpile, a MRSA, site water management pond (i.e., collection pond), and minor supporting infrastructure for equipment storage and maintenance. Alamos proposes to develop new infrastructure at the MacLellan site for processing ore from both sites (see Section 2.3.2).

The Project activities and components proposed for the Gordon site are described further below.

2.3.1.1 Resource Extraction and Storage

Open Pit

The Gordon resource will be developed as an open pit mine operation. The Gordon open pit overlaps with a portion of a historical MRSA. Mine rock from this historical MRSA will be moved to the new proposed Gordon MRSA (see Map 2-1).

During pre-production 2.3 million tonnes (Mt) of mine rock and overburden will be removed, and 29 kilotonnes (kt) of ore will be stockpiled. The run-of-mine (ROM) ore (i.e., raw/unprocessed ore that is intended for immediate processing rather than stockpiling) from the Gordon site will be transported via highway trucks to the mill feed storage area and crushing plant at the MacLellan site for short-term storage and initial crushing before it is used as feedstock for the adjacent ore milling and processing plant (see Section 2.3.2.1). The total quantity of material to be mined from the Gordon open pit during Project mine operations is approximately 59 Mt, which includes ore material of 8 Mt.

The anticipated ultimate depth of the Gordon open pit is approximately 225 metres (m). The open pit will be developed in a series of benches based on the pit design parameters with drilling and blasting completed on each bench. The pit slopes will be designed based on industry standards and the results of site-specific geotechnical investigations.

The Gordon site will provide ore as mill feed starting in Year 1 through to Year 6 of Project operation. Some ore will be stockpiled on site during pre-production years. The mining rate (including ROM, as well as ore, overburden, and mine rock to be stockpiled) at the Gordon site is planned to peak at 16.0 Mt/year or approximately 50,000 tonnes per day (t/day; rounded for seasonal considerations and to account for downtime) in Year 2. Mine operations at the Gordon site are planned to cease after Year 5. The transfer of Gordon ore, however, will continue into Year 6.

Ore, Overburden and Mine Rock Stockpiles/Storage Areas

Ore will be stockpiled at the Gordon site and used as feedstock for the ore milling and processing plant at the MacLellan site. The peak stockpile at the Gordon site will be 1.6 Mt. The ore stockpile area is proposed to be approximately 33,800 m^2, located south of the open pit at the Gordon site (see Map 2-1). Depletion of this stockpiled material is anticipated in Year 6.

ROM ore from the Gordon site will be transported to a pad directly adjacent to the ore milling and processing plant at the MacLellan site (see Map 2-2) for short-term storage before it is used as feedstock for the plant (Section 2.3.2.1). The Gordon site will also have stockpile areas for removed overburden and mine rock. These stockpile/storage areas are proposed to be located to the southwest and south of the open pit (see Map 2-1). Table 2-1 provides the estimated maximum volumes of each material for the Gordon site.

Table 2-1 Approximate Quantity of Mine Materials for the Gordon Site

Project Site	Ore Stockpiles		Overburden		Mine Rock	
	Tonnage (Mt)	Volume (Mm^3)	Tonnage (Mt)	Volume (Mm^3)	Tonnage (Mt)	Volume (Mm^3)
Gordon	1.6	0.7	0.9	0.5	50.1	22.3

Notes: Mine rock and ore stockpiled densities assumed to be 2.25 t/m^3. Overburden stockpile swelled density assumed to be 1.7 t/m^3. Mine rock volumes based on a bulking factor of 1.3. Overburden volumes based on a bulking factor of 1.1.

Table 2-2 provides the general characteristics of each stockpile/storage area (i.e., surface area, height, and overall slope). Final configurations will be developed based on detailed engineering.

Table 2-2 Proposed Configurations for Stockpiles/Storage Areas at the Gordon Site

Stockpile	Maximum Surface Area (m^2)	Maximum Total Height (m)	Maximum Overall Slope (H:V)
Ore	33,800	10	1.33H:1V
Overburden	123,300	15	2.5H:1V
Mine Rock	618,100	50	2.5H:1V

The Project will result in the generation of mine rock that could have the potential for acid rock drainage (ARD) and metal leaching (ML). Geochemical testing indicates that mine rock from the Gordon site contains potentially acid generating (PAG) materials and shows a leaching potential for arsenic and other trace elements as discussed in detail in Chapter 5 (Section 5.2.6). Blending of PAG and non-PAG material and/or dry and/or wet covers will be used to control ARD/ML from mine rock. Final required mitigation measures for mine rock will be determined during detailed engineering and outlined in the Environmental Management Plan. By contrast, ore stockpiles are not expected to generate ARD and have moderate leaching potentials for aluminum, fluoride, sliver, and copper. Overburden has a low risk of ARD/ML and is not expected to require special management or mitigation measures.

Seepage/runoff collection ditches will be constructed around the perimeter of each stockpile/storage area and directed to a series of sumps and/or small ponds at topographic lows. Water collected in the sumps and/or small ponds will be pumped to a site water management pond (or collection pond) for management and/or treatment (if required) prior to discharge (see Map 2-1).

Transportation of Ore

Based on a conservative assumed haulage rate of 4,100 t/d, the Project is estimated to require 7 truckloads per hour (20 hours per day) between the Gordon and MacLellan sites during the first six years of mining operations. The roadway is described in Section 2.3.1.2 below.

2.3.1.2 Utilities and Infrastructure

Water Supply and Distribution System

Raw water at the Gordon site is required for dust and fire suppression, safety showers, and for the truck shop and truck wash (Ausenco 2019). Normal freshwater requirements are expected to be 10 m^3/hour. Freshwater will be pumped from Farley Lake to a pumphouse located on the south shore of Farley Lake, and then to a freshwater tank located at the Gordon site. The suction pipe will be buried and heat-traced to prevent freezing (Ausenco 2019). The storage tank will have a live storage volume of 700 m^3. A portion of the storage volume will be utilized for fire and dust suppression and the remaining portion will be used to feed the freshwater pumps for other purposes.

Potable water for the Gordon site will be obtained from the fresh-water treatment plant located at the MacLellan site (Section 2.3.2.3). The water will be trucked to a central storage facility that will be set up on the Gordon site (see Map 2-1).

Power Supply and Distribution System

Power for the Gordon site will be supplied on site via two 300-kilowatt diesel generators (Ausenco 2019). Power distribution will be via 4.16 kilovolt (kV) overhead lines, cable tray and underground conduits, with local outdoor type e-houses for transformers and load centres at each point of utilization.

Fuel Storage and Distribution System

Tanker trucks will deliver diesel and gasoline fuels to the Gordon site on an as-needed basis for use by heavy equipment and Project vehicles, as well as for the site generators. Propane will be considered for space heating. Fuels will be stored in approved aboveground storage tanks equipped with secondary containment. Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements (e.g., the Storage and Handling of Petroleum Products and Allied Products Regulation under *The Dangerous Goods Handling and Transportation Act* of Manitoba). Stationary and mobile mine equipment will be fueled with a fuel-dispensing truck.

Roads

The main access to the Gordon site will be via the existing PR 391, which is under the authority of Manitoba Infrastructure. PR 391 is an all-weather road connecting Thompson, Manitoba, and Lynn Lake. PR 391 will be used by personnel, material deliveries, and haulage trucks transporting material from the Gordon site to the ore milling and processing plant at the MacLellan site.

The existing 15-km site access road from PR 391 is expected to be upgraded to safely accommodate Project-related traffic, including the bridge crossing of the Hughes River. The access road from PR 391 to the Gordon site will continue to be under Alamos care and control during operation. Alamos will own and maintain internal site roads at the Gordon site, which will allow movement of Project personnel, equipment, and materials on the site. Large haul truck traffic and other site vehicular traffic will be separated where appropriate. For example, large mine haul trucks being used at the Gordon site will have dedicated roads from the open pit to the various dump points and to the central maintenance and shift changeover area.

Buildings and Yards

Only a few buildings are proposed to be constructed on the Gordon site, including a security building to control access to the Gordon site and a small office.

The Gordon site will have a truck shop with sufficient bays to service open pit trucks and other surface equipment, as well as general maintenance facilities (Ausenco 2019). It will be equipped with overhead cranes and will provide adequate space for the storage of tool cabinets and other items required for maintaining the mobile fleet. The truck shop will also support truck wash and fueling activities and provide personnel services and office facilities for daily management issues.

Parking areas will be developed to service Project personnel, site visitors, and Project vehicles. The following parking areas will be required at the Gordon site (Ausenco 2019):

- A central parking facility for personnel, contractors, and visitors.
- A parking area for the mobile mine fleet.
- A parking area for the road haul trucks.

Laydown areas will also be required for the outdoor storage of equipment, maintenance, and construction equipment, as well as facilities for construction and operation.

Site Lighting and Security

General site lighting will be a combination of power line pole-mounted fixtures and building-mounted fixtures at the offices, shop, and other miscellaneous buildings (Ausenco 2019). Lighting will be designed to reduce spill-over light (i.e., unwanted outdoor light shining further than anticipated).

Explosives Storage

Emulsion explosives with non-electric detonators will be used during mine operations at the Gordon site (Ausenco 2019). Explosives storage will be located at the MacLellan site (see Section 2.3.2.3) and explosives will be transported to the Gordon site on an as-needed basis. Transportation of explosives will be the responsibility of an explosives contractor.

2.3.1.3 Other Waste Storage and Management

Sewage Handling

For the Gordon site, sewage will be conveyed by gravity to two septic tanks at the truck shop and administration building (Ausenco 2019). It will then be trucked to the MacLellan site for processing at a 60 m^3/day sewage treatment plant.

Domestic Solid Waste Handling

Waste disposal will follow a Waste Management Plan for the Project, which will be developed in accordance with applicable regulations (e.g., *The Waste Reduction and Prevention Act* of Manitoba and the provincial Collection and Disposal of Wastes Regulation under *The Public Health Act*) and best practices. Solid waste will be collected and recycled to the extent practical. Where feasible, paper and cardboard will be recycled, waste steel will be sold as scrap, and wood and plastic will be salvaged and recycled. Non-hazardous domestic solid waste will be deposited at the landfill in Lynn Lake. Waste oils, fuels, and hazardous wastes (if any) will be safely handled and transported as recommended by the suppliers and/or manufacturers and in compliance with applicable federal, provincial, or municipal regulations (e.g., the Hazardous Waste Regulation under *The Dangerous Goods Handling and Transportation Act* of Manitoba, *Canadian Environmental Protection Act* and associated regulations, and the *Transportation of Dangerous Goods Act* and associated regulations).

2.3.1.4 Water Development and Control

Alterations to stream channels which affect fish mobility and fish habitat are considered Class 2 developments under Section 3(9) of the CD Regulations pursuant to *The Environment Act* of Manitoba and are therefore subject to provincial EA and licensing requirements. The Project will not require natural watercourse re-alignments to accommodate Project components.

As part of the proposed development at the Gordon site, the existing, previously constructed diversion channel flowing from Gordon Lake to Farley Lake will require adjustment to the north (see Map 2-1). The new channel will be designed to safely pass the 1 in 100-year return period storm and will take long-term fish passage and habitat between Gordon and Farley lakes through a tributary into consideration. Water management structures such as diversion ditches and interceptor wells will be constructed to collect, divert, and release non-contact water to the environment.

A series of groundwater interceptor wells located between the ultimate footprint of the open pit and Gordon and Farley lakes will be used to mitigate a reduction in groundwater discharge to Gordon and Farley lakes as a result of open pit dewatering during mine operations and pit filling during mine closure. At this time, the interceptor wells are anticipated to be sited between the pit and the nearby lakes approximately 40 m from the boundary of the ultimate open pit limit. Groundwater extracted from the interceptor wells (originating from the adjacent lakes) will be pumped to a water management pond prior to being recirculated to the lakes. If required, the water will be treated to meet applicable federal and provincial regulatory requirements prior to discharge to the environment. The engineering design for these wells will be finalized during the detailed design phase for the Project.

As described in Section 1.4.2, no amendment(s) to Schedule 2 of the *Metal and Diamond Mine Effluent Regulations* (MDMER) is anticipated to be required for the Project. The MRSAs at the Gordon site, and the MRSAs and TMF at the MacLellan site, have been sited outside of and away from fish-bearing watercourses.

In August 2019, Alamos formally requested a paragraph 35(2)(b) *Fisheries Act* authorization from Fisheries and Oceans Canada (DFO) for the “serious harm to fish” that will occur in the existing diversion channel at the Gordon site and in East Pond at the MacLellan site (discussed in Section 2.3.2.4). Any *Fisheries Act* authorization will not be issued by DFO until after the CEAA decision on the Project.

Details regarding other liquid discharges associated with Project operation are discussed in Section 2.8.2.

2.3.2 MacLellan Site

The historical MacLellan site has been in a ‘care and maintenance’ phase since 1989 with very little reclamation having taken place. The site consists of a 4.6-km gravel access road, an abandoned power distribution pole line, and infrastructure from the former underground mine, such as a headframe, hoist house, shaft, access ramp, maintenance and other storage buildings, core shack and racks, vent raise, and mine water settling ponds (see Map 2-6). The underground workings are flooded with water.

Alamos proposes to develop mine infrastructure at the MacLellan site, including an open pit, central ore milling and processing plant, associated infrastructure, ore and overburden stockpiles, a MRSA, and a TMF. The existing 4.6 km access road will be used to access the site. Upgrades to the existing access road will be required, along with the addition of a second single lane steel bridge crossing of the Keewatin River (Section 2.3.2.3). With the proposed development of this site, the existing approx. 48 m tall headframe, hoist house and maintenance building will be demolished.

The project activities and components proposed for the MacLellan site are described further below.

2.3.2.1 Resource Extraction, Storage and Processing

Open Pit

The MacLellan resource will be developed as an open pit mine operation. During pre-production, 8.9 Mt of mine rock and overburden (excluding ore) during pre-production will be removed and 405 kt of ore will be stockpiled. Remaining ore will be used to feed the mill for commissioning. The total quantity of material to be excavated from the MacLellan open pit during Project mine operations is approximately 266 Mt; this includes 26.9 Mt of ore.

The anticipated depth of the MacLellan open pit is approximately 450 m. The open pit will be developed in a series of benches based on the pit design parameters with drilling and blasting completed on each bench. The pit slopes will be designed based on industry standards and the results of site-specific geotechnical investigations. The proposed mine operation is a conventional open pit with shovel and truck removal of the mine rock and ore produced during blasting. Ramp widths will be designed to accommodate the deployed type and size of the mine equipment and vehicles.

Mining operations after Year 5 will take place exclusively at the MacLellan site, with an expected peak mining rate of 28.0 Mt/year (in Years 6 and 7). Ore will be stockpiled at the MacLellan site and used as feedstock for the ore milling and processing plant. The peak stockpile at the MacLellan site will be 2.7 Mt. The ore stockpiles at the MacLellan site are planned to be active until the end of mine operation.

Mill Feed Storage Area and Crushing Plant

ROM ore from both sites will be transported to a pad directly adjacent to the ore milling and processing plant at the MacLellan site for short-term storage before it is used as feedstock for the plant (see Map 2-2). A truck dump and crushing circuit is proposed to be located south of the ore milling and processing plant at the MacLellan site and accessed by the open pit road (see Map 2-2). The crushing circuit will feed the ore milling and processing plant. Ore will be transported to the ore milling and processing plant by a conveyor system. Potential dust emissions will be reduced through dust containment (e.g., enclosure) and collection systems.

Ore Milling and Processing Plant

A process flow diagram depicting the proposed ore processing at the MacLellan site is provided in Appendix 2A. The ore milling and processing plant is designed to process 7,500 t/day of ore, with a maximum potential process rate of 8,250 t/day. Ore will first be crushed in a two-stage crushing circuit comprising a primary jaw crusher, followed by a secondary cone crusher. Processing will continue with semi-autogenous grinding, then further grinding in a closed-circuit ball mill and cyclone circuit. The fine-ground product will then enter a pre-leach thickener feed box to be thickened from 33% to 50% solids. This will be in preparation for the downstream pre-aeration, leaching, and carbon-in-pulp (CIP) steps.

The cyanidation process for gold recovery will begin in the leach tank circuit, which will consist of four tanks in a series (Ausenco 2019). Each tank will be interconnected with launders to allow slurry to flow sequentially to each tank in the train, and each tank will be equipped with a dual-impeller mechanical agitator to provide uniform mixing of slurry, lime slurry, sodium cyanide, and oxygen. From the last tank in the leach circuit, the slurry will flow to the first CIP tank in the adsorption circuit, which will consist of six adsorption tanks in series.

Pulp will flow continuously from the first tank to the last, while carbon will be pumped counter current from the last tank to the first. The countercurrent process will be repeated until carbon, progressively loaded with gold, advances to the first CIP tank, where it will be washed and transferred to the acid wash column. The carbon will be acid-washed and residual acid on the carbon, if any, will be neutralized, with both the acid and neutralization solutions being discharged to the tailings pump-box.

The washed and loaded carbon will then be transferred to the elution column, where it will be stripped of gold and silver by reversing the adsorption kinetics using a sodium hydroxide and cyanide solution (approximately 3% each by volume). After completion of the elution process, stripped carbon will be fed into the carbon regeneration kiln feed hopper and the regenerated carbon will be ready for re-introduction to the CIP circuit.

Gold and silver will be recovered from the pregnant (i.e., mineral bearing) solution in three electrowinning cells by stainless steel framed cathodes, after which the gold sludge will be smelted and refined into gold doré bars ready for transport to a certified facility for further processing. The slurry from the last CIP tank will be sent to the cyanide detoxification circuit (Air/SO_2 oxidation process) for cyanide destruction prior to being discharged to the tailings pump-box and then to the TMF (Section 2.3.2.2).

To support the cyanidation process, sodium cyanide will be transported in bricket form in 18-tonne isotainers to the processing plant at the MacLellan site. Approximately 82 tonnes will be consumed per month, requiring approximately 1 tanker delivery every 2-3 days (total of 7-8 tankers/month).

Water demand at the ore milling and processing plant will be met with water removed from the historical underground workings, followed by reclaimed water from the TMF, to reduce the need for fresh surface water demand (Sections 2.3.2.2 and 2.8.2.1).

Ore, Overburden and Mine Rock Stockpiles/Storage Areas

One ore stockpile area is planned for the MacLellan site, located south of the mill, and will be approximately 115,500 m^2 in area (see Map 2-2).

The MacLellan site will also contain stockpile areas for removed overburden and mine rock. The overburden stockpile area is proposed to be located to the west of the MRSA, while the MRSA is proposed to “wrap around" the south and east sides of the TMF (see Map 2-2). Table 2-3 provides the estimated maximum volumes of each material at the MacLellan site.

Table 2-3 Approximate Quantity of Mine Materials for the MacLellan Site

Project Site	Ore Stockpile		Overburden		Mine Rock	
	Tonnage (Mt)	Total Volume (Mm^3)	Tonnage (Mt)	Volume (Mm^3)	Tonnage (Mt)	Total Volume (Mm^3)
MacLellan	2.7	1.2	8.2	4.8	230.9	102.6

Notes: Mine rock and ore stockpiled swelled densities assumed to be 2.25 t/m^3. Overburden stockpile swelled density assumed to be 1.7 t/m^3. Mine rock volumes based on a bulking factor of 1.3. Overburden volumes based on a bulking factor of 1.1.

Table 2-4 provides the general characteristics of each stockpile/storage area (i.e., surface area, height, and overall slope).

Table 2-4 General Characteristics of Each Stockpile/Storage Area at the MacLellan Site

Stockpile	Maximum Surface Area (m^2)	Maximum Total Height (m)	Maximum Overall Slope (H:V)
Ore	115,500	30	1.33H:1V
Overburden	181,800	30	2.5H:1V
Mine Rock	3,561,300	45	2.5H:1V

Geochemical testing indicates that mine rock from the MacLellan site may contain up to 28% PAG materials and shows a leaching potential for arsenic and other trace elements as discussed in detail in Chapter 5 (Section 5.2.6). Blending of PAG and non-PAG material and/or dry and/or wet covers will be used to control ARD/ML from mine rock. Final required mitigation measures for mine rock will be determined during detailed engineering and outlined in the Environmental Management Plan. By contrast, ore stockpiles are not expected to generate ARD and have high leaching potentials for arsenic and cadmium. Overburden has a low risk of ARD/ML and is not expected to require special management or mitigation measures.

Seepage/runoff collection ditches will be constructed around the perimeter of each stockpile/storage area and directed to a series of sumps and/or small ponds at topographic lows. Water collected in the sumps and/or small ponds will be pumped to a site water management pond (the TMF collection pond) for management and/or treatment (if required) prior to discharge (see Map 2-2). Final required mitigation measures with respect to water quality will be determined through detailed engineering.

Transportation of Ore

Ore mined at the MacLellan site will remain on site. Transportation of ore from the Gordon site is described in Section 2.3.1.1.

2.3.2.2 Other Waste Storage and Management

Tailings Management Facility

The TMF is proposed to be located approximately 1.5 km from the ore milling and processing plant (see Map 2-2). The site was selected in consideration of technically and economically feasible alternatives, environmental constraints, the use of natural topography for containment, existing land tenure, the spatial footprint of the Project, and the benefits of having tailings contained in a single facility (see Section 2.9.2). The final TMF site selection considered ECCC's Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Environment Canada 2011).

Following discussions with DFO and ECCC in September 2016, the preliminary TMF design was revised to avoid the potential deposition of mine tailings into watercourses or waterbodies frequented by fish. The revised design of the TMF similarly does not overlap spatially with any fish-bearing waters (see Map 2-2). The design of the TMF for the Project is based on the design criteria provided in Table 2-5.

Table 2-5 Tailings Management Facility (Ultimate Footprint) Design Basis

Item	Quantity	Units
Mineral Reserve	35	Mt
Tailings/Ore Ratio	1.0	-
Tailings Production	35	Mt
Design Mill Rate	7,500	t/day
Specific Gravity	3.0	-
Deposition Method	Spigot/End of Pipe	-
% Solids	47.7%	-
Average Void Ratio	1.0	-
Deposited Dry Density	1.5	t/m^3
Tailings Volume Requirement	23.1	Mm^3

The TMF will be constructed in three stages: Stage 1, Stage 2 and Ultimate. The volume of tailings progressively stored at each stage is 2.0 Mm^3, 9.3 Mm^3, and 23.1 Mm^3, respectively. The TMF dams will be raised progressively to provide additional storage capacity. It is projected that three dam raises will be required during the 13-year operating period. The final two raises will be completed in back-to-back years.

The TMF dams will consist of a low permeability core constructed of suitable rockfill materials (i.e., clean, non-acid generating, relatively free draining) with internal bedding and filter zones, and upstream and downstream shells of granular material. Most of the dam materials are expected to be locally available from borrow sources. The dams will have an upstream slope of 3H:1V, a downstream slope of 2H:1V, and a crest width of 10 m. The starter dam crest elevation has been set at 362.5 m above mean sea level, with a dam height of 10 m and length of 4,150 m.

Geochemical testing shows that approximately 57% of the tailings will be non-PAG. ARD from tailings is therefore not expected during operation. In the tailings pond, MDMER limits could be exceeded for cyanide, un-ionized ammonia, copper and nickel during operation, but discharge to the environment from the pond is not expected based on the water balance model. Non-compliant discharges will not be allowed. Localized acidic conditions may develop in PAG tailings after closure. Under acidic conditions, MDMER limits for nickel and copper could be exceeded. The risk of ARD and ML from tailings will be managed at closure by placing covers to limit infiltration of precipitation and ingress of oxygen (Appendix 23B). The addition of a circuit for the removal of sulphides from the tailings with containment of produced concentrate will also be considered. Containment structures for the TMF will be designed in accordance with the Canadian Dam Association *Dam Safety Guidelines* (CDA 2013, 2014).

Based on available information regarding subsurface soils, it is expected that foundation seepage will be controlled via low permeability seepage cutoffs. A downstream seepage collection system, consisting of a series of sumps in combination with a buried weeping tile or rockfill finger drain system, will be installed during the starter dam construction to capture seepage at the toe of the dam, which will be pumped back to the TMF collection pond. Water from the TMF pond will be directed to open pit at closure (Appendix 23B).

Rockfill and aggregate for construction will be sourced from non-acid generating (NAG) mine rock and from local quarries and borrow pits near the Project. These quarries and borrow pits will be determined and evaluated for geotechnical and environmental suitability as detailed project planning and engineering proceeds.

Sewage Treatment Facility

The average sanitary wastewater flow rate will be approximately 60,000 L/day. A package treatment plant will be required with a discharge consisting of an outfall pipe and diffuser to the selected surface water receiver (likely the Keewatin River west of the MacLellan site). The details of the treatment technology selected will be determined as part of detailed Project design. The treatment facility will be designed so effluent will be non-acutely lethal to fish, and include the removal of nutrients such as nitrogen and phosphorous and other parameters to meet applicable regulatory requirements (e.g., Wastewater Systems Effluent Regulations under the federal *Fisheries Act*) prior to discharge to the environment.

Domestic Solid Waste Handling

Waste disposal will follow a Waste Management Plan for the Project, which will be developed in accordance with applicable regulations (e.g., *The Waste Reduction and Prevention Act* of Manitoba and the provincial Collection and Disposal of Wastes Regulation under *The Public Health Act*) and best practices. Solid waste will be collected and recycled to the extent practical. Where feasible, paper and cardboard will be recycled, waste steel will be sold as scrap, and wood and plastic will be salvaged and recycled. Non-hazardous domestic solid waste will be deposited at the landfill in Lynn Lake (approximately 4 km northeast of the community along PR 391). Waste oils, fuels, and hazardous wastes (if any) will be safely handled and transported as recommended by the suppliers and/or manufacturers and in compliance with applicable federal, provincial, or municipal regulations (e.g., the Hazardous Waste Regulation under *The Dangerous*

Goods Handling and Transportation Act of Manitoba, *Canadian Environmental Protection Act* and associated regulations, and the *Transportation of Dangerous Goods Act* and associated regulations).

2.3.2.3 Utilities and Infrastructure

Water Supply and Distribution System

Raw water is required at the MacLellan site for two purposes: 1) make-up water for ore processing during the first year of operations; and 2) fire and dust suppression, safety showers, truck washes, and the water treatment plant (for generation of potable water). This water will be withdrawn from the Keewatin River, located to the west of the MacLellan site (see Map 2-2). Make-up water requirements during the first year of operations are estimated to be 0.56 Mm^3 (Golder 2019) or 312 m^3/hour (Ausenco 2019). Water for fire and dust suppression is included in this annual volume, as a portion corresponding to the two-hour retention time of the total live storage in a holding tank that will be located at the MacLellan site. Freshwater demands from the Keewatin River are estimated to be 350,400 m^3 or 40 m^3/hour after the first year. The potable water treatment plant will have a capacity of 92,000 L/day and will produce potable water for both the Gordon and MacLellan sites. The treated water is anticipated to be stored in an on-site tank at the MacLellan site with water distribution providing potable water to the buildings at the MacLellan site.

Power Supply and Distribution System

Power for the MacLellan site will be supplied by Manitoba Hydro Line 6. The Project will require upgrades to the existing power supply transmission line between Laurie River and Lynn Lake and Lynn Lake's Copper Street Station from 69 kV to 138 kV. A new 138 kV-34.5 kV substation (located approximately 1 km from the Copper Street Station) and a new 8-km-long 34.5 kV overhead distribution line into the MacLellan site will also be required to accommodate the Project (BBA 2019). The line is anticipated to be preferentially routed for the majority of the line length along existing linear disturbances such as trails and cut lines and the MacLellan access road (see Map 2-2). The line is anticipated to be a combination of standard single pole lines centered on a 20-m right-of-way, and standard H frames with guy wires on a 40-m right-of-way. The line is anticipated to require two watercourse crossings.

It is anticipated that Manitoba Hydro will independently undertake the upgrade from Laurie River to Lynn Lake and at the Copper Street Station in Lynn Lake. Alamos will provide the new 138 kV-34.5 kV substation and 34.5 kV distribution line to the MacLellan site from Lynn Lake separately. The alignment, rights of way, and location of this distribution line and substation have not been determined at this time.

Alamos will not have the ability to direct or influence the construction/upgrade of Manitoba Hydro's power distribution system (i.e., transmission line between Laurie River and Lynn Lake and Copper Street Station), which will be assessed, built, owned, and operated by Manitoba Hydro. This construction/upgrade is therefore excluded from the scope of the Project to be assessed.

The new Alamos substation will be double-ended (i.e., containing two switchboards in one assembly separated by a tie circuit breaker) with 100% redundancy in transformer capacity in the form of two 21/28 MVA oil filled type substation transformers (sized to carry the maximum power required by the MacLellan site; BBA 2019). Power distribution from the Alamos substation in Lynn Lake to, and at, the MacLellan site will be via 34.5 kV overhead lines, cable tray and underground conduits, with local outdoor type e-houses for transformers and load centres at each point of utilization.

While the Alamos segment of the power distribution system is within the scope of the Environmental Impact Statement (EIS), the alignment, rights of way, and location of other elements of infrastructure are in the preliminary stages of planning and uncertain at this time. Detailed engineering will be undertaken in consideration of environmental constraints to avoid or reduce interactions with sensitive features such as watercourses and wetlands or known areas of habitat for rare species and archeological resources.

Fuel Storage and Distribution System

Tanker trucks will deliver diesel and gasoline fuels to the MacLellan site on an as-needed basis for use by heavy equipment and Project vehicles. Propane will be considered for space heating. Fuels will be stored in approved aboveground storage tanks in the truck shop and fueling station west of the processing plant and will be equipped with secondary containment in accordance with provincial regulations and standards. Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements (e.g., the Storage and Handling of Petroleum Products and Allied Products Regulation under *The Dangerous Goods Handling and Transportation Act* of Manitoba). Stationary and distant mine equipment will be fueled with a fuel-dispensing truck.

Roads and Pipelines

The MacLellan site will be accessed via an existing access road off PR 391. PR 391, which is under the authority of Manitoba Infrastructure, will be used by personnel, material deliveries, and haulage trucks transporting material to the ore milling and processing plant from the Gordon site. The potential need for upgrades to PR 391 and/or weight exception requirements to support the Project are being discussed with Manitoba Infrastructure. Based on a conservative assumed haulage rate of 4,100 t/d, the Project is estimated to require 7 truckloads per hour (20 hours per day) between the Gordon and MacLellan sites during the first six years of mining operations. Project-related truck traffic between the Gordon and MacLellan sites is included in the scope of the Project to be assessed.

The existing 4.6-km MacLellan site access road will be used for service, construction and operational vehicle access (see Map 2-2). A second single lane steel bridge crossing of the Keewatin River will be required to access the MacLellan site. Upgrades to the existing access road are anticipated to include removal and replacement of roadbed granular material and placement of new material and compacted granular. The existing side ditches will be cleared or reconstructed based on a suitable design.

Alamos will own and maintain internal site roads at the MacLellan site, which will allow movement of Project personnel, equipment, and materials on the site. Large haul truck traffic and other site vehicle traffic will be separated where appropriate. For example, large mine haul trucks being used at the site will have dedicated roads from the open pit to the various stockpiles and storage areas and to the central maintenance and shift changeover area.

Pipelines will be needed on site to transport and dispose of contact water between various facilities, including the open pit, ore milling and processing plant, and TMF. The locations and dimensions of these pipelines will be confirmed as Project engineering is advanced.

To avoid repeated disturbance to the riverbank and stream bed, and on account of the differing raw water requirements (first year versus subsequent years), two pipelines (one 10-inch diameter and one 4-inch diameter) will be buried into the riverbank during the original intake construction to provide the raw water required from the Keewatin River to the MacLellan site.

Buildings and Yards

Several buildings are proposed for the MacLellan site and will be amalgamated where possible without compromising Project requirements for efficiency, power, functionality, and safety.

Parking Areas

Parking areas will be developed to service Project personnel, site visitors, and Project vehicles including road trucks and haul trucks. The following parking areas will be required:

- A central parking facility for personnel, contractors, and visitors.
- A parking area for the mobile mine fleet.
- A parking area for the road haul trucks.

Security Buildings

Security buildings will be erected to control access to the MacLellan site and associated facilities.

Administration Offices

An administration office building will be required at the MacLellan site. The office, a 25 m x 65 m single story building, will contain offices for site management staff, operating and maintenance, geology, engineering, and administration personnel (Ausenco 2019). It will contain conference rooms, washroom facilities, mine dry facilities, a meal room, filing rooms, and mine rescue, fire and first aid facilities.

Truck Shop

The primary truck shop will be located at the MacLellan site. The shop will be a 35 m x 63 m fabric building that will have bays to service open pit trucks and other surface equipment, as well as general maintenance facilities (Ausenco 2019). It will be equipped with overhead cranes and will provide adequate space for the storage of tool cabinets and other items required for maintaining the mobile fleet. The truck shop will also support truck wash and fueling activities and provide personnel services and office facilities for daily management issues. Tire storage will also be provided in this area.

Laboratory

Assay, metallurgical, and environmental laboratories will be required for the Project and will be located at the MacLellan site.

Plant Control Room

A plant control room, which will allow for monitoring and control of the processing plant will be built within the ore milling and processing plant complex.

Workshop

The workshop will be located to service the ore milling and processing plant. The workshop will be sized to accommodate electrical, instrumentation, welding, piping, fabrication, and machining activities (Ausenco 2019). The workshop will include an overhead crane and an office facility will be incorporated for daily operations/management. The workshop will be housed in the warehouse.

Warehouse

The warehouse will be used to store equipment parts and other material required throughout the life of the Project. The warehouse building will be a 24 m x 15 m fabric building (Ausenco 2019).

Laydown Areas

Laydown areas will be required for the outdoor storage of equipment, maintenance, and construction equipment, as well as facilities for construction and operation. Laydown areas will also include platforms for equipment erection.

Work Camp

Worker accommodations will be provided by a permanent work camp facility located at the MacLellan site. The facility will consist of a 300-bed purchased camp plus a temporary 100-bed leased camp. The leased camp will be temporary and used during construction. The 300-bed purchased camp will be used during operation.

Accommodations are proposed to be provided in 30 to 44 person dormitories and are single occupancy. Rooms are approximately 6.5 m^2 with a mix of *en suite* or shared washrooms, and shared kitchen/dining, recreational, and laundry facilities (Ausenco 2019). Utilities (e.g., power, water and wastewater) will be supplied by the Project and the camp will operate independently of the Town of Lynn Lake.

Site Lighting and Security

General site lighting will be a combination of power line pole-mounted fixtures and building-mounted fixtures at the offices, shop, and other miscellaneous buildings (Ausenco 2019). Lighting will be designed to reduce spill-over light (i.e., unwanted outdoor light shining further than anticipated).

Explosives Storage

Emulsion explosives with non-electric detonators will be used and stored during mine operations at the MacLellan site. An explosives mixing plant and explosives magazine will be housed separately at a minimum prescribed distance away from main mine operations. Explosives storage requirements will be determined in conjunction with the selected explosives supplier and will be established in accordance with the National Standard of Canada document number CAN/BNQ 2910-510 – *Explosives – Quantity Distances* (SCC and BNQ 2015), and the facility will be licensed under the *Explosives Act*.

2.3.2.4 Water Development and Control

No watercourse re-alignments are required, and no fish-bearing streams will be overlain with mine rock, the TMF, or other associated mine infrastructure at the MacLellan site. As a result, no amendment to Schedule 2 of the MDMER is anticipated. However, it is expected that a small pond (‘East Pond’) located south of the proposed open pit will drain as a result of development of the open pit (see Map 2-2). Alamos will request a *Fisheries Act* Authorization from DFO after an Impact Assessment Agency of Canada decision is made on the Project

Details regarding other liquid discharges associated with Project operations are discussed in Section 2.8.2.

Water management structures (i.e., diversion ditches) will be constructed to collect, divert, and release non-contact water to the environment.

Construction and operation of the underground water withdrawal pipelines to provide raw water for use at the MacLellan site (Section 2.3.2.3) is not anticipated to result in substantial changes to water level, flow, or pH in the Keewatin River. There may be a temporary increase in turbidity during pipeline construction; this will be mitigated through development and implementation of a Project-specific Erosion and Sediment Control Plan that includes consideration of in-water and shoreline activities associated with pipeline construction. The pipe will be constructed in accordance with the DFO *Freshwater Intake End of Pipe Fish Screen Guideline* (1995).

2.4 ANCILLARY FACILITIES AND INFRASTRUCTURE OUTSIDE OF SCOPE OF PROJECT TO BE ASSESSED

2.4.1 Borrow Sources

Borrow sources for construction are uncertain at this time and are therefore not included in the scope of the EIS. Preliminary investigation details on borrow sources for the Project are presented in Chapter 5. Detailed project planning to identify the location and scope of borrow pit operation will be undertaken in consideration of environmental constraints to avoid or reduce interactions with sensitive features such as watercourses and wetlands or known areas of habitat for rare species and archeological resources. It is assumed that quarries and other borrow sources owned and operated by third parties will be operated in accordance with permit requirements and best practices stipulated by the applicable regulatory authorities.

2.4.2 Manitoba Hydro Substation and Transmission Line

It is anticipated that Manitoba Hydro will independently undertake the power supply upgrade from Laurie River to Lynn Lake and at the Copper Street Station in Lynn Lake from 69 kV to 138 kV. The upgraded power distribution system from Laurie River to the Copper Street Station (including the upgrade of the Copper Street Station) is expected to be assessed, built, owned, and operated by Manitoba Hydro. This portion of the power distribution system will be entirely under the care and control of Manitoba Hydro and is therefore excluded from the scope of the Project to be assessed.

2.5 WORKFORCE

The total Project labour force, as well as full time equivalents (FTEs), expected to be on site over a given time based on fly-in, fly-out rotations is 1,591 or 827 FTE on site. The total labour force and FTEs is based on pre-production peak, operation peak, and operation TMF lift. Short-term workforce spikes associated with TMF construction/lifting are in line with the peak operations workforce.

The total labour force, as well as FTEs expected on site at a given time (accounting for fly-in, fly-out rotations) is summarized below:

- Pre-production peak – 541 total labour force with 308 FTE on site.
- Operation peak – 519 total labour force with 253 FTE on site.
- Operation TMF lift – 531 total labour force with 266 FTE on site.

As described in Section 2.3.2.3, worker accommodations will be provided by first a temporary, then a permanent camp facility at the MacLellan site. It is anticipated that workers will be transported from the camp to the Gordon site via passenger vehicle (e.g. busses).

2.6 PROJECT SCHEDULE

The tentative Project schedule and approximate duration of the key Project phases are as follows:

- Construction (i.e., site preparation, physical construction/equipment installation, pre-production, and commissioning) will be scheduled following Project regulatory approval and is expected to take approximately 2 years to complete (Year -2, Year -1). Some limited pre-production may occur during this period. Project construction activities will be carried out concurrently at both mine sites.
- Operation (i.e., ore and mine rock extraction, processing, and waste management) will follow construction and is expected to take approximately 13 years to complete (Years 1 to 13).
  - Mining operations are expected to commence at both sites in Year 1. Mining at the Gordon site will be undertaken for six years (i.e., during Years 1 to 6) while mining at the MacLellan site will be undertaken for the entire life of the Project (i.e., during Years 1 to 13).

  - The ore stockpiled during mine operations (both sites) will provide feedstock to the ore milling and processing plant located at the MacLellan site during the Project.

- Decommissioning/closure will begin at the cessation of operation at each site. Active closure is scheduled to begin in Year 6 at the Gordon site and in Year 14 at the MacLellan site. Active closure is expected to take approximately 5 to 6 years to complete at each site. Active closure will be followed by post-closure, which is the time period during which active reclamation measures are complete, but monitoring is still required. The expected duration for post-closure is approximately 10 years. Pit filling is expected to take 11 years at the Gordon site and 21 years at the MacLellan site under average conditions (Chapter 9, Section 9.4.1). Permanent closure will occur when the site is stable, and monitoring is no longer required. The duration and conditions for post-closure monitoring and permanent closure will be detailed in subsequent submissions of the Closure Plan to regulatory agencies as Project design and execution progresses.

2.7 PROJECT PHASES

Working with Paraminerals Consulting, Alamos has developed a 3D visualization of what the Project will look like throughout the life of the Project. Visualizations for the Gordon and MacLellan sites are provided in Appendix 2B.

2.7.1 Construction

The timeframe to complete the required site preparation and surface infrastructure to start open pit activities is approximately nine months. Construction of the ore milling and processing plant is expected to take two years. Ore will be stored in stockpiles until the facility is operational.

Primary construction activities are generally expected to consist of:

- Site preparation
- Physical construction and equipment installation
- Commissioning.

2.7.2 Site Preparation

Construction will begin with clearing the areas for the ore milling and processing plant, open pits, stockpiles, a portion of the TMF area, internal access roads, and ancillary facilities. Cleared merchantable timber will be sold and remaining cleared vegetation will be mulched and stored on site for future use in active closure activities.

Water will be applied for dust suppression to haul roads and access roads and water management will be employed during the earthworks program to mitigate the potential environmental effects of fugitive dust on the surrounding area and mitigate surface erosion.

A 100-bed temporary construction camp will be established as part of the site preparation activities and will be located north of the ore milling and processing plant at the MacLellan site. The temporary camp will be used throughout the pre-production phase of the Project during which a permanent, 300-bed camp will also be established. The permanent camp will be used throughout operation of the Project (Section 2.7.3).

Access roads connecting the sites to PR 391 (i.e., upgrades to the existing 15-km access road at the Gordon site and upgrades of an existing 4.6-km access road and bridge crossing of the Keewatin River at the MacLellan site) are proposed to be developed in conjunction with site preparation activities.

2.7.2.1 Physical Construction and Equipment Installation

As clearing is completed, internal access roads, ore stockpiles, MRSAs, and the TMF surfaces will be prepared. Watercourse re-alignment works that may be required (Gordon site) will be constructed.

Starter dams for the TMF embankments at the MacLellan site will be constructed, and the embankments will be raised as storage requirements increase over the mine life.

The ore stockpile and MRSA pads will be grubbed and graded to promote drainage control. The foundations will be prepared in accordance with environmental and engineering standards dependent upon the anticipated drainage chemistry, and drainage collection works will be installed.

An aggregate crusher and a concrete batch ready mix plant will be required on site during construction. To meet future needs (e.g., road maintenance) for crushed aggregate, the portable crusher and concrete batch plant used during construction may remain on site or be contracted out on a periodic basis. Raw materials used for crushing will be NAG mine rock from the open pit, if suitable, or materials from nearby approved pits or borrow areas.

Services, including the power supply, waste handling and fresh water supply systems, will be installed. The power supply will be provided into the MacLellan site by Manitoba Hydro and Alamos (Section 2.3.2.3).

Footings and foundations for buildings and structures associated with the ore milling and processing plant will be poured in place. Pre-packaged and field-erected ancillary facilities, including the buildings, fueling, tanks and processing equipment, will be delivered to the sites and installed. Other equipment will be set up in their appropriate locations, and electrical and mechanical connections will be completed.

Removal of overburden in the area of the open pits will occur in preparation for mining activities. Suitable overburden and excavated soil will be used on site during construction as required with excess stored on site for future use in active closure activities.

The amount and frequency of blasting required during the construction phase of the Project will be determined during detailed engineering.

2.7.2.2 Commissioning

The mechanical and electrical systems associated with the Project will be commissioned as construction is completed. Commissioning activities for the Project will include commissioning of the power distribution system and control, contact water collection systems, open pit dewatering system, tailings management water reclaim system, the ore milling and processing plant, and on-site fueling system. Following commissioning, the Project will start commercial operation.

2.7.3 Operation

The operating life of the Project is estimated to be 13 years (excluding the pre-production period estimated at two years). As operations continue, the open pits will become progressively deeper, and related overburden, ore stockpiles, MRSAs, and the TMF will increase in size. Solid and liquid wastes will continue to be managed to comply with applicable federal and provincial regulatory requirements (Sections 2.8.2 and 2.8.3). Based on a conservative assumed haulage rate of 4,100 t/d, the Project is estimated to require 7 truckloads per hour (20 hours per day) between the Gordon and MacLellan sites during the first six years of mining operations.

The amount and frequency of blasting and drilling required during the operation phase of the Project will be confirmed during detailed engineering. Blasting is anticipated to occur two to three times per week, or approximately every third day, on average. Blasting is anticipated to be scheduled to coincide with shift change (i.e., approximately 7:00 pm). Ammonium nitrate and fuel oil emulsion is planned to be used for blasting at both sites. The ammonium nitrate and fuel oil emulsion will be manufactured at the MacLellan site. Drilling is anticipated to occur 24 hours a day. Production drilling is anticipated to consist of 165 mm drill holes and pre-splitting. Void collapse and delineation drilling is anticipated to consist of 114 mm drill holes, both using down-the-hole hammers. Grade control drilling is anticipated to consist of 114 mm diameter drill holes using reverse circulation drilling.

2.7.4 Decommissioning/Closure

A Conceptual Closure Plan has been developed (Appendix 23B) and will be implemented in accordance with the Mine Closure Regulation under *The Mines and Minerals Act* of Manitoba and associated *General Closure Plan Guidelines* (MARD n.d.), to remove redundant facilities and rehabilitate the Gordon and MacLellan sites following the completion of mining activities. The primary objective of closure activities will be to establish physical, chemical, and biological stability at the sites, and to meet desired end land functions and uses. The Closure Plan will be updated throughout the Project lifetime as necessary to reflect the environmental requirements in place at the time of closure.

At the end of operation, the main components will include the open pits, mill processing facilities, offices, storage areas, TMF, and MRSAs. Reclamation measures expected during decommissioning/closure for each of the main components are described briefly below with additional detail provided in Appendix 23B. Active closure activities will take place once mining has been completed (Year 6 at the Gordon site and Year 14 at the MacLellan site). As outlined in Section 2.6, active closure is anticipated to take 5-6 years to complete at each site and will be followed by 10 years of post-closure monitoring and between 11-21 years of pit filling (Chapter 9, Section 9.4.1). The duration and conditions for post-closure monitoring and permanent closure will be detailed in subsequent submissions of the Closure Plan to regulatory agencies as Project design and execution progresses. Alamos will be responsible for monitoring and maintaining the integrity of the remaining structures. This responsibility will be outlined in the Closure Plan.

Alamos will surrender the leases and the sites will be transferred back to the provincial Crown at permanent closure once all fees, rents, royalties and other liabilities applicable are paid. Both sites are expected to remain open indefinitely post closure for recreational activities such as hunting and trapping.

The main elements of decommissioning/closure are:

- Removal of buildings, equipment, and facilities (i.e., permanent structures) from the Gordon and MacLellan sites, together with aboveground concrete structures.
- Reclamation of mine access roads not needed for post-mining land access, with contouring to restore natural drainages and roadways revegetated.
- Recontouring of disturbed areas to blend in with surrounding topography and to re-establish natural drainage patterns.
- Removal of water management features that are no longer required, such as water treatment systems, ponds, and ditches. This will include: recontouring/spreading of pond berms; backfilling of ponds and ditches; and re-establishing natural drainage patterns.
- Management of site runoff from developed areas, including from the ore milling and processing plant site, MRSAs, TMF, and open pits, to meet federal and provincial regulatory requirements for downstream water quality.
- Implementation of public safety measures around the pits (e.g., re-sloping, fencing or rock berms).
- Allowing the open pits to fill with water to form pit lakes and directing the overflows to established drainages.
- Reclamation of MRSAs with suitable covers as needed, revegetation, and establishment of stable drainage conditions.
- Installation of a suitable cover and revegetation of the TMF and establishment of drainage to provide long-term erosion control.
- Re-vegetation of disturbed areas with plant species that are suitable for reclamation and the end land uses of the area. The goals of reclamation vegetation will be to: avoid erosion and sedimentation to protect aquatic resources; avoid invasive plant establishment; and re-establish a land use that is of value for wildlife and/or humans and mitigates the residual environmental effects of the Project on the environment.

2.8 EMISSIONS, DISCHARGES AND WASTES

2.8.1 Atmospheric Emissions

2.8.1.1 Air Contaminants

Air contaminant emissions during construction and operation will consist mainly of diesel combustion exhaust emissions from construction and mining equipment on site and heavy-duty trucks transporting ore from the Gordon site to the MacLellan site and trucks delivering fuel, explosives and processing plant consumables, as well as fugitive dust emissions from construction and mining operation activities. The primary mining equipment will operate for 15 hours per day on an average and the supporting equipment will operate for 8 hours per day (Q'Pit 2019).

The off-road equipment and vehicles consume diesel fuel and the products of combustion are released to the atmosphere, including oxides of nitrogen (NO_X), sulphur dioxide (SO_2), carbon monoxide (CO), hydrocarbons (HC), diesel particulate matter (DPM), polycyclic aromatic hydrocarbons (PAHs) and metals. DPM is respirable particulate matter that has an aerodynamic diameter less than 10 µm (PM_{10}). It is assumed that 97% of DPM is $PM_{2.5}$ or fine particulate matter that has an aerodynamic diameter less than 2.5 µm.

Fugitive dust emissions from drilling and blasting, surface disturbance activities, loading and unloading of material, truck traffic along haul roads and access roads, and wind erosion of exposed surfaces result in particulate matter (PM) emissions of various size ranges (e.g., total suspended particulate, PM_{10} and $PM_{2.5}$) that can also be deposited to off-site ground and water surfaces (i.e., dustfall).

During operation, PM emissions will also be released from dust collectors and wet scrubbers at the primary crusher, secondary crusher and the ore milling and processing plant gold room. The crushing plant conveyors and the fine ore stockpile are fully covered and therefore, fugitive dust emissions from these areas are not expected to be substantive.

Fugitive hydrogen cyanide emissions may result from the leach and CIP adsorption tanks in the ore milling and processing plant due to volatilization losses of sodium cyanide used in the leach and adsorption train, as well as from the TMF pond due to natural degradation and volatilization of a residual amount of cyanide contained in the tailings (a maximum of 10 mg/L, by design, of weak acid dissociable cyanide in wastewater discharged to the TMF) after cyanide detoxification.

Water will be applied to haul roads and access roads during construction and operation to mitigate the potential environmental effects of fugitive dust on surrounding properties. Chemical dust suppressants may be applied to haul roads on an as-needed basis during high wind conditions or if an increase of watering is determined ineffective or unfeasible at the time. Environmental effects of the Project on air quality will be considered and mitigated, where appropriate.

2.8.1.2 Greenhouse Gases

Project construction (estimated 24-month duration) will result in short-term greenhouse gas (GHG) emissions from the combustion of fuel in mobile construction equipment, stationary heaters, and power generators. GHGs will also be released from blasting activities and land-use changes (e.g., land clearing). The total annual construction emissions are estimated at approximately 80,617 tonnes of carbon dioxide equivalent (CO_{2e}) per year (Volume 5, Appendix A, Attachment F).

Project operation will result in GHG emissions from the combustion of fuel from transportation, in mobile and stationary equipment and releases from blasting activities. Assuming typical operations with the MacLellan mine (except mobile equipment) is powered using the existing Manitoba Hydro power grid (i.e., the available back-up diesel generation is not required) and the Gordon mine operations using on-site diesel-power generation, GHG emissions for the Project during operations are estimated to be 104,885 tonnes CO_{2e} per year (Volume 5, Appendix A, Attachment F).

2.8.1.3 Noise and Vibration

Noise and vibration will be generated during construction and will be typical of that associated with construction projects involving the movement of heavy mobile equipment such as haul trucks and stationary equipment such as power generators, compressors, and pumps.

Mining and surface crushing activities, including blasting of rock, and movement of material will be a source of noise and vibration throughout the Project operation phase. Stationary equipment such as crushers and mills will also generate noise and will be primarily used during the operation phase at the MacLellan site.

2.8.1.4 Light

Site lighting will be provided by a combination of power line pole-mounted fixtures and building-mounted fixtures at the offices, shop, and other miscellaneous buildings. Lighting will be designed to reduce spill-over light and will be typical of that associated with other industrial mine projects. Further information on light and visibility of the site from various viewpoints is provided in the Ambient Lighting Baseline Technical Data Report and Light Emissions Impact Assessment - Technical Modelling Report (Volume 4, Appendix B, Volume 5, Appendix G).

2.8.2 Liquid Discharges and Management

Multiple sources of liquid discharges during Project construction and operation will be managed, including site runoff arising from precipitation; dewatering for foundation preparation; and dewatering of the existing open pits and underground workings. Liquid discharges at the two sites can be classified as being either ‘contact’ or ‘non-contact’ water. Contact water is water, surface water or groundwater, that contacts mine workings or interacts with mine rock material. Contact water may also include dewatering associated with the Project. Non-contact water is water that does not contact mine workings and/or interact with mine rock material. Both sites have been designed, as much as practical, to reduce the generation of contact water.

At closure, the water management related infrastructure will be sustained or re-configured to meet the requirements of the approved Closure Plan.

2.8.2.1 Contact Water

Collection ditches will be constructed around Project infrastructure to manage contact water. Water collected in the sumps and/or small ponds and during open pit dewatering will be pumped to water management ponds located at each site, tested if required, and discharged directly to the environment, if it meets applicable federal and provincial regulatory discharge requirements. If it does not meet federal and provincial regulatory requirements, the water will be treated to meet the applicable requirements prior to discharge. Details of the treatment technologies (if any) and sampling methodologies to be used to test and treat contact water will be determined during detailed Project design.

For the MacLellan site, seepage water associated with the TMF will be collected and pumped back to the TMF. Reclaim water from the TMF, underground workings dewatering water, and/or contact water from the water management facility will be used to meet ore milling and processing demand requirements. Tailings and excess water from the ore milling and processing plant will be piped to the TMF. Current modelling and engineering feasibility studies show that no discharge from the TMF will be required during normal operations (Ausenco 2019). If discharge is required, it will be monitored and treated to meet relevant federal and provincial regulatory requirements (e.g., the MDMER under the federal *Fisheries Act* and the *Manitoba Water Quality Standards, Objectives and Guidelines Regulation* under *The Water Protection Act* of Manitoba) prior to discharge to the environment, where applicable.

At each site’s water management pond, water quality will be monitored. If necessary, the water will be treated to meet applicable federal and provincial regulatory requirements prior to discharge to the environment, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER. The water management ponds have been sized in consideration of the retention time required for the settling of suspended solids. Identification of the discharge locations for each site will be confirmed during detailed engineering. Discharge from the site water management pond is anticipated to be to Farley Lake at the Gordon site, and the Keewatin River at the MacLellan site.

Operational open pit dewatering will be carried out with in-pit pumps and/or using perimeter dewatering wells to intercept groundwater before it enters the pit.

2.8.2.2 Non-Contact Water

Where practical, collection ditches will be constructed to divert non-contact water around Project facilities to natural drainages. Consideration will be given to designing the channels to support fish habitat, where appropriate and practical. It will be determined during development of the Closure Plan whether the channels will remain or be re-configured following decommissioning/closure of the mine.

2.8.2.3 Sewage

Domestic sewage at the MacLellan site will be treated at the on-site sewage treatment facility. Effluent discharged from the facility will be treated to meet regulatory requirements. For the Gordon site, sewage will be conveyed by gravity to two septic tanks at the truck shop and administration building. It will then be trucked to MacLellan for processing at the MacLellan sewage treatment plant.

2.8.3 Solid Wastes and Management

Solid wastes include:

- Domestic waste
- Waste oils, fuels, and hazardous wastes.

Waste disposal will follow a Waste Management Plan for the Project, which will be developed in accordance with applicable regulations (e.g., *The Waste Reduction and Prevention Act* of Manitoba and the provincial Collection and Disposal of Wastes Regulation under *The Public Health Act*) and best practices.

2.8.3.1 Non- Hazardous Wastes

Non-hazardous domestic solid waste will be deposited at the landfill in Lynn Lake.

2.8.3.2 Hazardous Wastes

Waste oils, fuels, and hazardous wastes (if any) will be safely handled and transported as recommended by the suppliers and/or manufacturers and in compliance with applicable federal, provincial, or municipal regulations.

2.9 ALTERNATIVE MEANS FOR CARRYING OUT THE PROJECT

Consideration of alternative means for carrying out the Project that are technically and economically feasible, and the environmental effects of any such alternative means must be considered under Section 19(1)(g) of CEAA 2012, and in accordance with the Project's Final Guidelines for the Preparation of an Environmental Impact Statement, pursuant to CEAA, 2012, dated November, 2017 (Final EIS Guidelines). Consideration of alternatives is also stipulated in the provincial environmental assessment process under *The Environment Act* Proposal Report Guidelines.

Alternative means are defined as technically and economically feasible ways that would allow a Project to be carried out. Alternative means can include options for locations, development/and or implementation methods, routes, designs, technologies, and mitigation measures.

2.9.1 Approach Overview

The assessment of alternative means was completed in accordance with the CEA Agency's Operational Policy Statement "Addressing 'Purpose of' and 'Alternative Means' under the *Canadian Environmental Assessment Act, 2012*". The process for consideration of alternative means included the following steps:

- Consideration of legal compliance, technical feasibility, and economic feasibility of alternative means of carrying out the Project.

- Description of each identified alternative to the extent needed to identify and compare potential environmental effects.
- Consideration of the environmental (including socio-economic) effects of the identified technically and economically feasible alternative means of carrying out the Project; this includes potential adverse effects on potential or established Aboriginal and Treaty rights and related interests (where this information had been provided).
- Selection of the preferred alternative means of carrying out the Project, based on the relative consideration of effects.

A consideration of legal compliance, technical feasibility, and economic feasibility, as well as the environmental effects (where applicable) of each alternative means is described for each alternative.

Technical feasibility considered criteria that could influence safe, reliable, and efficient operations. Technology must be available and proven for use in a similar environment and activity set and cannot compromise personnel and process safety for it to be considered.

Economic feasibility considered capital and operational project expenditure. Project expenditure can be impacted directly (e.g., equipment and personnel requirements) and indirectly (e.g., schedule delays).

The assessment of Project alternatives considered Indigenous knowledge and current use of lands and resources for traditional purposes. Project design and siting took into consideration, where possible, various traditional activities, practices, sites, areas, and resources, including hunting, trapping, fishing, plant gathering, use of trails and travelways, use of habitation areas and use of cultural and spiritual sites and areas.

The preferred alternative means form the basis for the Project to be assessed (i.e., assumed to be the base case that is assessed for environmental effects in Chapters 6 to 19 of the EIS).

2.9.2 Project Components

The Final EIS Guidelines require that the alternative means analysis address the following Project components:

- Ore transportation (considering means and routing)
- Access to the project sites
- Location of key project infrastructure
- Ore processing methods/technologies
- Fuel storage and distribution
- Power supply

- Management of water supply and wastewater
- Water management and location of final effluent discharge points
- Diversion channel adjustments
- Mine waste disposal and final effluent discharge (considering methods and sites)
- Workforce accommodations and transportation.

The provincial Environment Act Proposal guidelines state that alternatives may consider one or more of the following: products to be provided, process technologies to be used, as well as feasibility and project siting.

2.9.3 Evaluation of Alternative Means for Carrying Out the Project

Each option for the alternative means identified above is described in the following sections and summarized in a table. Where only a single feasible alternative means was identified, a summary of the rationale for this decision is included. Where a range of alternatives were considered, a comparison evaluation based on potential environmental effects, legal compliance, and technical and economic feasibility of each alternative means is summarized.

2.9.3.1 Ore Transportation

Only one option of ore transportation was considered for the Project, which included truck transport. Ore will be stockpiled temporarily at the Gordon site before it is trucked to the MacLellan site (no rail or other transportation option is available) and used as feedstock for the ore milling and processing plant. Based on a conservative assumed haulage rate of 4,100 t/d, the Project is estimated to require 7 truckloads per hour (20 hours per day) between the Gordon and MacLellan sites during the first six years of mining operation. Ore mined at the MacLellan site will remain on site for ore milling and processing at the on-site plant. Truck transport using existing roads was the only option available and the on-site processing of the ore at the MacLellan site was determined to be the preferred option given the close proximity to the crushing plant and ore milling and processing plant. Off-site ore processing was not considered due to the associated inefficiencies and increased environmental footprint.

A summary of alternative means to ore transportation is provided in Table 2-6.

Table 2-6 Summary of Ore Transportation Options Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Ore transport by truck	Yes	Yes	Yes	Existing roads available for use; no other options for ore transportation.	Yes (No other options were assessed)
No other options were assessed for ore transportation.					

2.9.3.2 Access to Project Sites

Access to the sites will be required for personnel, material deliveries, haulage trucks transporting material to the ore milling and processing plant, as well as service, construction, and operational vehicle access. Two alternatives were considered for site access, use of existing access roads and construction of new access roads. The main access to the Gordon and McLellan sites will be via the existing PR 391, which is under the authority of Manitoba Infrastructure. PR 391 is an all-weather road connecting Thompson, Manitoba, and Lynn Lake.

At the Gordon site, there is an existing 15-km site access road from PR 391 including a bridge crossing of the Hughes River, which will be upgraded to safely accommodate Project-related traffic. At the MacLellan site, there is an existing 4.6-km access road that will also be upgraded. A new prefabricated, single-lane steel bridge will be constructed beside the existing bridge crossing of the Keewatin River to accommodate Project-related traffic. Alternatively, the construction of a new access road, located south of the plant site connecting to PR 391, east of the Keewatin River, was considered at the MacLellan site; however, the construction of a new access road would increase the Project footprint and result in the loss and/or alteration of vegetation and wetlands, as well as wildlife habitat. An eagle nest was avoided by the removal of the requirement for a new access road. Construction of a new access road may also result in effects to surface water and fish and fish habitat, including a water crossing of a tributary to the Keewatin River. The new access road would also increase access to other areas, which may result in effects to land and resource use, such as hunting, fishing, trapping, and gathering, as well as traditional use of lands and resources. The new access road would also have necessitated an additional access point onto PR 391. The use and upgrade of existing access roads will reduce the Project footprint and associated environmental effects.

A summary of alternative means to access the Project sites is provided in Table 2-7.

Table 2-7 Summary of Access to Project Sites Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Access via PR 391, and established access road from PR 391 to the MacLellan site	Yes	Yes	Yes	Using the existing access road reduces the Project footprint, thereby reducing effects to the environment.	Yes
Construction of a new access road at the MacLellan site	Yes	Yes	Yes	The development of a new access road may result in a loss and/or alteration of habitat, including vegetation and wetlands. There is potential for interactions with surface water and fish and fish habitat, creation of new access and requirement for an additional access point onto PR 391.	No

2.9.3.3 Location of Key Project Infrastructure

The location of facilities at both the Gordon and MacLellan sites were selected to avoid disturbance to sensitive habitat features, where possible, such as watercourses and forested areas. Where disturbance was unavoidable, the size and number of natural features affected were reduced. The footprint at the MacLellan site was condensed to reduce the overall footprint size and the amount of area that will require clearing. Facilities were sited within and not across watershed boundaries to reduce the number of potentially affected waterbodies. The Project Development Area was also sited and configured to avoid encroaching on both Payne Lake and Minton Lake (see Map 2-2). Bedrock conditions were considered when determining the location of heavy equipment foundations. Alternative locations were considered for key Project infrastructure, including the location of the ore milling and process plant, the TMF, and the ore, overburden and mine rock stockpiles/storage areas. Each of these alternatives are discussed below.

Ore milling and processing at the Gordon site was not considered economically feasible. Three locations at MacLellan were originally assessed for the location of the processing plant, and a location east of East pond was selected. As part of value engineering in 2018, the location of the processing plant was re-evaluated, and the current location, north of the open pit was selected. The current location was selected given its close proximity to the ore stockpile for process efficiency and reduced Project footprint (see Map 2-2). In addition, no watercourse crossings would be required for the mine road from the pit to the ore milling and processing plant. The original location would have resulted in production inefficiencies, additional costs, and increased adverse environmental effects from increased air emissions, an additional watercourse crossing and a larger Project footprint resulting in loss and/or alteration of habitat. The likelihood of flooding was considered when determining the location of the processing plant at the MacLellan site.

Several locations were assessed for the location of the TMF. The Gordon site was considered as a potential location for the TMF; however, it was not considered an economically viable option. Six original TMF locations were investigated, and a location immediately north of Minton lake was selected. A TMF location review was conducted as part of value engineering in 2018 and the current TMF location was selected, north west of Minton Lake (see Map 2-2). The current location was selected as it had a smaller footprint, a lower volume for dam construction, a higher storage capacity to dam volume ratio, limited to no upstream watershed diversion, and was closer to the ore milling and processing plant (Golder 2019). The current location avoids the potential deposition of mine tailings into fish-bearing watercourses or waterbodies.

Alternative locations for the ore, overburden and mine rock stockpiles/storage areas are limited based on the need to remain close to the open pit and process plant for cost and operational efficiency. Therefore, two alternatives were considered for the ore, overburden and mine rock stockpiles/storage areas at the MacLellan site, including north of the open pit and south of the open pit. North of the open pit was selected given that the location allowed for lower stockpile heights, as well as optimal hauling distance, resulting in reduced air and dust emissions (see Map 2-2).

A summary of alternative means for the location of key project infrastructure is provided in Table 2-8.

Table 2-8 Summary of Location of Key Project Infrastructure Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Ore Milling and Process Plant Location					
Current Location (north of the open pit)	Yes	Yes	Yes	The process plant location was selected to increase efficiency and reduce environmental effects.	Yes
Original Location (east of East Pond)	Yes	Yes	Yes – less efficient due to larger footprint.	Larger footprint than Option 1 with increased habitat alteration including upstream watershed diversion. Further from the mill.	No
Ore Milling and Process Plant at the Gordon site	Yes	Yes	No	Not assessed further*	No
Tailings Management Facility (TMF) Location					
Current Location (north west of Minton Lake)	Yes	Yes	Yes	Smaller footprint, a lower volume for dam construction, a higher storage capacity to dam volume ratio, limited to no upstream watershed diversion. Avoids deposition of mine tailings into fish-bearing watercourses or waterbodies.	Yes
Original Location (immediately north of Minton Lake)	Yes	Yes – less storage capacity than current location	Yes	Located on the other side of watershed divide from the MacLellan site.	No

Table 2-8 Summary of Location of Key Project Infrastructure Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Gordon Location	Yes	Yes	No	Not assessed further*	No
Ore, Overburden and Mine Rock Stockpiles/Storage Areas					
North of Open Pit	Yes	Yes	Yes	Allows for lower stockpile heights. This location also has optimal hauling distance, for greater efficiency and reduced environmental effects.	Yes
South of Open Pit	Yes	Yes	Yes	Higher stockpiles and less optimal hauling distances with lower efficiencies and greater environmental effects.	No
* Not assessed further as it was determined to be not legally, technically, and/or economically feasible.					

2.9.3.4 Ore Processing Methods/Technologies

Several options were considered for gold extraction, including cyanidation, gravity concentration, and flotation concentration. Testing indicated that there was no substantial difference in gold recovery observed between these processes (Ausenco 2019). Cyanidation was selected as the primary gold recovery process for its proven effectiveness and reliability.

A summary of alternative means to ore processing methods/technologies is provided in Table 2-9.

Table 2-9 Summary of Ore Processing Methods/Technologies Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Cyanidation	Yes	Yes. Sodium cyanide remains the primary reagent used for gold processing today because it allows for efficient extraction of gold from low-grade ore.	Yes	Spills of sodium cyanide are possible, although rigorous management procedures will be in place.	Yes
Gravity separation	Yes	Yes	No	Not assessed further*	No
Flotation concentration	Yes	Yes	No	Not assessed further*	No
* Not assessed further as it was determined to be not legally, technically, and/or economically feasible.					

2.9.3.5 Fuel Storage and Distribution

Fuels will be stored in approved aboveground storage tanks in the truck shop and fueling station west of the processing plant and will be equipped with secondary containment in accordance with provincial regulations and standards. Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements (e.g., the Storage and Handling of Petroleum Products and Allied Products Regulation under *The Dangerous Goods Handling and Transportation Act* of Manitoba). No other alternatives were assessed as they were not considered technically or economically viable to meet applicable regulations are standards.

A summary of alternative means to fuel storage and distribution is provided in Table 2-10.

Table 2-10 Summary of Fuel Storage and Distribution Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Fuels stored in approved aboveground storage tanks*	Yes	Yes	Yes	Meets regulated requirements for protection of the environment.	Yes
* No other options were assessed for fuel storage and distribution.					

2.9.3.6 Power Supply

Five alternatives were assessed for providing power to the Project. Three hydroelectric options were assessed as part of a Manitoba Hydro Alamos Gold Load Addition Load Interconnection Evaluation Study (Manitoba Hydro 2016) and one option of on-site diesel generators. An additional option was studied as part of the Lynn Lake Gold Project – Interconnection Feasibility Study (BBA 2019). At the MacLellan site, on-site diesel generators would result in higher costs and potential environmental effects, such as adverse air quality effects, if used to meet total operational power needs. The reuse of the existing distribution line right-of-way to the MacLellan site also reduced additional clearing required for a power line and therefore less loss and/or alteration of habitat. After consideration of various ownership arrangements, power for the MacLellan site will be supplied by Manitoba Hydro via infrastructure built by Alamos, including two transformers, a substation, and a distribution pole line with a connection between the Copper Street Station and the new substation via a tap, to facilitate the new mine at the MacLellan site.

Given the lower energy requirements at the Gordon site, diesel generators were considered to be more economical and will be used to supply power at that site for the duration of operations.

A summary of alternative means to power supply is provided in Table 2-11.

Table 2-11 Summary of Power Supply Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
On-site diesel generators	Yes	Yes	Yes; higher costs at MacLellan site given higher power requirements	On-site diesel generators at the MacLellan site would result in higher environmental effects (e.g., air emissions), if used to meet total operational power needs	Yes – for the Gordon site
Option 1 (Convert Copper Street Station) – Manitoba Hydro	Yes	Yes	Yes	System modifications within the existing Copper Street Station footprint with a short tap connection to a new substation located in close proximity.	Yes – for the MacLellan site
Option 2 (Construct new station)	Yes	Yes	No	*Not assessed further	No

Table 2-11 Summary of Power Supply Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Option 3 (New line from Laurie River Station to Project line)	Yes	Yes	No	Option includes the longest transmission line (75 km) which would result in the greatest alteration or loss of vegetation and wildlife habitat.	No
Option 4 (New substation and overhead distribution line – Alamos)	Yes	Yes	Yes	Substation option is closer to the MacLellan site and the required land area is available. The distribution line, while crossing two watercourses and two muskeg areas, will follow along existing an access road using single wood poles which reduces the clearing footprint and therefore reduces the loss and/or alteration of habitat. H-frame structures will be used at long span crossings only.	Yes – for the MacLellan site
* Not assessed further as it was determined to be not legally, technically, and/or economically feasible.					

2.9.3.7 Water Supply and Wastewater Management

The following alternatives were considered for the potable water supply:

- Surface water
- Water supplied by the Town of Lynn Lake.

A water supply of 92,000 L/day is required to produce water for both the Gordon and MacLellan sites, and to provide potable water for personnel working at the MacLellan site. Potable water quality is an ongoing issue in northern Manitoba with a Boil Water Advisory in effect since 2012 in the Town of Lynn Lake; therefore, the water system at the Town of Lynn Lake is unable to meet current demand and was not selected as a viable option. Potable water for the Gordon site will be obtained from the potable water treatment plant located at the MacLellan site. The source of freshwater will be the Keewatin River, located to the west of the MacLellan site (see Map 2-2). A freshwater pumping station will pump water to a potable water treatment plant.

Three alternatives were assessed for the wastewater system, including treatment at an on-site sewage treatment facility, septic tanks, and sewage lagoons. The wastewater treatment system at the Town of Lynn Lake is unable to meet current demand (close to reaching its physical capacity) and therefore was not selected as a viable option. Septic tanks will not provide adequate sewage treatment capacity for the site due to capacity restrictions at the MacLellan site; however, for the Gordon site, sewage will be conveyed by gravity to two septic tanks, and then will be trucked to the MacLellan site for processing at the MacLellan sewage treatment plant. Sewage lagoons will not provide adequate sewage treatment capacity for the site due to capacity restrictions. To meet capacity at the MacLellan site, the sewage from the MacLellan site buildings will be collected via a network of buried polyvinyl chloride (PVC) piping and manholes and conveyed by gravity to a 60 m^3/d sewage treatment plant.

A summary of alternative means to water supply and wastewater management is provided in Table 2-12.

Table 2-12 Summary of Water Supply and Wastewater Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Water Supply					
Surface water (Keewatin River)	Yes	Yes	Yes	Potable water will be obtained from potable water treatment plant at MacLellan site.	Yes
Water supplied by Town of Lynn Lake	Yes	Not assessed further*	Existing plant unable to meet demands	Not assessed further*	No
Wastewater					
Treated at the sewage treatment facility	Yes	Yes (at the MacLellan site)	Yes	Treatment to standards at MacLellan site prior to discharge.	Yes – at the MacLellan site
Septic tank(s)	Yes	Yes (at the Gordon site)	Yes	Sewage transported for treatment to the MacLellan site.	Yes – at the Gordon site
Lagoons	Yes	No; sewage lagoons will not provide adequate sewage treatment capacity.	Not assessed further*	Not assessed further*	No
* Not assessed further as it was determined to be not legally, technically, and/or economically feasible.					

2.9.3.8 Water Management and Effluent Discharge Points

Liquid discharges to be managed at the two sites can be classified as being either ‘contact’ or ‘non-contact’ water (Section 2.8.2). Contact water is water, surface water or groundwater, that contacts mine workings or interacts with mine rock material. Contact water may also include dewatering associated with the Project. Non-contact water is water that does not contact mine workings and/or interact with mine rock material. Both sites have been designed, as much as practical, to reduce the generation of contact water.

Non-contact water at both the Gordon and MacLellan sites will be diverted around Project facilities to reduce the amount of water that must be managed. No further treatment is proposed prior to discharge. No other options were therefore assessed for the management of non-contact water.

Only one option was assessed for the management of contact water and effluent discharge. Under normal operation, there will be no discharge of water from the TMF to the environment; therefore, no alternative discharge points were assessed. A system will be constructed at the MacLellan site to collect water and return it to the mill as part of a closed loop process. If necessary, the water will be treated to meet applicable federal and provincial regulatory requirements prior to discharge to the environment, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER. This option avoided the potential for adverse environmental effects to surface water, groundwater, and fish and fish habitat that may have resulted if surface water was considered the primary source for process water over using reclaim water.

A summary of alternative means to water management and effluent discharge points is provided in Table 2-13.

Table 2-13 Summary of Water Management and Effluent Discharge Points Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental/ Socio-Economic Considerations	Preferred Option
Collect contact water locally and treat through central contact water collection pond and/or treatment plant prior to discharge.*	Yes	Yes	Yes	Limit potential adverse environmental effects to surface water, groundwater and fish and fish habitat.	Yes
* No other options were assessed for water management and effluent discharge					

2.9.3.9 Workforce Accommodation and Transportation

The total labour force, as well as FTEs expected on site at a given time (accounting for fly-in, fly-out rotations) is discussed in Section 2.5. To accommodate the required workforce, four options were assessed in the Lynn Lake Workforce Accommodation Study (Environmental Resource Management 2017): a permanent camp at the MacLellan site; an off-site accommodation at the Town of Lynn Lake; the re-use of existing housing in the Town of Lynn Lake; and the combined use of a camp within the Town of Lynn Lake and triplex units.

With a declining population in the Town of Lynn Lake, the condition of much of the available housing has deteriorated and many units are not habitable (Town of Lynn Lake 2016). There are some options for temporary accommodations in the area, including hotel, motels, inns, campgrounds, and lodges (Travel Manitoba 2016); however, given the labour force requirements, the use of a work camp during construction and operation was selected to satisfy requirements for worker accommodation. A camp within the Town of Lynn Lake was not selected given substantial infrastructure upgrades that would be required to accommodate the camp, and therefore was not technically or economically feasible. The worker operation camp location at the MacLellan site was confirmed and refined within the footprint. Placement to the west of the Keewatin River outside of the Project Development Area was avoided. An on-site permanent camp will reduce traffic to/from site. To reduce adverse effects to infrastructure and services in the Town of Lynn Lake, camp infrastructure will be independent of existing Town facilities. Power for the MacLellan site will be supplied by Manitoba Hydro; potable water from the Keewatin River will be treated on site; and there will be on-site wastewater treatment. Workers will be bussed from the temporary camp to the Gordon site during construction and operation. This will reduce the additional road traffic generated by the Project.

A summary of alternative means to workforce accommodation and transportation is provided in Table 2-14.

Table 2-14 Summary of Workforce Accommodation and Transportation Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Permanent on-site camp facility	Yes	Yes	Yes	A permanent camp would reduce Project cost and increase efficiency. This option would reduce traffic and associated effects. It would also reduce worker / local interactions.	Yes
Off-site camp	Yes	No; a camp within the Town of Lynn Lake was not selected given substantial infrastructure upgrades that would be required to accommodate the camp.	Not assessed further*	Not assessed further*	No
Use of housing within Lynn Lake	Yes	No; insufficient housing stock.	Not assessed further*	Not assessed further*	No

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Combined use of an off-site and triplex units within the Town of Lynn Lake	Yes	No; insufficient housing stock.	Not assessed further*	Not assessed further*	No
* Not assessed further as it was determined to be not legally, technically, and/or economically feasible.					

2.9.3.10 Diversion Channel

There were two options evaluated for the diversion channel between Gordon and Farley lakes at the Gordon site. Option 1, evaluated in 2017, was an approximately 1,000 m constructed channel, similar to the existing diversion channel and provided continued connection between the two lakes. Option 1 originated at Gordon Lake and terminated at a tributary to Farley Lake. Option 2 (2019) is approximately 450 m longer than Option 1 and incorporates fish habitat features intended to contribute to offsetting the loss of the existing channel at a ratio of 1:1. Option 2 originates at Gordon Lake and terminates at a tributary to Farley Lake.

A summary of alternative means to the diversion channel is provided in Table 2-15.

Table 2-15 Summary of Diversion Channel Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Option 1 (Channel from Gordon Lake to tributary of Farley Lake)	Yes	Yes	Yes	Channelized ditch without habitat features that does not offset the loss of the existing channel.	No
Option 2 (Channel from Gordon Lake to a tributary of Farley Lake with fish habitat features)	Yes	Yes	Yes	Longer channel that includes fish habitat features and offsets the loss of the existing channel at a ratio of 1 to 1.	Yes

2.9.3.11 Mine Waste Disposal and Final Effluent Discharge Methods

Two disposal options were considered: conventional disposal and dry stacking (Golder 2016). Conventional disposal consists of disposing of tailings (50% solid) in a geomembrane-lined dam. The dry stacking method consists of disposing of filter cake (>80% solid) on a flat tailing surface that uses small diversion berms and ditches to divert clean water around the stack and a run-off and seepage collection system of ditches, ponds and sumps to collect water from the stack for settling and treatment prior to discharge.

Conventional disposal was the preferred option selected. The dry stack option was not preferred because it would be difficult to maintain and presented greater environmental risks. Furthermore, the dry stack option requires additional costs associated with transport, placement, processing, and compaction of the tailings.

Under normal operation, there will be no discharge of water from the TMF to the environment; therefore, no alternative discharge points were assessed.

A summary of alternative means to mine waste disposal and final effluent discharge methods is provided in Table 2-16.

Table 2-16 Summary of Mine Waste Disposal and Final Effluent Discharge Methods Analysis

Option	Legally Acceptable?	Technically Feasible?	Economically Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Mine Waste Disposal					
Conventional Disposal in TMF (50% solids)	Yes	Yes	Yes	Easier to collect seepage from a conventional tailings facility.	Yes
Dry Stack Option (>80% solids)	Yes	Yes; more difficult to maintain.	No; additional costs for transport, placement, processing, compaction of tailings.	Not assessed further*	No
Final Effluent Discharge					
No Final Effluent Discharge from TMF under Normal Operating Conditions**	Yes	Yes	Yes	Limit potential adverse environmental effects to surface water, groundwater and fish and fish habitat.	Yes

* Not assessed further as it was determined to be not legally, technically, and/or economically feasible.
**No other options were assessed for water management and effluent discharge.

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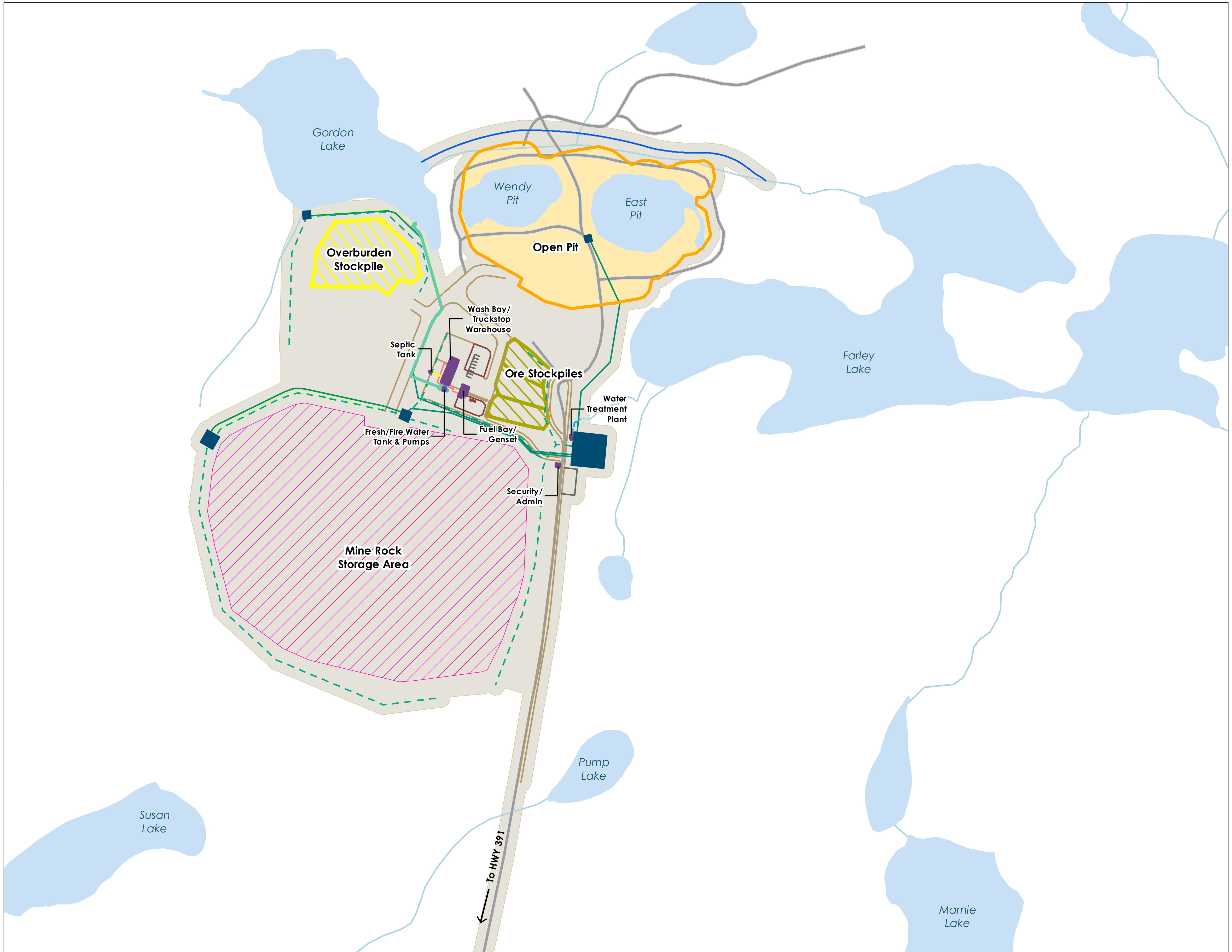

Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area
- Buildings
- Pond

Site Access

- Proposed Site Access Road
- Drainage Road

Other Infrastructure

- Construction Temporary Facility
- Parking
- Diversion Channel
- Fresh Water Pipe
- Sewer
- Potable Water
- Drainage Ditch - Clean water
- Drainage Ditch - Potentially Contaminated
- Drainage Pipe
- Fire Water

Landbase

- Existing Access Road
- Watercourse
- Waterbody

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Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Project Infrastructure features provided by QPit and Ausenco.

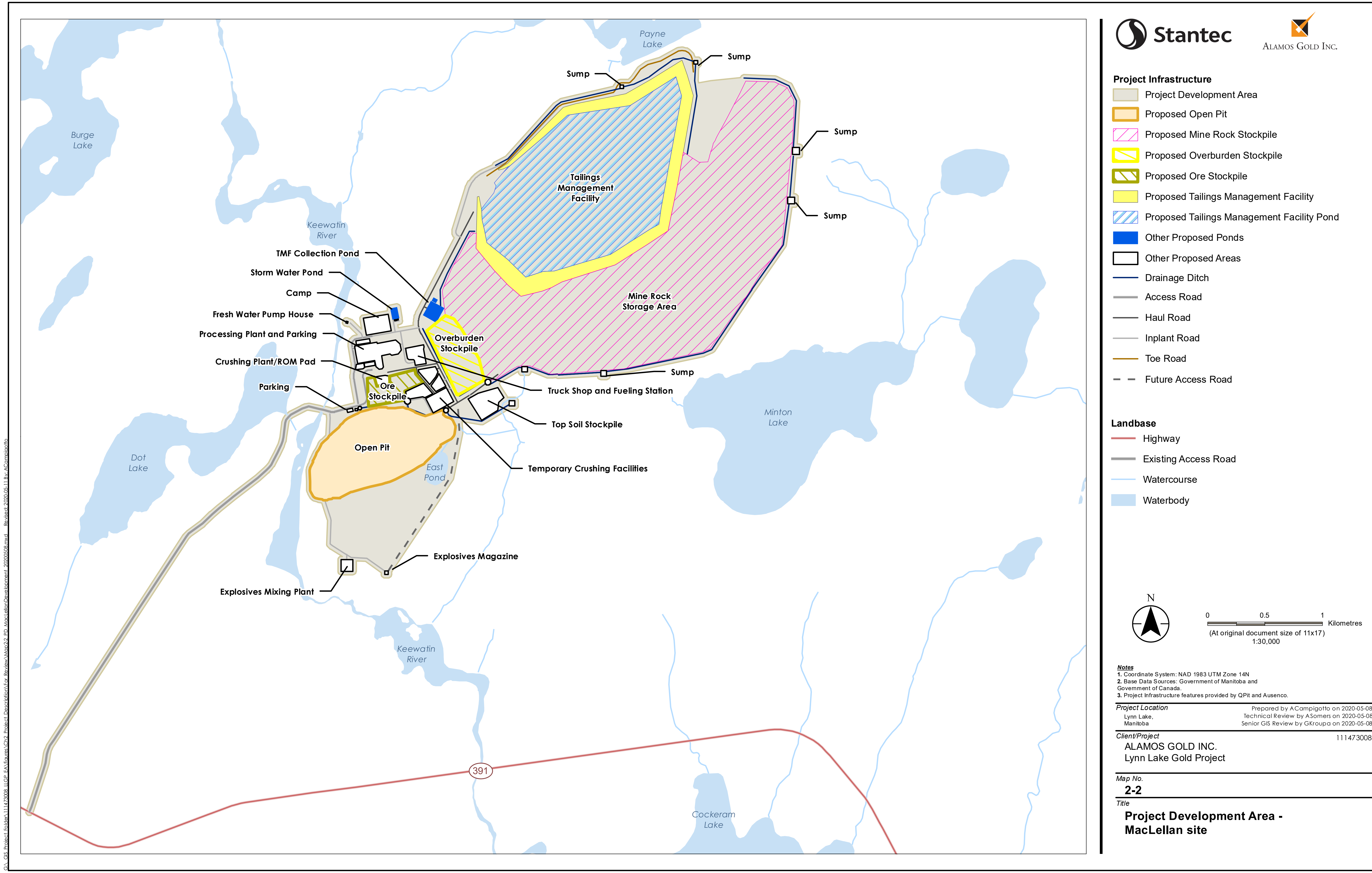
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2019-12-03
Technical Review by CAnseeuw on 2019-12-03
Senior GIS Review by GKroupa on 2019-12-11

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
2-1

Title
Project Development Area - Gordon site



Payne Lake
Burge Lake
Keewatin River
Dot Lake
East Pond
Minton Lake
Cockeram Lake
391
Sump
Sump
Sump
Sump
Sump
Tailings Management Facility
Mine Rock Storage Area
Overburden Stockpile
Ore Stockpile
Open Pit
TMF Collection Pond
Storm Water Pond
Camp
Fresh Water Pump House
Processing Plant and Parking
Crushing Plant/ROM Pad
Parking
Truck Shop and Fueling Station
Top Soil Stockpile
Temporary Crushing Facilities
Explosives Magazine
Explosives Mixing Plant
Stantec
Alamos Gold Inc.
Project Infrastructure
Project Development Area
Proposed Open Pit
Proposed Mine Rock Stockpile
Proposed Overburden Stockpile
Proposed Ore Stockpile
Proposed Tailings Management Facility
Proposed Tailings Management Facility Pond
Other Proposed Ponds
Other Proposed Areas
Drainage Ditch
Access Road
Haul Road
Inplant Road
Toe Road
Future Access Road
Landbase
Highway
Existing Access Road
Watercourse
Waterbody
N
0 0.5 1 Kilometres
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Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Project Infrastructure features provided by QPit and Ausenco.
Project Location
Lynn Lake, Manitoba
Prepared by ACampigotto on 2020-05-08
Technical Review by ASomers on 2020-05-08
Senior GIS Review by GKroupa on 2020-05-08
Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project
Map No.
2-2
Title
Project Development Area - MacLellan site
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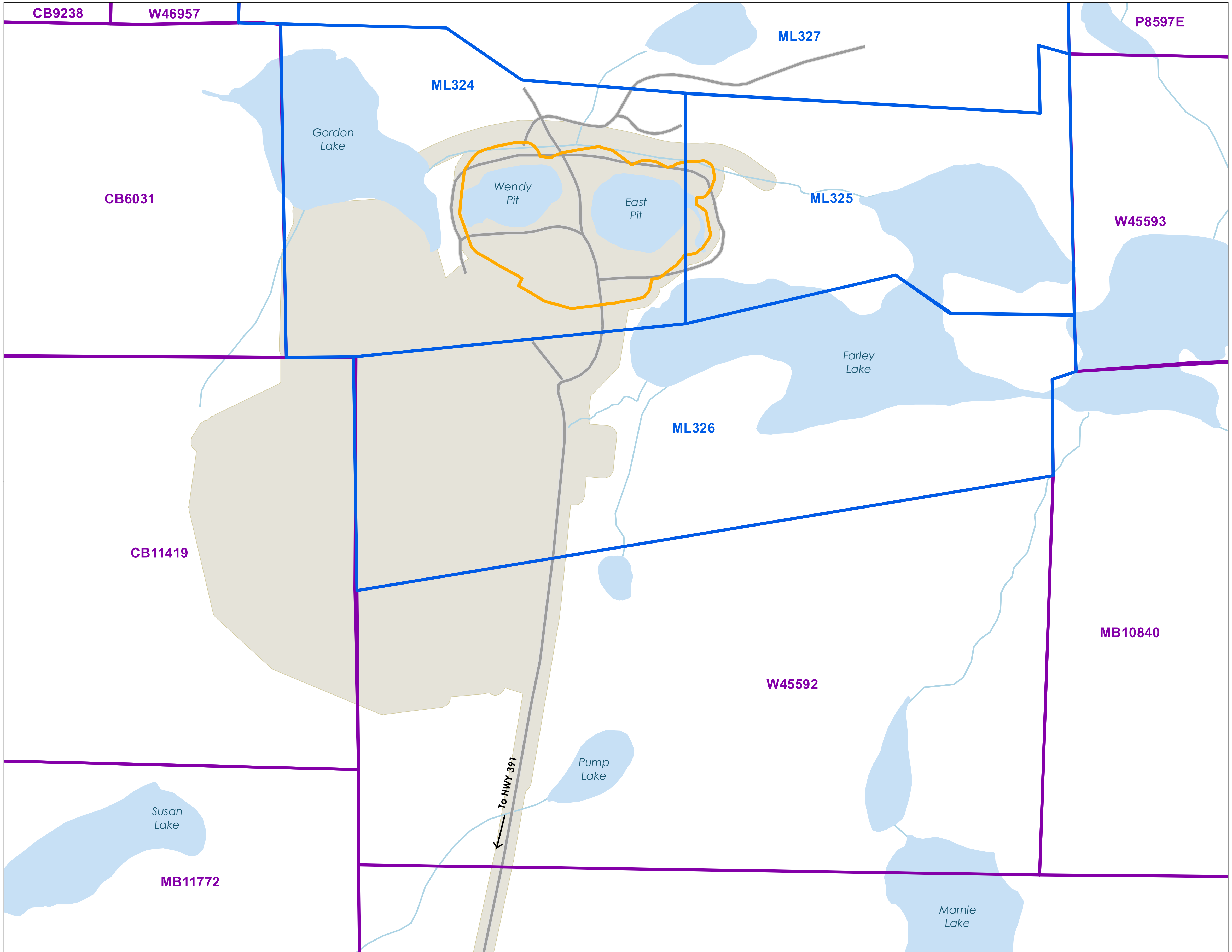


Stantec

Alamos Gold Inc.

Project Infrastructure

Proposed Open Pit

Project Development Area

Mining Claim Information

Mineral Leases

Mining Claims

Landbase

Existing Access Road

Watercourse

Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:12,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N

2. Base Data Sources: Government of Manitoba and Government of Canada.

3. Project Infrastructure features provided by QPit and Ausenco.

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-01-17
Technical Review by CAnseeuw on 2020-01-17
Senior GIS Review by GKroupa on 2020-01-17

Client/Project 111473008

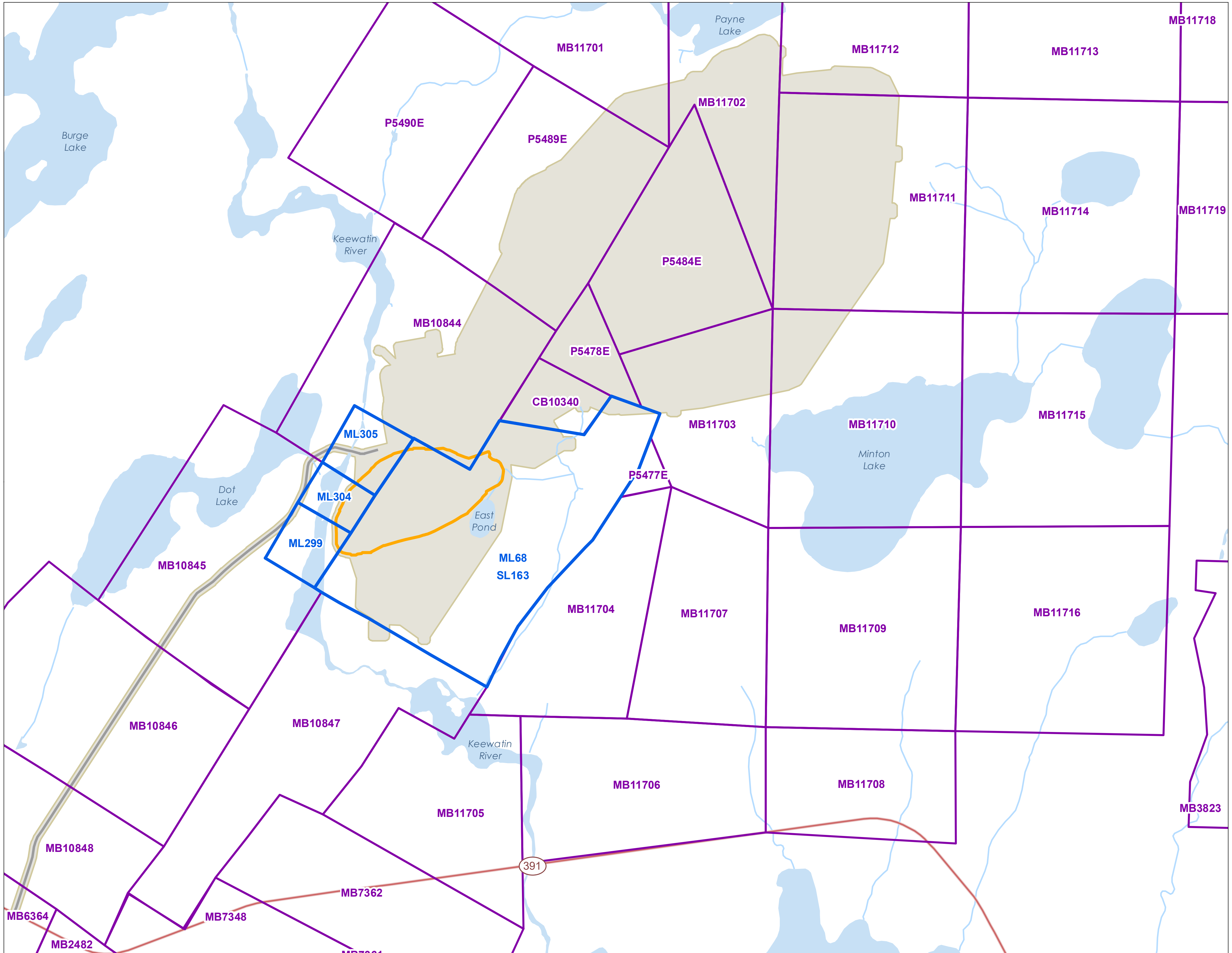
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.

2-3

Title

Mineral/Mining Claims and Leases - Gordon Site



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Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Mining Claim Information

- Mineral Leases
- Mining Claims

Landbase

- Highway
- Existing Access Road
- Watercourse
- Waterbody

N

0 0.5 1 Kilometres

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Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Project Infrastructure features provided by QPit and Ausenco.

Project Location
Lynn Lake, Manitoba

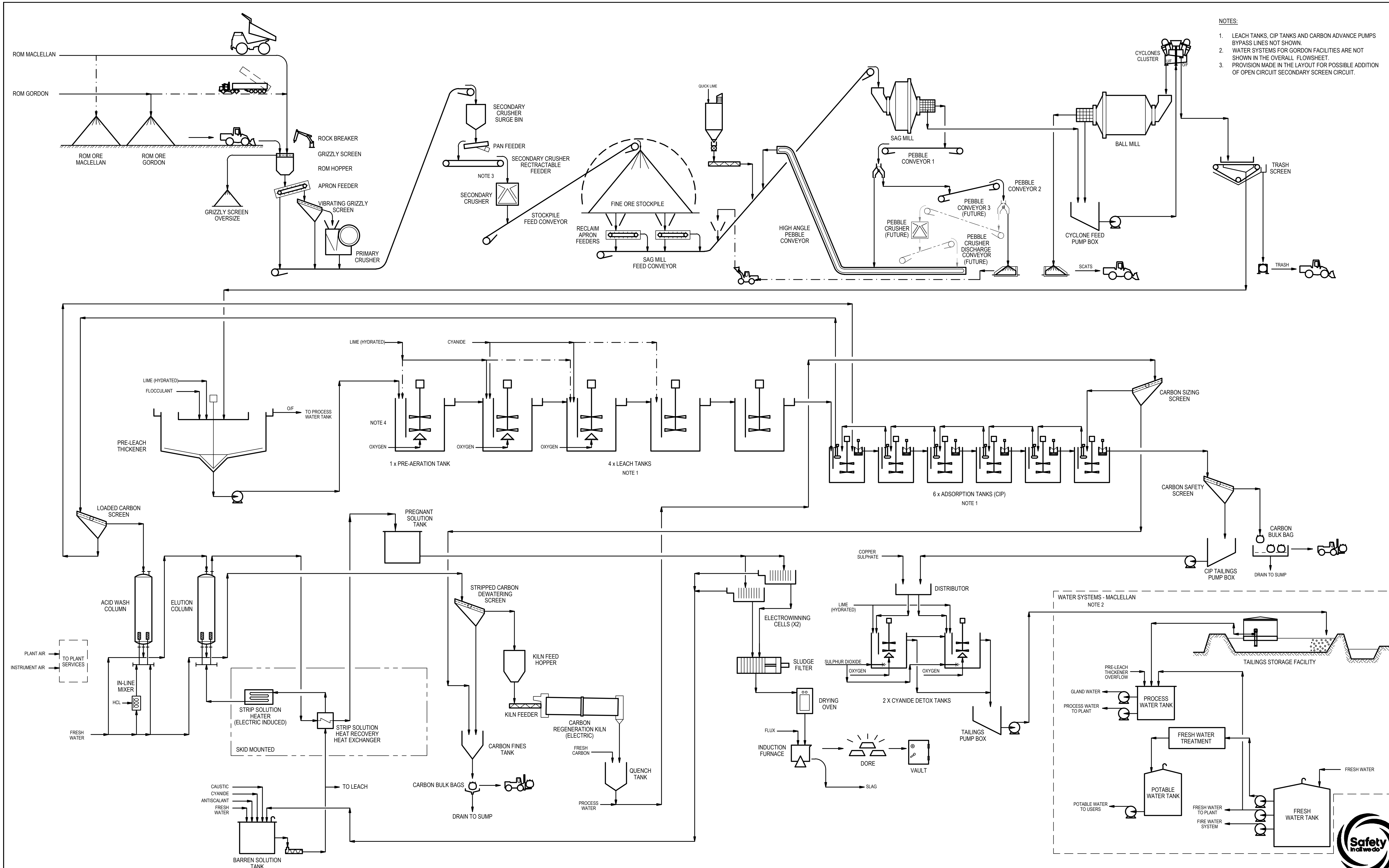
Prepared by ACampigotto on 2019-10-24
Technical Review by ASomers on 2019-10-24
Senior GIS Review by GKroupa on 2019-12-11

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
2-4

Title
Mineral/Mining Claims and Leases - MacLellan Site

Appendix 2A PROCESS FLOW DIAGRAM



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DRAWING No.	REFERENCE DRAWING

No	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR	CLNT
3	LL	31-05-2019	RE-ISSUED FOR USE	MF	MF	PM	
2	NT	27-03-2019	ISSUED FOR USE	MF	JPD	TP	
1	LL	14-01-2019	ISSUED FOR CLIENT REVIEW	MF	JD	GA	
0	LL	08-06-2017	ISSUED FOR FEASIBILITY STUDY	KR	EC	SR	

DRAWN	S. SUN	22-11-2016
CHECKED	K. RUTKOWSKI	09-12-2016
DESIGNED	E. CANER	22-11-2016
DES. APPR	E. McLEAN	09-12-2016
PROJ APPR	S. REDMOND	22-11-2016
CLIENT APPR		

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Ausenco

PROJECT: LYNN LAKE GOLD PROJECT

TITLE: MACLELLAN - PROCESSING PLANT
OVERALL PROCESS FLOW DIAGRAM - 7,500 TPD

PROJECT No	SCALE	SIZE
101781-02	NONE	A1

DRAWING No	REV
101781-0000-F-201	3

Appendix 2B 3D VISUALIZATION OF PROJECT DEVELOPMENT

Visualization
Lynn Lake Gold Project: Gordon Site -
Current Conditions, Operation and Decommissioning/Closure (Post-Closure) Phases

3D Visualization by Paraminerals Consulting

Current Conditions

3D Visualization by Paraminerals Consulting

Operation

3D Visualization by Paraminerals Consulting

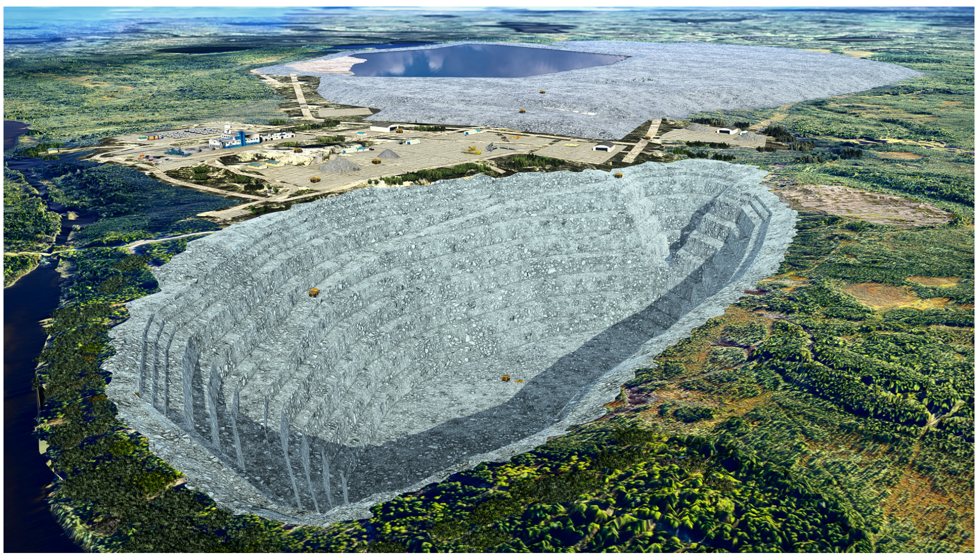
Decommissioning/Closure (post-closure)

Visualization
Lynn Lake Gold Project: MacLellan Site - Current Conditions, Operation and Decommissioning/Closure (Post-Closure) Phases

3D Visualization by

Paraminerals Consulting

Current Conditions



3D Visualization by

Paraminerals Consulting

Operation

3D Visualization by

Paraminerals Consulting

Decommissioning/Closure (post-closure)

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Lynn Lake Gold Project
Environmental Impact Statement
Chapter 3 - Engagement

Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Acronyms and Abbreviations

Alamos	Alamos Gold Inc.
ATEC	Atoskiwin Training and Employment Center
CEA Agency	Canadian Environmental Assessment Agency
CEAA	*Canadian Environmental Assessment Act*
EA	environmental assessment
Final EIS Guidelines	Final Guidelines for the Preparation of an Environmental Impact Statement, pursuant to CEAA, 2012, dated November 2017
ha	Hectare
IAAC	Impact Assessment Agency of Canada
INAC	Indigenous and Northern Affairs Canada
kilometer(s)	Km
MCC	Manitoba Conservation and Climate
Project, the	Lynn Lake Gold Project
Proponent, the	Alamos Gold Inc.
PR	provincial road
RCMP	Royal Canadian Mounted Police
TLRU	traditional land and resource use
TMF	tailings management facility
VC	valued component

3.0 ENGAGEMENT

3.1 OVERVIEW

Alamos Gold Inc. (Alamos) is committed to open and transparent engagement throughout the life of the Lynn Lake Gold Project (the Project). The engagement process for the Project was initiated in 2014, six years prior to regulatory filing. Alamos' Manager of Environment and Community Relations maintains an active presence in the Town of Lynn Lake and regularly engages with local businesses and services. The engagement process will continue through the construction, operation, and decommissioning/closure phases of the Project with communities that are affected by the Project or have identified a desire to continue to engage. A copy of Alamos' Community Engagement Plan is provided in Appendix 3A.

The purpose of the engagement process is to provide opportunities for meaningful engagement with Indigenous communities, public, stakeholders, and regulators during the environmental assessment (EA) process. Alamos provided, and will continue to provide, multiple opportunities through various methods for potentially affected communities to learn about the Project and provide updates as the Project develops. Alamos worked diligently, and will continue to work diligently, with participants to identify and document concerns raised in relation to the Project and its potential effects. The engagement process is flexible to adapt to the needs and expectations of Indigenous communities and stakeholders, where possible. This engagement process is separate from the Crown-Indigenous consultation process to be initiated by the government with First Nations and Métis nation communities to inform Crown decisions about the Project. This chapter focuses on the information shared and feedback received from Indigenous communities, public, stakeholders and regulatory agencies on the Project and the extent to which this feedback was addressed throughout the EA and incorporated in the design of the Project.

Alamos' engagement process consists of a multiple round approach that involves:

- Sharing project information.
- Obtaining feedback for use in the EA.
- Providing opportunity for Indigenous communities to review and provide comments on secondary sources of information used in the EA.
- Gathering and understanding key issues and concerns.
- Incorporating information into the design of the Project and the EA.
- Documenting and reporting on the feedback received and describing outstanding issues and ways to address them.

Map 3-1 illustrates the location of communities in relation to the Project.

3.2 ENGAGEMENT DOCUMENTATION

A key component of an effective engagement process is thorough documentation and tracking of communications, activities, events, and commitments. This allows Alamos to confirm completion of commitments, follow up on communications, and report back to Indigenous communities, public, stakeholders and regulators on how their concerns have been addressed and how their input has affected decisions and design.

For this Project, Alamos chose to use SustaiNet's© StakeTracker® (2019) information management software to manage documentation and tracking of communications, activities, events, and commitments. The secure, web-based database was managed to establish a comprehensive record of communications with Indigenous communities, members of the public, stakeholders, and regulatory agencies. These records included the date, time and means of engagement, individuals involved and community or organization they represent, and key topics discussed. A summary of communication by community current to May 22, 2020 is provided in Appendix 3B.

3.3 ENGAGEMENT WITH INDIGENOUS COMMUNITIES

3.3.1 Objective and Approach to Engagement with Indigenous Communities

Alamos is respectful of local beliefs, culture, language, and the defining features of a community including respect for local etiquette for engagement. Only through social engagement, participation, and support can Alamos succeed in understanding local challenges and priorities, and work towards building enduring relationships.

For Alamos, the principles of sustainable development include sharing the economic stimulus from the mine operations and enhancing the overall quality of life for host communities. Alamos recognizes that there may be potential effects of the Project to the traditional territory of Indigenous communities and strives to develop a Project that respects and preserves the environmental integrity of those areas to the extent possible. Overlaps in interest will be discussed in more detail to find a solution between Alamos and the community.

As outlined in the Indigenous Community Engagement Plan (Alamos 2017), the objectives of the Indigenous community engagement process are to:

- Provide the information needed by Indigenous communities to understand the Project and its potential effects.
- Demonstrate mutual respect, build trusting relationships, and have open communication with Indigenous communities potentially affected or interested in the Project.
- Listen with purpose and define strategies for facilitating meaningful engagement with potentially affected or interested Indigenous communities in a spirit of honesty, accountability, integrity, and legality.

- Seek information from Indigenous communities about potential adverse effects on the exercise of Aboriginal and treaty rights and traditional lands and resources, to limit or mitigate identified potential adverse effects.
- Address, to the extent possible, the concerns and issues raised by potentially affected or interested Indigenous communities and cooperatively develop solutions to those concerns and issues.

Alamos will provide feedback to the communities and, through this Environmental Impact Statement (EIS), demonstrate how input influenced the decisions made and the mitigation measures developed.

3.3.2 Identification of Potentially Interested Indigenous Communities

Indigenous people account for approximately 17.8% of the total population of Manitoba, which includes approximately 220,475 First Nations, Métis, and Inuit people (Statistics Canada 2016). First Nations people represent the largest portion of Manitoba's Indigenous population. As of December 31, 2016, there were 155,965 registered First Nation members in Manitoba, with a total of 92,645 members (59%) living on reserves (INAC 2016). First Nations groups indigenous to Manitoba include Ojibway, Cree, Oji-Cree, Dakota, and Dene (MIMR n.d.).

Based on the *Guidelines for the Preparation of an Environmental Impact Statement* (Canadian Environmental Assessment [CEA] Agency 2017) for this Project and current understanding of traditional lands located in proximity to, and/or downstream or downwind from, Project activities and components, the following seven Indigenous communities have been identified by the CEA Agency (now the Impact Assessment Agency of Canada [IAAC]) as expected to be "most affected" by the Project:

- Marcel Colomb First Nation
- Mathias Colomb Cree Nation
- Nisichawayasihk Cree Nation
- O-Pipon-Na-Piwin Cree Nation
- Manitoba Metis Federation
- Peter Ballantyne Cree Nation
- Barren Lands First Nation.

For the aforementioned communities, IAAC indicated that Alamos should "strive to use primary data sources and hold face-to-face meetings to discuss concerns" (CEA Agency 2017).

The IAAC also identified additional Indigenous communities that may also be affected by the Project, but "to a lesser degree". IAAC indicated that these communities should be "notified about key steps in the EIS development process and of opportunities to provide comments on key EA documents and/or information to be regarding their community". These communities include:

- Métis Nation – Saskatchewan Northern Region 1
- Métis Nation – Saskatchewan Eastern Region 1
- Hatchet Lake First Nation
- Northlands Denesuline First Nation
- Sayisi Dene First Nation.

Pickerel Narrows Cree Nation was also initially identified as potentially affected by the Project, but to a lesser degree; however, upon discussions with the IAAC, it was determined that Indigenous Services Canada recognizes the Granville Lake Indian Settlement (referred to as the Granville Lake community) as a reserve under the governance of Mathias Colomb Cree Nation, and therefore Pickerel Narrows Cree Nation is not discussed for the purposes of this EIS as a separately governed Indigenous community (CEA Agency pers. comm. 2018). The Granville Lake community represents the same community as Pickerel Narrows Cree Nation. The IAAC advised that until the Granville Lake community holds a referendum to be recognized as an independent First Nation (i.e., Pickerel Narrows Cree Nation), members of the Granville Lake community are members of Mathias Colomb Cree Nation. As such, the IAAC advised that engagement concerning potential effects of the Project to the Granville Lake community should occur through Mathias Colomb Cree Nation leadership. These communities, collectively, were included in the engagement process for the Project.

Alamos understands that throughout the engagement process and development of the EA it was possible the list provided by the IAAC could change as the Project developed and more was understood about the potential effects of the Project. To date, no additional communities have been identified through the engagement process or by IAAC as being potentially affected by or interested in the Project.

Chapter 17 provides an overview of the current use of lands and resources for traditional purposes by these Indigenous communities in the Project area and Chapter 19 provides the assessment of potential effects to Indigenous Peoples.

3.3.3 Indigenous Community Profiles

The following community profiles were compiled to provide a brief overview of each of the Indigenous communities identified by IAAC as being potentially affected by or interested in the Project. These profiles were compiled using publicly available information authored by the communities (i.e., community websites or other resources) wherever possible. The purpose of relying closely on this information is to avoid misrepresenting the community's own words. The profiles, along with a list of resources compiled for the profiles and the EA were provided to community leadership for review and comment. Status of this review has been noted at the beginning of each profile that follows.

3.3.3.1 Marcel Colomb First Nation #328

With exception of minor updates for the EIS, this community profile has been reviewed by and is used with approval from Marcel Colomb First Nation.

The Cree people of Marcel Colomb First Nation initially resided throughout northeastern Saskatchewan and northwestern Manitoba. Treaty No. 6 was signed in 1876 and extends across the portions of present-day Alberta and Saskatchewan (Taylor 1985). Marcel Colomb First Nation is one of the communities in Manitoba that adhered to Treaty 6 (TRCOM 2017). Marcel Colomb First Nation's reserve, Black Sturgeon (INAC No. 09000), is adjacent to Hughes Lake, north of Provincial Road (PR) 391, near Lynn Lake, Manitoba. The reserve covers 2,327 hectares (ha; INAC 2019a). Black Sturgeon reserve is six kilometers (km) from the Gordon site and 22 km from the MacLellan site at its nearest point.

Marcel Colomb First Nation was originally part of the Mathias Colomb Cree Nation. The Manitoba Treaty Land Entitlement Framework Agreement signed in 1997 prompted the recognition of Marcel Colomb First Nation as a separate First Nation under the *Indian Act*. On March 30, 1999, Marcel Colomb First Nation formally separated from Mathias Colomb Cree Nation (Treaty Land Entitlement Committee of Manitoba Inc. 2010).

The following information is taken from a plaque at the Marcel Colomb First Nation band office and describes the history of the community:

> In the 1960s there were several gold and nickel mines in Lynn Lake. The aboriginal people living nearby were not allowed in the Town of Lynn Lake and acquired the name the "Tent Village People." There were 10 tents. Five to eight families lived in each tent. It wasn't until 1983, when the last gold mine closed, that the aboriginal people were allowed to move into town.
>
> The land known as Black Sturgeon was claimed in 1972 by Marcel Colomb and in 1995, Black Sturgeon Reserve was officially approved as a new First Nation. In March 1999, the first election for Chief and Council was held, and Marcel Colomb First Nation was established.

Marcel Colomb First Nation governance is by a custom electoral system with a Chief and three councillors (INAC 2019a). Elections were last held in February 2020. As of November 2019, the total registered population of Marcel Colomb First Nation is 449 people with 81 living on reserve, 6 on other reserves, 251 on Crown Land, and 111 living off reserve (INAC 2019a). Marcel Colomb First Nation is a member of Swampy Cree Tribal Council Inc. along with Chemawawin Cree Nation, Mathias Colomb Cree Nation, Misipawistik Cree Nation, Mosakahiken Cree Nation, Opaskwayak Cree Nation, Sapotaweyak Cree Nation, and Wuskwi Sipihk First Nation (INAC 2019a).

Lynn Lake provides most of the services and infrastructure for Marcel Colomb First Nation members including the Lynn Lake Hospital, RCMP, West Lynn Heights School (Kindergarten to Grade 12), Canada Post, Manitoba Health and Family Services, MCC, Lynn Lake Resource Centre, and forest fire base with a seasonal crew. Additional medical services are available in Thompson, to which a bus provides transportation twice per week. Businesses in Lynn Lake include several retail outlets including the Northern Store, a gas station, two motels, and two restaurants (Town of Lynn Lake 2016b, Stantec 2017, FSD 2017). Marcel Colomb First Nation operates its own water treatment plant and sewage lagoon on the Black Sturgeon Reserve. Homes are serviced using a water truck and septic tank truck (Stantec 2017). Currently, new infrastructure is being constructed to tie all houses (both new and old) into the sewer and freshwater system.

Access to Lynn Lake is by PR 391 and air. Lynn Lake is the starting point of the road to Kinoosao, Saskatchewan, which is on the east side of Reindeer Lake. PR 391 connects Lynn Lake with Leaf Rapids and Thompson and points to the south. Air services are provided to Lynn Lake by way of the Lynn Lake Airport and the Eldon Lake Water base. The main users of the airport are fishing charters in the summer, Royal Canadian Mounted Police (RCMP) and health services. Charters are operated by Perimeter Airlines, Transwest Air and Wings Over Kississing (Stantec 2017, Town of Lynn Lake 2016a).

3.3.3.2 Mathias Colomb Cree Nation #311

In August 2018, and December 2019, the Mathias Colomb Cree Nation community profile and compiled reference list to be used in the EA were sent to the former Chief and Deputy Chief for review and comment. The documents were additionally provided to Chief and Council during a meeting in Winnipeg in October 2018. To date, no feedback has been received on the community profile that follows.

The Cree people of Mathias Colomb Cree Nation initially resided throughout northeastern Saskatchewan and northwestern Manitoba. Treaty No. 6 was signed in 1876 and extends across the portions of present-day Alberta and Saskatchewan (Taylor 1985). Mathias Colomb Cree Nation communities in Manitoba are among those adhering to Treaty 6 (TRCOM 2017). There are 16 reserves and settlements affiliated with Mathias Colomb Cree Nation including the Granville Lake Indian Settlement, a community located on the south shore of Granville Lake (INAC 2019b, Manitoba Government 2016). In 2016, the population of the Granville Lake community was 10 (StatsCan 2017). The governing centre of Mathias Colomb Cree Nation is in Pukatawagan on the Churchill River. Table 3-1 summarizes the reserves and settlements associated with Mathias Colomb Cree Nation and the distance from the Gordon and MacLellan sites to each.

Table 3-1 List of Reserves and Settlements Affiliated with Mathias Colomb Cree Nation

INAC Number	Name	Distance to Gordon Site (km)	Distance to MacLellan Site (km)	Size (ha)
06457	Granville Lake Indian Settlement	75	77	0
06455	Highrock 199	102	105	7879
09881	Kamihkowapihskak Pawistik	141	128	1725
09853	Kimosominahk	126	122	553
10038	King Fisher Bay	135	130	595
09878	Mistiategameek Sipi	130	140	732
09880	Moosowhapihsk Sakahegan	135	125	806
09852	Napahkapihskow Sakhahigan	150	150	1829
09882	Nihkik Ohnikapihs	100	90	367
09879	Ohpahahpiskow Sakahegan	120	120	1462

Table 3-1 List of Reserves and Settlements Affiliated with Mathias Colomb Cree Nation

INAC Number	Name	Distance to Gordon Site (km)	Distance to MacLellan Site (km)	Size (ha)
09911	Pachapesihk Wasahow	125	125	29218
06456	Pukatawagan 198	135	125	1537
09875	Sisipuk Sakahegan (A)	150	135	2090
09876	Sisipuk Sakahegan (B)	155	140	3
09877	Sisipuk Sakahegan (C)	155	140	4
09851	Wepuskow Ohnikahp	135	130	31035
Source: INAC 2019b				

Mathias Colomb Cree Nation falls under the *Indian Act* election provisions with a Chief and 10 councillors (INAC 2019b). Elections were last held in October 2018. As of February 2019, the total registered population of Mathias Colomb Cree Nation is 3,901 people, which includes 2,240 living on their own reserve, 170 on other reserves, 74 on Band-owned Crown Lands, 32 on other Crown Lands, and 1,385 live off reserve (INAC 2019b). Mathias Colomb Cree Nation is a member of Swampy Cree Tribal Council Inc. along with Chemawawin Cree Nation, Marcel Colomb First Nation, Misipawistik Cree Nation, Mosakahiken Cree Nation, Opaskwayak Cree Nation, Sapotaweyak Cree Nation, and Wuskwi Sipihk First Nation (INAC 2019b).

The Indigenous-owned Missinippi Airways serves the Pukatawagan airport. The temporary (annually established) winter road from Kississing Lake to Pukatawagan is open from approximately January to March depending on the weather. Pukatawagan has no all-weather road access. The absence of an all-weather road adds freight and transportation costs for individuals, communities, government, and industry. Mathias Colomb Cree Nation is a joint partner in the Keewatin Railway that connects the Pukatawagan community with The Pas.

Community health care is facilitated by Mathias Colomb Cree Nation Health Authority that employs a staff of approximately five (Manta Media Ltd n.d.). Infrastructure on the Mathias Colomb Cree Nation reserve includes Sakastew School (Kindergarten to Grade 12), University College of the North Pukatawagan Regional Centre, Mamawehetowin Women's Crisis Centre, and Pukatawagan Airport. University College of the North provides adult education and training services for individuals, industry, agencies, and community organizations. Businesses in the community include two grocery stores (Akochikan Co-Op Ltd. and The North West Company), Missinippi River Native Communications Inc., and Marilyn Braveheart Daycare (MFNERD 2017, Manta Media Ltd n.d.).

3.3.3.3 Nisichawayasihk Cree Nation #313

In August 2018 and December 2019, the Nisichawayasihk Cree Nation community profile and compiled reference list to be used in the EA were sent to community leadership for review and comment. To date, no feedback has been received on the community profile that follows.

Nisichawayasihk Cree Nation adhered to Treaty 5 on June 26, 1908. Nisichawayasihk Cree Nation contains 18 affiliated reserves with the governing centre at Nelson House on Footprint Lake (Nelson House 170). Table 3-2 summarizes the reserves and settlements associated with Nisichawayasihk Cree Nation and the distance of each from the Gordon and MacLellan sites. In addition, Nisichawayasihk Cree Nation has a 22,975 square kilometer Resource Management Area that is within the community's traditional territory (Nisichawayasihk Cree Nation n.d.(a)). The Resource Management Area is 45 km from the Gordon Site and 73 km from the MacLellan Site.

Table 3-2 List of Reserves and Settlements Affiliated with Nisichawayasihk Cree Nation

INAC Number	Name	Distance to Gordon Site (km)	Distance to MacLellan Site (km)	Size (ha)
09694	Kapawasihk	150	180	1870
09923	Mile 20 Second Revision	195	170	737
09695	Monahawuhkan	190	215	399
10046	Nisichawayasihk Cree Nation Mystery Lake Parcel Reserve	205	230	1.70
06450	Nelson House 170	150	170	1860.20
06451	Nelson House 170A	150	170	1161.50
06452	Nelson House 170B	150	170	2826.80
06453	Nelson House 170C	150	170	3.20
09798	Numaykoos Sakaheykun	150	180	3536
09750	Odei River	180	205	1371.20
09797	Opekanowi Sakaheykun	155	170	803.50
09696	Opekunosakakanihk	145	170	707.20
09748	Suwannee Lake	80	95	1620.80
09697	Wapasihk	140	165	1451.40
09925	Wapikunoo Bay	145	170	1796
09749	Wapisu Lake	140	160	1841.70
09863	Wuskwi Sakaheykun	155	185	918.70
09698	Wuskwi Sipi	170	200	802.90
Source: INAC 2019e				

Nisichawayasihk Cree Nation governance is by a custom electoral system with a Chief and six councillors (INAC 2019e). Elections were last held in August 2018 (as of February 2019, INAC has not provided an update on governance). The total registered population of Nisichawayasihk Cree Nation is 5,282 people with 2,995 living on reserve, 33 on other reserves, 123 on Crown Land, and 2,131 living off reserve (INAC 2019e). Nisichawayasihk Cree Nation is not affiliated with a Tribal Council (INAC 2019e). Access to Nelson House is via PR 391 from Thompson and by a 15-km gravel road.

In 2006, Nisichawayasihk Cree Nation signed the Wuskwatim Project Development Agreement with Manitoba Hydro to build the Wuskwatim Hydroelectric Generation Project at Taskinigahp Falls, about 40 km downstream of Nelson House in Nisichawayasihk Cree Nation's Resource Management Area. The agreement provides for Nisichawayasihk Cree Nation to own up to 33% of the project (balance owned by Manitoba Hydro) and related revenues once project loans are repaid. This Manitoba Hydro project provided job opportunities for qualified Nisichawayasihk Cree Nation members and business opportunities for Nisichawayasihk Cree Nation businesses and joint-venture business partnerships during construction. One of these businesses is the Mystery Lake Motor Hotel in Thompson, which was acquired over 10 years ago with funds obtained through the Northern Flood Implementation Agreement (Nisichawayasihk First Nation n.d.(a)). Nisichawayasihk Cree Nation acquired additional land surrounding the hotel and this became a Nisichawayasihk Cree Nation urban reserve in 2016.

Nisichawayasihk Construction Limited Partnership is wholly owned by Nisichawayasihk Cree Nation and is primarily focused on construction and equipment rental. Nisichawayasihk Cree Nation established the Taskinigahp Power Corporation to act as a partner with Manitoba Hydro in the Wuskwatim Power Limited Partnership and the corporation's directors represent Nisichawayasihk Cree Nation's interest. Nisichawayasihk Cree Nation created the Nelson House Development Corporation in 1992 to improve economic security and success for the community. More specifically, the Nelson House Development Corporation was created to build capacity, create employment for Nisichawayasihk Cree Nation citizens and generate revenue to fund Nisichawayasihk Cree Nation programs and services. The Nelson House Development Corporation office employs three full-time staff and additional student staff in the summer and currently oversees four businesses that are wholly owned by Nisichawayasihk Cree Nation: Meetah Building Supplies; Door and Cabinet Manufacturing Facility; Otohowin Gas Station (a gas bar in Thompson); Thompson Family Foods; and the Nisichawayasihk Cree Nation Three River Store (Nisichawayasihk First Nation n.d.(a)).

Nisichawayasihk Cree Nation operates the Nelson House Medicine Lodge that offers non-medical, alcohol and drug treatment, prevention and aftercare services that involve Indigenous traditional and contemporary teachings (Nisichawayasihk First Nation n.d.(a)). Nisichawayasihk Cree Nation also runs The Nisichawayasihk Nehetho Culture and Education Authority Inc. Otetiskiwin Kiskinwamahtowekamik is the community's elementary school for Nursery to Grade 8. Nisichawayasihk Neyo Ohtinwak Collegiate offers programs for Grades 9 to 12, including programming for mature students (Nisichawayasihk First Nation n.d.(a)).

The Atoskiwin Training and Employment Centre (ATEC) of Excellence is a fully accredited, non-profit, community-based, post-secondary training facility that opened in 2006. Originally designed to provide job training opportunities for work on the Wuskwatim Hydroelectric Generation Project, the centre has expanded to offer a wide range of post-secondary and other education opportunities to fill skill needs for the Nisichawayasihk Cree Nation and other northern Manitoba communities (Nisichawayasihk First Nation n.d.(a)).

The Family and Community Wellness Centre was established to support holistic wellness by providing different opportunities to Nisichawayasihk Cree Nation Members, to help build on their strengths as individuals, as members of families, and as part of the community (Nisichawayasihk First Nation n.d.(a)). The Nelson House Nursing Station provides nursing and dental services in cooperation with the Family and Community Wellness Centre (NHR 2017). The nearest hospital and ambulance service are in Thompson. The RCMP detachment stationed in Nelson House has officers who work co-operatively with Nisichawayasihk Cree Nation constables.

3.3.3.4 O-Pipon-Na-Piwin Cree Nation #318

In August 2018 and December 2019, the O-Pipon-Na-Piwin Cree Nation community profile and compiled reference list to be used in the EA were sent to Chief and Council for review and comment. The documents were additionally provided to the Chief and the Executive Director during subsequent communications regarding the Project. To date, no feedback has been received on the community profile that follows.

O-Pipon-Na-Piwin Cree Nation is on Southern Indian Lake on the Churchill River in northern Manitoba. The community is 90 km from the Gordon site and 120 km from the MacLellan site.

Originally part of the Nisichawayasihk Cree Nation, the federal and provincial governments and First Nation representatives signed a memorandum of understanding in 1995 to formalize a process to have the South Indian Lake community recognized as a separate Cree Nation. A final agreement between Nisichawayasihk Cree Nation and O-Pipon-Na-Piwin Cree Nation was signed in 2005 officially recognizing their independence (Nisichawayasihk First Nation, n.d.(b)). As part of Nisichawayasihk Cree Nation, O-Pipon-Na-Piwin Cree Nation signed an adhesion to Treaty 5 in June 1908 (Nisichawayasihk Cree Nation n.d.(b)).

O-Pipon-Na-Piwin Cree Nation governance is by a custom electoral system with a Chief and four councillors (INAC 2019d). Elections were last held in December 2018. O-Pipon-Na-Piwin Cree Nation is not affiliated with a Tribal Council (INAC 2019d). As of November 2019, the total registered population of O-Pipon-Na-Piwin Cree Nation is 1,704 people, with 1,084 living on reserve, 40 on other reserves, 1 on Crown Land, and 579 living off reserve (INAC 2019d).

An access road extends from PR 391 at Leaf Rapids to the C.F. Johnny Paul Cable Ferry, a seasonal ferry/barge that crosses a narrows to connect with an access road (PR 493) into the O-Pipon-Na-Piwin Cree Nation community. The airport is northeast of the community and is served regularly by Perimeter Aviation. Truck freighting to the community is via PR 391 and the ferry/barge crossing which operates all year around (Province of Manitoba 2011).

Police response is from the Leaf Rapids RCMP detachment (Province of Manitoba 2011). Medical response is based on a federal nursing station, with a five-bed capacity staffed by three nurses and two community health workers (Province of Manitoba 2011). The community also qualifies for patient transport assistance. Oscar Blackburn School (Kindergarten to Grade 12) is in South Indian Lake (FSD 2017). The community has limited employment but includes the school, the O-Pipon-Na-Piwin Cree Nation Band office, the South Bay Construction Company, and temporary construction jobs with outside contractors (Province of Manitoba 2011). There is also commercial fishing and trapping. The Northern Store provides amenities to the community. Other businesses include the Aswassis-Sekamink Centre, South Indian Lake Community Garage, and the South Indian Lake Development Corporation (Province of Manitoba 2011).

3.3.3.5 Manitoba Metis Federation

Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study for the Lynn Lake Gold Mine Project, Final Report (SVS 2020, Appendix 17A) provides a detailed profile of the history and identity of the Métis Nation and governance and representation of the Manitoba Métis Community through the democratically elected Manitoba Metis Federation. The Métis Nation represents a distinct Indigenous people as recognized by Section 35 of the *Constitution Act* (1982). The Manitoba Metis Federation is authorized by the citizens of the Manitoba Métis Community to be the sole self-governing body representing collective Métis rights, claims and interests, including consultation and negotiations of accommodations as directed by Manitoba Metis Resolution No. 8. The Manitoba Metis Federation has seven regional associations and 140 Locals (SVS 2020). The Project is in the Thompson Region, which has 16 Locals, the closest of which is Lynn Lake. Métis citizens have historically occupied the region, traveled and harvested resources on the lands and waters and continue to do so today for subsistence, commercial, cultural, and traditional purposes. This community profile is a brief summary and is not a complete depiction of the Manitoba Metis Federation or the dynamic way of life and systems of knowledge maintained by Manitoba's Métis citizens.

3.3.3.6 Peter Ballantyne Cree Nation #355

In August 2018 and December 2019, the Peter Ballantyne Cree Nation community profile and compiled reference list to be used in the EA were sent to Chief Peter A. Beatty for review and comment. The documents were additionally provided to a Councillor during subsequent communications regarding the Project. To date, no feedback has been received on the community profile that follows.

Peter Ballantyne Cree Nation adhered to Treaty 6 as members of the James Roberts of Lac La Ronge adhesion on August 10, 1898. Dominion Lands Surveyors began surveys of the first reserves in 1919. Land parcels were surveyed at Sturgeon Landing, Amisk Lake, Birch Portage, Mirond Lake, Pelican Narrows, Sandy Narrows, and Woody Lake, Saskatchewan (Peter Ballantyne Cree Nation 2009). Peter Ballantyne Cree Nation participates in the Northwest Co-operative Fisheries Limited, which is a commercial fishing co-op that serves seven First Nation communities in northwest Manitoba.

Peter Ballantyne Cree Nation represents eight separate, distinct communities that include: Kinoosao, Southend, Deschambault Lake, Pelican Narrows, Sandy Bay, Denare Beach, Sturgeon Landing and Prince Albert, Saskatchewan (INAC 2019c). Table 3-3 summarizes the reserves and settlements associated with Peter Ballantyne Cree Nation and the distance from the Gordon and MacLellan sites. There are also commercial urban reserves within Prince Albert, Saskatchewan city limits and others in the surrounding municipality (Peter Ballantyne Group of Companies 2017). The governing centre is at Pelican Narrows, Saskatchewan (INAC 2019c).

Table 3-3 List of Reserves and Settlements Affiliated with Peter Ballantyne Cree Nation

INAC Number	Name	Distance to Gordon Site	Distance to MacLellan Site	Size (ha)
06525	Amisk Lake 184	285	270	2,072.80
09466	Amiskosakahikan 210	270	260	442.60
06526	Birch Portage 184a	260	245	1,844.20
06635	Chief Joseph Custer	530	510	23
09987	Chief Philip Morin Indian Reserve No. 232	530	510	0.20
06619	Denare Beach Indian Settlement	270	260	0
06620	Deschambault Lake Indian Settlement	285	270	0
09160	Kimosom Pwatinahk 203	290	265	766.30
09394	Kinoosao-Thomas Clark 204	100	70	380.50
09489	Kipahigan Sakahikan 222	185	170	2,123.70
09347	Kiskaciwan 208	545	525	120.50
09721	Kistapinan 211	540	520	128.20
09720	Kistapinanihk 231	540	520	0.90
09533	Manawanstawayak 230	250	230	116.10
09639	Maskikopawiscikosik 229	245	225	180.50
09730	McKay 209	400	380	1,361.30
06527	Mirond Lake 184e	240	220	601.80
09327	Mistahi Wasahk 209	160	130	6,333.40
09065	Mistik	290	270	1,639.90
09483	Muskwaminiwatim 225	315	300	2,606.30
09484	Nakiskatowaneek 227	270	255	257.50
09487	Nemekus Sakahikan 221	205	190	92.90
09706	Northern Lights 220	540	515	2
06528	Pelican Narrows 184b	245	225	529.70
09303	Pelican Narrows 206	245	225	1,744.20
09304	Pisiwiminiwatim 207	300	285	2876
06621	Sandy Bay Indian Settlement	190	175	0
06529	Sandy Narrows 184c	260	240	1,077.70
09488	Sokatisewin Sakahikan 224	205	190	406.40
06530	Southend 200	180	150	4,219.10
09392	Southend 200a	180	150	278
06531	Sturgeon Weir 184f	300	290	2,329.40

Table 3-3 List of Reserves and Settlements Affiliated with Peter Ballantyne Cree Nation

INAC Number	Name	Distance to Gordon Site	Distance to MacLellan Site	Size (ha)
09393	Sturgeon Weir 205	300	290	26.30
09970	Thomas Morin	255	245	0.20
09156	Wapaskokimaw 202	195	175	64.50
09586	Waskwaynikapik 228	265	250	1,381.80
09486	Waskwiatik Sakahikan 223	210	195	871.40
06532	Woody Lake 184d	250	230	677.10
Source: INAC 2019c				

Peter Ballantyne Cree Nation governance is by a custom electoral system with a Chief and 14 councilors (INAC 2019c). Elections were last held in April 2018. As of November 2019, the total registered population of Peter Ballantyne Cree Nation is 11,257 people and consists of 6,018 living on reserve, 213 on other reserves, 1,002 on Band-owned Crown Land, 1 on other Band-owned Crown Land, 14 on other Crown Land, and 4,009 living off reserve (INAC 2019c). Peter Ballantyne Cree Nation is a member of the Prince Albert Development Corporation along with Black Lake First Nation, Cumberland House Cree Nation, Fond du Lac First Nation, Hatchet Lake First Nation, James Smith First Nation, Lac La Ronge Indian Band, Montreal Lake First Nation, Red Earth First Nation, Shoal Lake Cree Nation, Sturgeon Lake First Nation, and Wahpeton Dakota Nation (INAC 2019c).

Peter Ballantyne Cree Nation has a long history of business ventures and management. Peter Ballantyne Cree Nation's first investment was the La Ronge Wild Rice Corporation in 1983 and the processing plant, which is still in operation, provides seasonal employment for many of the surrounding residents. In 1985, the 12 First Nations of the Prince Albert Grand Council formed the Prince Albert Development Corporation. Each First Nation has an equal share of what is now called Prince Albert First Nations Business Development Limited Partnership (Peter Ballantyne Group of Companies 2017). Peter Ballantyne Development Corporation was formed in 1995 as the legal entity to develop, manage and operate businesses on behalf of the Peter Ballantyne Cree Nation. In 1996, Prince Albert Casino Ventures L.P. was formed as a 50-50 partnership between Peter Ballantyne and Prince Albert development corporations to develop the Northern Lights Casino property in Prince Albert, Saskatchewan. In 1998, Peter Ballantyne Development Corporation and Peter Ballantyne Cree Nation Health Services Inc. formed the Peter Ballantyne Cree Nation Ambulance Service to provide essential services to Peter Ballantyne Cree Nation communities. Mee-Toos Forest Products Ltd. was formed in 1999 to develop and manage the timber resources in the Amisk-Atik land base area, the traditional territory of Peter Ballantyne Cree Nation.

Pelican Narrows is the largest of the communities within Peter Ballantyne Cree Nation and is 388 km northeast of Prince Albert, Saskatchewan. The community is accessible by paved Saskatchewan Highways 55 and 106 with the final 50 km into the community by gravel road on Saskatchewan Highway 135. The closest urban centers to Pelican Narrows, Saskatchewan are the towns of Creighton, Saskatchewan and Flin Flon; the latter approximately 120 km southeast. Services available in Pelican Narrows, Saskatchewan include a primary care nursing station, a 24-hour ambulance service, an RCMP detachment of 15 officers, a gas station, two grocery stores, one restaurant, a water base for fixed wing aircraft, a youth centre, two churches, two schools that provide education from Kindergarten to Grade 12 and mature student education programs, a forest fire base with a seasonal crew, and various home-based enterprises including tire repairs and traditional crafts (PBCN Health Services Inc. 2017). A major concern identified by the community is adequate housing for community residents. As of 2008, there were 410 houses on reserve in Pelican Narrows with an average house size of three bedroom and an average occupancy rate of 7.2 persons per house (PBCN Health Services Inc. 2017). The largest community employer is Peter Ballantyne Cree Nation through schools, the health centre, administrative office, and Child and Family Services. Other employers include the Province of Saskatchewan, which offers seasonal jobs through Forest Fire Management.

The Peter Ballantyne Cree Nation community of Southend is 222 km northeast of La Ronge, Saskatchewan on the south shore of Reindeer Lake. Access to the community is by the gravel Provincial Highway 102. The community has a primary care nursing station, Child and Family Services, Reindeer Lake School, which provides nursery to Grade 12, a youth centre, Band office, daycare, and an RCMP detachment of five officers (PBCN Health Services Inc. 2017). The community also has two confectionary-gas bars, a Northern Store, a restaurant, radio station and two churches. There is a Saskatchewan Ministry of the Environment office with three Conservation Officers and a seasonal fire crew. Peter Ballantyne Cree Nation is the main employer for the community through delivery of community programs and community-based operations that include Peter Ballantyne Cree Nation Health Services, Band office, Band school, child and family services, Band store and gas stations, community services, and housing maintenance. Bird’s Nest Contracting is a private business for geophysical line cutting, oilfield slashing and bucking, site and access brushing and cleanup, camp set up, operation and take down, scouting, flagging and access construction, reclamation and revegetation provides work opportunities for community members (Bird’s Nest Contracting, n.d.). There are 163 houses in the community with an average of three bedrooms per household and an average per house occupancy rate of seven persons (PBCN Health Services Inc. 2017).

Kinoosao, on the east shore of Reindeer Lake, is the most northern community within Peter Ballantyne Cree Nation territory and the nearest Peter Ballantyne Cree Nation community to the Project (approximately 70 km at the nearest point). The community is linked with Lynn Lake by Saskatchewan Highway 994 and Manitoba PR 394, a 93-km section of gravel road. Kinoosao residents have close family ties with Southend, 111 km to the south. Access is by boat in the summer and snow machine or truck over ice in the winter. Peter Ballantyne Cree Nation Health employs a transportation clerk half-time to facilitate travel arrangements required by community residents for medical appointments (PBCN Health Services Inc. 2017). Kinoosao also receives community health support from the Southend Health Centre. A community health nurse makes two trips annually by air to deliver immunization services and complete home care assessments. The community school does not extend past Grade 9 and employment opportunities are limited. The community contains 10 houses and an average house occupancy rate of 5.2 persons (PBCN Health Services Inc. 2017). Community residents travel to the larger communities such as Lynn Lake or Thompson or Prince Albert, Saskatchewan for shopping, medical care, and entertainment.

3.3.3.7 Barren Lands First Nation #308

In August 2018 and December 2019, the Barren Lands First Nation community profile and compiled reference list to be used in the EA were sent to community leadership for review and comment. To date, no feedback has been received on the community profile that follows.

Barren Lands First Nation is on the northeast shore of Reindeer Lake. Barren Lands First Nation signed Treaty 10 on August 19, 1907 at Lac Brochet. At that time, the population of Barren Lands First Nation was 232 people (Duhamel 1966). The governing centre is in Brochet, approximately 130 km from the Gordon site and 115 km from the MacLellan site.

Barren Lands First Nation governance is by a custom electoral system with a Chief and three councillors (INAC 2019f). Elections were last held in April 2018. As of November 2019, the population of Barren Lands First Nation is 1,187, with 456 living on reserve, 29 on other reserves, 34 on Crown Land, and 668 living off reserve (INAC 2019f). Barren Lands First Nation is affiliated with the Keewatin Tribal Council along with Northlands Dene First Nation, Sayisi Dene First Nation, Bunibonibee Cree Nation, Fox Lake Cree Nation, God's Lake First Nation, Manto Sipi Cree Nation, Shamattawa First Nation, Tataskweyak Cree Nation, War Lake First Nation, and York Factory (INAC 2019f). Access to the community is by air, boat across Reindeer Lake from Kinoosao, snowmobile, and seasonal road.

There are limited community services at Barren Lands First Nation. Off-reserve services include the Brochet nursing station and Brochet School (Kindergarten to Grade 9; NHR 2017, FSD 2017). The Northern Store formerly in Brochet, burned down in April 2017 (CBC News 2017).

3.3.3.8 Métis Nation-Saskatchewan

Métis Nation - Saskatchewan was formed in 2000 and, by the articles of its constitution, has an elected council consisting of four executive members and 12 regional representatives (Métis Nation-Saskatchewan 1993). Métis Nation - Saskatchewan consists of 12 regions, each divided into locals that have an elected president.

The Métis Nation – Saskatchewan organization is affiliated with the Métis National Council and the Métis Nation – Saskatchewan president is a member of the council’s Board of Governors. Métis Nation - Saskatchewan main administrative offices are in Saskatoon, Saskatchewan. In May 2017, a new president and regional representatives were elected. The last election prior to 2017 was in 2012. Major funding for Métis Nation - Saskatchewan is from the federal government (Métis Nation-Saskatchewan 2016).

The Métis Environment and Resource Management Advisory Committee was established in early 2012 to consult with the Government of Saskatchewan regarding a framework for managing and protecting the environment while encouraging innovative environmental solutions and supporting the province’s growing economy.

In November 2010, Métis Nation – Saskatchewan and the Province of Saskatchewan signed a Memorandum of Understanding on Métis harvesting rights. The agreement pertains to the negotiation of key harvesting actions such as Métis community and Métis traditional territories; Métis food harvesting customs, practices and traditions; ancestral and community acceptance requirements necessary to be a beneficiary of harvesting rights; achieving legal enforceability and certainty of those rights; and, the identification of additional research or studies necessary to assist Métis Nation – Saskatchewan and the Province of Saskatchewan to reach interim and final agreements (Métis Nation-Saskatchewan 2016).

Métis Nation – Saskatchewan is affiliated with the following organizations: Back to Batoche, Clarence Campeau Development Fund, Gabriel Dumont Institute, Métis Addictions Council of Saskatchewan, Métis Family & Community Justice Services Saskatchewan Inc., Sask Métis Economic Development Corporation (Métis Nation-Saskatchewan 2016).

The Métis Nation – Saskatchewan locals which are closest to the Project are Northern Region 1 and Eastern Region 1. Additional information about the locals within each of these regions is provided below. The Regions are governed by a council composed of the presidents of each local within the region plus a regionally elected representative who is the regional council chairperson and the region's representative on the provincial Métis Council of the Métis Nation Legislative Assembly. Each region has an administrative office that delivers the programs and services decentralized to that level (Métis Nation-Saskatchewan 1993).

Métis Nation-Saskatchewan Northern Region 1

In August 2018 and December 2019, the Métis Nation-Saskatchewan Northern Region 1 community profile and compiled reference list to be used in the EA were sent to the Regional Director for review and comment. To date, no feedback has been received on the community profile that follows.

Métis Nation - Saskatchewan Northern Region 1 comprises six locals: Local 16 in Weyakwin, Saskatchewan, Local 19 in La Ronge, Saskatchewan, Local 20 in Timber Bay, Saskatchewan, Local 50 in Uranium City, Saskatchewan, Local 79 in Camsell Portage, Saskatchewan, and Local 80 in Stony Rapids, Saskatchewan. Table 3-6 summarizes the locals associated with Métis Nation - Saskatchewan Northern Region 1 and the distance of each from the Gordon and MacLellan sites.

Table 3-4 List of Métis Nation-Saskatchewan Northern Region 1 Communities

Local Number	Name	Distance to Gordon Site (km)	Distance to MacLellan Site (km)
16	Weyakwin	430	410
19	La Ronge	380	350
20	Timber City	445	425
50	Uranium City	565	540
79	Camsell Portage	600	575
80	Stony Rapids	410	390
Source: Métis Nation-Saskatchewan 2016			

Métis Nation-Saskatchewan Eastern Region 1

In August 2018 and December 2019, the Métis Nation - Saskatchewan Eastern Region 1 community profile and compiled reference list to be used in the EA were sent to the Regional Director for review and comment. To date, no feedback has been received on the community profile that follows.

The Métis Nation - Saskatchewan Eastern Region 1 is subject to the constitutional guidelines summarized for Métis Nation - Saskatchewan. Métis Nation - Saskatchewan Eastern Region 1 comprises three locals: Local 42 in Cumberland House, Saskatchewan, Local 90 in Sandy Bay, Saskatchewan, and Local 89 at Creighton/Denare Beach, Saskatchewan. Table 3-5 summarizes the locals associated with Métis Nation - Saskatchewan Eastern Region 1 and the distance of each to the Gordon and MacLellan sites.

Table 3-5 List of Métis Nation-Saskatchewan Eastern Region 1 Communities

Local Number	Name	Distance to Gordon Site (km)	Distance to MacLellan Site (km)
42	Cumberland House	350	340
89	Sandy Bay	195	175
90	Creighton/Denare Beach	255	245
Source: Métis Nation-Saskatchewan 2016			

3.3.3.9 Hatchet Lake First Nation #352

In August 2018 and December 2019, the Hatchet Lake First Nation community profile and compiled reference list to be used in the EA were sent to community leadership for review and comment. To date, no feedback has been received on the community profile that follows.

Hatchet Lake First Nation, also known as Lac La Hache, occupies 11,020 ha (Lac La Hache 220 INAC No. 06504) on the southeastern shore of Wollaston Lake in northern Saskatchewan. Hatchet Lake First Nation is at Wollaston Post, adjacent to the unincorporated community of Wollaston Lake. Hatchet Lake First Nation signed Treaty 10 on August 22, 1907 at Lac Brochet. At that time, the population was listed as 97 people (Duhamel 1966). Hatchet Lake First Nation is 205 km from the Gordon site and 185 km from the MacLellan site.

Hatchet Lake First Nation governance is by a custom electoral system with a Chief and six councillors. Elections were last held in June 2018 (INAC 2019g). As of November 2019, the population of Hatchet Lake First Nation consists of 1,466 living on reserve, 25 on other reserves, 1 on Crown Land, and 440 living off reserve (INAC 2019g). Hatchet Lake First Nation is affiliated with the Prince Albert Development Corporation along with Black Lake First Nation, Cumberland House Cree Nation, Fond du Lac First Nation, James Smith First Nation, Lac La Ronge Indian Band, Montreal Lake First Nation, Peter Ballantyne Cree Nation, Red Earth First Nation, Shoal Lake Cree Nation, Sturgeon Lake First Nation, and Wahpeton Dakota First Nation (INAC 2019g).

Access to the community is by Wollaston Lake Airport, served by regularly scheduled flights through Transwest Air, charter flights as well and Saskatchewan Highway 905. The highway terminates on the west side of the lake and access to the community from the highway is by the Wollaston Barge Ferry in the summer and by a winter road established annually between January and March (Transwest Air 2017, PAGC 2008).

Most Hatchet Lake First Nation residents are Dene and the main language spoken is Denesuliné, with English used as a second language. Father Megret Elementary School (Kindergarten to Grade 8) and Father Megret High School (Grades 9 to 12) teach the Denesuliné language as part of the school curriculum (PAGC 2008). Hatchet Lake First Nation manages and administers their own programs for education, health, social development and also have made several business investments through the Hatchet Lake Development Limited Partnership.

Health services are available at the Hatchet Lake Health Centre. Other facilities available in the community include a general store and gas bar, post office, restaurant, economic development office, education office, and Northern Settlement office. A RCMP detachment with three staff is also available in the community (PAGC 2008).

3.3.3.10 Northlands Denesuline First Nation #317

In August 2018 and December 2019, the Northlands Denesuline First Nation community profile and compiled reference list to be used in the EA were sent to community leadership for review and comment. To date, no feedback has been received on the community profile that follows.

Northlands Denesuline First Nation is on the northeastern shore of Lac Brochet in northern Manitoba. Northlands Denesuline First Nation was originally part of Barren Lands First Nation and therefore included when Barren Lands First Nation signed Treaty 10 on August 22, 1907 at Lac Brochet. Northlands Denesuline First Nation separated from Barren Lands First Nation in 1973 to initially establish a community at Misty Lake and then, in 1973, relocated to Lac Brochet (Tssessaze 2007).

Northlands Denesuline First Nation falls under the *Indian Act* election provisions with a Chief and six councillors (INAC 2019h). Elections were last held in April 2019. As of November 2019, the population of Northlands Denesuline First Nation consists of 952 living on reserve, 4 on other reserves, 1 on Crown Land, and 173 living off reserve (INAC 2019h). Northlands Denesuline First Nation is affiliated with the Keewatin Tribal Council along with Barren Lands First Nation, Sayisi Dene First Nation, Bunibonibee Cree Nation, Fox Lake Cree Nation, God's Lake First Nation, Manto Sipi Cree Nation, Shamattawa First Nation, Tataskweyak Cree Nation, War Lake First Nation, and York Factory (INAC 2019h). Reserves affiliated with Northlands Denesuline First Nation and distances to the Gordon and MacLellan sites are listed in Table 3-6.

Table 3-6 List of Reserves and Settlements Affiliated with Northlands Denesuline First Nation

INAC Number	Name	Distance to Gordon Site (km)	Distance to MacLellan Site (km)	Size (ha)
06468	Lac Brochet	200	194	464.3
09935	Sheth Chok	191	183	1,213.6
09914	Thuycholeeni	225	218	47.5
09921	Thuycholeeni Azé	222	215	201.0
09922	Tthekalé	226	217	211.0
Source: INAC 2019h				

Access to the Lac Brochet community is by Lac Brochet Airport, served by Perimeter Aviation, and by a winter road established annually from approximately mid-January to mid-March.

The Northlands Denesuline First Nation community members are Dene and the main language spoken is Denesuliné. Northlands Denesuline First Nation operates the Petit Casimir Memorial School (Kindergarten to Grade 12) through the Northlands Dene Education Authority (MENERC 2016).

The Awasis Agency of Northern Manitoba provides child and family services to the community (AllPages 2017). The Northern Health Region operates the nursing station in Lac Brochet (NHR 2017). Other services include a Northern Store and a daycare centre that are also in Lac Brochet (AllPages 2017).

3.3.3.11 Sayisi Dene First Nation #303

In August 2018 and December 2019, the Sayisi Dene First Nation community profile and compiled reference list to be used in the EA were sent to community leadership for review and comment. To date, no feedback has been received on the community profile that follows.

Sayisi Dene First Nation is at the north end of Tadoule Lake in northern Manitoba. Sayisi Dene First Nation, as the Fort Churchill Band, signed an adhesion of Treaty 5 at Fort Churchill on August 1, 1910 (Queen's Printer 1969). Sayisi Dene First Nation originally resided at Little Duck Lake, but then was relocated by the governments of Canada and Manitoba to Churchill in the mid-1950s (Petch 1998). Following two decades of hardship, Sayisi Dene First Nation left Churchill and established a community at Tadoule Lake. Tadoule Lake is 230 km from the Gordon site and 250 km from the MacLellan site. In September 2017, the Province of Manitoba announced that it had signed an agreement to transfer 52 km^2 km of Crown Land near Little Duck Lake to the Government of Canada for conversion to a reserve for the Sayisi Dene First Nation.

Sayisi Dene First Nation governance is by a custom electoral system with a Chief and three councillors (INAC 2019i). Sayisi Dene First Nation is a member of the Keewatin Tribal Council along with Barren Lands First Nation, Northlands Dene First Nation, Bunibonibee Cree Nation, Fox Lake Cree Nation, God's Lake First Nation, Manto Sipi Cree Nation, Shamattawa First Nation, Tataskweyak Cree Nation, War Lake First Nation, and York Factory (INAC 2019i). As of November 2019, the population of Sayisi Dene First Nation consists of 315 people living on reserve, 4 on another reserve, and 539 living off reserve (INAC 2019i).

Community access is by air, served by Perimeter Aviation, or by an annually established winter road between January and March.

Sayisi Dene First Nation manages the Sayisi Dene School Authority and the community school, Peter Yassie Memorial School, provides Nursery to Grade 12 (Education Canada Network 2017). Sayisi Dene First Nation is within the Northern Health Region and Bayshore Health Care operates the nursing station in the community (Bayshore Healthcare 2017). The Tadoule Lake Northern Store provides amenities for the community. There is no RCMP detachment stationed at Tadoule Lake; the Thompson detachment serves the community.

3.3.4 Indigenous Engagement Methods

Alamos used several engagement methods to present the Project information, facilitate discussion, and solicit feedback on the Project from Indigenous groups. These engagement methods were selected based on responses to initial communications with Indigenous groups on how they would like to be engaged on the Project. As per Alamos' Community Engagement Plan (Alamos 2017), Alamos recognizes that individual communities may have different etiquette and expectations for engagement and, after introducing the Project by letter, offered an opportunity to meet in person with each community to share information about the Project, answer questions, and hear concerns from the community leadership and members. This process provided an opportunity for Indigenous groups to understand the project and evaluate its effects on their communities, traditional land and resource use activities, and potential or established Section 35 rights, including title and related interests.

3.3.4.1 Community Meetings

Marcel Colomb First Nation

A community meeting for Marcel Colomb First Nation members living off-reserve was held in Winnipeg on March 26, 2015. The community meeting included a sign-in sheet, PowerPoint® presentation, and participant questionnaires (Appendix 3A). Project representatives from Alamos and Stantec were in attendance to answer questions and document issues and concerns brought forward by attendees.

A community meeting with Marcel Colomb First Nation members living at the Black Sturgeon Reserve was held on May 30, 2017. Ten members of Marcel Colomb First Nation were in attendance. This meeting was to illustrate three main concepts/steps that were to be addressed over the next 1-2 years including collaboration between Alamos, Stantec, and Marcel Colomb First Nation during the EA process; set up a Participation Agreement (e.g., Impact Benefit Agreement or similar); and community preparation to support Marcel Colomb First Nation when there are Project-related job openings and business opportunities.

An additional community meeting with Marcel Colomb First Nation members at Black Sturgeon Reserve was held on June 15, 2017 due to the low attendance at the meeting on May 30, 2017. Similar to the May 30, 2017 meeting, the purpose was to illustrate the three main concepts/steps that were to be addressed over the next one to two years. There were approximately 10 attendees from Marcel Colomb First Nation.

Peter Ballantyne Cree Nation

A community meeting was held with Peter Ballantyne Cree Nation in Southend, Saskatchewan on May 31, 2018, to present information about the Project to interested community members. The meeting was advertised by poster (Appendix 3A) and word of mouth. Twenty members of Peter Ballantyne Cree Nation were in attendance. The community meeting included a sign-in sheet, PowerPoint® presentations, poster boards, and questionnaires (Appendix 3A). Representatives from Alamos and Stantec were in attendance to answer questions about the Project and the environmental assessment.

A community meeting was also held with Peter Ballantyne Cree Nation members residing in Kinoosao, Saskatchewan, a remote community on the shores of Reindeer Lake. The meeting took place on August 20, 2018, to present information about the Project to interested community members. Fifteen community members were in attendance. The community meeting included PowerPoint® presentations, the May 2017 open house handout, and questionnaires (Appendix 3A); however, none of the questionnaires were filled out. Representatives of Alamos and Stantec were in attendance to answer questions about the Project and the environmental assessment.

A meeting with Peter Ballantyne Cree Nation Chief and Council was held on July 10, 2019 in Kinoosao, Saskatchewan. The purpose of the meeting was to present an update on the Project including the current status of the EIS. In addition, Stantec presented an overview of the Traditional Land and Resource Use (TLRU) study completed with the Peter Ballantyne Cree Nation members living in Kinoosao, Saskatchewan. Copies of the TLRU study report were provided to Chief and Council for their review and an information sharing agreement for inclusion of the TLRU information in the EA was discussed.

Nisichawayasihk Cree Nation

A community meeting was held with Nisichawayasihk Cree Nation in Nelson House on February 3, 2020, to present information about the Project and the EIS to interested members. The meeting was advertised by newspaper advertisement, poster, and word of mouth. Materials presented included a PowerPoint® presentation to provide a status update on the Project and an overview of the EIS process and findings. The meeting was attended by 19 individuals of which 15 identified as living in Nelson House or Nisichawayasihk Cree Nation. Representatives of Alamos and Stantec were in attendance to present the information and to answer questions about the Project and the EIS findings.

3.3.4.2 Introductory Information Packages

Introductory information packages were sent by registered mail to the 12 identified Indigenous communities on October 18, 2017 (Appendix 3D). The purpose of the information packages was to introduce the Project, provide the contact information for Project representatives, and to provide an opportunity for Indigenous communities to respond with how they would like to be engaged on the Project going forward. The information packages included background information of the Project, a description of the Project components, and information with respect to the environmental assessment. The information packages were also emailed to the 12 identified Indigenous communities and a follow-up telephone call was given to confirm receipt and address any questions or concerns.

3.3.4.3 Meetings with Leadership

Several of the 12 Indigenous communities identified by the IAAC to be potentially affected by the Project requested meetings between their community leadership and Project representatives. The purpose of the meetings with leadership was to introduce the Project, to document issues, concerns, or potential opportunities with the Project, and to discuss how each community would like to be engaged on the Project going forward. Meetings with leadership were held with Barren Lands First Nation, Manitoba Metis Federation, Marcel Colomb First Nation, Mathias Colomb Cree Nation, Nisichawayasihk Cree Nation, Peter Ballantyne Cree Nation, and O-Pipon-Na-Piwin Cree Nation. In addition to meeting with Mathias Colomb Cree Nation, Alamos has met with the Headman of the Granville Lake community. The meetings are described further in Section 3.3.5. Additionally, a meeting with Sayisi Dene First Nation was scheduled, but Chief and Council were unable to attend last minute. Northlands Denesuline First Nation has requested a meeting with Alamos but attempts to schedule the meeting have so far been unsuccessful.

3.3.4.4 Follow-up E-mail, Telephone, and Text Message Communications

E-mails, telephone calls, and/or text messages were sent to the 12 identified Indigenous communities throughout the engagement process to follow-up on communications, and to respond to questions or concerns about the Project. E-mails, telephone calls and/or text messages were used to arrange meeting logistics, where requested, and to follow-up on items of discussion from in-person meetings.

3.3.4.5 Traditional Land and Resource Use Studies

Where Indigenous communities identified traditional land and resource use in the Project-area, Alamos provided the opportunity for communities to complete a Project-specific TLRU study, if interested. Indigenous communities could complete a TLRU study independently, collaborate with Stantec, or hire an independent consultant. Of the communities who expressed interest in completing a Project-specific TLRU study, two chose to collaborate with Stantec and one hired an independent consultant. A fourth community began the scoping process for a collaborative study with Stantec, but the study was not completed at the request of the community.

A Project-specific TLRU study was completed collaboratively with Marcel Colomb First Nation with a final report provided to the community on January 11, 2018. The TLRU study included interviews in Lynn Lake, Black Sturgeon, Pukatawagan, Winnipeg and Regina conducted in October 2016 with participants selected by Marcel Colomb First Nation. Interview questions were regarding traditional land use in the Project area, including availability of traditional resources, access to traditional resources or areas, occupancy, cultural sites and areas, and experience of traditional land and resource use. Following a change in Marcel Colomb First Nation leadership, additional interviews were conducted in May 2017, at the request of the new Chief and Council. Information collected for the TLRU study remains the sole property of Marcel Colomb First Nation and the study participants. Use of the TLRU study in the EA is with written permission of Marcel Colomb First Nation leadership through an Information Sharing Agreement signed February 26, 2018. Following completion of the TLRU study and ongoing engagement with Marcel Colomb First Nation, an additional opportunity to discuss with harvesters their current use of resources in the general area around the Project occurred in April 2019. This additional information was not incorporated into the previously completed TLRU study, but, with the permission of Marcel Colomb First Nation leadership, was considered in the EIS, as appropriate.

A Project-specific TLRU study is currently being conducted by an independent consultant for Mathias Colomb Cree Nation. Should the information from this TLRU study become available, and with written approval of Mathias Colomb Cree Nation, it will be considered in supplemental filings to the EIS.

A Project-specific TLRU study was completed in collaboration with Peter Ballantyne Cree Nation that included interviews with community members in Kinoosao, Saskatchewan. During a meeting with leadership on July 10, 2019, Chief and Council reviewed the TLRU study report and provided feedback and requested changes. Those changes were subsequently made and a final version of the TLRU study report and an information sharing agreement were provided to community leadership for review and approval. The TLRU study has not yet been approved by community leadership or released for use in the EIS.

A third TLRU study (Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study for the Lynn Lake Gold Mine Project) was completed by an independent consultant for the Manitoba Metis Federation, the results of which were received in February 2020. The study documents harvesting and land use by the Manitoba Métis Community within a 100 km radius of the Project (SVS 2020). Information collected for the TLRU study remains the sole property of and is used in the EIS with permission from the Manitoba Metis Federation.

The results of the completed TLRU studies that have been shared by communities through an information sharing agreement are described in Chapter 17.

3.3.4.6 Committee and Liaison Position

In early 2015, Marcel Colomb First Nation suggested establishing an Environmental Committee comprised of members of Marcel Colomb and a Community Liaison position. The first meeting of the Environmental Committee was held March 26, 2015, and consisted of an Elder representative, a Council representative, and a youth representative. The mandate of the committee was not specific to the Project. A committee of community Elders was reestablished in April 2019, which was expanded to include youth representatives in 2020.

The Community Liaison position was not filled following an employee going on leave as Alamos and Marcel Colomb First Nation had established a productive working relationship. In fall 2019, it was determined the position should be reinstated and a new Community Liaison was hired in January 2020, in consultation with Marcel Colomb First Nation leadership.

3.3.4.7 Tours

Site tours were held with representatives from Alamos and Indigenous community representatives from Marcel Colomb First Nation on May 30, 2015, June 16, 2018, and September 17, 2019, which included a tour of the Project site with community members and the Environmental Committee, tours with Elders, and a helicopter tour, respectively. On March 4, 2015, Marcel Colomb First Nation members visited the Alamos Young-Davidson mine in Ontario to provide community members with an opportunity to see an active mining operation and better understand the potential effects of the Project. An additional tour of the Project site was planned following election of new Marcel Colomb First Nation leadership but was postponed until summer 2020 at Chief and Council's request.

In response to a request from Nisichawayasihk Cree Nation, community and Alamos representatives toured ATEC, a post-secondary and employment training facility on October 19, 2017. The purpose of this tour was to engage directly with Nisichawayasihk Cree Nation leadership and gain an understanding of current training capacity within the community.

3.3.4.8 Fieldwork Opportunities

Fieldwork opportunities were offered to Indigenous community members, particularly Lynn Lake community members who self-identified as members of nearby Indigenous communities. Fieldwork opportunities focused on the Environmental Baseline Studies conducted from 2015-2017 in support of this EIS (Volume 4). Several community members, representatives, and Elders were hired for fieldwork assistance. Positions included a guide for the surface water monitoring program, three community liaison positions, and five Elders for environmental monitoring of activities associated with the exploration program deemed to be of high impact by Marcel Colomb First Nation (i.e., scout drilling and excavation trenching). In 2020, youth community representatives were added to participate in the environmental monitoring activities.

3.3.4.9 Cultural Awareness Activities

On December 12, 2019, Alamos participated in an inaugural Culture and Mental Health Day organized by Marcel Colomb First Nation. The event included activities to increase cultural awareness of Alamos employees. Current plans are to hold similar events on a biannual basis.

3.3.4.10 Information Package Update

Letters and information packages were sent out to each of the 12 identified Indigenous communities on December 5, 2019 (Appendix 3E). The purpose of the information package was to follow up and summarize the engagement completed to date. This package included a Project background, summary of engagement activities completed to date, the current state of the Project, Project schedule, continued opportunities for feedback and participation, map of the Project, and a handout from the last open house. The letter included a list of contact information for the community relations team member and the dedicated Project engagement e-mail address. Alamos requested a formal response to the letter by January 6, 2020.

3.3.5 Indigenous Engagement Results

Between 2014 and present, Alamos has been engaging with Indigenous communities in the Project area to introduce the Project, receive feedback, and document potential issues and concerns. The 12 identified Indigenous communities have been contacted to discuss the potential effects of the Project on their community. Alamos continues to proactively engage communities by providing Project information, documenting issues and concerns, and working with interested communities to collect and document traditional knowledge and traditional land use information for the Project area as part of the environmental assessment and engagement process.

3.3.5.1 Marcel Colomb First Nation

Overall Summary

Marcel Colomb First Nation, the closest community to the Project, has engaged with Alamos on over 100 occasions regarding the Project since November 2014. Engagement with Marcel Colomb First Nation has included regular e-mail and telephone communications; Project update meetings; meetings with leadership, the appointed Community Liaison, and the Marcel Colomb Development Corporation; site tours; a TLRU study; and community meetings for members to bring forward their concerns. In addition to the following, a summary of key issues is presented in Section 3.3.6.

Marcel Colomb First Nation raised key issues, including potential effects of the Project to water (including surface water [e.g., natural springs], groundwater, and long-term monitoring), land, sacred areas, exercise of traditional practices (spatially or seasonally), fish and wildlife, noise and air, environment in the long-term (i.e., 50-100 years after mining ceases), aquatic and terrestrial habitat, housing in Lynn Lake, human health (including increased alcohol use resulting from increased incomes and the need for more consideration to social programming and funding to address these issues), cumulative effects in Cockeram Lake due to historic tailings seepage and the added potential effects of the MacLellan site, acid rock drainage/metal leaching from potential quarry and borrow pit material, economic exit plan to reduce local impacts, non-mineral waste management (i.e., garbage volumes) and creating high demands on municipal landfill, municipal water and wastewater usage.

Alamos understands that Marcel Colomb First Nation has concerns that the Environmental Baseline Study results may be difficult to interpret. Alamos has suggested that Marcel Colomb First Nation consider hiring a third-party consultant to review and provide guidance on the Environmental Baseline Study results and the EIS. Marcel Colomb First Nation has applied for funding for this review from the IAAC.

Throughout engagement for the Project, Alamos and Marcel Colomb First Nation have successfully navigated several concerns expressed by community leadership. For example, Marcel Colomb First Nation expressed concern that Alamos' exploration permit, issued by the Province, had the potential to preclude Marcel Colomb First Nations' selection of Treaty Land Entitlement land in areas where Alamos had applied to stake claims. As a result of this feedback, Alamos has changed its claim staking process to now notify Marcel Colomb First Nation when Alamos has identified a new claim area. The Elder Committee then reviews the general area where the proposed claim would be placed and analyzes the area for potential sources of concern. These concerns could include potential future location of treaty land entitlement land, areas of cultural importance, etc. If there are concerns, contested areas are avoided where possible during the claim staking process. If there are areas of mutual interest, a dispute mechanism that has been established between Alamos and Marcel Colomb First Nation will be employed.

Together with Marcel Colomb First Nation, Alamos has established quarterly Elder meetings and Elder pre-site investigation and verification so that Alamos and the Project can benefit from their guidance. Alamos is also discussing increasing the frequency of community meetings to keep members informed of updates as the Project progresses and has reinstated a community liaison to assist in streamlining this process. This position would also mentor and counsel Marcel Colomb First Nation members during present and future training and employment phases. Alamos and Marcel Colomb First Nation will continue to work together on establishing a Participation Agreement (e.g., Impact Benefit Agreement or similar), to achieve mutual benefits considering potential adverse effects, including interruption to trapline users, etc. Alamos appreciates Chief and Council's support in providing a Band Council Resolution stating that Marcel Colomb First Nation has no concerns with the current Exploration scope, given the mitigation measures established in the Exploration Agreement. Establishment of this agreement and the ongoing collaboration illustrates that open communication has been built on trust, which Alamos and Marcel Colomb First Nation have established together throughout the course of this Project.

Alamos was invited by the North West Community Futures Development Corporation to meet and present the Project on July 19, 2019. Communities sitting on the board included representatives from Council of many of the Indigenous groups that Alamos has engaged including the Barren Lands First Nation (Brochet Reserve), Marcel Colomb First Nation, Mathias Colomb Cree Nation, and O-Pipon-Na-Piwin Cree Nation. Alamos explained that Project updates would be shared through open houses and that Alamos would send an invitation to the surrounding communities prior to the events.

Alamos and Marcel Colomb First Nation will continue to work together to establish a training and education partnership with Manitoba Keewatinowi Okimakanak Inc. and the Northern Manitoba Sector Council to provide training opportunities for Marcel Colomb First Nation members. Alamos will work together with Marcel Colomb First Nation to build capacity within the community throughout the exploration and later potential mining phases. Alamos understands that Marcel Colomb First Nation values showing respect to the environment and understanding and respecting that all land is sacred and therefore should be protected to the extent possible. Alamos and Marcel Colomb First Nation have worked together to establish a Cultural Awareness and Mental Health Day that is led by Marcel Colomb First Nation representatives. The inaugural Culture and Mental Health Day was held on December 12, 2019 and provided an opportunity for Alamos employees to better understand the community's culture and values. Current plans are to hold similar events on a biannual basis.

An information package update was provided to Marcel Colomb First Nation on December 4, 2019. The information in the package included a summary of engagement to date similar to the information provided above.

Community Meetings

A Marcel Colomb First Nation community meeting was held in Winnipeg on March 26, 2015, to discuss the Project. Members of Marcel Colomb First Nation living off-reserve in Winnipeg were invited by word of mouth and social media. At the meeting, 12 questionnaires were filled out and submitted. On the questionnaire, five participants identified as members of Marcel Colomb First Nation, two participants did not identify as members of Marcel Colomb First Nation, and five participants did not answer. The number of participants who indicated the most important components to focus on as part of the Environmental Study (rated 4 or 5 out of 5) are outlined below for each component:

- Air Quality: 11

- Wildlife and Fish Habitat: 11
- Ground and Surface Water: 11
- Plants: 11
- Traditional Land and Resource Use: 10
- Employment: 9
- Contracts and Business Opportunities: 7
- Training and Job Skills: 1
- Noise: 9
- Increased Traffic: 7
- Impacts to Land and Resource Use: 9
- Tailings and Waste Rock Management: 9

Comments and concerns brought forward by participants included:

- Prioritizing opportunities in education, employment, and information flow for Marcel Colomb First Nation members.
- Advantageous to hold additional information sessions for Marcel Colomb First Nation members and for people who live, work, and interact with Marcel Colomb First Nation.
- The long-term impact on freshwater supply, quality, and cost of remediation in the event of a disaster.
- Community members should be involved in the Environmental Study.
- Concerns about moose and caribou populations.
- Job availability.
- Interest in employment.
- Effects to water on the reserve and traplines.

An additional community meeting was held on May 30, 2017, at Black Sturgeon Reserve, for Marcel Colomb First Nation members. There were approximately 10 people at the meeting. As a result of the meeting, Alamos and Marcel Colomb First Nation members arranged for an additional meeting/presentation to be provided. The meeting was received with interest from the attendees. Alamos received many questions and spoke about the importance of collaboration and initiation of training for Marcel Colomb First Nation members. A follow up meeting took place on June 15, 2017, to try to reach more members of the Black Sturgeon Reserve. There were approximately 10 people in attendance.

Meetings with Leadership

An initial meeting with leadership was held on January 13, 2015, and included four representatives from Marcel Colomb First Nation, and four representatives from Alamos. The purpose of the meeting was to provide an opportunity for introductions and to describe the Project and history. The meeting resulted in Marcel Colomb First Nation describing the history in the community and expressing their interests. The meeting also included discussion regarding the potential for an Environmental Committee and Community Liaison position. The Marcel Colomb Development Corporation was originally the designated representative for Marcel Colomb First Nation engagement activities. The organization was dissolved in November 2016, and Alamos was informed to cease engagement activities with Marcel Colomb Development Corporation on November 24, 2016. Engagement was resumed with the newly elected Chief and Council on January 17, 2017.

Alamos and Marcel Colomb First Nation have engaged regarding the Project on over 100 occasions since November 2014. In-person meetings between Alamos and Marcel Colomb First Nation leadership or designated representatives are summarized in Table 3-7.

Table 3-7 Summary of Marcel Colomb First Nation In-Person Meetings

Date	Representatives in Attendance	Topic
November 19, 2014	MCFN, MCDC	Introductions of MCFN leadership to team members and the drilling partner
November 27, 2014	MCFN	Introductions, listening to members' personal experiences, providing an overview of possible feasibility study and potential opportunities
January 13, 2015	MCFN, MCDC	Introductions, overview of planned 2015 exploration program and geophysics survey
January 14, 2015	MCDC	Exploration Agreement, employment opportunities and upcoming workplan
January 19, 2015	MCDC	Exploration agreement meeting
February 18-19, 2015	MCFN, MCDC	Introductions, overview of Environmental Baseline Studies and Project-specific concerns
March 1, 2015	MCFN, MCDC	Ongoing drilling work permit challenges
March 4, 2015	MCFN, MCDC	Meeting and tour of the Young-Davidson mine in Ontario
April 2, 2015	MCFN	Community Liaison employment position
April 21, 2015	MCFN	Environmental Committee, concerns regarding AuRico-Alamos merger press release and lack of consultation regarding contractor involvement, drilling contractors, access trail and test-pitting contracts, and Project concerns
April 22, 2015	MCFN, MCDC	Helicopter tour of the proposed Project site, trail and test-pitting scope and terms, concerns regarding contractor involvement
April 23, 2015	MCFN, MCDC	Drilling contractor, outstanding issues related to trail and test pitting contract
May 30, 2015	MCFN, MCDC	Tour of Alamos' proposed Project site, contractor concerns

Table 3-7 Summary of Marcel Colomb First Nation In-Person Meetings

Date	Representatives in Attendance	Topic
June 2, 2015	MCFN, MCDC	Environment Committee roles, opportunities, 2015 Environmental Baseline Studies, and Project concerns
July 15, 2015	MCFN	Drilling and core processing, work program and status of those currently employed on the drilling activities
July 19, 2015	MCFN	Updating contact information
September 17, 2015	MCFN	Environmental assessment and drill program, potential for field trip for high school students
September 29, 2015	MCFN[1]	Environmental Committee, potential field trip for high school students
October 22, 2015	MCFN	Field trip site visit with high school students
October 27, 2015	MCFN, MCDC[2]	Environmental Committee and possible committee trip to Young-Davidson mine site in Ontario
December 4, 2015	MCDC	Presentations to West Lynn Lake Highschool
February 18, 2016	MCFN	Discussion with new council, Project overview and goals of engagement
February 23, 2016	MCFN, MCDC	Plans for events and activities for youth
August 26, 2016	MCFN	General project info, decision on roadway from MacLellan site to Minton Lake, environmental committee communications
September 27, 2016	MCFN	Participation Agreement (Impact Benefit Agreement or similar) and Project update
October 25, 2016	MCFN, MCDC	Workforce Housing study
January 17, 2017	MCFN	Project update and potential new development corporation
March 1, 2017	MCFN	Regular meeting including Project update, concerns, and status of TLRU study
March 17, 2017	MCFN	Environmental Baseline Study and Participation Agreement (Impact Benefit Agreement or similar) update
April 24, 2017	MCFN	Regular Project update meeting, Alamos safety concerns and signage
May 16, 2017	MCFN	Regular meeting including Project update, community coordinator, and TLRU study
September 20, 2017	MCFN	Regular Project update meeting
November 24, 2017	MCFN	Agreements, community protocols, TLRU study, and employment opportunities
December 13, 2017	MCFN	TLRU study
January 15, 2018	MCFN	Meeting with leadership and 10 youth discussing the “Dream Team” initiative for youth to access funding from Alamos
January 16, 2018	MCFN	Regular quarterly update meeting
February 26, 2018	MCFN	Information sharing agreement and TLRU study
March 13, 2018	MCFN	TLRU study report

Table 3-7 Summary of Marcel Colomb First Nation In-Person Meetings

Date	Representatives in Attendance	Topic
June 13, 2018	MCFN	Next steps for the Project and thank you dinner for completion of the TLRU study
June 16, 2018	MCFN	Site visit with Elders
February 5, 2019	MCFN	Work permit application
April 23, 2019	MCFN	Elders workshop and information sharing agreement
May 16, 2019	MCFN	Summer exploration activities and possible trip to Ontario mine
June 9, 2019	MCFN	Participation Agreement (Impact Benefit Agreement or similar) and training partnerships
August 20, 2019	MCFN	Employment and training opportunities
September 12, 2019	MCFN	Potential training initiatives
September 13, 2019	MCFN	Participation Agreement (Impact Benefit Agreement or similar)
September 17, 2019	MCFN	Helicopter tour of the site
October 7, 2019	MCFN	Training partnerships

[1] – MCFN: Marcel Colomb First Nation
[2] – MCDC: Marcel Colomb Development Corporation

Traditional Land and Resource Use Studies

Stantec conducted interviews with 19 participants in Black Sturgeon, Lynn Lake, Pukatawagan, Winnipeg, and Regina in October and November 2016, and May 2017. Elders and harvesters shared their traditional knowledge and traditional land and resource use information through map biographies and guided questionnaires. Participants were given a per diem and gift of tobacco for sharing their knowledge. The TLRU study final report was published for Marcel Colomb First Nation on January 11, 2018. The results of the TLRU study are summarized in Chapter 17.

Tours

Site tours were held with representatives from Marcel Colomb First Nation and representatives from Alamos at the proposed Project site on May 30, 2015, June 16, 2018, and September 17, 2019, and included a tour with community members and the Environmental Committee, tours with Elders, and a helicopter tour, respectively. On March 4, 2015, Alamos and Marcel Colomb First Nation representatives chartered a flight from Toronto to Kirkland Lake where they were met by the Environmental Manager at Young-Davidson Mine and a First Nation Environmental Technician at the Young-Davidson Mine. The purpose of the visit was for representatives from Marcel Colomb First Nation to see firsthand what an operating mine site looks like and to better understand the potential effects of the Project to their community. The group drove to Young-Davidson Mine in Matachewan, Ontario where a general introduction to the mine was provided followed by a tour of the Mill, Paste Back Fill Plant, open pit, waste dumps, ore stockpile, and tailings storage facility. The manager at Young-Davidson Mine gave a general project overview followed by a discussion about how the Matachewan First Nation has been engaged by Alamos including employment and business opportunities and involvement of the Environment Committee from the Matachewan First Nation, providing an opportunity for Marcel Colomb First Nation to gain a better understanding of Alamos' mine operations.

An additional tour of the Project site was planned following election of new Marcel Colomb First Nation leadership but was postponed until summer 2020 at Chief and Council's request.

Committee and Liaison Position

On January 13, 2015, a representative of Marcel Colomb First Nation suggested establishing an Environmental Committee comprised of Marcel Colomb First Nation members and a Community Liaison position. On February 18, 2015, Marcel Colomb First Nation discussed the role of Environmental Committee with Alamos and Stantec. The first meeting of the Environmental Committee was held March 26, 2015, and consisted of an Elder representative, a Council representative, and a youth representative. The mandate of the committee was not specific to the Project. A committee of community Elders was reestablished in April 2019, which was expanded to include youth representatives in 2020. The committee meets quarterly. The Community Liaison position was not filled following an employee going on leave as Alamos and Marcel Colomb First Nation had established a productive working relationship. In fall 2019, it was determined the position should be reinstated and a new Community Liaison was hired in January 2020, in consultation with Marcel Colomb First Nation leadership.

Youth Engagement

A site tour with Alamos and West Lynn Heights School teachers and students (grade 11 and 12 outdoor education class) was held on October 22, 2015. The site tour involved visiting a water monitoring well. The class learned how to pump a well, saw a head frame at the MacLellan site and discussed groundwater theory and some basic hydrogeology. In class discussion following the site tour included the importance of groundwater and the potential effects of a mining operation on groundwater. Discussion also involved potential career options related to mining and exploration, as well as career options in environmental assessment and remediation.

On December 4, 2015, Alamos and three members of the of Marcel Colomb Development Corporation gave a presentation to students at West Lynn Heights School. The presentation involved an overview of Alamos, the Project, and the various aspects of work that contribute to a feasibility study. Alamos held a question and answer session after the presentation and discussed the potential effects of a mine opening close to Lynn Lake.

On January 13, 2016, two representatives from Alamos and two members of the Marcel Colomb Development Corporation gave a presentation to students at the Frontier School Division career fair which had been arranged by the Frontier School Division Career Development Officer. The students attending ranged from grades 4 to 8. The focus of the career fair was to promote careers in exploration and mining to students at a young age, so they can begin to think about their secondary and post-secondary school decisions. Alamos representatives gave a brief presentation on Alamos and the Lynn Lake Project, followed by a hands-on workshop involving core technology work. On May 2, 2017 and February 4, 2020, Alamos and Stantec provided career presentations to grade 7-12 students at the West Lynn Heights School. The events involved an introductory presentation of the staff, Alamos, and the Project followed by workshop activities and a question and answer session.

On January 15, 2018, Alamos met with 10 youth to establish the Dream Team, an initiative of Marcel Colomb First Nation. The purpose of the Dream Team was to provide an opportunity for Marcel Colomb First Nation youth to propose community projects and receive funding from Alamos. The focus of the community projects includes littering, suicide prevention, and addictions.

Cultural Awareness Activities

On December 12, 2019, Marcel Colomb First Nation hosted the first Culture and Mental Health Day for Alamos employees in Lynn Lake. The all-day event was facilitated by Marcel Colomb First Nation and included participation in a sweat ceremony and sharing in a traditional feast. The purpose of the event was for Alamos employees to build awareness and appreciation of Indigenous culture and traditions, further build the relationship with Marcel Colomb First Nation, and provide an opportunity for employees to relax and recharge in a positive environment.

3.3.5.2 Mathias Colomb Cree Nation

Mathias Colomb Cree Nation, including the Granville Lake community, was first contacted about the Project in October 2017 with an introductory letter and Project information package that was sent to Chief and Council. Since 2017, engagement with Mathias Colomb Cree Nation has included e-mail and telephone communications, and meetings with leadership.

The comments from the Mathias Colomb Cree Nation review of the draft Federal Final EIS guidelines include concerns regarding the Project area location within traditional territory, Mathias Colomb Cree Nation's ability to exercise their Aboriginal and Treaty rights, and other specific concerns noted in Section 3.3.6. Mathias Colomb Cree Nation noted that the land is sacred and the concept of a "sacred site" is not compatible with their worldview. Mathias Colomb Cree Nation would like Alamos to take a new approach to engagement that involves arriving at a Participation Agreement (e.g., Impact Benefit Agreement or similar) prior to discussing traditional knowledge sharing. Mathias Colomb Cree Nation has registered their objection to the Project and mining projects in general. Mathias Colomb Cree Nation has asked about the potential benefits and opportunities including training and job opportunities if the Project was to go forward. Members of the Granville Lake community have noted that the Granville Lake community has the potential to be more affected by the Project compared to Pukatawagan because Granville Lake is directly downstream of the Project. Members of the Granville Lake community also noted that water and fish up to the Keewatin River is of huge importance and expressed concerns regarding the Project location and potential impacts. Representatives from the Granville Lake community have expressed interest in contributing and completing a traditional land use study. Alamos has continued attempts to engage with the community representative provided by the Chief, but no response has been received.

Alamos was invited by the North West Community Futures Development Corporation to meet and present the Project on July 19, 2019. Communities sitting on the board included representatives from Council of many of the Indigenous groups that Alamos has engaged including the Barren Lands First Nation (Brochet Reserve), Marcel Colomb First Nation, Mathias Colomb Cree Nation, and O-Pipon-Na-Piwin Cree Nation.

Alamos explained that Project updates would be shared through open houses and that Alamos would send an invitation to the surrounding communities prior to the events.

An information package update was sent to Mathias Colomb Cree Nation by registered mail on December 4, 2019. The information in the package included a summary of engagement similar to information provided above.

A summary of key issues is presented in Section 3.3.6.

Meetings with Leadership

A meeting with leadership was held on April 20, 2018. Alamos met with the Deputy Chief, the Council of the Mathias Colomb Cree Nation and the recognized representative for the Granville Lake community to discuss conducting a TLRU study for the Project. The meeting started with introductions and Alamos gave a Project description and update. Further discussion at the meeting focused on the TLRU study design and logistics. Mathias Colomb Cree Nation requested a meeting where Chief and Council, and possibly Elders, could come, listen to a presentation, have their questions answered and attend a tour of the Project site. Alamos recommended that the Granville Lake community also be involved to determine if they were on board with the approach to the Mathias Colomb Cree Nation TLRU study.

A meeting with newly elected Mathias Colomb Cree Nation leadership was held on October 19, 2018, in Winnipeg. The meeting included six representatives of Mathias Colomb Cree Nation, one representative of Alamos, and one Project Team representative. Alamos provided an overview and update of the Project including location, existing conditions at the site, planned construction, EA and permitting process, potential effects, and the desire to collaborate on traditional knowledge sharing. Further discussion focused on the TLRU study and accommodation. Mathias Colomb Cree Nation expressed concern over the TLRU study and added that Alamos must take a new approach to engagement that involves arriving at an accommodation agreement before discussing traditional knowledge sharing. Further concerns were expressed regarding the cleanup of the existing abandoned mine sites in the north before permitting new mines. Several of the Mathias Colomb Cree Nation council stated that they were generally against mining projects in the region or that they object to the Project. Others stated that mining in the region may be feasible if Mathias Colomb Cree Nation had a controlling share in the mine. The results of the meeting indicated that Mathias Colomb Cree Nation would be in contact with Alamos to discuss next steps in engagement.

Prior to IAAC amending the list of included Indigenous communities, meetings were held with representatives from Pickerel Narrows First Nation, which was later determined to be under the leadership of Mathias Colomb Cree Nation as the Granville Lake community. Meetings were held between the community representative from Pickerel Narrows First Nation and one representative of Alamos on November 11, 15, and 24, 2017, with the purpose of discussing leadership status in the community, concerns about the Project, Indigenous agreements and protocols, as well as general Project information. Topics discussed included a Terms of Reference, compensation for traditional land use and opportunities for employment. The meeting resulted in interest from the community on receiving guidelines or a template for incorporating community-specific information into the EIS and interest in training opportunities. Meetings were held with the Headman of the Granville Lake community on February 19, 2018, November 14, 2018, and January 12, 2019, with one representative of Alamos to provide an update on the Project and explain federal requirements for the Project for engagement with Mathias Colomb Cree Nation as the official leadership of the Granville Lake community.

3.3.5.3 Nisichawayasihk Cree Nation

Overall Summary

Nisichawayasihk Cree Nation was first contacted about the Project in October 2017, with an introductory letter and Project information package that was sent to Chief and Council. Since 2017, engagement with Nisichawayasihk Cree Nation has included e-mail and telephone communications, a meeting with leadership, and a tour of the ATEC.

On October 19, 2017, a representative of Alamos met with the Chief of Nisichawayasihk Cree Nation and members of ATEC to tour the centre. Funding options and budget for training opportunities were discussed. A representative of Alamos also had a meeting with the Chief to discuss the Project and engagement. The Chief was interested in finding opportunities for Nisichawayasihk Cree Nation businesses to be involved in the Project, as well as job opportunities for members. Alamos also delivered the introductory letter and Project information package to the Chief at this time.

Alamos was contacted by a representative of InnocEduca Consulting Services, hired by Nisichawayasihk Cree Nation regarding housing options, the training alliance program, and to set up a meeting.

In August 2018, a representative of Alamos sent an email to the Chief to coordinate a meeting to discuss the community profile and compiled reference list to be used in the EIS.

A representative of Alamos received a telephone call from a member of Nisichawayasihk Cree Nation in January 2019, to inquire about updates on the Project. A meeting was scheduled during the call for January 8, 2019. A representative of Alamos was scheduled to meet with the Chief and a representative of ATEC, but they were both unable to meet. Instead, Alamos met with another representative of ATEC and further discussed the ATEC and their educational philosophy and training success. Nisichawayasihk Cree Nation wanted to be incorporated into a partnership to build housing for the Project through one of ATEC's carpenter training programs.

Alamos sent an email in February and March 2019 to the Chief and representatives of ATEC to discuss rescheduling a meeting with Chief and Council to provide a Project update and discuss potential business opportunities.

An information package update was sent to Nisichawayasihk Cree Nation by registered mail on December 4, 2019. The information in the package included a summary of engagement to date similar to information provided above.

On December 16, 2019, a representative of Alamos met with representatives of Nisichawayasihk Cree Nation in Nelson House following receipt of the information package update. At the request of Nisichawayasihk Cree Nation, a community meeting was held in Nelson House on February 3, 2020, to present information about the Project and the EIS to interested community members.

A summary of key issues is presented in Section 3.3.6.

Meetings with Leadership

A meeting was held in Nelson House on October 19, 2017. The meeting included one representative of Alamos, the Chief of Nisichawayasihk Cree Nation, and representatives of ATEC. The purpose of the meeting was to tour ATEC, discuss funding options and training opportunities, and discuss general Project information and engagement. The meeting resulted in Alamos requesting more information regarding funding and programs offered at ATEC. Alamos met with Nisichawayasihk Cree Nation representatives on December 16, 2019 in Nelson House, following receipt of the information package update.

Site Tours

A tour of ATEC was held with Nisichawayasihk Cree Nation, Alamos, and ATEC representatives on October 19, 2017. The tour provided Alamos representatives with a better understanding of the programs offered at ATEC and potential opportunities for partnerships, including funding options and budget for training opportunities. As a result of the tour, Alamos requested more information regarding funding and programs offered at ATEC. ATEC and Nisichawayasihk Cree Nation expressed how they would like to closely collaborate with affected Indigenous communities to enhance funding and streamline the educational process.

Community Meetings

As requested by leadership, a community meeting was held with Nisichawayasihk Cree Nation in Nelson House on February 3, 2020 for Alamos and Stantec to present information with respect to the Project and the EIS. The meeting included a formal PowerPoint® presentation to provide an update on the Project and on the environmental assessment process and findings. The meeting included open dialogue for question and answers. The meeting was attended by 19 people, of which 15 attendees identified as living in Nelson House or Nisichawayasihk Cree Nation. Of the attendees, 13 completed the provided questionnaires. Of the respondents, four indicated that they attended the meeting for general information, seven indicated that they were interested in employment or economic opportunities, and four cited concerns regarding the environment. Ten of the respondents identified as Indigenous from Nisichawayasihk Cree Nation, while the remaining three respondents indicated they were Métis, non-Indigenous, or from Norway House Cree Nation.

Regarding activities conducted in the Project area, hunting and fishing were identified by the respondents as the most common activities (3 responses to each activity; 23% of respondents), followed equally by gathering, trapping, snowmobiling and boating (2 responses to each activity; 15% of respondents). Other activities conducted included training and employment, ceremonial activities, harvesting of medicines/berries, and looking out for First Nations people’s interests. Hunting for caribou was reported to take place north of Lynn Lake, while fishing was reported in Suwannee Lake. Respondents also included Black Sturgeon (Marcel Colomb First Nation) and north of the 53rd parallel.

Feedback from the questionnaires indicated that participants are interested in labour force development, potential job, training, educational opportunities, and economic spin-offs from the project. Some of the concerns raised included the need for consultation, cross cultural training for employees, and potential adverse impacts including vehicle traffic on PR391, impacts to air and noise, water and fish, wildlife and plants, socio-economics, health, heritage and traditional land use.

3.3.5.4 O-Pipon-Na-Piwin Cree Nation

Overall Summary

O-Pipon-Na-Piwin Cree Nation was first contacted about the Project in October 2017, with an introductory letter and Project information package that was sent to Chief and Council. Since 2017, engagement with O-Pipon-Na-Piwin Cree Nation has included e-mail and telephone communications and meetings with leadership.

In November 2017, the Executive Director of O-Pipon-Na-Piwin Cree Nation was contacted to confirm receipt of the information package and they expressed O-Pipon-Na-Piwin Cree Nation’s interest in the Project and requested a meeting to discuss the Project.

On January 25, 2018, a representative of Alamos met with the Executive Director of O-Pipon-Na-Piwin Cree Nation to discuss the Project and toured the community and administration office. The Executive Director indicated that he and Chief and Council have reviewed the Project materials and expressed interest in workforce and business opportunities for O-Pipon-Na-Piwin Cree Nation. At the meeting, the Executive Director of O-Pipon-Na-Piwin Cree Nation indicated verbally that they have no current use of land and resources for traditional purposes in the area potentially affected by the Project. In November 2018, Alamos met with the Chief in South Indian Lake to introduce the Project, discuss traditional practices around the Project area, and review the community profile.

In January 2019, Alamos contacted the Executive Director of O-Pipon-Na-Piwin Cree Nation to determine if he was available to continue engagement on the Project through the newly elected leadership. A meeting was held on February 15, 2019, at the O-Pipon-Na-Piwin Cree Nation Band Office. Chief and Council were not available, and a representative of Alamos met with the Executive Director. On March 18, 2019, a representative of Alamos met with the Executive Director and Council to introduce the newly elected leadership to the Project. Potential concerns were discussed including water quality and impacts to resources. Alamos explained potential effects of the Project, mitigation measures, and potential business opportunities. An open house in South Indian Lake was requested by Council.

Alamos was invited by the North West Community Futures Development Corporation to meet and present the Project on July 19, 2019. Communities sitting on the board included representatives from Council of many of the Indigenous groups that Alamos has engaged including the Barren Lands First Nation (Brochet Reserve), Marcel Colomb First Nation, Mathias Colomb Cree Nation, and O-Pipon-Na-Piwin Cree Nation. Alamos explained that Project updates would be shared through open houses and that Alamos would send an invitation to the surrounding communities prior to the events.

An information package update was sent to O-Pipon-Na-Piwin Cree Nation by registered mail on December 4, 2019. The information in the package included a summary of engagement to date similar to information provided above.

O-Pipon-Na-Piwin Cree Nation has requested a community meeting, which was scheduled in February 2020, but was canceled due to a death in the community. A community meeting will be rescheduled as possible in consultation with the community.

A summary of key issues is presented in Section 3.3.6.

Meetings with Leadership

On January 25, 2018, Alamos met with O-Pipon-Na-Piwin Cree Nation Executive Director to discuss the Project and they also toured the community and band office. O-Pipon-Na-Piwin Cree Nation indicated that Project materials were reviewed, and the Project area is not currently high on the importance list for Chief and Council as the area has not been used for traditional practices. O-Pipon-Na-Piwin Cree Nation expressed interest in workforce and business opportunities. A subsequent meeting with O-Pipon-Na-Piwin Cree Nation Executive Director was held on February 15, 2018, to further discuss the Project.

Alamos met with the newly elected Chief of O-Pipon-Na-Piwin Cree Nation on November 13, 2018. The purpose of the meeting was to update the Chief on the Project. As a result of the meeting, O-Pipon-Na-Piwin Cree Nation indicated that they would like to wait to further engage until Council is re-elected around December 24, 2018. On March 18, 2019, Alamos met with O-Pipon-Na-Piwin Cree Nation Chief and Council to introduce the newly elected leadership to the Project. Discussions included potential concerns including water quality and effects to resources. At the meeting, O-Pipon-Na-Piwin confirmed verbally that they have no current use of land and resources for traditional purposes in the area potentially affected by the Project; however, some treaty land entitlement lands are close to the Gordon Site. As a result of the meeting, an open house was requested in South Indian Lake.

3.3.5.5 Manitoba Metis Federation

Overall Summary

Manitoba Metis Federation was first contacted about the Project in October 2017, with an introductory letter and Project information package that was sent to the Manitoba Metis Federation President. Since 2017, engagement with Manitoba Metis Federation has included e-mail and telephone communications, and meetings with representatives. Alamos acknowledges that Manitoba Metis Federation is the democratic, self-governing representative body of the Manitoba Métis Community and has been authorized under Manitoba Metis Federation Resolution No. 8 by the citizens of the Manitoba Métis Community to address collective Métis rights, claims, and interests, including conducting consultation (MMF 2013:15; SVS 2020:13).

The Manitoba Metis Federation's engagement on the Project has focused on the consideration of the potential effects of the Project on the environment and on the Manitoba Métis Community's ability to exercise their rights; whether the Project is environmentally sustainable; and, the economic benefits of the Project on Métis citizens. The Manitoba Metis Federation Director of Energy and Infrastructure, described the Federation's capacity to provide construction services through Métis N4 Construction Inc. The Director of Energy and Infrastructure stated that there are impacts on current use to harvesters who are active in Project areas but there are also impacts to collective rights because the presence of the Project removes future opportunities to exercise rights in the Project area. Manitoba Metis Federation indicated that Métis people are highly mobile, have far reaching family connections, and can exercise their harvesting rights anywhere.

A community-specific engagement plan to address communication needs with the Manitoba Metis Federation was discussed. The Manitoba Metis Federation stated that they will be looking for procurement targets for Manitoba Metis Federation business interests and offered to assist Alamos with developing an Indigenous procurement policy for the Project. Manitoba Metis Federation asserts Indigenous rights to harvest according to Section 35 of the *Constitution Act* (1982). The Manitoba Metis Federation indicated that cumulative project impacts were substantial to Manitoba Metis Federation. The Manitoba Metis Federation asked about potential economic development opportunities associated with the Project and the timeline on potential partnership opportunities. The Manitoba Metis Federation indicated they would like to discuss mandatory minimums for Indigenous participation in procurement (e.g., camp tenders).

An information package update was sent to Manitoba Metis Federation by registered mail on December 4, 2019. The information in the package included a summary of engagement to date similar to the information provided above.

A TLRU study (Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study for the Lynn Lake Gold Mine Project) was completed by an independent consultant for the Manitoba Metis Federation, the results of which were received in February 2020. The study documents harvesting and land use by the Manitoba Métis Community within a 100 km radius of the Project (SVS 2020). Information collected for the TLRU Study remains the sole property of and is used in the EA with permission from the Manitoba Metis Federation.

A summary of key issues is presented in Section 3.3.6.

Meetings with Leadership

A meeting with leadership was held on October 27, 2017, at the Manitoba Metis Federation office in Winnipeg. The meeting included six representatives of the Manitoba Metis Federation, three representatives of Alamos, and one representative from Stantec. The meeting included introductory conversation about the Project, and discussion on potential business opportunities, the draft Federal EIS guidelines, and traditional knowledge studies. The Manitoba Metis Federation also described the five phases of the Resolution 8 process for decisions regarding consultation and accommodation. The results of the meeting included concerns from the Manitoba Metis Federation regarding the draft guidelines, adequate consultation with Métis citizens to mitigate project effects, and development of business opportunities. The meeting also resulted in interest from the Manitoba Metis Federation on conducting a TLRU study and a forthcoming proposal for the work.

A meeting with the Manitoba Metis Federation leadership was also held on June 19, 2018, at the Manitoba Metis Federation office in Winnipeg with four representatives from the Manitoba Metis Federation, two representatives from Alamos, and two representatives from Stantec. The meeting was specific to the TLRU study scoping, including budgets and discussion on the drafted proposal. The results of the meeting indicated that additional federal funding and efficiencies should be incorporated into the proposal and a second draft required once specific shortfalls in funding were identified.

A subsequent meeting was held on November 27, 2018, in Winnipeg with three representatives from Alamos, two representatives from Stantec, and four representatives from the Manitoba Metis Federation to continue engagement efforts for the Project. The agenda included: Project update; discussion of the Métis Land Use and Occupancy Study (also known as a TLRU study) scope and schedule; contract opportunities; and the Manitoba Metis Federation community profile. Manitoba Metis Federation expressed that they would like to discuss mandatory minimums for Indigenous content in procurement as soon as possible for such things as camp tenders. The community profile and associated edits were also discussed. As a result of the meeting, Stantec committed to editing the community profile as requested. Following this discussion, the Manitoba Metis Federation made the decision to contribute their own community profile for inclusion in the EIS (Section 3.3.3).

On February 21, 2018, Alamos met with a local Métis representative regarding Métis traditional land use in the Lynn Lake area. Topics of discussion included harvester cards, hunting zones, and hunting licenses and tags.

3.3.5.6 Peter Ballantyne Cree Nation

Overall Summary

Peter Ballantyne Cree Nation was first contacted about the Project in October 2017. An introductory letter and Project information package was sent to Chief and Council. In January 2018, Stantec spoke with a Councillor and community member regarding the Project. The Councillor indicated that the Project area was within the traditional territory of the Peter Ballantyne Cree Nation community at Southend, Saskatchewan. Stantec spoke with another representative of Peter Ballantyne Cree Nation to confirm the receipt of the introductory letter and then forwarded the letter and asked if the community would like a meeting with Peter Ballantyne Cree Nation and Alamos. At a meeting between Stantec and Peter Ballantyne Cree Nation in February 2018, Peter Ballantyne Cree Nation requested a community meeting be held regarding the Project in Southend at the end of April 2018.

A community meeting was held on May 31, 2018, at the Southend Community Centre, with approximately 20 community members from Peter Ballantyne Cree Nation in attendance. At the meeting, community members expressed concerns about the environment and quality of life for the community, including the potential for contamination of Reindeer Lake. Alamos explained such contamination would not be possible based on the watershed and direction of flow from the waterbodies near the Project. Alamos provided information about employment opportunities and job training programs.

During the meeting, Peter Ballantyne Cree Nation requested that Alamos return to present the information to the community of Kinoosao, Saskatchewan in July. On August 20, 2018, a community meeting and workshop was held at the Grand Slam Lodge in Kinoosao with approximately 15 community members of Peter Ballantyne Cree Nation in attendance. Community members were invited to meet with the TLRU facilitators and share information through a guided questionnaire and map biography. Alamos and Stantec attended a Chief and Council meeting in Kinoosao on July 10, 2019 to discuss the TLRU study report.

On October 2019, at a meeting with the Councillor representing Peter Ballantyne Cree Nation throughout engagement on the Project, the Councillor indicated that they did not have capacity to review the final draft of the TLRU study or continue engagement regarding the Project. Despite being unable to contribute to TLRU review, the Councillor indicated a desire to see the information in the TLRU study incorporated into the EA. Subsequent efforts to engage directly with the Chief of Peter Ballantyne Cree Nation remain unanswered and therefore, without an Information Sharing Agreement in place, the TLRU study has not been incorporated into the EA at this time.

An information package update was sent to Peter Ballantyne Cree Nation by registered mail on December 4, 2019. The information in the package included a summary of engagement to date similar to information provided above.

Community Meetings

On May 31, 2018, Alamos and the Project Team in partnership with the Saskatchewan Ministry of Highways and Infrastructure hosted a community meeting regarding the Project and an unrelated second development project in the North, both that have the potential to affect the community of Peter Ballantyne Cree Nation. The event began with an opening prayer followed by a meal. This was followed by a presentation given by Alamos. A total of 16 community members attended and signed in at the meeting with approximately four additional members who did not sign in. Community members were provided with a handout. Community members were also asked to complete a questionnaire. Three completed questionnaires were returned; additional copies of the handouts and questionnaires were left with community leadership. A community member expressed concerns about the environment and quality of life for the community. They were particularly concerned with the potential contamination of Reindeer Lake. Alamos clarified that with the direction of water flows within the watershed it would be impossible for the Project to contaminate Reindeer Lake. A community member posed the question 'how can our community benefit from this development?' to which Alamos responded with information about potential job opportunities and job training programs. The following is a summary of the questionnaire responses from the community meeting.

The questionnaire results indicated that one attendee heard about the open house from a social media post; two others heard by word of mouth. For reasons for attending, one respondent indicated that they used to work in the area of the mines driving trucks and still has family living in Lynn Lake. The other two respondents were looking for general information about the mine, job opportunities and a community meal. The respondents rated environmental aspects as highly important with wildlife and fish habitat as the most important. Traditional land and resource use was also ranked in the top three for the respondents. Two other environmental aspects that were highly rated were surface and groundwater, and tailings and waste rock management. Both respondents identified as Indigenous or Métis. One respondent identified as a member of Peter Ballantyne Cree Nation, the other identified with Lac La Ronge Indian Band.

Additional verbal comments at the community meeting included comments that winter travel is uncommon between the communities of Southend and Lynn Lake, but would be by snowmobile, and that Peter Ballantyne Cree Nation members harvest barren ground caribou in Manitoba. For next steps, Peter Ballantyne Cree Nation requested that Alamos return to present information in the community of Kinoosao, Saskatchewan a Peter Ballantyne Cree Nation community on the east side of Reindeer Lake connected via road to Lynn Lake.

An additional community meeting was held on August 20, 2018, hosted by Alamos and the Project Team for members of Peter Ballantyne Cree Nation residing in Kinoosao, Saskatchewan, a remote community on the shores of Reindeer Lake. Approximately 15 community members attended, but a sign in sheet was not circulated. Community members were provided with a handout. Community members were asked to complete a questionnaire, but no completed questionnaires were returned. Following the presentation, several community members asked questions including a question about metals other than gold being extracted during the processing and a question about the lifespan of the mines. A few of the community members expressed that this was the first time they had heard of the Project; whereas, another community member who resides in Lynn Lake through the winter has attended open houses hosted in Lynn Lake in the past.

Meetings with Leadership

A meeting with leadership was held on July 10, 2019, and included one representative from Alamos, two representatives from Stantec, and representatives of Peter Ballantyne Cree Nation Council. The meeting included information on the Project and on the TLRU study that was conducted in 2018. Several questions were raised at the meeting about the potential effects of the Project, the TLRU study release, and potential employment and business opportunities. The meeting resulted in Peter Ballantyne Cree Nation requesting minor changes to the TLRU study report and discussion on the next steps to finalize the report. Peter Ballantyne Cree Nation also requested a written document/contract specifying that they would be guaranteed employment as part of the Project.

Stantec met with a Councillor of Peter Ballantyne Cree Nation on October 8, 2019, to discuss the information sharing agreement for the completed TLRU study. The Councillor indicated that they did not have capacity to continue engagement regarding the Project and that future communication should occur with the Chief.

Traditional Land and Resource Use Studies

Interviews and map biographies for a TLRU study were conducted with knowledge holders and harvesters from the Peter Ballantyne Cree Nation community of Kinoosao on August 20, 2018, at the Grand Slam Lodge on the shore of Reindeer Lake, Saskatchewan. A draft of the TLRU study was reviewed with Peter Ballantyne Cree Nation Chief and Council during a meeting on July 10, 2019. A revised version of the TLRU study was forwarded to Peter Ballantyne Cree Nation leadership representatives on August 25, 2019, but the information has not yet been released for incorporation into the EIS.

3.3.5.7 Barren Lands First Nation

Overall Summary

Barren Lands First Nation was first contacted about the Project in October 2017, with an introductory letter and Project information package that was sent by Stantec, on behalf of Alamos, to Chief and Council. In

January 2018, Alamos spoke with the Chief to discuss the Project and confirm receipt of the introductory letter and Project information package. A representative of Alamos inquired about traditional practices in the Project area and if the First Nation had traditional knowledge information relating to the Project. To date, no traditional practices or traditional knowledge has been identified within the Project area by Barren Lands First Nation. A follow up email was sent to the Chief from Alamos to express interest in scheduling a meeting in Brochet to introduce the Project, once the seasonal road opened.

In August 2018, the Barren Lands First Nation community profile and compiled reference list to be used in the EIS were sent to the Chief for review and comment. A meeting was also scheduled for September 2018 in Brochet with Chief and Council. A meeting was held in Brochet on September 18, 2018, with a representative of Alamos and Barren Lands First Nation Chief and Council. Alamos provided a high-level presentation of the Project and provided the community profile and literature review for Chief and Council to review and provide feedback and approval for use in the environmental assessment. A discussion was had on federal funding received by the First Nation for the Project. Alamos inquired about present or historic traditional practices within the Project footprint, which would be confirmed with Elders. Chief and Council expressed concern about the Project's effects on air and water quality, and barren ground caribou due to their reliance on caribou meat and noted that job creation was a positive result of the Project. Alamos sent the presentation, community profile and literature review to community leadership via email following the meeting.

In October 2018, Alamos sent an email to the Chief requesting a status update for approval of the community profile, requesting the verification of traditional practices in the Project area, and to summarize the proposed timeline for the Project, as requested by Chief and Council during the September 2018 meeting. A response was received in February 2019 from the Chief stating that they had been busy and were not able to review the files.

Alamos was invited by the North West Community Futures Development Corporation to meet and present the Project on July 19, 2019. Communities sitting on the board included representatives from Council of many of the Indigenous groups that Alamos has engaged including the Barren Lands First Nation (Brochet Reserve), Marcel Colomb First Nation, Mathias Colomb Cree Nation, and O-Pipon-Na-Piwin Cree Nation. Alamos explained that Project updates would be shared through open houses and that Alamos would send an invitation to the surrounding communities, including the Community of Brochet and Leaf Rapids. Alamos encouraged leadership to communicate shared information to the members and to relay potential questions and concerns back to Alamos.

An information package update was sent to Barren Lands First Nation by registered mail on December 4, 2019. The information in the package included a summary of engagement to date.

A summary of key issues is presented in Section 3.3.6.

Meetings with Leadership

On September 18, 2018, Alamos met with Barren Lands First Nation Leadership in Brochet to provide an initial Project introduction. The meeting included one representative of Alamos and four representatives of Barren Lands First Nation. The community profile was also presented for review. As a result of the meeting, Barren Lands First Nation expressed concerns regarding air quality, water quality, and barren ground caribou and indicated that they would need to follow-up with Elders regarding traditional practices in the Project area. The community indicated that they might have more questions or concerns once the Project information had been further reviewed and requested a copy of the presentation, community profile, and literature review which were sent via e-mail after the meeting.

3.3.5.8 Métis Nation Saskatchewan – Northern Region 1

Overall Summary

The Métis Nation – Saskatchewan Northern Region 1 was first contacted about the Project in October 2017, with an introductory letter and Project information package that was sent to the Director of the Métis Nation – Saskatchewan Northern Region 1. Since 2017, engagement has included e-mail and telephone communications.

From telephone conversations in April 2018, regarding the Project, the Métis Nation – Saskatchewan Northern Region 1 indicated that given the distance from the Project area, being upstream in the direction of regional stream flow, and lack of easy access to the Project area, it was unlikely that members would have concerns regarding the Project. The Métis Nation – Saskatchewan Northern Region 1 indicated that the Métis citizens of Saskatchewan Eastern Region 1 are more likely to be interested in or affected by the Project due to the proximity of its member communities.

In August 2018, the Métis Nation – Saskatchewan Northern Region 1 community profile and compiled reference list to be used in the EIS were sent to the Regional Director for review and comment.

A representative of Stantec contacted the Director by telephone in February 2019 to inquire about comments or concerns regarding the community profile and reference list or the Project. The Director reiterated that the distance of the Project was too far to be of concern to its members' traditional practices.

An information package update was sent to Métis Nation Saskatchewan – Northern Region 1 by registered mail on December 4, 2019. The information in the package included a summary of engagement to date.

A summary of key issues is presented in Section 3.3.6.

3.3.5.9 Métis Nation – Saskatchewan Eastern Region 1

Overall Summary

The Métis Nation – Saskatchewan Eastern Region 1 was first contacted about the Project in October 2017, with an introductory letter and Project information package that was sent to the Director of the Métis Nation – Saskatchewan Eastern Region 1. Since 2017, engagement with Métis Nation – Saskatchewan Eastern Region 1 has included e-mail and telephone communications and a meeting with leadership. A summary of key concerns is presented in Section 3.3.6.

In May 2018, a representative of the Project Team spoke with the Director to discuss the Project. The Director requested that the introductory letter and information package be resent and indicated that a consultant would be retained to review the information and respond to Stantec with recommended next steps.

In September 2018, Métis Nation – Saskatchewan Eastern Region 1 indicated that they had been conducting due diligence on the Project information received and intended to meet with the Sandy Bay Local to discuss their potential concerns regarding the Project effects and traditional uses in the Project area.

The Director of Métis Nation – Saskatchewan Eastern Region 1 and a Stantec representative met in-person in November 2018. The Director planned to meet with the Sandy Bay Local in mid-November, following their election, to discuss concerns regarding potential effects and traditional uses in the Project area. They expected that local hunters would be concerned about effects on the migration of woodland caribou.

In February 2019, the Director was contacted by telephone and email to follow up discussions from their November 2018 meeting.

An information package update was sent to Métis Nation Saskatchewan – Eastern Region 1 by registered mail on December 4, 2019. The information in the package included a summary of engagement to date.

Meetings with Leadership

Stantec and Métis Nation – Saskatchewan Eastern Region 1 met in-person on November 1, 2018, to follow-up on communications in April, May, August, and September of 2018. Métis Nation – Saskatchewan Eastern Region 1 planned to meet with the Sandy Bay Local in mid-November, following their election, to discuss concerns regarding potential effects and traditional uses in the Project area. It was expected that local hunters would be concerned about effects on the migration of woodland caribou. No further information has been received to date.

3.3.5.10 Hatchet Lake Denesuline First Nation

Overall Summary

Hatchet Lake Denesuline First Nation was first contacted about the Project in October 2017, with an introductory letter and Project information package that was sent to Chief and Council. Since 2017, engagement with Hatchet Lake Denesuline First Nation has included e-mail and telephone communications.

Through telephone communications on April 30, 2018, a Councillor of Hatchet Lake Denesuline First Nation indicated verbally that they have no current use of land and resources for traditional purposes in the area potentially affected by the Project, but noted that the First Nation had more interactions in the Lynn Lake area in the past. Hatchet Lake Denesuline First Nation informed Alamos that they hunted caribou in the South Indian Lake area during the winter of 2018 and expressed concern about potential effects to barren ground caribou herds. Hatchet Lake Denesuline First Nation also expressed interest in Project-related employment opportunities for the community and indicated that the First Nation had work experience in mining.

On November 20, 2019, Ya'thi Nene Lands and Resource Office who represents Hatchet Lake Denesuline First Nation contacted IAAC requesting more information about the Project. An information package update was sent to Hatchet Lake Denesuline First Nation by registered mail on December 4, 2019. The information in the package included a summary of engagement to date.

A summary of key concerns is presented in Section 3.3.6.

3.3.5.11 Northlands Denesuline First Nation

Overall Summary

Northlands Denesuline First Nation was first contacted about the Project in October 2017, with an introductory letter and Project information package that was sent to Chief and Council. Since 2017, engagement with Northlands Denesuline First Nation has included e-mail and telephone communications.

Through telephone and e-mail communications with Alamos in March and April 2018, Northlands Denesuline First Nation indicated that they have no current use of land and resources for traditional purposes within the area potentially affected by the Project; however, they would like to maintain open communication between all parties and although they do not currently have concerns about the Project; they would like to schedule an in-person meeting for Alamos to present to the community.

In January 2019, a representative of Alamos spoke with a Councillor of Northlands Denesuline First Nation to discuss the Project. The Councillor was unavailable at the time and requested that Alamos call back at another time. In February 2019 in response to their April 2018 correspondence, an in-person meeting with Chief and Council was proposed in Lac Brochet. The Councillor also emailed a representative of the IAAC to inform her of Alamos' intent to visit the community. To date, this meeting has not yet been held but Alamos will continue to work with community leadership to schedule the meeting as travel allows.

An information package update was sent to Northlands Denesuline First Nation by registered mail on December 4, 2019. The information in the package included a summary of engagement to date.

A summary of key issues is presented in Section 3.3.6.

3.3.5.12 Sayisi Dene First Nation

Overall Summary

Sayisi Dene First Nation was first contacted about the Project in July 2017, where Alamos spoke with Sayisi Dene First Nation leadership to discuss general information about the Project. In October 2017, Stantec on behalf of Alamos, sent an introductory letter and Project information package to Chief and Council. Since 2017, engagement with Sayisi Dene First Nation has included e-mail and telephone communications.

On a telephone call on January 16, 2018 Sayisi Dene First Nation indicated verbally that they have no current use of land and resources for traditional purposes within the area potentially affected by the Project but would like to be included in Project-related training, employment, and business opportunities. Alamos is working towards a regional training partnership and will keep Sayisi Dene First Nation informed of training opportunities.

On March 16, 2018, Alamos was scheduled to meet with Chief and Council of Sayisi Dene First Nation, but no one was available. Instead, Alamos met with an available representative and shared a copy of the Project introduction letter and information package originally shared via mail in October 2017.

An information package update was sent to Sayisi Dene First Nation by registered mail on December 4, 2019. The information in the package included a summary of engagement to date.

A summary of key issues is presented in Section 3.3.6.

3.3.6 Summary of Key Issues

A summary of key issues identified through the Indigenous engagement process is outlined in Table 3-8 by Indigenous community. This table is included as a summary and is not intended to represent a complete list of issues discussed with Indigenous communities throughout the Project.

Table 3-8 Summary of Key Issues Raised by Indigenous Communities

Indigenous Community	Valued Component	Comment/Concern Raised	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Marcel Colomb First Nation	Atmospheric Environment, Noise and Vibration	Noise and air quality effects are of high importance for the EIS Effects of blasting on the community	Chapter 6 (Sections 6.1.2, 6.3 and 6.4) Chapter 7 (Sections 7.1.2, 7.3 and 7.4)
	Groundwater	Need to protect natural springs Groundwater effects are of high importance for the EIS High-impact activities associated with exploration work must be accompanied by a monitoring Elder	Chapter 8 (Sections 8.1.2, 8.3 and 8.4) Chapter 3 (Section 3.3)
	Fish and Fish Habitat	Jumbo whitefish at Simpson Lake whose population was totally depleted after the Farley Lake Mine opened Poor water quality due to mining affecting fisheries Fish and fish habitat are of high importance for the EIS	Chapter 10 (Sections 10.1.2, 10.3 and 10.4) Chapter 9 (Sections 9.1.2, 9.3 and 9.4)
	Surface Water	Need for water quality monitoring Cumulative effects in Cockeram Lake due to historical tailings seepage and potential MacLellan effects	Chapter 9 (Sections 9.1.2, 9.3 and 9.4) Chapter 22

Table 3-8 Summary of Key Issues Raised by Indigenous Communities

Indigenous Community	Valued Component	Comment/Concern Raised	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Marcel Colomb First Nation	Surface Water	Concern about deleterious substances entering a waterbody Alamos' Long-term effects from the Project on freshwater supply, including volume quality and cost of remediation in the event of an environmental disaster Surface water, tailings, and mine rock management effects are of high importance for the EIS	Chapter 9 (Sections 9.1.2, 9.3 and 9.4)
	Wildlife and Wildlife Habitat	Effects to terrestrial habitat Wildlife effects and increased traffic are of high importance in the EIS Concern over moose and caribou population Effects to land and animals due to mining High-impact activities must be accompanied by a monitoring Elder	Chapter 12 (Sections 12.1.2, 12.3 and 12.4) Chapter 3 (Section 3.3) Chapter 23
	Vegetation and Wetlands	Effects to plants are of high importance in the EIS High-impact activities must be accompanied by a monitoring Elder Effects to terrestrial habitat	Chapter 11 (Sections 11.1.2, 11.3 and 11.4) Chapter 23 Chapter 3 (Section 3.3)
	Community Services and Infrastructure	Concern over the discussion of potential use of Marcel Colomb First Nation water truck for hauling potable water including wear and tear Lack of opportunities and amenities in the community, causing social problems	Chapter 14 (Sections 14.1.2, 14.3 and 14.4)
	Indigenous Peoples	Information regarding the Environmental Committee should be shared via newsletter or website Lack of previous consultation with the government from mining activities Issues with understanding the environmental baseline study results	Chapter 3 (Section 3.3)

Table 3-8 Summary of Key Issues Raised by Indigenous Communities

Indigenous Community	Valued Component	Comment/Concern Raised	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Marcel Colomb First Nation	Indigenous Peoples	Concerns not being listened to and addressed meaningfully Community members should be involved in environmental studies Bring school kids to Gordon site to learn about effects and opportunities Need to keep Winnipeg-based members informed of potential job opportunities Potential to build cabins on Hughes Lake as part of Participation Agreement (Impact Benefit Agreement or similar)	Chapter 3 (Section 3.3) Chapter 19 (Section 19.1.2) Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
	Indigenous Peoples	Compensation for effects to traditional activities Interest in Alamos' support to purchase and establish housing Need for cultural sensitivity training for contractors	Chapter 3 (Section 3.3) Chapter 19 (Section 19.1.2) Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
	Current Use of Lands and Resources for Traditional Purposes	Water quality and aquatic and terrestrial habitat and the potential side effect on hunting and fishing in the area Concern over effect to traplines Exploratory helicopter flying over reserve during moose and goose season infringes on treaty rights Traditional land and resource use is of high importance in the EIS Access concerns over gate at bridge on Hughes River	Chapter 17 (Sections 17.1.3, 17.3 and 17.4) Chapter 19 (Sections 19.3, 19.4, and 19.7) Chapter 15 (Sections 15.1.2, 15.2 and 15.3) Chapter 7 (Sections 7.2.1 and 7.4.1)
	Heritage Resources	Ensure that any unmarked traditional burial grounds are not disturbed	Chapter 16 (Sections 16.1.2, 16.4 and 16.5)
	Labour and Economy	Training requirements and potential government support Interest in education and training, job shadowing Training needs for the Environmental Committee Prioritize opportunities in education, employment, and information flow Employment, contracts, business opportunities, training, increased traffic, and job skills are of high importance for the EIS	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)

Table 3-8 Summary of Key Issues Raised by Indigenous Communities

Indigenous Community	Valued Component	Comment/Concern Raised	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Marcel Colomb First Nation	Labour and Economy	Interest in job availability Lack of community capacity, training, to benefit from mine development Need community liaison/councillor to mentor trainees and employees Training should have a pre-life skills/essential skills component to deal with hardship and addiction issues Positive overall for employment, training, and economic development opportunities for members Concern over drilling contractors and lack of partnering opportunities Interest in exploring transportation aspects such as trucking or courier services Waste dumps may not be an issue if there is potential for economic spin-off such as ski-hill Open pit could be used for fish farming post operation Negative effects include increased alcohol use from increased incomes Opportunities for associated projects to benefit children and youth Need for programming and funding for social programming to address socio-economic issues	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
	Cumulative Effects	Concern over long-term effects and cumulative effects Post-mining legacy concerns Concern about ongoing industrial activities at Mile 30	Chapter 20 (Section 20.1.2)
Mathias Colomb Cree Nation	Atmospheric Environment, Noise and Vibration	Large amount of noise, dust, and other emissions from the Project Vehicle and truck traffic and disturbance/dust and associated environmental contamination	Chapter 6 (Sections 6.1.2, 6.3 and 6.4) Chapter 7 (Sections 7.1.2, 7.3 and 7.4)
	Surface Water	High potential for acid rock drainage and issues for water management at the sites	Chapter 9 (Sections 9.1.2, 9.3 and 9.4)

Table 3-8 Summary of Key Issues Raised by Indigenous Communities

Indigenous Community	Valued Component	Comment/Concern Raised	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Mathias Colomb Cree Nation	Current Use of Lands and Resources for Traditional Purposes	Large amount of earth moving required for the Project and large changes to ground structure, aesthetics, and associated effects to rights Concept of a sacred site is not compatible with the Mathias Colomb Cree Nation world view Intersection with Project/transportation routes and Mathias Colomb Cree Nation traplines Decrease in wildlife resources due to increased harvesting by non- Mathias Colomb Cree Nation members (i.e., employees and contractors from elsewhere)	Chapter 17 (Sections 17.1.3, 17.3 and 17.4) Chapter 19 (Sections 19.3, 19.4, and 19.7) Chapter 15 (Sections 15.1.2, 15.2 and 15.3)
	Wildlife and Wildlife Habitat	Wildlife collision risks with heavy truck traffic Cumulative effects on already vulnerable ecosystem Decrease in migratory birds, game, and fur-bearing animals within Mathias Colomb Cree Nation territory, to due to increased harvesting	Chapter 12 (Sections 12.1.2, 12.3, 12.4, and 12.5)
	Fish and Fish Habitat	Decrease in fish and aquatic species due to increased harvesting	Chapter 10 (Sections 10.1.2, 10.3 and 10.4) Chapter 15 (Sections 15.1.2, 15.2 and 15.3)
	Indigenous Peoples	No knowledge sharing would take place without a written agreement about compensation Approach should involve arriving at an accommodation agreement before discussing traditional knowledge sharing Desire to review baseline data and have an opportunity for an independent consultant to conduct studies to compare results Would like to complete TLRU study for Granville Lake community Request for an open house and tour of the Project site	Chapter 3 (Section 3.3)

Table 3-8 Summary of Key Issues Raised by Indigenous Communities

Indigenous Community	Valued Component	Comment/Concern Raised	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Mathias Colomb Cree Nation	Labour and Economy	Mining may be feasible if Mathias Colomb Cree Nation had controlling share in the mine Granville Lake community interested in training programs/training alliance	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
	Human Health	Public safety risks with heavy truck traffic Large workforce numbers of outsiders and associated adverse effects on already vulnerable communities and harvesting areas Cumulative effects on already vulnerable people Effect on socio-economic conditions due to resource depletion by non-members	Chapter 18 (Sections 18.1.2, 18.3, and 18.4) Chapter 22 Chapter 15 (Sections 15.1.2, 15.2 and 15.3)
	Heritage Resources	Potential damage to archeological and cultural sites in and around Lynn Lake	Chapter 16 (Sections 16.1.2, 16.4 and 16.5)
Nisichawayasihk Cree Nation	Indigenous Peoples	Questions regarding the level of engagement due to time period between contact Lack of meaningful Section 35 consultation	Chapter 3 (Section 3.3)
	Atmospheric Environment	Potential effect to climate change Increased dust resulting from increased traffic along roadways through resource management area	Chapter 6 (Sections 6.1.2., 6.3 and 6.4)
	Surface and Ground Water Quality	Potential effects of increased traffic, potential release of hazardous materials as a result of transportation of dangerous goods	Chapter 22 Chapter 14 (Sections 14.2.2 and 14.5)
	Community Services and Infrastructure	Potential effect to road condition and proper qualification and procedures for drivers (Project related) – safety along roadways Potential increase of vehicle accidents due to increased traffic Spill response protocol along roadways within resource management area	Chapter 14 (Sections 14.1.2 and 14.4) Chapter 22
	Fish and Fish Habitat, Wildlife and Wildlife Habitat	Potential effects to species at risk, migratory birds, and big game species	Chapter 12 (Sections 12.1.2, 12.3 and 12.4)
	Vegetation and Wetlands	Potential effect of invasive species (weeds) introduced by vehicle traffic within the resource management area	Chapter 11 (Sections 11.1.2, 11.3 and 11.4)

Table 3-8 Summary of Key Issues Raised by Indigenous Communities

Indigenous Community	Valued Component	Comment/Concern Raised	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Nisichawayasihk Cree Nation	Labour and Economy	Indigenous trades training for workforce readiness Would like to enhance funding and streamline the educational process Guaranteed job at the end of training to pursue partnership Job opportunities for Nisichawayasihk Cree Nation members ATEC and Nisichawayasihk Cree Nation would like to build housing for the Project and discuss training and business opportunities Opportunities for Nisichawayasihk Cree Nation businesses to be involved in the Project	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
O-Pipon-Na-Piwin Cree Nation	Surface Water	Potential concerns including water quality and effects to resources	Chapter 9 (Sections 9.1.2, 9.3 and 9.4)
	Economy and Employment	Interested in workforce and business opportunities	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
	Indigenous Peoples	Some treaty land entitlement lands are close to the Gordon Site	Chapter 3 (Section 3.3)
Manitoba Metis Federation	Surface Water, Groundwater, Fish and Fish Habitat, Wildlife and Wildlife Habitat	Overprinting of aquatic habitats and seepage causing degradation of water quality, quantity and affecting wetlands, rivers, lakes, and wildlife	Chapter 9 (Sections 9.1.2, 9.3 and 9.4) Chapter 10 (Sections 10.1.2, 10.3 and 10.4) Chapter 8 (Sections 8.1.2, 8.3 and 8.4) Chapter 12 (Sections 12.1.2, 12.3 and 12.4)
	Wildlife and Wildlife Habitat	Loss and fragmentation of habitat for sensitive species	Chapter 12 (Sections 12.1.2, 12.3 and 12.4)
	Indigenous Peoples	Concern over wording in the community profiles Concern over number of interviews proposed for TLRU Study Need for community meetings to ask questions and register concerns Concern regarding draft Federal Final EIS guidelines	Chapter 3 (Section 3.3) Chapter 19 (Section 19.1.2)

Table 3-8 Summary of Key Issues Raised by Indigenous Communities

Indigenous Community	Valued Component	Comment/Concern Raised	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Manitoba Metis Federation	Economy and Employment	Interest in potential economic development opportunities Interest in provision of construction services through Métis N4 Construction Inc. Would like to discuss mandatory minimums for Indigenous procurement	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
	Current Use of Lands and Resources for Traditional Purposes	Effects on current harvesters who are active in the Project areas and also effects to collective rights Project is located within a region with known contemporary and historical use for fishing, hunting, trapping, and cultural purposes	Chapter 17 (Sections 17.1.3, 17.3 and 17.4) Chapter 15 (Sections 15.1.2, 15.2 and 15.3)
	Current Use of Lands and Resources for Traditional Purposes	Workforce will bring people who will engage in hunting, fishing, and recreation that could negatively affect wildlife	Chapter 17 (Sections 17.1.3, 17.3 and 17.4) Chapter 15 (Sections 15.1.2, 15.2 and 15.3)
Peter Ballantyne Cree Nation	Surface Water	Concern over the potential contamination of Reindeer Lake Need for 3rd party monitoring/testing of water in Hughes River	Chapter 9 (Sections 9.1.2, 9.3 and 9.4) Chapter 23
	Current Use of Lands and Resources for Traditional Purposes	Comment that Peter Ballantyne Cree Nation harvest barren ground caribou in Manitoba Project is within traditional territory of the Southend community	Chapter 17 (Sections 17.1.3, 17.3 and 17.4)
	Economy and Employment	Request for written contract that Peter Ballantyne Cree Nation would be guaranteed employment as part of the Project Interested in economic benefits/opportunities, commitments to employment and training Concern for local people being pushed out of jobs Interested in partnerships that will be offered	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
Barren Lands First Nation	Atmospheric Environment	Effects to air quality	Chapter 6 (Sections 6.1.2, 6.3 and 6.4)
	Surface Water	Effects to water quality	Chapter 9 (Sections 9.1.2, 9.3 and 9.4)

Table 3-8 Summary of Key Issues Raised by Indigenous Communities

Indigenous Community	Valued Component	Comment/Concern Raised	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Barren Lands First Nation	Wildlife and Wildlife Habitat	Effects to barren-ground caribou	Chapter 12 (Sections 12.1.2, 12.3 and 12.4)
	Economy and Employment	Biggest positive of the Project is job creation	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
	Current Use of Lands and Resources for Traditional Purposes	Effects to barren-ground caribou due to their reliance on caribou meat	Chapter 17 (Sections 17.1.3, 17.3 and 17.4) Chapter 12 (Sections 12.1.2, 12.3 and 12.4)
Métis Nation Saskatchewan – Northern Region 1	Indigenous Peoples	Anticipate that Métis Nation of Saskatchewan - Eastern Region 1 should be engaged given the location.	Chapter 3 (Section 3.3)
Métis Nation Saskatchewan – Eastern Region 1	Wildlife and Wildlife Habitat, Current Use of Lands and Resources for Traditional Purposes	Expect that the local hunters will be most concerned about effects on the migration of woodland caribou	Chapter 12 (Sections 12.1.2, 12.3 and 12.4) Chapter 17 (Sections 17.1.3, 17.3 and 17.4)
Hatchet Lake First Nation	Wildlife and Wildlife Habitat	Concerns about potential effects to barren ground caribou herds	Chapter 12 (Sections 12.1.2, 12.3 and 12.4)
	Current Use of Lands and Resources for Traditional Purposes	Hatchet Lake First Nation hunted caribou at South Indian Lake in winter of 2018 and there are concerns over effects to barren ground caribou herds	Chapter 17 (Sections 17.1.3, 17.3 and 17.4)
	Land and Resource Use	Hatchet Lake First Nation people used to boat over Reindeer Lake and come shopping in Lynn Lake, likely 20 years ago	Chapter 15 (Sections 15.1.2, 15.2 and 15.3)
	Economy and Employment	The people have work experience with mining and would be interested in employment opportunities	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)
Sayisi Dene First Nation	Economy and Employment	Would like to be integrated into future employment opportunities	Chapter 13 (Sections 13.1.2, 13.3 and 13.4)

3.3.7 Ongoing Engagement with Indigenous Communities

Alamos is committed to sharing information with Indigenous communities throughout the Project. Information provided herein is current to May 22, 2020. Follow-up emails and phone calls regarding the information update packages sent out to each of the 12 identified Indigenous communities on December 4, 2019 were completed by Stantec on behalf of Alamos.

In February 2020, Open Houses were held in Lynn Lake and Nisichawayasihk Cree Nation to provide updates on the Project and the environmental assessment. Spatial boundaries and proposed mitigation measures were presented in the open houses held in February 2020. No issues related to spatial and temporal boundaries were raised. Specific feedback has not yet been received from Indigenous communities regarding mitigation measures. No concerns or issues were raised that were not previously learned through Alamos' engagement program. Feedback will be managed going forward as monitoring results are reported on and presented to government and Indigenous groups.

In April 2020, Stantec, on behalf of Alamos, sent an information package to leadership of each potentially affected Indigenous community to request their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec requested feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. This mail-out was followed up by email in early May 2020. Any feedback provided by the community after May 22, 2020 will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement. Input received during the regulatory review phase is anticipated to include the final TLRU study from Peter Ballantyne Cree Nation and Mathias Colomb Cree Nation. Alamos continues to engage and anticipates additional meetings with Indigenous communities to review and discuss the EIS findings and how the information shared will inform the mitigation measures for the Project. New information brought forward about potential effects, concerns, issues, or recommendations for mitigation will be reviewed against the results of the EIS and incorporated into project planning and regulatory reporting as appropriate. Future planned engagement activities may include:

- Mailout of information pack from the February 2020 open house in Lynn Lake to those communities unable to attend.
- Announcement to potentially affected communities when the EIS is posted for public review with details for access to the documents and application for participant funding.
- Project updates regarding design, schedules, employment, and contract opportunities through the life of the Project.

In the construction phase, Alamos plans to meet with interested Indigenous communities to discuss concerns identified through the TLRU studies and EA. The meetings will provide an opportunity to discuss how concerns will be addressed and mitigated. Alamos plans to develop resource protection plans in collaboration with potentially affected Indigenous communities, which may include additional monitoring work by Elders.

In the operation and decommissioning/closure phases, Alamos will continue to engage with Indigenous communities with respect to ongoing environmental management and monitoring plans. Alamos will meet with communities upon request in these phases.

As part of the ongoing engagement process, Project update information will be made available through newsletters, e-mail, phone calls, and in-person discussion with Alamos' Environment and Community Relations Manager, based in Lynn Lake.

3.4 STAKEHOLDER AND PUBLIC ENGAGEMENT

3.4.1 Objectives and Approach to Stakeholder and Public Engagement

Alamos is committed to providing meaningful opportunities for ongoing dialogue about the Project with potentially interested or affected parties. Engagement with the public and stakeholders was initiated early in the process and continued throughout the EA to create Project transparency and provide opportunities for feedback received from stakeholders to be considered and incorporated into the EA. New stakeholders were identified and engaged as the EA progressed. Engagement will continue with stakeholders and the public to provide the results of the EA and Project updates.

Alamos' approach to engagement is guided by the following objectives:

- Provide meaningful opportunities for the early involvement of interested and affected parties and allow continued participation throughout the Project.
- Use a variety of engagement approaches to exchange information, receive feedback and engage with participants in a transparent manner.
- Provide flexibility in the approach so that engagement activities can be revised in response to comments and feedback received.
- Use feedback received from engagement activities to assist with decision-making, as well as to assist in avoiding or reducing potential adverse effects and enhancing benefits and opportunities.
- Communicate to participants on how their feedback has been used in the EA process and Project planning.

3.4.2 Identification of Potentially Affected and Interested Stakeholders

The following is a preliminary list of the types of stakeholders that have been identified as potentially having an interest in or being affected by the Project:

- Local community members (e.g., residents and property owners)
- Business/economic stakeholders (e.g., local businesses, business associations, and industry groups)
- Development corporations
- Local services (e.g., fire and police departments, hospitals)
- Non-governmental organizations
- Research/academic organizations
- Towns/Municipalities.

3.4.3 Stakeholder and Public Engagement Methods

3.4.3.1 Public Open Houses

Four open house public meetings have been held to date in Lynn Lake for members of the local community, including members of Marcel Colomb First Nation. The open houses were advertised using posters/mail-outs (Appendix 3A), word-of-mouth and social media.

The first event was an informal drop-in style open house held on March 25, 2015, in Lynn Lake. Preliminary Project details were communicated through the distribution of a four-page Project Information handout (Appendix 3A). Representatives from Alamos and Stantec were present to answer questions about the Project.

The second and third open houses occurred on April 26, 2016, and May 1, 2017, respectively, in Lynn Lake. During each of these events, Alamos distributed handouts (Appendix 3A) and delivered a formal presentation to share Project information and solicit feedback/input.

The fourth open house occurred on February 4, 2020 in Lynn Lake. Engagement materials included a formal presentation, handout, and questionnaire to solicit feedback (Appendix 3A). The information presented included an overview of the project and proponent, update on the regulatory process and timelines, and EIS findings.

3.4.3.2 Questionnaires

At all four open houses, attendees were invited to complete questionnaires to provide feedback on the Project, as well as identify issues, concerns or inquiries related to the Project (Appendix 3A). The questionnaires asked respondents to use a scale from 1 (not important) to 5 (very important) to rate the importance of studying various topics as part of the EA (Section 3.4.4.7).

3.4.3.3 Letters

Where direct responses were warranted or requested at the open houses, the Proponent Team sent follow-up letters to individuals to address questions, comments or concerns noted on their questionnaires. Close to 40 letters have been sent by Alamos to open house attendees in response to questions, comments or concerns noted on questionnaires.

3.4.3.4 Local Office

A dedicated Project office was established by Alamos in the town of Lynn Lake in January 2016. The office is staffed by Alamos Monday to Friday from 8:00 a.m. to 5:00 p.m. and open to the general public to inquire about the Project. An office will remain open during construction and operation of the Project. Having a local Project office, Alamos employees work and live in the town of Lynn Lake and are active members of the community and local economy. The Alamos Manager of Environment and Community Relations lives in Lynn Lake on a rotational basis and has developed relationships with the community through participation in the Lynn Lake Chamber of Commerce, volunteering with the Lynn Lake Fire Department, and as a patron of local businesses.

3.4.3.5 Project-Dedicated Email

A dedicated Project email address (LLGPengages@stantec.com) was created at the beginning of the EA process as a means of communication to receive comments and feedback from stakeholders, and address concerns and answer questions related to the Project. The email address will remain active throughout the EA review process, and during Project construction and operation. Emails sent to the Project address are entered into StakeTracker®.

3.4.3.6 Youth Engagement

Alamos has offered interactive site tours for students and participated in career fairs at local schools to inform youth on the potential effects of the mining operation and educate them on career opportunities associated with mining and exploration, and environmental assessment and remediation. A description of the school and career fair events is presented in Section 3.3.5.1. Alamos has worked closely with local schools to establish summer employment opportunities for students.

3.4.3.7 3D Modelling

Alamos has developed a 3D model to provide stakeholders, the public, and Indigenous communities a visual representation of what the Project will look like throughout the proposed Project phases (Appendix 2B). The model helps illustrate how the landscape will change from the current conditions throughout operation and following reclamation of the area. It also provides views of the Project from various vantage points along PR 391 and from Black Sturgeon Reserve (Chapter 15). A video of the model will be produced to be used as an engagement tool.

3.4.3.8 Meetings and Conferences

Alamos has conducted other stakeholder and community engagement activities, including in-person meetings and presentations, telephone calls and email communication, as summarized in Table 3-9. Alamos' Manager of Environment and Community Relations maintains an active presence in the Town of Lynn Lake and regularly engages with local businesses and services. Members of the Proponent Team have supported these engagement efforts, where appropriate.

Alamos and community representatives from the Marcel Colomb First Nation were panel members at two mining conferences. The first conference was in January 2018 at the annual Association for Mineral Exploration (AME) Roundup in Vancouver, British Columbia. The panel discussion, called Agreements and Relationships: The Communications Pathway to Success, was a discussion of examples and sharing of advice on “best practices in communications to enable healthy relationships and agreements” (AME 2019). The panel was part of “The Gathering Place” a space for sessions centered around building relationships between Indigenous communities, industry, and government, to work together towards long-term partnerships and mutually beneficial projects.

The second conference was a panel discussion called “Practical Interactions: Industry & Indigenous Engagement Panel” at the 2019 Central Canada Mineral Exploration Convention (CCMEC) on November 19, 2019, held in Winnipeg, Manitoba. During the panel session, a representative from Alamos and Marcel Colomb First Nation, and an Elder from Marcel Colomb First Nation were part of a discussion to share their perspective and experiences on “the benefits of early engagement, the importance of dedicated individuals for engagement and liaison, and the traits of a good Community Liaison person” (CCMEC 2019). Further, the panel discussed how to begin the conversation with communities, build a relationship based on trust, and the value of education and training partnerships (AME 2019).

3.4.4 Stakeholder and Public Engagement Results

Table 3-9 provides an overview of relevant stakeholder engagement conducted for the Project and general topics discussed. This table is not intended to represent a complete list of stakeholder engagement activities (e.g., does not include informal meetings or all written correspondence and telephone calls).

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Business/Economic Stakeholders				
Element Drilling	January 13, 2015	Meeting with Carlisle Goldfields Ltd (preceding owner), Marcel Colomb First Nation, Marcel Colomb Development Corporation and Element Drilling	• Exploration investigations	• Chapter 2 (Section 2.1 and 2.3)
	March 4, 2015	Meetings and site tour of Young-Davidson Mine in Matachewan, Ontario with Marcel Colomb First Nation and Marcel Colomb Development Corporation	• Community engagement • Project engineering • Employment and business opportunities	• Chapter 3 (Section 3.4) • Chapter 2 (Section 2.3) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Lynn Lake Chamber of Commerce	May 11, 2015 and June 19, 2015	Mail received and meeting with the Secretary/Treasurer of the Lynn Lake Chamber of Commerce regarding sponsorship for the annual fishing derby	• Community engagement • Socio-economics	• Chapter 3 (Section 3.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4); Chapter 14 (Section 14.1.2, 14.3 and 14.4)

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Lynn Lake Chamber of Commerce	March 14, 2018	Meeting with Lynn Lake Council members and Chamber of Commerce for Project update	• General Project information • Regulatory requirements • Community engagement	• Chapter 2 (Section 2.3) • Chapter 1 (Section 1.4) • Chapter 3 (Section 3.4)
Dorado Drilling	July 30, 2015	Informal meeting with the President of Dorado Drilling and Chief Douglas Hart of Marcel Colomb First Nation	• General Project information • Community engagement	• Chapter 2 (Section 2.3) • Chapter 3 (Section 3.4)
	August 26, 2016	Meeting with a representative of Dorado Drilling and two members of the Marcel Colomb Development Corporation to discuss the Project and plans for drilling	• General Project information • Exploration investigations • Community engagement	• Chapter 2 (Section 2.1 and 2.3) • Chapter 3 (Section 3.4)
	October 5, 2016	Meeting with a representative of Dorado Drilling and two representatives of the Frontier District School Board to discuss establishing programs at the school	• Education and training	• Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Leaf Rapids Consumers Cooperative	November 9, 2015	Meeting at the Government of Manitoba's Mineral Resources Open House	• Community engagement • Water resources	• Chapter 3 (Section 3.4) • Chapter 8 (Section 8.1.2, 8.3 and 8.4), Chapter 9 (Section 9.1.2, 9.3 and 9.4)
Green Water Group	November 9, 2015	Meeting at the Government of Manitoba's Mineral Resources Open House	• General Project information • Community engagement • Employment opportunities	• Chapter 3 (Section 3.4) • Chapter 2 (Section 2.3) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
ALS Limited	November 18, 2015	Meeting with representatives of ALS at the Manitoba Mining and Minerals Convention	• Business opportunities • Geology/Geochemistry	• Chapter 13 (Section 13.1.2, 13.3 and 13.4) • Chapter 8 (Section 8.1.2, 8.3 and 8.4)
Rodren Drilling	November 18, 2015	Meeting with a representative of Rodren Drilling at the Manitoba Mining and Minerals Convention to discuss potential drilling programs	• Exploration investigations • Business opportunities	• Chapter 2 (Section 2.3) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
	November 20, 2015	Meeting with representatives of Rodren Drilling at the Manitoba Mining and Minerals Convention to discuss business opportunities and Indigenous relations	• Business opportunities • Indigenous relations	• Chapter 13 (Section 13.1.2, 13.3 and 13.4) • Chapter 3 (Section 3.3)
Reflex	November 19, 2015	Meeting with a representative of the drilling company at the Manitoba Mining and Minerals Convention to discuss current and upcoming drilling programs	• Project engineering • Exploration investigations • Business opportunities	• Chapter 2 (Section 2.1, and 2.3) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Driving Force	November 20, 2015	Meeting with representatives of Driving Force regarding rental vehicles	• Business opportunities	• Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Unnamed business	May 3, 2016	Meeting with local business owner to discuss organizing a citizens' committee	• Community engagement	• Chapter 3 (Section 3.4)
Norwest Manufacturing	October 24, 2017	Meeting with Norwest Manufacturing, Vale, and the Town of Thompson to discuss employment opportunities	• Employment opportunities	• Chapter 13 (Section 13.1.2, 13.3 and 13.4)

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Vale	October 24, 2017	Meeting with Vale, Norwest Manufacturing, and the Town of Thompson to discuss employment opportunities	• Employment opportunities	• Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Esso Gas Station	April 29, 2016	Meeting with local business owner who was unable to attend Project Open House	• General Project information	• Chapter 2 (Section 2.1, and 2.3)
Lynn Inn	May 3, 2016	Meeting	• Citizens' Committee	• Chapter 3 (Section 3.4)
	July 4, 2016	Meeting	• General Project information • Citizens' Committee	• Chapter 2 (Section 2.1, and 2.3) • Chapter 3 (Section 3.4)
	July 5, 2016	Meeting	• Citizens' Committee	• Chapter 3 (Section 3.4)
	July 8, 2016	Meeting	• Citizens' Committee	• Chapter 3 (Section 3.4)
Development Corporations				
Northwest Manitoba Community Futures Development Corporation	May 3, 2016	Meeting with the Manager of the Northwest Manitoba Community Futures Development Corporation to discuss what assistance and programs they offer, and creation of a citizens' committee	• Business opportunities • Community engagement	• Chapter 3 (Section 3.3) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
	February 21 and 22, 2018	Meeting with a local Métis representative to discuss traditional land use and Métis rights in the Lynn Lake area	• Traditional knowledge	• Chapter 3 (Section 3.3), Chapter 17 (Section 17.2.14)

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Northwest Manitoba Community Futures Development Corporation	July 18, 2019	Email exchange with Councillor of Mathias Colomb Cree Nation and the Northwest Manitoba Community Futures Development Corporation regarding meeting arrangements	• Community engagement	• Chapter 3 (Section 3.3
Northwest Manitoba Community Futures Development Corporation	July 19, 2019	Presentation by Alamos at a meeting hosted by the Northwest Manitoba Community Futures Development Corporation which included representatives from many Indigenous communities	• General Project information • Community engagement • Traditional knowledge	• Chapter 2 (Section 2.1, and 2.3) • Chapter 3 (Section 3.3) • Chapter 17 (Section 17.2.14)
Local Services				
Lynn Lake Hospital	August 18, 2015, August 19, 2015, and August 25, 2015	Telephone interview with the Manager of the Lynn Lake Hospital related to health services and facilities, and follow up email exchanges	• Human environment • Socio-economics • Employment opportunities	• Chapter 18 (Sections 18.1.2, 18.3, and 18.4) • Chapter 14 (Section 14.1.2, 14.3, 14.4) • Chapter 13 (Section 13.1.2, 13.3, 13.4)
Lynn Lake RCMP	Several dates between August 25, 2015 and September 2, 2015	Email exchanges with the Lynn Lake RCMP Detachment Commander and a telephone interview regarding police services and public security in Lynn Lake	• Socio-economics • Human environment	• Chapter 18 (Sections 18.1.2, 18.3, and 18.4) • Chapter 14 (Section 14.1.2, 14.3, 14.4) • Chapter 13 (Section 13.1.2, 13.3, 13.4)
Lynn Lake Fire Department	June 10, 2015	Meeting	• General Project information	• Chapter 2 (Section 2.1, and 2.3)
	April 14, 2016	Meeting with the Lynn Lake Fire Chief to discuss the open house and safety protocol for Alamos' office renovations	• Community engagement • Fire safety protocols	• Chapter 3 (Section 3.4) • Chapter 14 (Section 14.1.2, 14.3, 14.4), Chapter 22 (Section 22.4.9), Chapter 23 (Section 23.5)

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Manitoba Hydro	April 14, 2016	Meeting with Manitoba Hydro to discuss open house	• Community engagement	• Chapter 3 (Section 3.4)
	April 27, 2016	Email from Manitoba Hydro regarding power supply to the Project site	• Project engineering	• Chapter 2 (Section 2.3)
	November 11, 2016	Meeting with Manitoba Hydro to discuss requirements for hydro upgrade, installation of the power system, and EA components	• Project engineering • Regulatory requirements	• Chapter 2 (Section 2.3) • Chapter 1 (Section 1.4)
	June 20, 2017	Meeting with Manitoba Hydro and the Town of Lynn Lake to introduce the environmental team of Manitoba Hydro and discuss preliminary power line routing	• Project engineering	• Chapter 2 (Section 2.3)
Non-Governmental Organizations				
Northern Manitoba Sector Council	November 19, 2015	Meeting at the Manitoba Mining and Minerals Convention	• Community engagement • Employment opportunities	• Chapter 3 (Section 3.4) • Chapter 13 (Section 13.1.2, 13.3, 13.4),
Northern Manitoba Sector Council	September 12, 2019 and October 7, 2019	Meetings with the Aboriginal Liaison of the Northern Manitoba Sector Council, Marcel Colomb First Nation, and Manitoba Keewatinowi Okimakanak Inc.	• Education and training • Employment opportunities	• Chapter 13 (Section 13.1.2, 13.3, 13.4),
Lynn Lake Friendship Centre	November 1, 2016	Meeting with the Manager of the Lynn Lake Friendship Centre to discuss current and upcoming projects that would benefit the community	• Education and training • Community engagement	• Chapter 13 (Section 13.1.2, 13.3, 13.4) • Chapter 3 (Section 3.4)

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Lynn Lake Friendship Centre	February 21, 2018	Meeting with a local Métis representative to discuss traditional land use in the Lynn Lake area	• Traditional knowledge	• Chapter 3 (Section 3.3) • Chapter 17 (Section 17.2.14)
Manitoba Keewatinowi Okimakanak Inc.	April 8, May 6, and May 7, 2019	Telephone and email correspondence for meeting coordination	• Community engagement	• Chapter 3 (Section 3.3)
	August 20, 2019	Meeting with Manitoba Keewatinowi Okimakanak Inc., and Chief and Council of Marcel Colomb First Nation to discuss employment and training	• Education and training • Employment opportunities	• Chapter 13 (Section 13.1.2, 13.3, 13.4)
Manitoba Keewatinowi Okimakanak Inc.	September 12, 2019 and October 7, 2019	Meetings with Manitoba Keewatinowi Okimakanak Inc., Northern Manitoba Sector Council, and Marcel Colomb First Nation	• Education and training • Employment opportunities	• Chapter 13 (Section 13.1.2, 13.3, 13.4)
Schools and Academic Organizations				
West Lynn Heights School	Several dates between October 22, 2015 and May 4, 2017	Meetings, email correspondence, presentations at school, career fair presentation, site tour for students	• General Project information • Employment opportunities • Education • Community involvement	• Chapter 2 (Section 2.3) • Chapter 13 (Section 13.1.2, 13.3 and 13.4) • Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 3 (Section 3.3)

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Northern Manitoba Mining Academy	November 20, 2015	Meeting at the Manitoba Mining and Minerals Convention	• Community engagement • Education • Employment opportunities	• Chapter 3 (Section 3.3) • Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Frontier School Division	January 13, 2016	Presentation given at the Frontier School Division career fair to discuss future career opportunities in exploration and mining to students in grades 4 to 8	• Education • Employment opportunities	• Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Frontier School Division	October 5, 2016	Meeting with Frontier District School Board to discuss educational program opportunities.	• Education • Employment opportunities	• Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Atoskiwin Training and Employment Centre (ATEC)	October 10, 2017	Meeting to discuss ATEC's capabilities and opportunities for Indigenous peoples	• Education and training • Employment opportunities • Workforce accommodations	• Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Atoskiwin Training and Employment Centre (ATEC)	October 12, 2017	Meeting to discuss opportunities related to workforce accommodations	• General Project information • Education and training • Employment opportunities • Workforce accommodations	• Chapter 2 (Section 2.3) • Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Atoskiwin Training and Employment Centre (ATEC)	October 19, 2017	Meeting and tour of ATEC with Alamos and Nisichawayasihk Cree Nation	• Education and training • Employment opportunities	• Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
	November 15, 2017	Telephone call followed by meeting	• Education and training • Employment opportunities • Housing	• Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
	January 8, 2019	Meeting with ATEC and Nisichawayasihk Cree Nation regarding potential partnership and opportunities	• General Project information • Community engagement • Education and training	• Chapter 2 (Section 2.3) • Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
	February 8, 2019 and March 5, 2019	Email from Alamos to schedule a meeting for Project update and to discuss business opportunities	• General Project information • Business opportunities	• Chapter 2 (Section 2.3) • Chapter 14 (Section 14.1.2, 14.3 and 14.4), Chapter 13 (Section 13.1.2, 13.3 and 13.4)
	September 7, 2019	Text message from ATEC requesting information	• General Project information • Business opportunities	• Chapter 2 (Section 2.3) • Chapter 14 (Section 14.1.2, 14.3 and 14.4), Chapter 13 (Section 13.1.2, 13.3 and 13.4)

Table 3-9 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Means of Engagement	Key Topics	How the Comment was Considered in the Final Environmental Impact Statement and Proposed Mitigation Measures
Towns/Municipalities				
Town of Flin Flon	January 24, 2017	Telephone call with representative of the Town of Flin Flon to discuss employment opportunities for the Town	• General Project information • Business opportunities • Employment opportunities	• Chapter 2 (Section 2.3) • Chapter 14 (Section 14.1.2, 14.3 and 14.4) • Chapter 13 (Section 13.1.2, 13.3 and 13.4)
City of Thompson	October 24, 2017	Meeting with the City of Thompson, Vale, and Norwest Manufacturing to discuss employment opportunities	• Employment opportunities	• Chapter 13 (Section 13.1.2, 13.3 and 13.4)
Community of Brochet	July 19, 2019	The Community of Brochet participated in a meeting hosted by the Northwest Manitoba Community Futures Development Corporation where Alamos presented	• General Project information • Community Engagement	• Chapter 2 (Section 2.3) • Chapter 3 (Section 3.4)
Town of Leaf Rapids	July 19, 2019	The Town of Leaf Rapids participated in a meeting hosted by the Northwest Manitoba Community Futures Development Corporation where Alamos presented	• General Project information • Community engagement	• Chapter 2 (Section 2.3) • Chapter 3 (Section 3.4)
	September 9 and 13, 2019	Telephone calls with the Mayor of Leaf Rapids to discuss the Project	• General Project information	• Chapter 2 (Section 2.3)

3.4.4.1 Business/Economic Stakeholders

Engagement with businesses and other economic stakeholders generally focused on an interest in Project information, and business and employment opportunities. Concerns were raised about potential impacts to groundwater downstream of the Project and plans for water monitoring, and inquiries were made on tailings pond management.

Interest was expressed by an unnamed local business owner to organize a citizens' committee for collaboration between organizations, and to facilitate fundraising initiatives for youth and community programs.

Following discussions with the Secretary/Treasurer of the Town of Lynn Lake Chamber of Commerce, Alamos provided sponsorship for the annual fishing derby which took place on June 27, 2015.

Alamos met with a representative of the Green Water Group at the Government of Manitoba's Mineral Resources Open House on November 9, 2015 and discussed a collaboration to provide training and employment opportunities for the community.

Several meetings were held with Alamos and drilling companies to discuss general Project information and business opportunities for drilling programs required for the Project. Additional meetings were held with Alamos and Dorado Drilling on August 26, 2016, and October 5, 2016, that included representatives of the Marcel Colomb Development Corporation and the Frontier School Division, respectively, at each meeting. At the August 26, 2016 meeting, discussions were had on drilling plans for the 2016 season, the current state of the Environmental Committee, and plans for future communication. At the October 6, 2016 meeting with Alamos, Dorado Drilling and the Frontier School Division, interest was expressed by Alamos in becoming more involved in establishing programs at the school that would enhance employment opportunities for youth.

A meeting was held on October 24, 2017, with representatives from Alamos, Vale, Norwest Manufacturing, and the Town of Thompson to discuss employment opportunities, life skills training, and workforce readiness.

3.4.4.2 Development Corporations

Alamos met with the Northwest Manitoba Community Futures Development Corporation on May 3, 2019, to discuss available grants for start-up businesses in northern Manitoba and challenges associated with the program. Creation of a citizens' committee was also discussed to formalize collaboration and facilitate fundraising for community programs. On July 19, 2019, Alamos was invited by the Northwest Manitoba Community Futures Development Corporation to present the Project at a board meeting. Communities sitting on the board included representatives from Council of the Community of Brochet, Barren Lands First Nation (Brochet Reserve), Community of Leaf Rapids, Marcel Colomb First Nation, Granville Lake, and O-Pipon-Na-Piwin Cree Nation. Alamos discussed plans to share Project updates and encouraged leadership to communicate the shared information to their community members and to relay potential questions and concerns back to Alamos.

3.4.4.3 Local Services

A telephone interview was conducted on September 2, 2015, with the Detachment Commander of the Lynn Lake RCMP to obtain information on police services and public security in Lynn Lake. The RCMP Detachment Commander indicated that the Project may benefit Lynn Lake by providing business opportunities, employment, and an increased tax base for services. Although employment opportunities for local people would be a benefit of the Project, concern was raised that an influx of income for some people could result in an increase of substance abuse and violence.

A telephone interview was conducted on August 18, 2015, with the Manager of the Lynn Lake Hospital and Leaf Rapids Health Centre to obtain information related to health services and facilities. The Manager noted that the arrival of project workers and their families would increase employment opportunities for health care services; however, may also increase stress on the health care clinic, emergency room and housing, and create social pressures associated with alcohol and drug use.

A meeting was held on November 11, 2016, with Manitoba Hydro to discuss requirements for power supply upgrades and a new power line to the MacLellan site, including the scoping process, schedule, estimated timelines to complete surveys, construction, and cost estimates. A meeting was held on June 20, 2017, with Alamos, Manitoba Hydro, and the Mayor of Lynn Lake to discuss the proposed power line and routing preferences.

Stantec contacted the Town of Lynn Lake on November 21, 2019, to discuss infrastructure and services including housing and temporary accommodations, recreation, health care, police and emergency services, transportation, solid waste management services, and water and wastewater services. The Chief Administrative Officer responded with information regarding the vacancy rates for housing and accommodations and information on water and sewer infrastructure.

3.4.4.4 Non-Governmental Organizations

Alamos met with the Lynn Lake Friendship Centre manager in November 2016 to discuss current and upcoming projects to benefit the community, including the Tiny House Project, 4H Program, Training and Employment Program, and Hot Lunch Program. Alamos met with a local Métis representative of the Lynn Lake Friendship Centre to discuss traditional land use of the Métis in the Lynn Lake area.

A meeting was held on August 20, 2019 with Alamos, Chief and Council of Marcel Colomb First Nation, and members of Manitoba Keewatinowi Okimakanak Inc. to discuss employment and training opportunities for the Project and the Participation Agreement (e.g., Impact Benefit Agreement or similar). The need for a Community Liaison to mentor trainees and employees was identified, as well as establishing a database to track training completed. Follow-up meetings were held on September 12 and October 7, 2019, with Alamos, the Aboriginal liaison of the Northern Manitoba Sector Council, Chief and Council of Marcel Colomb First Nation, and a mentor coach with Manitoba Keewatinowi Okimakanak Inc. to discuss training initiatives and employment opportunities for members of Marcel Colomb First Nation. The Northern Manitoba Sector Council and Manitoba Keewatinowi Okimakanak Inc. noted their experience with similar types of training initiatives as those proposed and, as such, would act as program coordinators. The proposed training program would be implemented in two phases: one for exploration-specific employment and one for potential mining operations.

3.4.4.5 Schools and Academic Organizations

Several meetings were held with Alamos and representatives of West Lynn Heights School between April 22, 2015, and May 4, 2017, to discuss education and student employment opportunities associated with the Project. On October 22, 2015, Alamos met with teachers and students at West Lynn Heights School for a site tour with the outdoor education class comprising grade 11 and 12 students. The site tour included a visit to a groundwater monitoring well where the class learned how to pump a well. The class saw a headframe at the MacLellan property, and discussed groundwater theory and basic hydrogeology. In-class discussion following the site tour included the importance of groundwater and potential effects of a mining operation on groundwater. Discussion also involved potential career opportunities related to mining and exploration, as well as career options in environmental assessment and remediation. On December 4, 2015, Alamos and members of the Marcel Colomb Development Corporation gave a presentation to students at the West Lynn Heights School career fair to provide a Project overview and discuss aspects of the feasibility study. Additional events included a career fair presentation at the Frontier School Division Career Fair to grades 4 to 8 on January 13, 2016, and additional career presentation to grades 7 to 12 on May 2, 2017 (Section 3.3.5.1).

A meeting was held with Alamos and the Administrative Officer for the Northern Manitoba Mining Academy at the Manitoba Mining and Minerals Convention on November 20, 2015. During the meeting, discussion included community outreach and engagement, and potential funding opportunities for educational and training programs offered by the province.

The ATEC expressed interest in business and training opportunities to integrate Indigenous trades training as part of the workforce for housing construction. Alamos toured the ATEC in October 2017 with members of the Centre and the Chief of Nisichawayasihk Cree Nation. Nisichawayasihk Cree Nation wanted to be incorporated into a partnership to build workforce accommodations for the Project through ATEC's training programs.

3.4.4.6 Towns/Municipalities

A telephone call was had between Alamos and a representative of the Town of Flin Flon on January 24, 2017, to discuss ways to collaborate or be involved in business opportunities associated with the Project. A discussion was also had on employment opportunities and the potential of having a career fair in Flin Flon. Alamos indicated that the initial focus would be on local employment, but that regional opportunities would likely be available. A suggestion was made by the Town to establish bus transportation for employees during rotational changes.

The Town of Leaf Rapids and Community of Brochet participated in a meeting on July 19, 2019, hosted by the Northwest Manitoba Community Futures Development Corporation where Alamos presented. The meeting details are discussed above in Section 3.4.4.2.

3.4.4.7 Public

2015 Public Open House

The first public open house was held on March 25, 2015, in Lynn Lake. This open house was attended by 42 individuals. Of the 42 recorded attendees at the open house, 16 (38%) attendees completed the questionnaire. None of the 16 respondents self-identified as members of Marcel Colomb First Nation. In general, the questions, comments and concerns identified on the questionnaires completed at the 2015 Open House pertained to:

- Opportunities for employment and economic development in local communities.
- Opportunities for education/training, employment, and engagement specifically for members of Marcel Colomb First Nation.
- The status and results of environmental baseline studies.
- Potential Project-related effects on water quantity and quality, soil quality, wildlife, traplines, human health, and community services and infrastructure.
- Site remediation.
- Potential accidental events.

The following topics were rated 'very important' in the opinions of more than 60% of the respondents from the 2015 questionnaire:

- Tailings and mine rock management (94%)
- Wildlife and fish habitat (94%)
- Employment (75%)
- Surface water and groundwater (75%)

2016 Public Open House

Seventy people were recorded in total as attendees at the second open house held on April 26, 2016, in Lynn Lake. Most attendees (45 individuals, or 64% of attendees) noted on the sign-in sheet that they lived in the Town of Lynn Lake; however, 14 (20%) of the attendees did not indicate where they lived. Eleven (16%) of the attendees self-identified as members of Marcel Colomb First Nation on the sign-in sheet.

Thirty-three people (47% of the 70 recorded attendees) completed the questionnaire at the 2016 Open House; 15 (45%) of the respondents indicated that they had also attended one of the previous open houses. Eight (24%) of the 33 respondents self-identified as members of Marcel Colomb First Nation. In general, the questions, comments and concerns identified on the questionnaires completed for the 2016 Open House pertained to:

- Opportunities for employment and economic development in local communities.
- Opportunities for education/training, employment, and other benefits specifically for members of Marcel Colomb First Nation.
- Accommodation concerns for workers.

- The importance of ongoing engagement.
- Tailings containment.
- Potential Project-related environmental effects on water, fish and fish habitat, wildlife, vegetation, human health, local housing, and Marcel Colomb First Nation/Black Sturgeon Reserve.

For the questionnaires completed in 2016, the following topics were rated 'very important' in the opinions of more than 60% of respondents:

- Wildlife and fish habitat (91%)
- Tailings and mine rock management (85%)
- Surface water and groundwater (79%)
- Plants (76%)
- Air quality (73%)
- Employment (67%)
- Contracts and business opportunities (64%)
- Training and job skills (64%).

2017 Public Open House

There was a total of 53 recorded attendees at the third open house held on May 1, 2017, in Lynn Lake. As noted on the sign-in sheet, most attendees (28 individuals, or 53% of attendees) lived in the Town of Lynn Lake; however, 13 (25%) of the attendees did not indicate where they lived. Nine (17%) of the attendees self-identified as members of Marcel Colomb First Nation on the sign-in sheet; two of these individuals also indicated on the sign-in sheet that they lived in Lynn Lake. Five (9%) of the attendees indicated on the sign-in sheet that they lived in other areas (e.g., Churchill River Lodge, Manitoba; Montreal Lake, Saskatchewan; Prince Albert, Saskatchewan; and Thompson, Manitoba).

Of the 53 attendees at the third open house in May 2017, a total of 37 people (70%) completed the provided questionnaire; 13 (35%) of these people indicated that they had also attended one of the previous open house sessions. The 2017 questionnaire was more detailed than the previous questionnaires used for the 2015 and 2016 Open House meetings. Twenty-three (62%) of the 37 respondents indicated that they lived in Lynn Lake, and three (8%) responded "yes" to owning property near the Project. Thirteen (35%) of the respondents self-identified as Indigenous, representing Marcel Colomb First Nation, O-Pipon-Na-Piwin Cree Nation, and Cross Lake First Nation.

Fishing was identified as the activity conducted by the highest percentage (51%) of respondents, followed by boating (49%), gathering (46%), hunting (41%), snowmobiling (35%), and trapping (30%). Activities not listed, but mentioned by respondents, included hiking (8%), tourism (5%), employment (5%), swimming, outfitting, and camping (each 3%). Areas in which respondents are conducting these activities include Berge Lake, Cockeram Lake, Barrington Lake, Zed Lake, Hughes River, Churchill River, Fox Mine Road, PR 391, PR 397, Black Sturgeon Reserve, and the general vicinity of the MacLellan site, Gordon site, and Lynn Lake.

In general, the questions, comments and concerns identified on the questionnaires completed for the 2017 Open House pertained to:

- Opportunities for employment and economic development in local communities
- Opportunities for improved housing or other benefits specifically for local First Nations communities
- Project infrastructure
- The results of environmental baseline studies
- Potential Project-related effects on the local economy, community services, and infrastructure
- Potential Project-related effects on the current use of lands and resources for traditional purposes by Indigenous peoples

More than 60% of respondents that participated in the 2017 questionnaire rated the following topics as ‘very important’:

- Surface water and groundwater (86%)
- Community health (81%)
- Wildlife and fish habitat (81%)
- Tailings and mine rock management (73%)
- Plants (68%)
- Air quality (65%)
- Employment (65%)
- Training and job skills (65%)

When asked to list various environmental aspects in order of importance (in the 2017 questionnaire only), surface water and groundwater was ranked as the most important aspect by the highest percentage (33%) of respondents, while wildlife and fish habitat was ranked the most important by the second highest percentage (27%). The environmental aspect identified as second most important by the highest percentage of respondents was wildlife and fish habitat (31%). The environmental aspect identified as third most important by the highest percentage of respondents was evenly split between community health, contracts and business opportunities, training and job skills, and increased traffic (each 13%).

2020 Public Open House

There were 46 recorded attendees at the fourth open house held on February 4, 2020, in Lynn Lake. Of the attendees, 36 individuals (78%) indicated that they lived in the Town of Lynn Lake, while 4 individuals (9%) did not indicate where they were currently live. Two individuals (4%) identified that they were from Marcel Colomb First Nation and the remaining 4 attendees (9%) indicated they were from other communities including Pukatawagan, The Pas, Leaf Rapids, and Opaskwayak Cree Nation.

Of the 46 attendees who signed in at the open house, 25 individuals (54%) completed the provided questionnaire (Appendix 3A). Of the respondents, 12 (48%) indicated that they heard about the event via advertising/mailouts, nine (36%) indicated that they heard about the event via word of mouth, and two individuals (8%) indicated that they heard about the event via social media.

Of the respondents, 13 (52%) indicated that they attended a previous open house for the project (2015-2017), 10 respondents (40%) indicated that they have not attended a previous open house and 2 did not respond. The majority of respondents (24 individuals; 96%) indicated that they live in the Lynn Lake area and three (12%) indicated that they own property near the Project.

Boating was identified as the most frequently conducted activity by respondents in the questionnaire with a total of 19 responses (76%). Other frequently conducted activities included fishing (15 responses; 60%) and snowmobiling (13 responses; 52%) and gathering (12 responses; 48%), followed by hunting (9 responses; 36%) and trapping (8 responses, 32%). Areas in which respondents indicated they are conducting these activities include Berge Lake, Marcel Colomb First Nation, Hughes Lake/River, Eden Lake, Hanson Lake, Matriach Lake, Chepil Lake, Dunphy Lake, Cockeram Lake, McGavock Lake, Cartwright Lake, Fox Road, Highway 391 Area, Berg Lake/River, Laurie River Lake, Newton Lake, Snare Lake, Moose Lake, Hanson Lake, Simpson Lake, Swede Lake, and McVeigh Lake.

Additional comments and concerns from respondents included positive comments; for example, “good division of topics/categories”, “appreciated being able to address questions”, and “well done”. One respondent commented “Environmentally yes, our Land that the creator gifted Indigenous Nation is sacred. It is always a worry. We thrive off the Land, it is our temple that eases our Mental, Spiritual, Emotional and Physical Health.” Other questions raised were with respect to the headframe being destroyed, possibility of relocation, and what minerals are being found. Responses were provided to questionnaire respondents who requested follow-up and provided contact information in April 2020.

3.4.4.8 Summary of Key Issues

Key issues and concerns identified during the stakeholder and community engagement activities undertaken to date are summarized in Table 3-10 and categorized by valued component (VC). Responses to concerns and information on how the issue has been addressed in the EA can be found in the respective VC chapter.

Table 3-10 Summary of Key Issues from Public and Stakeholder Engagement

Valued Component	Key Issues/Concerns
Economy and Employment (Chapter 13)	Employment and economic development opportunities in local communities. Economic exit plan to reduce local effects.
Community Services, Infrastructure, Wellbeing (Chapter 14)	Housing shortage in Lynn Lake; accommodations/camps for workers. Effects on community services and infrastructure (municipal landfill, water, and wastewater). Infrastructure proposed on PR 391.
Groundwater, Surface Water (Chapters 8 and 9)	Clean water and resource protection. Impacts to groundwater downstream of the Project and plans to monitor those respective waterbodies.
Fish and Fish Habitat (Chapter 10)	Sturgeon and whitefish habitat and population decline. Effects to fish quality.
Wildlife and Wildlife Habitat (Chapter 12)	Presence of moose and bears in the Project area. Effects on wildlife and wildlife habitat.
Vegetation and Wetlands Chapter (11)	Effects on vegetation.
Human Health, Community Services, Infrastructure, and Wellbeing (Chapters 18 and 14)	Effects to wildlife, fish and plants linked to human health. Influx of income for some people could result in increased substance abuse and violence. Greater demand on health care clinic, emergency room and housing may create social pressures associated with alcohol and drug use.
Current Use of Lands and Resources for Traditional Purposes (Chapter 17)	Effects on the current use of lands and resources for traditional purposes by Indigenous peoples.
Indigenous Peoples (Chapter 19)	Opportunities for local First Nations communities including education, training, and employment. Marcel Colomb First Nation/Black Sturgeon Reserve community services, infrastructure, and housing.
Other (For example, Project Description) (Chapters 2 and 22)	Proposed infrastructure at the Project site. Management of potential accidental events. Tailings disposal and containment.
Other (For example, Project Description) (Chapters 2 and 23)	Proposed site remediation activities.

3.4.5 Ongoing and Proposed Stakeholder and Public Engagement Activities

Proponent-led stakeholder and public engagement has been ongoing throughout the EA process and will continue for the duration of the Project. It is understood that there will also be several additional government-led engagement opportunities during the federal and provincial EA processes (e.g., public review and comment periods for EA-related documents).

Alamos is committed to open and transparent engagement throughout the life of the Project and recognizes that ongoing engagement is critical to making the Project successful. A public open house was held in Lynn Lake in February 2020 to provide a Project update and outline the results of the EA. Additional public open houses may be held as the Project progresses. The dedicated Project email will be maintained as a means of communication to provide information to the stakeholder distribution list and to accept inquiries from stakeholders. Alamos maintains a local office/presence in Lynn Lake that facilitates ongoing communications with members of the local community. Alamos welcomes members of the community to drop in during office hours to obtain information, provide comments, and ask questions relating to the Project. An office will remain open during Project operations. Thresholds or events that would trigger engagement in the future may include changes in mine design or construction/operation/decommissioning schedules.

3.5 REGULATORY ENGAGEMENT

3.5.1 Objective and Approach to Regulatory Engagement

Alamos took a proactive approach to resolve regulatory issues and concerns, and to verify technical requirements in a collaborative manner with federal and provincial regulatory agencies. The objectives of the regulatory engagement process are to provide information needed by regulators to understand the proposed Project and its potential effects; seek information from regulators about potential adverse effects and applicable regulatory requirements to study those effects; to develop solutions to regulatory concerns; and to verify conformance with regulatory guidelines through regular lines of communication.

3.5.2 Identification of Relevant Regulatory Authorities and Jurisdictions

The Project is subject to various federal, provincial, and municipal legislative and regulatory requirements. The regulatory authorities that administer those requirements are expected to have an interest in the Project, as is the local government of the Town of Lynn Lake (Table 3-11).

Table 3-11 Relevant Regulatory Authorities and Jurisdictions

Federal Government	Provincial Government	Municipal Government
• Canadian Environmental Assessment Agency (now IAAC) • Environment and Climate Change Canada • Fisheries and Oceans Canada • Health Canada • Natural Resources Canada • Indigenous Services Canada	• Manitoba Growth, Enterprise, and Trade (now Manitoba Agriculture and Resource Development) • Manitoba Indigenous and Northern Relations • Historic Resources Branch of Manitoba Sport, Culture, and Heritage • Manitoba Sustainable Development (now MCC) • Workplace Safety and Health of Manitoba Finance	• Town of Lynn Lake

3.5.3 Regulatory Engagement Methods

Alamos has conducted regulatory engagement activities, including telephone calls, email communications, in-person meetings, and presentations. Alamos' Manager of Environment and Community Relations maintains an active presence in the Town of Lynn Lake and regularly engages with the local representatives. Members of the Proponent Team have supported these engagement efforts, where appropriate.

3.5.4 Regulatory Engagement Results

Appendix 3E summarizes regulatory engagement activities undertaken to date by Alamos. This table is not intended to represent a complete list of regulatory engagement activities (e.g., does not include informal meetings and all written correspondence and telephone calls).

3.5.4.1 Summary of Key Issues

Key issues identified and discussed during the regulatory engagement activities undertaken to date have pertained to:

- The provincial requirement to obtain separate licenses under *The Environment Act* for the Gordon and MacLellan sites.
- The importance of redesigning the TMF to avoid interactions with waters frequented by fish.
- The importance of proactively engaging the local First Nation community and other potentially affected Indigenous communities.
- The importance of local economic benefits, including job opportunities and youth summer work experience.
- The importance of using town housing in Lynn Lake (Chapter 14).
- The importance of fish and fish habitat offsetting requirements under the *Fisheries Act* (Chapter 10).
- The importance of caribou habitat, including discussions regarding the baseline studies, whether offsetting is required, and the potential effect on Critical Habitat (Chapter 12).
- The regulator review of air quality and the planned approach to air dispersion modelling for the Atmospheric Environment (Chapter 6).
- The identification of the potentially affected or interested Indigenous communities (Section 3.3.2).
- The proper documentation of areas of heritage value at the mine sites prior to demolition (Chapter 16).

With respect to the provincial requirement to obtain separate licenses under *The Environment Act* for the Gordon and MacLellan sites, the Environmental Approvals Branch of MCC advised (during a meeting with the Director of the Mines and Geological Survey, representatives from MCC, and representatives of the

Proponent Team on May 3, 2017) that it considers proposed Project activities at the Gordon and MacLellan sites to be distinct "developments" under *the Act*. Separate provincial licenses will therefore be required for each site. MCC also indicated that one EIS may be submitted, but it must be accompanied by separate Environment Act Proposals for each site. The separate Environment Act Proposals will summarize the Project activities, environmental effects, and mitigation for each site, with reference to the core information in the EIS.

With respect to the importance of redesigning the TMF to avoid interactions with waters frequented by fish, Fisheries and Oceans Canada (DFO) and Environment and Climate Change Canada indicated (during a meeting with representatives of the Proponent Team on September 20, 2016) that the deposit of tailings, mine rock, drainage water, or other mine effluent into watercourses or waterbodies that are frequented by fish (including stickleback) constitutes introduction of a deleterious substance and is prohibited under the Metal and Diamond Mining Effluent Regulations (formerly the Metal Mining Effluent Regulations) pursuant to the *Fisheries Act* unless authorized by Environment and Climate Change Canada. It is understood that this policy applies whether or not the fish are part of or support a Commercial, Recreational, or Aboriginal fishery under the previous *Fisheries Act*. The regulators advised that the preliminary TMF design presented during that meeting would be expected to trigger a Schedule 2 amendment under the Metal and Diamond Mining Effluent Regulations, if not changed. In consideration of this regulatory guidance, the Proponent Team (Chapter 1, Section 1.2) subsequently re-designed the dam alignment for the east end of the TMF to avoid encroaching on the headwaters of two tributaries to Minton Lake that are frequented by fish. The currently proposed design of the TMF (including start-up and ultimate TMF infrastructure) does not overlap spatially with fish-bearing waters.

In August 2019, Alamos formally requested a paragraph 35(2)(b) *Fisheries Act* authorization from DFO for the "serious harm to fish" that will occur in the existing diversion channel at the Gordon site and in East Pond at the MacLellan site (discussed in Section 2.3.2.4, Chapter 2). Any *Fisheries Act* authorization will not be issued by DFO until after the CEAA decision on the Project.

With respect to proactively engaging potentially affected Indigenous communities, Alamos has its Environmental and Community Relations Manager based out of Lynn Lake. Twelve Indigenous communities have been contacted to discuss the potential effects (if any) of the Project on their community. Alamos continues to attempt to work with each of these communities to provide Project information, document issues and concerns, and work with interested communities to collect and document traditional knowledge and traditional land use information for the Project area as part of the environmental assessment and engagement process.

With respect to the importance of using town housing in Lynn Lake, a Workforce Housing Study was completed for Alamos in 2017 by Environmental Resource Management as part of the Feasibility Study. The change in housing and temporary accommodations is discussed in Chapter 14.

3.5.5 Ongoing Regulatory Engagement Activities

Regulatory engagement with government has continued throughout the EA process and will remain ongoing (on an as-needed basis) for the duration of the Project. It is understood that there will also be several government-led engagement opportunities during the federal and provincial EA processes (e.g., public review and comment periods for EA-related documents).

As a responsible corporate citizen, Alamos is also committed to providing Project and corporate updates to interested government officials, as appropriate.

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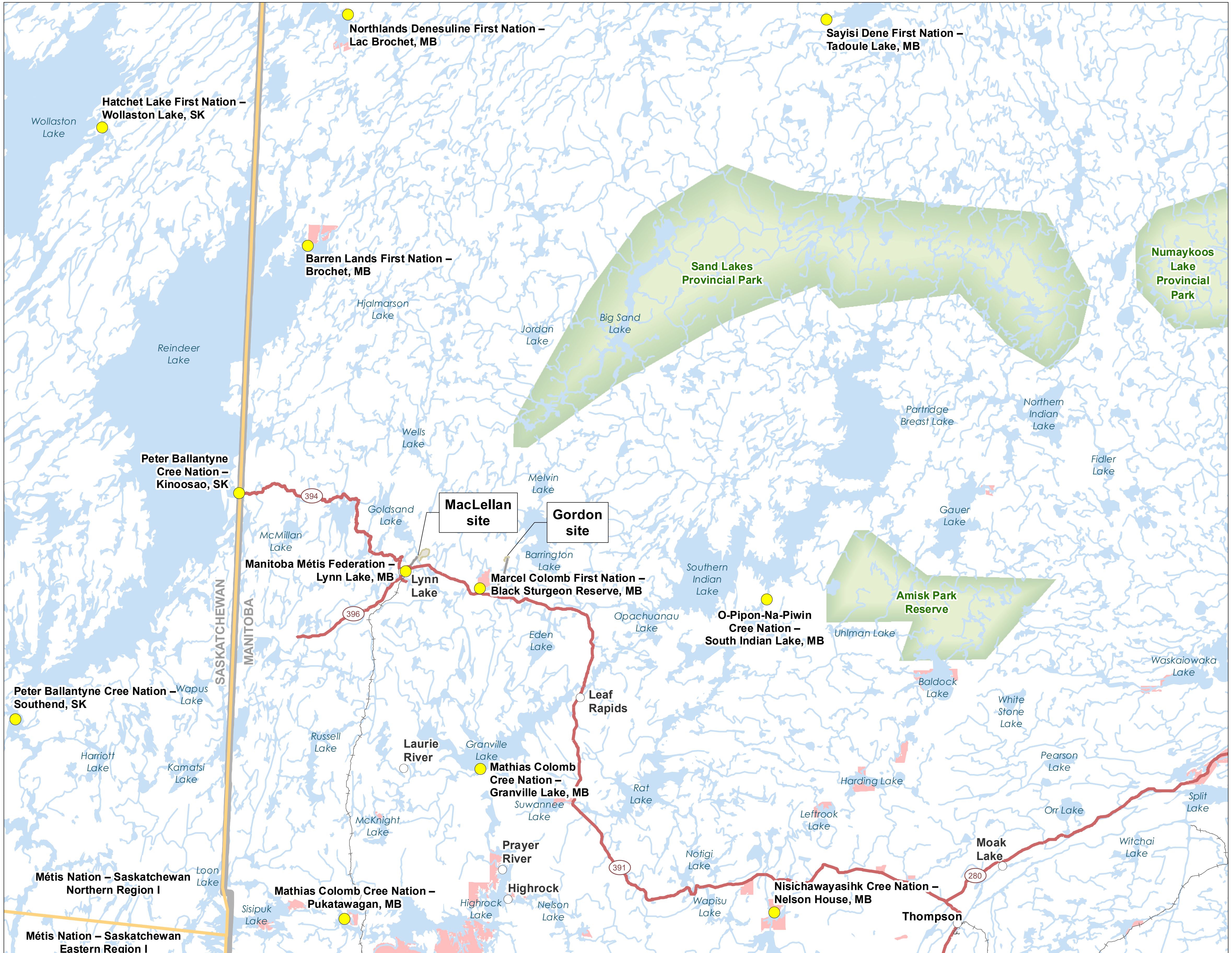

Stantec

Alamos Gold Inc.

Project Infrastructure

- Project Development Area

Communities

- Community
- Indigenous Community

Landbase

- Highway
- Access Road
- Rail
- Watercourse
- Waterbody
- First Nation Reserve
- Provincial Park
- Métis Nation - Saskatchewan Regions
- Provincial Border

N

0 20 40 Kilometres

(At original document size of 11x17)
1:1,400,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-08
Technical Review by AVanBuren on 2020-05-08
Senior GIS Review byGKroupa on 2020-05-11

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
3-1

Title
Community Locations Relative to the Project

Appendix 3A COMMUNITY ENGAGEMENT PLAN

ALAMOS GOLD INC.
LYNN LAKE

Community Engagement Plan

2020 (Version 1.0)

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1 Introduction

Alamos Gold Inc. (Alamos) is committed to open and transparent engagement throughout the life of the Lynn Lake Gold Project (the Project). Alamos' Manager of Environment and Community Relations maintains an active presence in the Town of Lynn Lake and regularly engages with local businesses and services. Engagement with communities that are potentially affected by the Project or identify a desire to start or continue to engage, will continue through the construction, operation, and decommissioning/ closure phases of the Project. This Community Engagement Plan is meant to document Alamos' plan for ongoing engagement in relation to the Project. The Community Engagement Plan is a forward-looking plan and living document intended to accommodate for potential change. As outlined herein, the engagement process is designed to be flexible to adapt to the needs and expectations of Indigenous communities, the public, and other community stakeholders. The goal is to continue to keep open lines of communication and facilitate conversations in regard to recording issues, concerns, comments, and recommended mitigations raised by communities, and to discuss and facilitate sharing of information as the Project progresses.

This engagement process is separate from the Crown-Indigenous consultation process to be initiated by the government with First Nations and Métis nations to inform Crown decisions about the Project.

2 Objectives and Principles of Engagement

Alamos is committed to engaging in an ongoing dialogue with potentially affected or interested Indigenous communities, the public, and other stakeholders regarding the proposed Project. Alamos strives to be respectful of local beliefs, culture, language, and all the defining features of a community including respect for local etiquette for engagement. Only through social engagement, participation, and support can Alamos succeed in understanding local challenges and priorities, and work towards building enduring relationships.

Alamos recognizes that there may be potential effects of the Project to the traditional territory of Indigenous communities and strives to develop an Environmental Protection Plan that respects and preserves the environmental integrity of those areas.

The objectives of the community engagement process are to:

- Provide the information needed by Indigenous communities, the public, and other stakeholders to understand the proposed Project and its potential effects, including updates to Project details and schedule.
- Demonstrate mutual respect, build trusting relationships, and have open communication with those potentially affected or interested in the Project.
- Listen with purpose and define strategies for facilitating meaningful engagement with potentially affected or interested Indigenous communities in a spirit of honesty, accountability, integrity and legality.
- Seek information from Indigenous communities about potential adverse effects on the exercise of Aboriginal and treaty rights and traditional lands and resources in order to limit or mitigate identified potential adverse effects.
- Address, to the extent possible, the concerns and issues raised by potentially affected or interested communities and work cooperatively to develop solutions to those concerns and issues.

3 Potentially Affected or Interested Communities

Based on the past six years of engagement, the current understanding of traditional lands located near, and/or downstream or downwind from proposed Project activities and components, the Project could, to varying degrees, potentially affect or be of interest to those communities outlined in Table 1 below (roughly ordered based on distance from the Project sites).

Table 1: Potentially Affected or Interested Communities

Community	Governance Representative	Contact Details	Approximate Distance between Project Mine Sites and Nearest First Nation Reserve or Métis Local Associated with Community (km)	
			Gordon	MacLellan
Marcel Colomb First Nation	Chief Christopher Colomb	PO Box 1150 Lynn Lake, MB, R0B 0W0 Phone: (204) 356-2439	12	24
Town of Lynn Lake	Mayor Jim Shortt	503 Sherritt Ave, Lynn Lake, MB R0B 0W0 Phone: (204) 356-2418	55	8
Manitoba Metis Federation	President David Chartrand	300-150 Henry Avenue Winnipeg, MB, R3B 0J7 Phone: (204) 586-8474	55 (local Lynn Lake office)	8 (local Lynn Lake office)
Town of Leaf Rapids	Chief Administrative Officer Kirk Glenday	General Delivery Leaf Rapids, MB, R0B-0P0 Phone: (204) 473-2436	55	76
Mathias Colomb Cree Nation	Chief Lorna Bighetty	PO Box 135 Pukatawagan, MB, R0B 1G0 Phone: (204) 553-2090 Granville Lake: Headman: Clarence Bighetty General delivery, Leaf Rapids, MB, R0B-0P0 Phone: (204) 473-6002	70	77
Nisichawayasihk Cree Nation	Chief Marcel Moody	General Delivery Nelson House, MB, R0B 1A0 Phone: (204) 484-2332	80	95
O-Pipon-Na-Piwin Cree Nation	Chief Shirley Ducharme	PO Box 139 South Indian Lake, MB, R0B 1N0 Phone: (204) 374-2271	90	120
Peter Ballantyne Cree Nation	Chief Peter A. Beatty	General Delivery Pelican Narrows, SK, S0P 0E0 Phone: (306) 632-2125	100	70
Barren Lands First Nation	Chief John Clarke	PO Box 40 Brochet, MB, R0B 0B0 Phone: (204) 323-2300	130	115
Town of Brochet	Mayor Norma Cook	Community of Brochet General Delivery Brochet, MB R0B 0B0 Phone: (204) 323-2114	130	115
Métis Nation – Saskatchewan Eastern Region 1	Director Ryan Lee Carriere	General Delivery Cumberland House, SK, S0E 0S0 Phone: (306) 609-0110	195	175

Community	Governance Representative	Contact Details	Approximate Distance between Project Mine Sites and Nearest First Nation Reserve or Métis Local Associated with Community (km)	
			Gordon	MacLellan
Métis Nation – Saskatchewan Northern Region 1	Director Earl Cook	PO Box 1647 La Ronge, SK, S0J 1L0 Phone: (306) 425-7530	380	350
Métis Nation - Saskatchewan	President Glen McCallum	Suite 201, 208-19th St W, Saskatoon, SK S7M 5X8 (306) 343-8285	see above	see above
Sayisi Dene First Nation	Chief Evan Yassie	General Delivery Tadoule Lake, MB, R0B 2C0 Phone: (204) 684-2022	200	195
Hatchet Lake Denesuline First Nation	Chief Bartholomew Joseph Tsannie	General Delivery Wollaston, SK, S0J 3C0 Phone: (306) 633-2003	205	185
Northlands Denesuline First Nation	Chief Simon Denechezhe	PO Box 120 Lac Brochet, MB, R0B 2E0 Phone: (204)337-2270	230	250
Chemawawin Cree Nation	Chief Clarence Easter	PO Box 9 Easterville, MB, R0C 0V0 Phone: (204) 329-2161	385	397

4 Engagement Methods

Over the past six years, Alamos has developed methods and tools that align to how individual communities have identified they would like to be engaged for the Project. Alamos will continue to distribute information to potentially affected or interested Indigenous communities, the public, and other stakeholders, and continue to maintain established open lines of communication between Alamos and the communities interested in engaging regarding the Project primarily in face-to-face meetings and by telephone but also with written correspondence (Table 2). The dedicated Project email, which was created as part of the engagement program, will be maintained as a means of communication to provide information and accept inquiries. Project information will also be provided on the company website: https://www.alamosgold.com/operations/development-projects/lynn-lake-canada/default.aspx.

Table 2: Ongoing Methods of Engagement

Method of Engagement	Details
Information Sharing	Letters mailed to potential affected or interested community's leadership.
Phone Calls	A representative for Alamos will keep in touch with communities and the interested public by telephone (including confirming receipt of any letters sent by mail requiring discussion).
Follow up Emails	Liaison by email where this is the preferred method of communication for ongoing engagement and/or to follow up on any letters sent. Emails may also be used in follow up to telephone/teleconference discussions (to confirm record of call).

Face-to-Face Meetings	Open invitation to request a meeting with project representatives as needed for ongoing engagement
Written Feedback	Logs of engagement will continue to be kept for the Project.

5 Engagement Documentation

To accurately document the engagement process, Alamos has maintained a detailed, up-to-date log of all engagement activities. As the Project proceeds, information gathered during ongoing community engagement will continue to be tracked by Alamos using the StakeTracker™ by SustaiNet information management software implemented at the start of the Project.

Key issues raised at engagement events (including meetings, workshops, and open houses) are recorded and categorized in a StakeTracker™ database, where details on who raised an issue, what that issue was, and how it was responded to are logged for reporting purposes, and referenced for future engagement.

As communities have chosen to share information that is confidential, Alamos has committed, and will continue to commit, to respecting that confidentiality and, only with approval from the community, will share information with others on a strictly confidential basis to protect the information from being shared with other potential users.

New information brought forward through engagement activities during the environmental assessment (EA) and permitting process will be incorporated into project planning and regulatory processes as appropriate. Alamos will review this new information against the results of the Environmental Impact Statement (EIS) and will provide the information to relevant regulatory agencies as supplemental filings.

6 Engagement and Project Timeline

The following table presents predicted tasks and proposed windows of time for completing each. The specifics of the schedules and activities depend on the results of engagement with each community.

Table 3: Proposed Ongoing Engagement Timeline

Task	Estimated Timeline	Comments
Follow up to Review of Draft Indigenous and Treaty Rights Assessment of the Lynn Lake Gold Project Environmental Impact Statement	July 2020 - September 2020	Follow up emails and telephone calls in addition to the May follow up emails to receive comments.
Mail out of February 2020 Open House information sheets to communities that did not attend with request for comments or questions	July 2020 - August 2020	Follow up emails and telephone calls in within one month of mail out.
Reschedule Open House with O-Pipon-Na-Piwin Cree Nation	July 2020 - TBD	Dependent on COVID-19 restrictions
Announcement of review period for EIS	July 2020 - August 2020	Mail out and email to each potentially affected community with details to access the EIS.

Task	Estimated Timeline	Comments
Ongoing communications with communities that wish to be on the mailing list	July 2020 – ongoing through life of project	Updates on design, schedules, employment, contract opportunities, ask if there are ongoing concerns or issues throughout the detailed engineering, construction, operation, and decommissioning phases.

7 Contact Details

The company website for Alamos Gold is: www.alamosgold.com.

Please feel free to contact us at any time if you have any questions or concerns regarding the company or the proposed project.

Alamos Gold Inc.

Paolo Toscano (Director - Projects) PToscano@alamosgold.com;
(647) 629-9605

Michael Raess (Manager, Environmental and Community Relations) MRaess@alamosgold.com;
(204) 356-2646

8 References

Alamos Gold Inc. (No date). *Community and Stakeholder Engagement*. Retrieved from Alamos Gold Inc. : http://www.alamosgold.com/sustainability/community-and-stakeholder-engagement/default.aspx

Appendix 3B COMMUNICATION SUMMARIES BY COMMUNITY

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
May 21, 2020	Glenn Laycock, executive director of the Northern Manitoba Sector Council (NMSC), Sharon Lidbetter of NMSC, Don Nisbet, Aboriginal Liaison Coordinator with NMSC, Freda Lepine ISET Program Coordinator for Manitoba Keewatinowi Okimakanak Inc. (MKO), and Stephanie Austin with MKO had a conference call with Michael Raess of Alamos regarding the training and employment program. On the call they discussed the need for a community meeting to present the program and illustrate the application and interview process and emphasize that the program will require commitment on behalf of the participants. They still require the demographics database from Marcel Colomb First Nation (MCFN) to determine who is available to participate. Michael Raess emphasized the need to support individuals that are not yet ready for the program.	Telephone - Sent	Northern Manitoba Sector Council, Manitoba Keewatinowi Okimakanak Inc.,
May 19, 2020, 01:00 PM	Chief Chris Colomb of the Marcel Colomb First Nation (MCFN) and council members Evelyn Sinclair, and Don McCullum, and Judy Sinclair-Moose, health program coordinator with MCFN had a teleconference with Michael Raess of Alamos regarding the filing of the Environmental Impact Statement (EIS) on May 25, 2020. The telephone conversation was cut off due to a power outage in Lynn Lake so Michael Raess followed up with an email summarizing items to discuss. Environmental Impact Study (EIS):- Did MCFN receive the federal funding to help with a 3rd party review? Michael Raess spoke with the federal representatives and they said they would reach out to you.- Alamos is planning to file/submit the EIS early next week. Again, as mentioned briefly on the call, this does not mean that you cannot give input anymore, but instead means that the official time to give input, ask questions and request clarifications starts. You will be able to review the entire EIS (the report) and give input. If there are any changes needed, we will amend more data to the report later.- When we file the EIS, this will trigger the start for the required Consultation process between MCFN and the federal government. The federal government will contact you regarding this process. Stantec Fieldwork:- Stantec is planning to do some maintenance field work (e.g., checking the wildlife cameras and conducting some spring fish surveys needed for the Department of Fisheries and Ocean (DFO). As they are coming from Winnipeg, we want to share the planned procedures with you (attached).- All field work is remote and either accessed via helicopter or through the sites – there will be no interaction with the community and Stantec has additional COVID-19 precautions in place. The Training and Employment Program with MKO and NMSC:- Meeting this Thursday.- We hope to find a solution to start the program soon but will have to balance the current COVID-19 situation and ensure everyone stays healthy and safe.- We would have loved to have community meetings to illustrate the training program to everyone in the community, but I am not sure how or when that would be happening due to the current COVID-19 situation. Alamos returning to Lynn Lake:- We are regularly talking to the Government and the Public Health officials to get updates on the current COVID-19 situation. We do not want to rush anything and ensure that if /when we come back we can mitigate any potential issues.- Once we find a way to proceed with a staged return, we would like to share this plan with you in advance to make sure that you are comfortable with our plan. Access to Lynn Lake:- What are the plans for you and the community? Do you have a predicted date that you will be opening up access to the reserve etc.?- Do you have any prediction when you would allow small in-person meetings? Impact Benefit Agreement (IBA): We hope to continue the IBA discussion.-Ongoing Engagement- Would it be OK to schedule a regular call to touch base regarding LLGP? DFO offset plan:- I would like to share with you our plan to offset fish habitat. The next Culture Day/Mental Health Day:- It would be great if we can hold our next culture day outdoors with lots of space once the COVID-19 restrictions are lifted. Summer youth plans:- In winter we talked about a youth program where a mentor would show them how to maintain a trail and establish portages from Hughes Lake into Swede and Simpson Lake.- Have you been able to explore this plan further or will this not be able because of COVID-19?"	Telephone - Sent	Marcel Colomb First Nation #328
April 28, 2020	Stantec on behalf of Alamos sent an information package to leadership of Marcel Colomb First Nation Chief and Council regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Marcel Colomb First Nation #328
April 02, 2020, 03:13 PM	Chief and Council of Marcel Colomb First Nation (MCFN) were contacted by Michael Raess of Alamos regarding an update on COVID-19. A notice regarding LLGP was attached to the email.	Email - Sent	Marcel Colomb First Nation #328
April 02, 2020, 03:01 PM	Chief Chris Colomb, Councillor Don McCallum, and Councillor Evelyn Sinclair of Marcel Colomb First Nation (MCFN) were contacted by Michael Raess of Alamos to ask if a regular conference call between Chief and Council and Alamos could be established as they were not longer not able to meet in person because of COVID-19.	Email - Sent	Marcel Colomb First Nation #328
March 19, 2020, 08:56 AM	Michael Raess of Alamos provided a public notice to Chief and Council indicating what Alamos Lynn Lake is doing regarding COVID-19. To ensure Social Distancing, we decided to shut down the site for at least a month. Michael Raess requested that Vernon Michelle keep him up to date during the COVID-19 outbreak with regards to MCFN. Michael Raess requested that the database work to continue. Michael Raess assumed that the training and employment meeting on April 3, 2020 and the Impact Benefits Agreement meeting on April 8, 2020 would be postponed. Michael Raess also requested the email address of the Chief's and Cory Hart.	Email - Sent	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
March 05, 2020, 01:00 PM	Vernon Michelle, community liaison for Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos stating that Chief and Council do not have time for the planned field trip on Friday March 6, 2020. Chief and Council want to organize something for the summer instead.	Telephone - Received	Marcel Colomb First Nation #328
March, 5, 2020, 12:00 AM	Michael Raess of Alamos contacted a community mental health worker for Lynn Lake/Leaf Rapids to discuss options to implement an additional hardship component to the training and employment program for Marcel Colomb First Nation (MCFN) through Northern Manitoba Sector Council (NMSC). They discussed the normal process one would go through in Lynn Lake and the options available for treatment including Alcoholics Anonymous, Medicine Lodges (8 week program), for-fee providers, and counselling (Winnipeg). It was suggested that phone sessions or secure online platforms for counselling is an option. The Lynn Lake Hospital could set up a room for this type of Telehealth technology.	Telephone - Sent	n/a
March 3, 2020	Don McCullum and Evelyn Sinclair, Councillors of Marcel Colomb First Nation (MCFN) met with Michael Raess and Vernon Michelle of Alamos to discuss next steps. Michael Raess announced that there is a conference in Thompson (April 1 to 2): "Linkages North: Tools for Economic Growth" that might be of interest to the Band leadership. Michael Raess will be attending. The conference is free and gets northern communities in one room to discuss current and future matters. Michael Raess would like to meet with MCFN in Thompson to discuss the training and employment program with new leadership. Chief and Council agreed to come to Thompson on April 3, 2020. Don McCullum talked about the Lands Management Program. MCFN wants to establish agreements that any business in the Community Interest Zone (CIZ) has to give the Band some kind of business opportunity. One idea leadership has is to get a contract from Manitoba Hydro to cut brush/trees along powerlines. They would want Manitoba Hydro to provide professional training. Michael Raess inquired about the status of the federal funding application to support MCFN during the Environmental Impact Statement (EIS) review. Chief and Council have sent a band council resolution (BCR) to the Impact Assessment Agency of Canada (IAAC) and is eligible for $65,000. Michael Raess asked about Youth funding for the summer programs. Chief and Council stated that NorthCo Management (NorthCo) should be looking for funding, but it is only for municipalities. Michael Raess asked if we can meet to discuss the Impact Benefits Agreement (IBA) April 8th, 2020 in Winnipeg. Chief and Council agreed that this will work. Michael Raess asked what the status is for the driver's training through Manitoba Keewatinowi Okimakanak Inc. (MKO). Evelyn Sinclair stated we have currently 16 students signed up, the instructor will come to the Band and Sarah is in the process of becoming a trainer herself. Michael Raess discussed issues regarding the tree cutting contract with MCFN. Vernon will be looking for additional personnel. Michael Raess suggested to have a field trip to the future mine sites and to the core shack to give new leadership a better understanding of what we are currently doing and to show how we have implemented the Elder Inspections. Michael Raess and Chief and Council agreed to go on Friday March 6, 2020 at 9:30 am. Michael Raess informed Chief and Council that Alamos has started to burn tree tops as per a request by the Elder during one of the Elder Inspections.	In-Person	Marcel Colomb First Nation #328
February 27, 2020, 10:00 AM	Marcel Colomb First Nation (MCFN) Elders completed field visits with Ron Avery of Alamos as part of the Environmental Monitoring program requested during the last quarterly meeting with MCFN. These field visits were for high disturbance activities including trenching, excavating, and drilling programs. The field visit on February 27, 2020 included visiting 6 drill locations: 20 MC-012, 20 MC-013, 20 MC-014, 20 MC-011, 20 MC-017, Foldnose Target Area, and K-New Area. All drill locations were near the MacLellan Site. Mush Sinclair indicated that MCFN does not have any concerns with the documented proposed activities. He also suggested to burn the tree tops when hand cutting to minimize brush pile sizes. Subsequently, Alamos started burning tree tops, which also helped with the temperatures and staying warm. A burn permit is not required prior to April 1. Alamos will coordinate further field visits as the work progresses.	In-Person	Basil Colomb, Marcel Colomb First Nation #328
February 26, 2020, 12:33 PM	Don McCullum, Councillor of Marcel Colomb First Nation (MCFN) and Evelyn Sinclair, Councillor of MCFN met with Michael Raess and Vernon Michelle of Alamos to discuss exploration activities. Alamos would like to minimize disturbances during the exploration drilling program and started to hand cut access roads and drill pads instead of using a dozer, which would have a greater impact and cause leaning trees. Because of this, Michael Raess asked MCFN leadership if they could provide cutters as a business opportunity. Alamos then would establish a Service Agreement.	Email - Sent	Marcel Colomb First Nation #328
February 13, 2020, 08:20 AM	Don McCullum, Councillor of Marcel Colomb First Nation (MCFN) met with Michael Raess of Alamos to discuss a request to help the MCFN apply for federal funding to review the environmental assessment (EA) process. Michael Raess contacted Jennifer Howe of the Impact Assessment Agency of Canada (IAAC) to initiate this process. Based on feedback from Jennifer Howe, Michael Raess emailed the information to Chief and Council. Chief and Council needs to send a band council resolution (BCR) indicating that MCFN is interested in the IAAC funding. The IAAC would allocate the funds. MCFN would also have to find out who has the technical experience/expertise to review all technical discipline chapters in the Environmental Impact Statement (EIS).	Email - Sent	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
February 10, 2020, 09:00 AM	Chief Chris Colomb and Council of the Marcel Colomb First Nation (MCFN) met with Michael Raess and Matt Osborne of Alamos for the Q1 Elder Committee to discuss the proposed Exploration scope. 1.) Discussion of the logistics for the cutter crew starting February 12, 2020.2.) Exploration Scope, associated Elder Committee and Elder field inspections. Eustache Sinclair would like to include youth during the field inspections. Chief and Council want to continue with the quarterly meetings and established process. 3.) On-ground contributions to be transferred to the trust fund. 4.) Chief and council indicate that the community liaison (Vernon Michelle) is a great resource. Chief and council hope to increase MCFN employment by having a MCFN member as the Community Liaison. Discuss MCFN providing a vehicle for the community liaison and charging mileage to Alamos. 5.) Exploration Agreement: Chief and council state that there is a need to prioritize MCFN members for employment. They stated that there are not many MCFN members currently hired by Alamos. Michael Raess indicated that Alamos is prioritizing MCFN member, but the candidates must be qualified. If there are two equally qualified and experienced applicants Alamos would give preference to a MCFN member. Alamos and MCFN have to continue with establishing training opportunities to build capacity. 6.) Impact Benefit Agreement (IBA): Michael Raess summarized the meetings between Chief and council (August 20, September 13, October 25, November 18). Chief and council agreed they can use a lawyer for the IBA, but there should be a third party advisor. Otherwise Alamos and MCFN can work on a draft IBA and MCFN will get a third party to review it. 7.) Education and Training Partnership: Michael Raess summarized the proposed program. Chief and council indicated that other Indigenous communities can take part of the program, but MCFN would have enough individuals to fit the criteria. Vernon Michelle is working on creating a comprehensive database and has planned to interview individuals to gain more details. 8.) Federal Funding for review of the Environmental Assessment Process: Chief and council would like Michael Raess to start the application process. 9.) Culture and Mental Health Day: Michael Raess gave a summary of the previous culture day. Chief and council would like to continue with the Culture and Mental Health days. 10.) Indigenous and Northern Initiatives Grant Program: Chief and council would like to access funding for this program. Potential program ideas include access to Chepil Lake (e.g., ATV trail),cabin(s) within the Reserve along the south shore for land-based training, or canoe portages to Chepil and/or Simpson Lake. 11.) Fisheries Improvement: Michael Raess asked if MCFN knew of any fisheries that need improvement. The Chief and council had no specific ideas. Follow - up: Michael Raess contacted the federal government to start the funding application for MCFN to have funding to participate in the Environmental Assessment process (item 8) and sent a draft Service Agreement for the cutting business opportunity. Elder committee meeting: No immediate flags were raised. All regional sites need further review once the exact drill hole locations are determined.	In-Person	Gabe Moose, Marcel Colomb First Nation #328
February 07, 2020, 12:00 PM	Judy Sinclair-Moose, employee of Marcel Colomb First Nation (MCFN), and Vernon Michelle, community liaison MCFN, met with Michael Raess of Alamos to discuss the database for the training and employment program. This database would assist with community member (MCFN) selection for future training programs and to know individual skills.	In-Person	Marcel Colomb First Nation #328
January 31, 2020, 06:33 PM	Don McCullum of Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos regarding the results of Thursday's January 30th election. The new council consists of: Christopher (Manch) Colomb - Chief, Celestine (Cory) Hart - Councillor, Donald McCallum (Donny) - Councillor, Evelyn Sinclair - Councillor. The new council will not be officially sworn in until midnight Friday January 31, 2020. However, come Monday February 3rd New Band Council Resolution will need to be made to document these changes. MCFN's term for council lasts 4 years.	Email - Received	Marcel Colomb First Nation #328
January 22, 2020	Marcel Colomb First Nation was sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the even to answer questions and provide information.	In-Person	Marcel Colomb First Nation #328
January 20, 2020	Glenn Laycock, Executive Director of the Northern Manitoba Sector Council (NMSC) contacted Michael Raess of Alamos regarding some preliminary funding details. The amount of funding available is $2.2 million, but includes all NMSC projects (4 locations) for 1.5 years. The LLGP is one of the approved projects for a part of this allocation. There is currently no project specific charter and a project specific amount is not available. Glenn Laycock indicated that he is hiring a project coordinator to commence with the project charter. Projects within are separately funded (e.g., upgrading for literacy and numeracy; learner driver's training). All components will be coordinated through the NMSC.	Email - Sent	Northern Manitoba Sector Council
January 20, 2020, 08:00 AM	Vernon Michelle, community liaison for Marcel Colomb First Nation (MCFN) met with Michael Raess and Matt Osborne of Alamos regarding her new position as the community liaison. Vernon Michelle is now an Alamos employee but can act as the cornerstone between MCFN and Alamos. The prior community liaisons were Judy Sinclair-Moose and Liz Martel. Leadership indicated in fall 2019 that they would like a separate person, other than Judy, who would also be mentoring and counseling MCFN members throughout employment. Vernon Michelle will also help directly with the training and employment program. He is responsible to finalize a comprehensive database which he has planned to interview individuals to gain more details about their skills.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
January 17, 2020, 11:44 AM	Judy Sinclair-Moose, Health Program Coordinator with the Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos indicating that MCFN have cleaned up financial inconsistencies with Manitoba Keewatinowi Okimakanak Inc. (MKO) and are now eligible to receive funding.	Text/SMS - Received	Marcel Colomb First Nation #328
January 14, 2020, 02:53 PM	Evelyn Sinclair, Acting Chief of the Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos indicating that MCFN Acting Chief and Council are ok with the 2020 Permit to go to the regulators.	Email - Received	Marcel Colomb First Nation #328
January 13, 2020	Glenn Laycock, Executive Director of the Northern Manitoba Sector Council contacted Michael Raess of Alamos indicating that the LLGP has been approved and confirmed as a project eligible to receive funding.	Email - Sent	Northern Manitoba Sector Council
January 08, 2020, 11:50 AM	Acting Chief Evelyn Sinclair and council of Marcel Colomb First Nation were contacted by Michael Raess of Alamos regarding the 2020 Work Permits and the Environmental Scope work permit. The environmental work that Stantec includes monitoring the groundwater quality, changing batteries on the wildlife cameras, and monitoring surface water quality. Alamos may have to do geotechnical drilling to assess the ground for potential bridges and will inform MCFN prior to any work as per the ongoing procedures (Elder meetings, etc.). Michael Raess asked if there were any concerns. With respect to the Exploration Scope Work Permit, Alamos is in the second year of the permit and is only renewing the permit. The band council resolution signed last spring is sufficient for this, but Alamos wanted to ask if there are any concerns. Alamos will continue to have meetings with MCFN and the Elders to showcase the next steps and discuss if any proposed work poses concerns.	Email - Sent	Marcel Colomb First Nation #328
January 8, 2020	Glenn Laycock, Executive Director of Northern Manitoba Sector Council (NMSC) was contacted by Michael Raess of Alamos clarifying that the Marcel Colomb First Nation (MCFN) Chief and Council election is January 30, 2020 and MCFN are scheduled to meet with Manitoba Keewatinowi Okimakanak Inc. (MKO). This may affect the timeline in which a band council resolution from MCFN can be obtained in regards to reaching out to other Indigenous communities if there are not enough eligible people in MCFN.	Email - Sent	Northern Manitoba Sector Council
January 7, 2020	Glenn Laycock, Executive Director of Northern Manitoba Sector Council (NMSC) met with Michael Raess of Alamos in Thompson, MB at the NMSC office to discuss the LLGP specific program. Glenn Laycock believes that it will be built with a focus on basic capacity building. Capacity building for MCFN will rely heavily on mental health assistance and essential and life skills curriculum. It is important for the province to understand that this is crucial to capacity building in the area. Mentoring trainees through the program is necessary and will likely require more expertise funded by the program. The technical program would likely be secondary and apply to current job opportunities through the exploration program. Marcel Colomb First Nation (MCFN) will complete a demographic database. In addition, Alamos may need a band council resolution from MCFN stating that Alamos can reach out to other Indigenous communities if there are not enough eligible people in MCFN. The technical program will be delivered through University College of the North (UCN) and will be built according to Alamos' specifications. The program is to start in March 2020. Prior to the beginning of the program a community meeting, assessments and interviews will be held.	In-Person	Northern Manitoba Sector Council
December 30, 2019	Glenn Laycock, Executive Direction of Northern Manitoba Sector Council (NMSC) sent an email to Michael Raess of Alamos regarding funding that NMSC has received from the Province of Manitoba. Glenn Laycock confirmed that LLGP is part of the funding.	Email - Sent	Northern Manitoba Sector Council
December 16, 2019, 01:00 PM	Glenn Laycock, Executive Direction of Northern Manitoba Sector Council (NMSC), Freda Lepine, Partnership Coordinate at Manitoba Keewatinowi Okimakanak Inc. (MKO) met with Michael Raess of Alamos and councillors of the Marcel Colomb First Nation (MCFN) to establish a training/educational partnership between MKO and MCFN. Michael Raess received a preliminary draft for the training/education partnership together with MKO and the NMSC. They established a to do list for December: -MCFN outstanding financial report from previous projects-MCFN eligible work force demographics-approval from Government for NMSC operating funding January 2020-meet to confirm funding and dates-send in project funding proposals (MKO/NMSC) February 2020-town hall meetings-set dates and run essential skills assessment-set dates for essential skills training-run class 5 driver training Misc. Activities:-work with Nelson House and their treatment center as possible support-wilderness training and opportunities for project.	In-Person	Marcel Colomb First Nation #328, Northern Manitoba Sector Council, Manitoba Keewatinowi Okimakanak Inc.
December 12, 2019, 10:00 AM	The first Cultural/Mental Health Day organized by Marcel Colomb First Nation (MCFN). Tribal Health brought two Elders to teach the Sweat Ceremony. There was a traditional feast at the end.	In-Person	Marcel Colomb First Nation #328
December 11, 2019, 11:00 AM	Three Elders of Marcel Colomb First Nation (MCFN) with Judy Sinclair-Moose, Health Program Coordinator, Sara Copapay, councillor and youth from MCFN met with Michael Raess and Dan Brisbin from Alamos for the quarterly Elder committee meeting. They discussed the upcoming exploration plans. Alamos illustrated areas where drilling could occur. Elders indicated that drilling should avoid the "Little Wing" block north of Pill Lake as it is an important moose hunting area. They are planning a field trip in January to the drill(s) and later to the core shack for a better understanding of the process.	In-Person	Marcel Colomb First Nation #328, Pickerel Narrows Cree Nation

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
December 06, 2019, 10:00 AM	An Elder for the Marcel Colomb First Nation (MCFN) and Ron Avery of Alamos completed an inspection of the drilling operations. They looked at one active drilling site, the pump shack set up, three completed drill hole set ups and an area where the cat broke through the muskeg, and a new trail get the rig off that site. Everything was clean and tidy. The Elder did not have any issues.	In-Person	Marcel Colomb First Nation #328
December 4, 2019	Chief and Council of Marcel Colomb First Nation (MCFN) was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and MCFN, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for MCFN to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	In-Person	Marcel Colomb First Nation #328
December 04, 2019, 11:00 AM	Michael Raess of Alamos emailed the Indigenous Communities regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and each community, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for each community to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Email - Sent	Marcel Colomb First Nation #328, Sayisi Dene First Nation, Nisichawayasihk Cree Nation, O-Pipon-Na-Piwin Cree Nation, Barren Lands First Nation, Hatchet Lake Denesuline First Nation, Northlands Denesuline First Nation
November 19, 2019, 03:00 PM	Judy Sinclair-Moose, Health Program Coordinator and Eustache Sinclair, Elder of Marcel Colomb First Nation (MCFN) with Michael Raess of Alamos took part on a panel discussion at the 2019 Central Canada Mining and Exploration Conference (CCME). The panel was moderated by Karen Mathers of Stantec. The title of the panel was "Practical Interactions: Industry and Indigenous Engagement." Abstract: In this panel session, Industry and Indigenous representatives will share their individual perspectives and experiences on the benefits of early engagement, the importance of dedicated individuals for engagement and liaison, and the traits of a good Community Liaison person. The panel will explore how to best start a conversation, and build from that a positive and trusting relationship. The value of education and training partnerships and the appropriate timing for agreements will also be discussed.	In-Person	Marcel Colomb First Nation #328
November 18, 2019, 01:00 PM	Judy Sinclair-Moose, Don McCullum, Sarah Copapay, Evelyn Sinclair, and Angel Castel, councillors of Marcel Colomb First Nation (MCFN) and Freda Lepine, Partnership Coordinator with Manitoba Keewatinowi Okimakanak Inc. (MKO) met with Michael Raess and Colin Webster of Alamos regarding the Impact Benefits Agreement (IBA). The focus was on ensuring that MCFN gets a third party to help the Band with the IBA and the Environmental Impact Statement (EIS). MCFN think that NorthCo can fulfill this role. They also discussed requirements for rock truck drivers; issues about criminal records; business opportunities; and, joint ventures (e.g., camp catering, cleaning, hauling, etc.). They also identified a youth summer training program, installing portages and maintaining trails from the Reserve to east of Gordon, which may also help with the issue of breaking the Gordon road access gate. There could be land based training for brush cutting, etc. Freda Lepine of MKO joined and gave some descriptions of the planned training and education program.	In-Person	Marcel Colomb First Nation #328, Manitoba Keewatinowi Okimakanak Inc.
November 15, 2019	Judy Sinclair-Moose of Marcel Colomb First Nation (MCFN) was contacted by Michael Raess of Alamos regarding applications for the community liaison job posting. Judy Sinclair-Moose has someone who is interested and she is in the process of getting their resume.	Text/SMS - Sent	Marcel Colomb First Nation #328
November 14, 2019, 10:35 AM	Marcel Colomb First Nation (MCFN) Elders completed field visits with Ron Avery and Michael Raess of Alamos as part of the Environmental Monitoring as requested during the last quarterly meeting with MCFN. Eight proposed drill locations were visited (PL 10-17) near the Gordon site. Elders had concerns or comments for the sites and Alamos took their feedback as mitigation measures that included moving sites; adjusting the location of sumps; building suitable barriers to avoid any deleterious substance entering a waterbody; and, hand cutting trees only where necessary. The Elders indicated that MCFN does not have any concerns with the documented/proposed activities if proper mitigation measures are implemented and no return water or other material enters adjacent waterbodies. Alamos will coordinate further field visits as the work progresses.	In-Person	Marcel Colomb First Nation #328
November 07, 2019, 11:00 AM	Judy Sinclair-Moose, Health Program Coordinator for Marcel Colomb First Nation (MCFN) and an Elder from MCFN met with Michael Raess of Alamos to discuss the Central Canada Mineral Exploration Convention (CCMEC) in Winnipeg, Manitoba. In addition they discussed the next Impact Benefit Agreement (IBA) meeting. Michael Raess stated that Alamos is to start a small drilling program before the new year and that he would like to bring the Elders on site on November 13, 2019. Michael Raess suggested the next Elder Committee meeting could be held on December 9 or 10, 2019. Michael Raess also identified that the education meeting between Manitoba Keewatinowi Okimakanak Inc. (MKO) and Northern Manitoba Sector Council (NMSC) has been delayed into December, but no date has been set as NMSC is awaiting funding from the province of Manitoba. Lastly, Michael Raess inquired about the job posting for the community liaison position. Judy Sinclair-Moose mentioned that she knows of one person that would be interested. Michael Raess committed to following up on November 12, 2019.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
October 25, 2019, 09:00 AM	Judy Sinclair-Moose, Health Program Coordinator, Don McCullum, 3rd Party Manager, and Sara Copapay of Marcel Colomb First Nation (MCFN) met with Colin Webster and Michael Raess of Alamos in Winnipeg to discuss the Impact Benefit Agreement (IBA). They discussed the Environmental section of the IBA including the importance of respecting the environment and understanding that all land is sacred and therefore should be protected. They also discussed mitigation measures, reclamation standards, and minimizing alterations to the environment. They spoke about the need for a "see and feel" component where MCFN community members are involved in the environmental committee and members get to see the mine for themselves. MCFN noted the importance of seasonality including harvesting/hunting and how they are impacted by the mine. In addition they suggested that Alamos ensures that all LLGP employees are informed about Indigenous communities and the impacts the mine can have on the community. They also discussed the need to create a community outreach program to include the entire community in discussions and update meetings. Lastly they discussed the need for a letter of support from MCFN as per the mining operation. The next meeting was scheduled for November 18, 2019.	In-Person	Marcel Colomb First Nation #328
October 11, 2019, 10:00 AM	An Elder of the Marcel Colomb First Nation (MCFN) completed a field visit as part of the Environmental Monitoring by MCFN, as requested during the last quarterly meeting. The field visit was required for a high disturbance activity at the McBride location. The Elder indicated that MCFN did not have any concerns with the documented/proposed activities.	In-Person	Marcel Colomb First Nation #328
October 10, 2019, 10:00 AM	Don McCullum, 3rd Party Manager; Evelyn Sinclair, Councillor; Judy Sinclair-Moose, Health Program Coordinator, and Angel Castel, Councillor of the Marcel Colomb First Nation (MCFN) met with Michael Raess of Alamos to discuss the three provided training programs and the best fit for current jobs. Michael Raess sent a summary of the findings to the training program facilitators. In addition, MCFN will start accessing funding to commence with Class 5 drivers' licenses, treaty cards and identification cards.	In-Person	Marcel Colomb First Nation #328
October 07, 2019, 01:00 PM	Council members from the Marcel Colomb First Nation (MCFN) and representatives from Manitoba Keewatinowi Okimakanak Inc. (MKO), Northern Manitoba Sector Council (NMSC), and Michael Raess of Alamos met to discuss the potential training/educational partnership with Alamos, MCFN, NKO and NMSC. It was determined that MCFN needs to complete the Database describing MCFN membership qualifications. It was emphasized that we have to incorporate an addition and hardship component. MNSC is drafting a proposal on options for training to MKO. Michael Raess is developing a list of required qualifications for current exploration positions. The next meeting was planned for November 5, 2019.	In-Person	Marcel Colomb First Nation #328, Northern Manitoba Sector Council, Manitoba Keewatinowi Okimakanak Inc.
October 3, 2019	Don McCullum, band manager of Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos regarding MCFN leadership. Priscilla Colomb has stepped down as Chief and Evelyn Sinclair is the Deputy Chief. There may be an early election.	Telephone - Received	Marcel Colomb First Nation #328
October 2, 2019	Don McCullum, band manager of Marcel Colomb First Nation (MCFN) was contacted by Michael Raess of Alamos regarding claim staking for exploration. Michael Raess shared the proposed claim delineation to ensure there was no conflict of interest (e.g., potential Treaty Land Entitlement land, traditional practices, sensitive areas, etc..). Don McCullum stated that MCFN has no qualms regarding Alamos' staking claims as long as we work together and we look at possible employment opportunities in the future. Michael Raess recommended sending new claim maps to MCFN's legal council to add to the Exploration agreement amendment and to add the new claims to the existing Work Permits in 2020, when the Work Permits have to be renewed.	Email - Sent	Marcel Colomb First Nation #328
September 27, 2019, 02:00 PM	Judy Sinclair-Moose (health program coordinator) , Evelyn Sinclair (Councillor), and Don McCallum (Band Manager) of the Marcel Colomb First Nation (MCFN) had a conference call with Michael Raess of Alamos and Karen Mathers of Stantec to discuss presenting and having a panel discussion at the 2019 Central Canada Mineral Exploration Convention in Winnipeg November 18-19, 2019. MCFN and Alamos would present on the importance of early engagement and positive relationship building.	Email - Sent	Marcel Colomb First Nation #328
September 25, 2019, 12:32 PM	Chief Priscilla Colomb and council of the Marcel Colomb First Nation (MCFN) were contacted by Michael Raess of Alamos regarding the September 10, 2019 Elder meeting. The Elders had indicated that the map created for sharing traditional knowledge was accurate and verified. Michael Raess asked if this verbal verification is sufficient and if they give Stantec the approval to incorporate to map into the Environmental Impact Statement. Don McCallum replied and stated that leadership approves the Elders decision and verbal verification is good.	Email - Sent	Marcel Colomb First Nation #328
September 17, 2019, 01:00 PM	Michael Raess of Alamos took representatives of the Chief, Council, and two youth from Marcel Colomb First Nation (MCFN) on a helicopter tour of the Gordon Site as an example of how Lynn Lake Gold Project (LLGP) might look after it was reclaimed. Michael Raess also showed them the diversion channel to discuss the Department of Fisheries and Oceans Canada (DFO) fish habitat offset requirements.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
September 16, 2019, 10:15 AM	Ron Avery of Alamos completed field visits with Elders of the Marcel Colomb First Nation (MCFN) as part of the environmental monitoring of the summer 2019 exploration program. The Elders were requested for high disturbance activities at 5 locations including Rushed Showing, K3 Extension, K-new, Powerline Showing, and Central Showing. The Elders indicated that MCFN did not have any concerns with the documented/proposed activities.	In-Person	Marcel Colomb First Nation #328
September 13, 2019, 09:00 AM	Colin Webster, VP, Sustainability and External Affairs for Alamos Gold Inc., Nils Engestad, VP, General Counsel for Alamos Gold Inc., and Michael Raess, Manger, Environment and Community Relations for Alamos Gold Inc., met with Evelyn Sinclair and Angel Castel, Council Members, Judy Sinclair-Moose, Employee, Don McCollum, third part manager, and Neil Duboff, Lawyer, all for Marcel Colomb First Nation, to continue the discussion with regards to the Impact Benefits Agreement for Marcel Colomb First Nation. Three components of the Impact Benefits Agreement were discussed:-Education/Training-Business opportunities-Cultural components. A discussion of the meeting the previous day of the proposed approach took place, but focused on the importance of having a pre-life skills/essential skills component that would deal with addiction and heart-ship issues. The requirement to have a mentor and Councillor assisting trainees and employees during as well as post training/education was emphasized. This position would be in addition to the Community Liaison. With regards to Business opportunities, opportunities were discussed to venture with other contractors and business (e.g., camp catering, heavy equipment, etc.) if there were no businesses in place and the importance to specialize in one aspect vs. trying to cover all aspects. It was evident that Marcel Colomb First Nation had an interest in exploring the transportation aspects including trucking, crew transportation, hotshot/courier services etc. This section would be mainly written by the lawyers. The third component was the cultural piece. Potentially building cabins along Hughes Lake was discussed. A work plan would be made for the next meeting, and a Project update was given. Workplace training was discussed for current and future positions. The Community Liaison position was discussed, which would also become the Councillor and Mentor of trainees and employees. Marcel Colomb First Nation was to create a database with which individuals had what training. The next meetings would separate training partnership discussions from the core Impact Benefits Agreement discussions. The Agreement would have 5-6 chapters including: Employment/Training; Business opportunities; Environment; Finances; Cultural Pieces (TLE); and Implementation Colin Webster emphasized that Impact Benefit Agreements would also be made with other communities. The following meetings were scheduled.	In-Person	Neil Duboff, Marcel Colomb First Nation #328
September 12, 2019, 01:00 PM	Colin Webster, VP of Sustainability and External Affairs, Nils Engelstad, VP of General Counsel, and Michael Raess, Manger of Environment and Community Relations, all for Alamos Gold Inc., met with Priscilla Colomb, Chief, Evelyn Sinclair and Angel Castel, Council Members, Judy Sinclair-Moose, an Employee, and Don McCollum, a third-party manager, all with Marcel Colomb First Nation, as well as Freda Lepine, a Mentor Coach with Manitoba Keewatinowi Okimakanak Inc., and Don Nisbet, an Aboriginal Liaison with Northern Manitoba Sector Council. Northern Manitoba Sector Council and Manitoba Keewatinowi Okimakanak Inc. noted that they had experience with these types of training initiatives, and would therefore act as program coordinators, arranging for all components and working with training facilities etc. Northern Manitoba Sector Council and Manitoba Keewatinowi Okimakanak Inc. noted that they had not however have experience with the addiction and heart-ship component, which may be associated with the Project. The importance of having a mentor and Councillor assisting all participants was emphasized. The proposed training program would be two phased, one for exploration specific employment opportunities and one for potential mine related jobs. The proposed program would start with establishing a database of all Marcel Colomb First Nation members that were seeking employment, including youth, and a portion would be selected. Northern Manitoba Sector Council mentioned that several people were not to be included because of addiction issues, but they would not receive this information because of confidentiality issues. It was suggested that individuals could agree to share this information and those would be incorporated in a mental health program and then reassessed. The next phases would be extended life and essential skills including opening bank accounts, learning how to manage money etc. Following this would be select specific training that were required for the current job needs. If jobs at the Lynn Lake Gold Project were not available, Michael Raess recommended to work for other employers and to get experience which would be critical when competing for jobs. Michael Raess explained what employment currently was required during the exploration phase and outlined other key requirements including a drivers license, being physically fit, having the ability to read and write, commitment to work, etc. Northern Manitoba Sector Council indicated that most programs did not allow for more than 12 people because of the importance for instructors to have one-to-one time. The next meeting was scheduled for October 7th, 2019. It was recommended that a separate meeting with all Marcel Colomb First Nation members be set up for before or after the meeting to present the proposed training and education partnership.	In-Person	Marcel Colomb First Nation #328, Northern Manitoba Sector Council, Manitoba Keewatinowi Okimakanak Inc.

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
September 10, 2019, 01:00 PM	On September 10th, 2019, Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., and Matt Osborne, Project Geologist for Alamos Gold Inc., met with four Elders of Marcel Colomb First Nation, including Gordon Colomb Sr., Eustache Sinclair, Allan Douglas Colomb, and Ralph Thomas. The quarterly meeting illustrated the proposed Exploration scope for the upcoming 2-3 months, among other matters. Meeting Agenda was as follows: 1 Exploration scope for the following 2-3 months. 2 Review of the Environmental Monitoring field trips with Eustache. 3 Review/verification of the Current Use data. 4 Fisheries offset planning (DFO requirement)5 Scheduling the following quarterly meeting in November, 2019Meeting summary: 1. Matt Osborne illustrated on a large scale map the locations and associated scope of work during the previous 3 months. He then described the proposed field work for the next 2-3 months for Exploration. High Impact work would be included in the Elder Environmental Monitoring Program and each site were to be signed off by an Elder prior to any disturbance. A description of the proposed work would be described at that time. It was also discussed the potential for adding new claims to the southwest of Lynn Lake and requested input as to any sensitive or sacred areas that should have been known of and that were to be avoided. The three Elders did not know of any potential conflicts with sensitive or sacred areas. 2. Michael Raess showed the Elders copies of the Environmental Monitoring Summary Reports. Michael Raess and Eustache Sinclair described the process of the field investigations. Gordon Sr. voiced his concern about any deleterious substances entering a waterbody as a result of Alamos Gold Inc.'s ongoing work scope. Eustache Sinclair described that there are no issues and that no sensitive areas including traplines were jeopardized. Michael Raess ensured that during the process of cleaning the bedrock and cutting the trenches, no deleterious substances or sediment were released or had the ability to reach a waterbody. It was agreed to bring all four Elders to the field to show some of the ongoing work and to verify that nothing harmful had reached the waterbodies due to the ongoing work scope. This meeting/ field trip was planned for Monday, September 16, 2019. 3. Michael Raess presented the map and data generated by Stantec based on the “current use” workshop with the Elders and Butch Amundson of Stantec in spring. This map and associated description had to be verified and signed off by the Elders and Chief and Council. The Elders asked to review this material and verify by the field trip date. Michael Raess had provided this material to Chief and Council previously via email and by providing paper copies. 4. Michael Raess described that if the proposed mine were to be built, two low quality fish habitats likely would have to be offset as a requirement by Department of Fisheries and Oceans Canada (DFO). Considering that Alamos Gold Inc. would replace similar scale and quality habitat in the Lynn Lake area, Michael Raess asked the Elders if they are aware of any place where fisheries could be improved (including improved spawning habitat, establishing habitat connectivity, etc.). Michael Raess used Google Maps to present satellite imagery as a reference. The Elders showed several healthy spawning areas but were not able to indicate any potential fish habitat offsetting project. 5. It was decided to hold off on scheduling the next meeting date. Michael Raess concluded the meeting by asking the Elders if these meetings were meaningful, productive and sufficiently detailed or if there could be any improvements. The Elders did not have any concerns or proposed improvements and were content with the meeting.	In-Person	Marcel Colomb First Nation #328
September 04, 2019, 09:00 AM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., and Ron Avery, Exploration Contractor for Alamos Gold Inc., completed the next round of Environmental Monitoring with Marcel Colomb First Nation Elders, as requested during the last quarterly meeting. Field visits by a Marcel Colomb First Nation Elder, Eustache Sinclair, were requested for high disturbance activities including trenching/excavating and drilling programs. This round of field visits occurred September 04, 2019. Both assessed areas were part of the excavation /trenching exploration program. The completed sites (incl. sign-off by Marcel Colomb First Nation Elder) were:- “MacLellan NW”-“Powerline trench "These sites would require an excavator. As this work was to be conducted after August 31, 2019, no Breeding Bird Survey would be required. Eustache Sinclair, indicated that Marcel Colomb First Nation did not have any concerns with the documented/proposed activities. Alamos Gold Inc. was to coordinate further field visits, as the work progressed.	In-Person	Marcel Colomb First Nation #328
September 03, 2019, 03:47 PM	Judy Sinclair-Moose, Health Program Coordinator of Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos to update him on some changes with Council. One Councillor was removed and the third party Band Manager had been replaced.	Email - Received	Marcel Colomb First Nation #328
August 23, 2019	Judy Sinclair-Moose, Health Program Coordinator of Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos to ask if she could share the traditional land and resource use (current use) data collected on April 23, 2019 with the Elders. Michael Raess forwarded the documents directly to Chief and Council and will bring the data to the second quarterly Elder meeting scheduled for September 10, 2019.	Email - Sent	Marcel Colomb First Nation #328
August 20, 2019	Judy Sinclair-Moose, Health Program Coordinator of Marcel Colomb First Nation (MCFN) was contacted by Michael Raess of Alamos to get an update on the verification and approval of the traditional land and resource use (current use) information which was collected on the April 23, 2019.	Email - Sent	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
August 20, 2019, 10:00 AM	Chief Priscilla Colomb and Council of Marcel Colomb First Nation (MCFN) with members of Manitoba Keewatinowi Okimakanak Inc. (MKO) met with Colin Webster and Michael Raess of Alamos to discuss the employment/training and the Impact Benefits Agreement (IBA). They also discussed a two phase approach to workplace training, one for exploration and later for the mining stages. They also discussed the need for a Community Liaison to mentor trainees and employees. MCFN would create a database to track the training. Colin Webster would create a work plan for the IBA. They scheduled the next training partnership meeting for September 12, 2019, the next IBA meeting on September 13, 2019, and the second quarterly Elders meeting regarding the exploration work on September 10, 2019.	In-Person	Neil Duboff, Marcel Colomb First Nation #328, Manitoba Keewatinowi Okimakanak Inc.
August 19, 2019, 09:00 AM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., and Ron Avery, an Exploration Contractor for Alamos Gold Inc., completed the third round of Environmental Monitoring with Marcel Colomb First Nation Elders, including Eustache Sinclair, as requested during the last quarterly meeting with Marcel Colomb First Nation. Field visits by an Elder had been requested for high disturbance activities including trenching, excavating and drilling programs. The third round of field visits occurred August 19, 2019. All four assessed areas were part of the excavation and trenching exploration program. One additional site was visited to illustrate the completed channel cutting at the Rushed Showing. The completed sites (with sign-off by Marcel Colomb First Nation Elder) were:-Rushed Showing at Dot-South Dot-Central Showing-Ameli Showing. One of these sites did not require an excavator and was to be prepared/cleared with hand tools (“Ameli Showing”). Three sites required removal of mature trees and/or overburden. These sites would require an excavator. Alamos Gold Inc. was to conduct Breeding Bird Surveys at all three sites within 7 days of any vegetation clearing. The Elder, Eustache Sinclair, indicated that Marcel Colomb First Nation does not have any concerns with the documented and proposed activities. Alamos Gold Inc. would coordinate further field visits as the work progressed.	In-Person	Marcel Colomb First Nation #328
July 19, 2019, 10:00 AM	Michael Raess of Alamos was invited by the North West Community Futures Development Corporation to meet and present the Lynn Lake Gold Project (LLGP) on July 19, 2019. Communities sitting on the board included representatives from Council of many of the Indigenous groups that Alamos was engaging with including the Community of Brochet, Barren Lands First Nation (Brochet Reserve), Community of Leaf Rapids, Marcel Colomb First Nation, Granville Lake, and O-Pipon-Na-Piwin Cree Nation. Michael Raess of Alamos explained that Alamos would continue to share Project updates for public through Open Houses (next in November 2019). Alamos would specifically send an invitation to the surrounding communities including the Community of Brochet and Leaf Rapids. With respect to Indigenous Community Members, Michael Raess explained that Alamos encouraged leadership to communicate all shared information to the members and to relay all potential questions and concerns back to Alamos. Michael Raess also added that Alamos would be sending out packages in September 2019 summarizing all current data and data gaps for each Indigenous Community to verify the data for the Environmental Impact Statement.	In-Person	Marcel Colomb First Nation #328, Northwest Manitoba Community Futures Development Corporation, O-Pipon-Na-Piwin Cree Nation, Barren Lands First Nation, Granville Lake Community, Town of Leaf Rapids, Community of Brochet
July 19, 2019, 10:00 AM	Marcel Colomb First Nation Chief, Council and members were celebrating Treaty Days from July 18-21, 2019 in Black Sturgeon Reserve. Michael Raess of Alamos took part in the Treaty Days and volunteered.	In-Person	Marcel Colomb First Nation #328
July 18, 2019, 03:18 PM	Judy Sinclair-Moose, Health Program Coordinator of Marcel Colomb First Nation (MCFN) was contacted by Michael Raess of Alamos with a draft map and database with the traditional land and resources use (current use) information collected during the April 23, 2019 meeting, for Chief and Council to review.	Email - Sent	Marcel Colomb First Nation #328
July 15, 2019, 09:00 AM	Elders from Marcel Colomb First Nation (MCFN) with Ron Avery of Alamos completed the second round of environmental monitoring for high disturbance activities associated with the summer exploration program by Alamos. Five sites were visited including Rush Showing, K2, TC showing, Audet Showing, and K-New Showing. The MCFN Elder indicated that they had no concerns with the documented/proposed activities.	In-Person	Marcel Colomb First Nation #328
July 09, 2019, 12:00 PM	Chief and Council of Marcel Colomb First Nation (MCFN) met with Michael Raess of Alamos to arrange a meeting date to discuss the Impact Benefits Agreement (IBA), find a suitable date to discuss training partnerships with Manitoba Keewatinowi Okimakanak Inc. (MKO), bringing Elder reports from the environmental monitoring for review, and determine the status on the current use data verification.	In-Person	Sarah Copapay, Marcel Colomb First Nation #328
July 02, 2019, 10:00 AM	Judy Sinclair-Moose, Health Program Coordinator for Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos regarding the exploration agreement funds to support the Treaty Days July 18-21, 2019.	Text/SMS - Sent	Marcel Colomb First Nation #328
June 17, 2019, 07:20 PM	Judy Sinclair-Moose, Health Program Coordinator at Marcel Colomb First Nation (MCFN) was contacted by Michael Raess of Alamos to start a discussion with Chief and Council regarding the Impact Benefit Agreement.	Text/SMS - Sent	Marcel Colomb First Nation #328
June 15, 2019, 06:51 PM	An Elder of Marcel Colomb First Nation (MCFN) with Ron Avery of Alamos monitored high disturbance exploration activities by Alamos at three sites (Rushed Showing, K2, and K3). The Elder indicated that MCFN did not have any concerns with the proposed activities at those three sites.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
June 11, 2019, 10:09 PM	Chief Priscilla Colomb of Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos indicating an issue with the trust fund. Michael Raess arranged with the MCFN and Alamos lawyers to clarify that MCFN leadership could decide on the allocation of the trust fund funds.	Telephone - Received	Marcel Colomb First Nation #328
June 10, 2019	Judy Sinclair-Moose, Health Program Coordinator of Marcel Colomb First Nation (MCFN) was contacted by Michael Raess of Alamos regarding arranging a trip to see an active mine. Alamos had determined that the costs of conducting the trip were too high and the trip was cancelled.	Text/SMS - Sent	Marcel Colomb First Nation #328
June 01, 2019, 10:09 AM	Judy Sinclair-Moose, Health Program Coordinator at Marcel Colomb First Nation (MCFN) was contacted by Michael Raess of Alamos to discuss the visit to an active mine site in Ontario. A tentative date was set for June 10, 2019.	Text/SMS - Sent	Marcel Colomb First Nation #328
May 22, 2019, 07:56 AM	Michael Raess of Alamos contacted Marcel Colomb First Nation (MCFN) Chief and Council to share a request for quotation for plumbers and roofers to see if there was any interest. Mark D'Amato called Michael Raess to say that MCFN could commit to both requests. Michael Raess indicated that MCFN should submit a detailed proposal and Alamos would analyze all the quotes.	Email - Sent	Marcel Colomb First Nation #328
May 17, 2019	Judy Sinclair-Moose of Marcel Colomb First Nation (MCFN) met with Michael Raess of Alamos at the band office. Michael Raess dropped off a job opportunity poster. The posting is for an Exploration Assistant. Alamos conducted interviews and hired a member of MCFN.	In-Person	Marcel Colomb First Nation #328
May 16, 2019, 01:00 PM	Chief Priscilla Colomb and Elders of the Marcel Colomb First Nation (MCFN) met with Michael Raess, Environment and Community Relations Manager, and Dan Brisbin, Exploration Manager, of Alamos met to discuss the Summer 2019 exploration activities. They discussed low impact activities including soil sampling and determined that monitoring by an Elder was not required. High impact activities such as scout drilling and excavation/trenching must be accompanied by an monitoring Elder. Contact information for the Elders was exchanged with the agreement that they will be given advanced notice. Michael Raess discussed the monitoring paperwork and compensation. Chief Priscilla Colomb and Michael Raess also discussed a trip to see an operational gold mine in Ontario. Michael Raess also inquired about rescheduling the meeting between MCFN, Alamos, Granville Lake and Manitoba Keewatinowi Okimakanak Inc. (MKO) to discuss job/training/partnership opportunities.	In-Person	Marcel Colomb First Nation #328
May 9, 2019	Judy Sinclair-Moose, Health Program Coordinator of Marcel Colomb First Nation was contacted by Michael Raess of Alamos to discuss a meeting with the Chief and Elders on at noon on May 16, 2019 at the Barn to discuss monitoring the summer exploration work.	Text/SMS - Sent	Marcel Colomb First Nation #328
May 09, 2019, 03:50 PM	Chief Priscilla Colomb and Judy Sinclair-Moose, Health Program Coordinator of Marcel Colomb First Nation was contacted by Michael Raess of Alamos to set up a breakfast meeting with Chief and Council regarding the exploration work and to create a system for Elders to monitor and verify the exploration work.	Text/SMS - Sent	Marcel Colomb First Nation #328
May 6, 2019	Freda Lépine, Indigenous Skills and Employment Training (ISET) Partnership Coordinator for Manitoba Keewatinowi Okimakanak Inc. (MKO) contacted Michael Raess of Alamos to send the Agenda for the proposed meeting between Marcel Colomb First Nation, MKO, Granville Lake and Alamos Gold regarding employment, training, business, and partnership opportunities regarding Lynn Lake Gold Project (LLGP). On May 7, 2019 Freda Lépine replied to state that the meeting needed to be rescheduled as MCFN Chief and Council were not available.	Email - Received	Manitoba Keewatinowi Okimakanak
May 05, 2019, 01:00 PM	Judy Sinclair-Moose, Health Program Coordinator of Marcel Colomb First Nation (MCFN) met with Michael Raess of Alamos at the MCFN Band Office regarding posting an advertisement for a summer position for Alamos as an Exploration Assistant.	In-Person	Marcel Colomb First Nation #328
April 26, 2019	Neil Duboff, legal counsel for Marcel Colomb First Nation (MCFN) sent a band council resolution to Michael Raess of Alamos stating that MCFN does not have any objections or concerns with respect to Alamos' Exploration program. The BCR was required for the Province as part of the 2 year work permit application.	Email - Sent	Marcel Colomb First Nation #328
April 26, 2019, 12:00 PM	Judy Sinclair-Moose, Health Program Coordinator of the Marcel Colomb First Nation contacted Michael Raess of Alamos to send the signed Information Sharing Agreement for the Traditional Knowledge Study addendum.	Email - Sent	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
April 23, 2019, 10:00 AM	Evelyn Sinclair and Angel Castel, Councillors of Marcel Colomb First Nation (MCFN) with Judy Sinclair Moose and five Elders/traditional knowledge keepers of the MCFN met with Michael Raess of Alamos and Butch Amundson of Stantec to have the first quarterly meeting (action item from April 4, 2019 meeting). During the first portion of the meeting Butch Amundson conducted a workshop to facilitate the Elders and knowledge keepers sharing TK and to record traditional knowledge applicable to the project area. This information was collected to add to and update the traditional land use study produced for MCFN dated January 2018. The information shared by the knowledge keepers will be compiled and presented to MCFN for verification of accuracy and approval to forward to Chief and Council for release under the conditions of an addendum to the Information Sharing Agreement dated February 26, 2018. These compiled data (previous traditional land use study data and current traditional land use study data) would be used to assist in determining potential conflict areas with respect to Alamos' exploration scope and the LLGP. Further, these data could inform Chief and Council of MCFN in determining potential locations for Traditional Land Entitlement land selection. Following the workshop, Michael Raess presented for discussion the proposed 2019 exploration program including various levels of disturbances including geological mapping and prospecting, soil and till sampling, drilling, and mechanized trenching. The knowledge holders shared their concerns. The information gathered at the workshop/quarterly meeting would be used to inform the Band Council resolution to fulfill the requirements of a letter of support that would enable Alamos to finalize the Work Permit Application process. Concurrently, the addendum to the Information Sharing Agreement would allow Stantec and Alamos to use gained data to help identify potential areas of shared importance.	In-Person	Gordon Colomb Sr., Ralph Thomas, Allan Douglas Colomb, Darren Dumas, Marcel Colomb First Nation #328
April 16, 2019, 02:00 PM	Chief Priscilla Colomb of the Marcel Colomb First Nation (MCFN) was contacted by Michael Raess of Alamos regarding scheduling a meeting on May 9, 2019 regarding training with Manitoba Keewatinowi Okimakanak Inc. and MCFN.	Telephone - Sent	Marcel Colomb First Nation #328
April 15, 2019, 09:00 AM	Chief Priscilla Colomb of the Marcel Colomb First Nation (MCFN) was contacted by Michael Raess of Alamos as a follow up to the action items from the April 4, 2019 meeting to initiate the first quarterly meeting with MCFN to discuss the proposed exploration field work scope. The meeting would also include a sign-off to the addendum to the Information Sharing Agreement for the Traditional Land Use data. Chief Priscilla Colomb noted that she would like to have the requested current traditional land use interviews on April 23, 2019.	Telephone - Sent	Marcel Colomb First Nation #328
April 11, 2019, 02:35 PM	Judy Sinclair-Moose, Health Program Coordinator of the Marcel Colomb First Nation was contacted by Michael Raess of Alamos regarding a job posting with Alamos in Lynn Lake. An interview process had been conducted and a candidate chosen.	Email - Sent	Marcel Colomb First Nation #328
April 10, 2019, 08:00 AM	Michael Raess of Alamos contacted Chief Priscilla Colomb and Judy Sinclair-Moose of Marcel Colomb First Nation to follow up on the April 4, 2019 meeting. Michael indicated that he had an updated Information Sharing Agreement that needed to be signed by the Chief. Michael Raess also asked what the next steps were to get a written statement allowing Alamos to complete the work permit application.	Email - Sent	Marcel Colomb First Nation #328
April 04, 2019, 01:30 PM	Chief and Council of the Marcel Colomb First Nation (MCFN) met with Michael Raess, Colin Webster, and Scott Parsons and David Brisbin from Alamos along with Butch Amundson from Stantec. The purpose of the meeting was to discuss consultation with MCFN prior to Alamos' extension of their mineral rights licensing because of MCFN's Treaty Land Entitlement and current use in the areas proposed for exploration activities. Several action items were created from this meeting including drafting of maps, an addendum to the current Information Sharing Agreement, and scheduling quarterly meetings between MCFN and Alamos to discuss the exploration program.	In-Person	Marcel Colomb First Nation #328
March 29, 2019, 01:30 PM	Chief Priscilla Colomb from the Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos to schedule a time for their meeting on April 4, 2019. The meeting was scheduled for 1:30 pm and included Chief and Council of MCFN, legal representatives, Alamos, and Butch Amundson from Stantec.	Text/SMS - Sent	Marcel Colomb First Nation #328
March 28, 2019	Chief Priscilla Colomb and Council of Marcel Colomb First Nation (MCFN) along with their legal counsel contacted Michael Raess regarding Alamos' claims (new and old). MCFN did not have a full understanding of the location of all of Alamos' claims. They wanted to meet to go through all the claims to indicate where there are issues and where MCFN does not want Alamos to work. The meeting was scheduled for April 4, 2019.	Telephone - Received	Marcel Colomb First Nation #328
March 27, 2019	Chief Priscilla Colomb of Marcel Colomb First Nation contacted Michael Raess of Alamos and stated that Council would like to move forward with the Band Council Resolution regarding Alamos' work permit.	Telephone - Received	Marcel Colomb First Nation #328
March 25, 2019	Mark D'Amato, third party manager of Marcel Colomb First Nation (MCFN) contacted Michael Raess of Alamos regarding maps showing details of Alamos' claim delineation with respect to three specific areas. Michael Raess sent the maps via email to Mark D'Amato, Chief and Council. Mark D'Amato replied that he had received them and will use them to select Treaty Land Entitlement (TLE) land.	Telephone - Received	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
March 22, 2019, 11:00 AM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., followed up with Chief Priscilla Colomb of Marcel Colomb First Nation #328, following the meeting held the previous day, March 21, 2019. The Chief informed Michael Raess that the lawyer had not yet been in contact and she had no further update on Traditional Land Entitlement conflicts.	Telephone - Sent	Marcel Colomb First Nation #328
March 21, 2019, 11:00 AM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., met with Chief and Council of Marcel Colomb First Nation #328, including Judy Sinclair-Moose, Employee, Priscilla Colomb, Chief, Evelyn Sinclair, Councillor, and Angel Castel, Councillor. The purpose of the meeting was to discuss claim staking and work permit applications. The process of claim-staking was briefly discussed, and whether work could continue in areas where work had already taken place. Michael Raess pointed out on maps all of the claimed areas, distinguished claim blocks that were not associated with Alamos Gold Inc., new areas, and those inside the community interest zone (CIZ), among others. The maps were provided to Chief and Council for their reference. Michael Raess shared all correspondence between the Province and Marcel Colomb First Nation #328 through Mark D'Amato. Michael Raess indicated that Alamos Gold Inc. had followed all procedures, regulations, and guidelines, but that he could not engage on the topic of claim-staking due to confidentiality concerns. Chief and Council verbally stated that there were no concerns with Alamos Gold Inc. continuing work in previous areas. They wished to ensure that Legal Council agreed with their decision however, and attempted to contact a lawyer. The lawyer could not comment having not seen maps to determine if there were any conflicts with Traditional Land Entitlement selection. The Chief expected to hear back from the lawyer on March 22, 2019.	In-Person	Marcel Colomb First Nation #328
March 21, 2019, 10:00 AM	Chief Priscilla Colomb of Marcel Colomb First Nation was contacted by Michael Raess of Alamos. Chief Priscilla Colomb regarding the meeting they had on March 21, 2019. Chief Priscilla Colomb and Council had stated that they had no concerns with Alamos working in old/previous areas, but she needed to confirm with their legal council. She indicated that the lawyer would get back to her on March 22, 2019. Michael Raess followed up the next day, but Chief Priscilla Colomb was still waiting to hear back from the lawyer.	Text/SMS - Sent	Marcel Colomb First Nation #328
March 18, 2019, 03:50 PM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., emailed two letters to Judy Sinclair-Moose, a staff member of Marcel Colomb First Nation #328, as per Michael's discussion with Chief Priscilla Colomb earlier on March 13, 2019. Document(s) provided:MCFN-20190318_Letter-Cont-MineralExpl-18-March-2019; MCFN-20190318_AlamosGold_WorkPermit01-OldClaims-reduced	Email - Sent	Marcel Colomb First Nation #328
March 18, 2019, 03:50 PM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., telephoned Judy Sinclair-Moose, a staff member of Marcel Colomb First Nation #328. On the call, Michael Raess inquired about the outcome the community had reached with Legal Council regarding delaying the work permit application. Judy Sinclair-Moose replied that Chief and Council had not reached an outcome, but overall they were of the consensus the application could proceed and wanted a discussion to take place before April 6, 2019. Michael Raess indicated that April 6, 2019 may be too late, and offered to meet Chief and Council in Winnipeg on March 21, 2019. Judy Sinclair-Moose suggested that Michael Raess should contact the Chief directly.	Telephone - Sent	Marcel Colomb First Nation #328
March 18, 2019, 03:50 PM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc. telephoned Priscilla Colomb, Chief of Marcel Colomb First Nation #328. Michael Raess explained briefly that Alamos Gold Inc., at that time, prioritized areas of previous work over new claim areas. Michael Raess inquired if a meeting with Chief and Council could be arranged in Winnipeg. The Chief responded in the affirmative to both points, suggesting Michael Raess contact Judy Sinclair-Moose with a letter specifying Alamos Gold Inc.'s preferences going forward. The Chief also indicated that Chief and Council wanted to keep an open line of communication between Alamos Gold Inc. and Marcel Colomb First Nation #328.	Telephone - Sent	Marcel Colomb First Nation #328
March 15, 2019, 04:00 PM	Tommy Colomb, a member of Marcel Colomb First Nation and Chief Priscilla Colomb's brother, approached Alamos Gold Inc. Exploration staff, inquiring about trap-lines and land rights. The Exploration staff put Tommy in contact with Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc. Tommy Colomb explained to Michael Raess that he was in ownership of the reserve trap-line and all associated trap-lines, including those at the Alamos Gold Inc. Gordon site. Tommy Colomb indicated that he believed he should receive direct compensation from Alamos Gold Inc. Michael Raess responded that concerns should be discussed with Chief and Council for Marcel Colomb First Nation #328, and that this issue would need to go through the Band formally. Tommy Colomb did not want to speak to Chief and Council, but still believed direct compensation was in order. Michael Raess then told Tommy Colomb he would speak with Chief and Council on the matter, and Tommy replied that this would not be necessary.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
March 13, 2019, 02:50 PM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., emailed Judy Sinclair-Moose, a staff member of Marcel Colomb First Nation. Michael Raess inquired as to whether Legal Council was able to advise Chief and Council, and requested updates. Judy Sinclair-Moose responded that Legal Council had postponed the meeting to March 18, 2019, and that the permit application remained up for discussion. Michael Raess responded, further emphasizing that currently, Alamos Gold Inc. prioritizes the "old/previous" claims where they had been working in the past. Michael Raess requested to speak to Chief and Council to make this clear, and expressed concern that Alamos would not be able to receive the required work permit in time, causing a shut down of work.	Email - Sent	Marcel Colomb First Nation #328
March 05, 2019, 12:00 PM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., sent an email to the Chief and Council of Marcel Colomb First Nation #328. The email requested updates on the letter sent to the Province on February 13, 2019, as no response had been given to Michael Raess's previous correspondence. Mark D'Amato later replied that the matter would be discussed with Legal Council on March 11, 2019, and that Chief and Council would be responding to Alamos Gold Inc.	Email - Sent	Marcel Colomb First Nation #328
February 27, 2019, 09:30 AM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc. sent an email to Judy Sinclair, Employee, Mark D'Amato, Priscilla Colomb, Chief, Evelyn Sinclair, Council Member, and Angel Castel, Council Member of Marcel Colomb First Nation #328. The email intended to follow up on the correspondence with the Province on February 13, 2019 and the status of the work permit. Michael expressed concern that the delay could result in a 'stop work' scenario, influencing all employees at Lynn Lake. Michael inquired as to whether the work permit application could be continued with, at least for the areas around the existing mines as per previous years. Michael finally requested an update and offered to meet or telephone Chief and Council if they so desired.	Email - Sent	Marcel Colomb First Nation #328
February 26, 2019, 01:00 PM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., sent a text message to Judy Sinclair, Employee, and Priscilla Colomb, Chief of Marcel Colomb First Nation #328. The message was inquiring as to whether discussions had taken place, or if there was a possibility to meet and further discuss the issue outlined in the letter from Mark D'Amato, Third Party Manager, sent on February 13, 2019.	Text/SMS - Sent	Marcel Colomb First Nation #328
February 14, 2019, 06:00 PM	Michael Raess of Alamos contacted the Chief and Council of Marcel Colomb First Nation to thank them for copying him on their letter to the Province. Michael Raess attached the 2019 Work Permit Applications which had been submitted to the Province.	Email - Sent	Marcel Colomb First Nation #328
February 14, 2019, 03:00 PM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., telephoned Priscilla Colomb, Chief of Marcel Colomb First Nation #328, in order to arrange a meeting in regards to issues with work permits and claim staking. Michael Raess, also wished to discuss the Impact Benefit Agreement in the meeting, as well as other open topics such as visiting an operational mine. The Chief returned the call later that day, indicating that there was no availability to meet in the near future.	Telephone - Sent	Marcel Colomb First Nation #328
February 13, 2019, 12:00 PM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., received an email along with Judy Sinclair-Moose, Employee, Priscilla Colomb, Chief, Evelyn Sinclair, Council Member, and Angel Castel, Council Member of Marcel Colomb First Nation #328 from Mark D'Amato, a Third Party Manager of Marcel Colomb First Nation #328. The recipients were copied on a letter sent by Mark D'Amato to the Province, summarizing Marcel Colomb First Nation #328's concerns. The letter suggested a temporary moratorium or delay on issuing any more mining claims and/or permits until all Traditional Land Entitlement agreements had been selected. Document(s) provided: MCFN-20190213_Manitoba Mining Feb	Email - Received	Marcel Colomb First Nation #328
February 12, 2019	Chief Priscilla Colomb of the Marcel Colomb First Nation copied Michael Raess of Alamos in a letter sent on behalf of Marcel Colomb First Nation to the Government of Manitoba regarding the encroachment of mining claims surrounding their reserve. The letter states that the Marcel Colomb First Nation has been notified of mining claims and work permits submitted without their consultation and that they would like a temporary moratorium on issuing any more mining claims and/or work permits until Marcel Colomb First Nation can select their Treaty Land Entitlement lands and protect their trap-line areas.	Mail - Received	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
February 11, 2019	Chief Priscilla Colomb and Council of Marcel Colomb First Nation (MCFN) were contacted by Michael Raess of Alamos regarding an issue around the Work Permit Application and claim staking. Michael Raess apologized for the current frustration they have caused and hopes they could discuss further. As Michael Raess understands, MCFN did not get to comment on the claim staking prior to receiving a letter from the Province stating that Alamos' claims were registered. Further, the Province did not send an inclusive Crown Consultation letter to MCFN about the work permit application (i.e., Environmental Scope only). MCFN is under the impression that registered claim blocks are not available for selection as Treaty Land Entitlement (TLE) lands. Michael Raess explained that the Claim staking process is very secretive and is very confidential (even within Alamos internally). Employees are not allowed to talk about the process until claims are registered because any leaked information about the process could let another company stake the claim and take over the proposed sub-surface rights. Michael Raess says that he too is confused by the process with the Province and he is trying to be as inclusive with MCFN as possible. He states that he has been in contact with the Province and they indicated that claimed Crown land can be selected by MCFN as TLE land through a third party process (i.e., claims to not prevent TLE land selection). The Province also stated that they initiate the Crown consultation when they receive a work permit application. If concerns are voiced, the government will consult and determine solutions. Alamos has followed the Provincial process. The Province does not conduct Crown consultation during the claims registration process and does not interfere with the registration process. Anyone with a prospecting license can stake Crown land and register a claim. To minimize the potential for a delay for work at the MacLellan and Gordon, Alamos plans to re-apply for work permits, by splitting off the new claim blocks from the area we worked in in 2018. On a separate matter, Michael Raess has requested the budget for the 2019 work on the ground. He also stated that they can discuss visiting an operational mine and gave several examples. Michael Raess has requested specific information with regards to the impacts of blasting and Stantec will have the Environmental Impact Statement (EIS) in the fall of 2019. In the mean time Michael Raess will look into general information regarding the impacts of blasting.	Email - Sent	Marcel Colomb First Nation #328
February 08, 2019, 11:00 AM	Judy Sinclair-Moose, an employee of Marcel Colomb First Nation, sent a text message to Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., suggesting that Michael Raess set up an in-person meeting with Chief and Council to explain specific procedures outlined by the government for claim staking. Judy Sinclair-Moose mentioned that Marcel Colomb First Nation #328 had not been informed about the staking process before it took place. Michael Raess inquired as to a meeting location, with Judy Sinclair-Moose responding that Chief and Council were to be in Winnipeg until Saturday, February 9, 2019, and to speak with Council to set up a meeting.	Text/SMS - Received	Marcel Colomb First Nation #328
February 07, 2019, 11:00 AM	Michael Raess, Manager of Environment and Community Relations for Alamos, sent a text message to Judy Sinclair-Moose, a staff member for Marcel Colomb First Nation #328. Michael Raess contacted Judy Sinclair-Moose to determine if Chief and Council were able to draft a letter stating that Marcel Colomb First Nation #328 had no concerns with Alamos Gold Inc.'s work permit application for Explorations. Judy Sinclair-Moose responded that the letter could not be completed at the time, due to Marcel Colomb First Nation wanting to determine the status of other mining claims from a separate Mining/Exploration company and how each of the claims, including the new claims in regards to Alamos Gold Inc., would have an effect on the Traditional Land Entitlement selection. Judy Sinclair-Moose further informed Michael Raess that Chief and Council were questioning Alamos Gold Inc.'s process on "claim staking", as Marcel Colomb First Nation #328 had not been informed before staking had begun. Chief and Council were to determine next steps and inform in the near future. Michael Raess communicated to Judy Sinclair-Moose that Alamos Gold Inc. would be re-submitting the work permit to ensure that work can continue in areas with claims staked before 2018. Michael Raess further indicated that Alamos Gold Inc. had followed all guidelines, regulations and policies during claim staking and the work permit application process. Michael Raess emphasized the confidential nature of the process, and could not share information with regards to staking.	Text/SMS - Sent	Marcel Colomb First Nation #328
February 05, 2019, 11:00 AM	Michael Raess of Alamos met with Judy Sinclair-Moose and Mark D'Amato of Marcel Colomb First Nation to discuss the 2019 Work Permit Applications for both the Environmental and Exploration Scopes of the Project. The copy of the Crown Consultation letter addressed to Marcel Colomb First Nation for the 2019 Work Permit Application was distributed on January 28, 2019 and received. Marcel Colomb First Nation had received notification of Alamos's exploration permit and expressed concerns regarding the application precluding the selection of Treaty Land Entitlement land in areas where Alamos had applied to stake claims. Mark D'Amato suggested the Barrick Gold project in Nevada and Michael Raess suggested Young Davidson or Hemlo mines in Ontario. Michael Raess would contact the Ontario mines and determine the possibility of visiting. Finally, Marcel Colomb First Nation would like to know the mitigations and potential impacts to the Reserved based on the proposed blasting at Gordon during operation. Michael Raess was discussing the information with Stantec and would confirm the general mitigations, but the Environmental Impact Assessment was expected for the fall of 2019.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
January 31, 2019, 11:00 AM	Celestin Colomb and Marvin Colomb of Marcel Colomb First Nation (MCFN), accompanied by Dane Harwood of Alamos, met with Michael Raess of Alamos at the office. Celestin Colomb and Marvin Colomb voiced concern about ongoing industrial activities at mile 30 (Highway Bridge over Hughes River). They were also concerned about their traplines south of Gordon. Michael Raess indicated that there were no activities at mile 30 and confirmed with Manitoba Sustainable Resources and MCFN Chief and Council that Celestin Colomb and Marvin Colomb did not hold traps south of Gordon.	In-Person	Marcel Colomb First Nation #328
January 30, 2019	Judy Sinclair-Moose and Evelyn Sinclair of Marcel Colomb First Nation (MCFN) and Michael Raess of Alamos gave a presentation at the 2019 AME Roundup Conference. The panel session was a success and received positive feedback.	In-Person	Marcel Colomb First Nation #328
January 15, 2019, 12:00 PM	Michael Raess of Alamos Gold met with Judy Sinclair-Moose and Evelyn Sinclair of Marcel Colomb First Nation to discuss the upcoming Association for Mineral Exploration BC (AMEBC) RoundUp conference. Michael Raess, Judy Sinclair-Moose and Evelyn Sinclair brainstormed applicable answers to the submitted questions/topics that would be posed during the panel discussion. Michael Raess summarized the information discussed during the meeting and distributed it to Marcel Colomb First Nation Chief and Council and the Alamos Gold project team.	In-Person	Marcel Colomb First Nation #328
December 17, 2018, 11:00 AM	Michael Raess of Alamos Gold had discussions with Andrew Colomb, Roland Cook, Eustache Sinclair and Judy Sinclair-Moose of Marcel Colomb First Nation (MCFN) regarding the gate Alamos installed at the bridge over Hughes River approximately half way to Gordon from the Hwy 391 junction. Alamos had several negative encounters with the public due to the access restriction. Alamos had to replace the gate and lock once because of vandalism. Alamos checked with the province and legal department and had the full right and responsibility for the Gordon Road. There were at least two other ways to access the area north of the gate (other than the mine road). The people that were opposed to the gate preferred the easy access on the road. Roland Cook and Andrew Colomb reached out to Michael Raess to request a key. Michael Raess declined to provide a key due to security and liability concerns. Michael Raess contacted Judy Sinclair-Moose to tell Chief and Council about this and to ask about their opinion. Chief was not happy because Roland Cook did not ask for permission to go and use the communities camps. Later Andrew Colomb called the province and the Conservation Officer (CO) to pressure Alamos in handing out a key. Michael Raess talked to the province, the CO, Roland Cook and Andrew Colomb, explaining the reasons why there couldn't be traffic in the mine area, etc. Michael Raess further provided maps of the alternate access route to go hunting and trapping. The next day, Roland Cook came to apologize and to submit his resume for potential work at Alamos. Michael Raess did not hear anything else on this topic until January 11, 2019, when Eustache Sinclair from MCFN voiced concern about the gate at the Gordon site during the Chase the Ace. Michael Raess had mentioned this to leadership and would be visiting Eustache Sinclair to discuss the reason(s) of having the new gate at the bridge. Michael Raess discussed this with Eustache Sinclair and the discussion is ongoing as Alamos is applying for a grant to make alternate access easier through a land based training and brush cutting exercise along an old winter road.	Telephone - Received	Marcel Colomb First Nation #328
December 09, 2018, 03:00 PM	Michael Raess of Alamos Gold emailed Mark D'Amato, Band Manager of Marcel Colomb First Nation to ask for the Community Interest Zone Map showing that Marcel Colomb First Nation had full jurisdiction over Lynn Lake. Michael Raess explained that he would like to compare the Marcel Colomb First Nation and Mathias Colomb Cree Nation maps with respect to the proximity of the Lynn Lake Gold Project.	Email - Sent	Marcel Colomb First Nation #328
December 07, 2018, 02:00 PM	Michael Raess of Alamos Gold met with Evelyn Sinclair, Councillor, and Judy Sinclair-Moose, Employee of Marcel Colomb First Nation to discuss the community profiles and literature review, and the RoundUp conference in January 2019. Michael Raess received a written statement from Chief and Council indicating that Marcel Colomb First Nation does not require any alteration to the existing community profile and approval to use all references listed. Their lawyer and Mark D'Amato reviewed the documents independently and have no further comments. Michael Raess explained that he received an email from the RoundUp conference organizers with questions that would be asked during the panel discussion. Michael Raess indicated that he would like to schedule a meeting with Judy Sinclair-Moose and Evelyn Sinclair to brainstorm answers, examples and discussion topics.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
November 14, 2018, 03:00 PM	Michael Raess of Alamos Gold met with Mark D'Amato and Judy Sinclair-Moose, Employees of Marcel Colomb First Nation. Mark D'Amato stated the agreement in place allocates a certain amount of funding each year but Marcel Colomb First Nation is getting less and less each year, which is not in good faith. Michael Raess explained that the agreement allocates a certain percentage of funding based on the work completed. This year exploration had to reorganize and establish targets. Next year is forecasted for more drilling again. Mark D'Amato requested a forecast of next year's exploration work. Michael Raess stated he will update Mark D'Amato once it is determined. Mark D'Amato stated that the exploratory helicopter flying over the reserve during moose and goose season is not allowed and infringes on treaty rights. Mark D'Amato asked why Alamos did not ask permission or communicate their plans. Michael Raess stated that he emailed Marcel Colomb First Nation about the helicopter use on August 22, 2018 and September 29, 2019, and that it was further communicated during meetings. Michael Raess indicated that he did not receive concerns from Marcel Colomb First Nation regarding the helicopter use but would advise Alamos internally about the concerns discussed at this meeting. Michael Raess asked if there are any maps or documents showing that Marcel Colomb First Nation split traditional land when they split from Mathias Colomb Cree Nation. Mark D'Amato stated that there are Community Zone Maps that show that Marcel Colomb First Nation is the only directly affected First Nation contrary to Mathias Colomb Cree Nation's belief. Michael Raess told Mark D'Amato that he had spoken with the Canadian Environmental Assessment Agency and that they had no deadline and would still accept applications for federal funding. Mark D'Amato stated he would re-submit the application for federal funding. Michael Raess asked for an update regarding Marcel Colomb First Nation's review of the community profile and literature review. Mark D'Amato and Judy Sinclair-Moose stated that the community profile and literature review had been provided to Chief and Council and their lawyers and that they hadn't received feedback. Mark D'Amato and Judy Sinclair-Moose stated they would remind Chief and Council to complete the review. Mark D'Amato noted that Chief and Council did not have an appreciation of the scale of the proposed Lynn Lake Gold Project and would like the opportunity to visit a similar scale site. Michael Raess stated that he brought Chief and Council to the Gordon site to get an appreciation of the proposed scale of the Project, and that an opportunity was provided to fly around the MacLellan site as well. Michael Raess explained that it is a relatively small operation compared to other mines and that he would follow up internally to ask if they could provide an example of a similar operation in Canada that could be visited.	In-Person	Marcel Colomb First Nation #328
October 11, 2018, 04:00 PM	Michael Raess of Alamos Gold met with Judy Sinclair-Moose of Marcel Colomb First Nation to discuss if there were any concerns about the Gordon Road access gate that had been broken. Judy Sinclair-Moose said no one at the Band office had heard of complaints. Michael Raess and Judy Sinclair-Moose scheduled a meeting for October 15, 2018 to complete the community profile approval process and discuss the federal funding application that was submitted late. Michael Raess suggested that Marcel Colomb First Nation contact the Canadian Environmental Assessment Agency (CEAA) for funding consideration.	In-Person	Marcel Colomb First Nation #328
September 24, 2018, 10:52 AM	Michael Raess of Alamos Gold emailed Judy Sinclair-Moose of Marcel Colomb First Nation attaching a copy of a news release regarding the federal funding that was released for the purposes of assisting Indigenous groups in their participation in the environmental assessment of the Lynn Lake Gold Project. Michael Raess asked Judy Sinclair-Moose why Marcel Colomb First Nation had not applied for federal funding and requested that she speak with Chief and Council about it. At 12:01 p.m., Judy Sinclair-Moose replied via email thanking Michael Raess for the news release and his commitment to engaging with Marcel Colomb First Nation. At 12:07 p.m., Michael Raess responded via email thanking Judy Sinclair-Moose for her response. At 3:41 p.m., Judy Sinclair-Moose responded via email stating that she spoke with Mark D'Amato, Band Manager for Marcel Colomb First Nation, regarding the federal funding allocation. Judy Sinclair-Moose stated that Mark D'Amato filled out the funding application but that it may have been submitted late. Judy Sinclair-Moose asked Michael Raess how often the helicopter would fly over and on which dates. At 3:51 p.m., Michael Raess responded via email suggesting that Judy Sinclair-Moose contact CEAA to see if they could process Marcel Colomb First Nation's late application for federal funding. On September 25, 2018 at 11:35 a.m., Michael Raess responded to Judy Sinclair-Moose's request for information regarding the low flying helicopter Alamos flying over the Lynn Lake area for exploration purposes. Michael Raess provided a map showing the areas the helicopter would be flying, noting they had completed 5,800 km of the 7,500 km survey, and that it should have been complete by early the following week, weather dependent. Michael Raess asked if Judy Sinclair-Moose had any concerns or requests for clarification.	Email - Sent	Marcel Colomb First Nation #328
September 20, 2018, 10:30 AM	Michael Raess of Alamos Gold met with Angel Castel, Councillor, and Judy Sinclair-Moose, Employee of Marcel Colomb First Nation, to discuss the community profile and literature review created for inclusion in the environmental impact statement and to ask about applying for available federal funding through the Canadian Environmental Assessment Agency (CEAA) Participant Funding Program. Michael Raess delivered additional paper copies of the community profile and literature review and committed to following up the next week regarding their review of the documents. Michael Raess did not discuss the federal funding due to the fact that the Chief was not present at the meeting.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
August 22, 2018, 12:19 PM	Michael Raess of Alamos emailed Chief and Council of Marcel Colomb First Nation to discuss the community profile and the associated reference documents which Alamos planned to incorporate into the Environmental Impact Statement (EIS) for the Project. Michael Raess informed that Alamos was planning to fly the Lynn Lake area with a low flying helicopter to record gravitation for exploration. That was a helicopter slinging an instrument that recorded the density of the ground. The helicopter would fly at 35 meter height and 100 meter apart (back and forth). Exploration indicated that this would occur in September for 2-3 weeks.	Email - Sent	Marcel Colomb First Nation #328
July 25, 2018, 03:45 PM	Michael Raess of Alamos Gold emailed Chief Priscilla Colomb and Councillors, Evelyn Sinclair, Angel Castel and Judy Sinclair-Moose and Mark D'Amato, Band Manager for Marcel Colomb First Nation in follow up to his July 10, 2018 email. Michael Raess inquired about scheduling a meeting on August 16 or 17, 2018 to discuss the community profile and literature review that had been drafted for inclusion in the environmental impact assessment. Michael Raess requested that Marcel Colomb First Nation review the documents and provide any feedback.	Email - Sent	Marcel Colomb First Nation #328
July 18, 2018, 10:00 AM	Michael Raess and Liz Martel of Alamos Gold attended Treaty Days hosted by Marcel Colomb First Nation, which included games and a general celebration at the Black Sturgeon Reserve. Michael Raess and Liz Martel took part and helped Marcel Colomb First Nation in organizing some of the games, including the announcement of the canoe races.	In-Person	Marcel Colomb First Nation #328
July 10, 2018, 05:35 PM	Michael Raess of Alamos Gold emailed Chief Priscilla Colomb and Councillors, Evelyn Sinclair, Angel Castel and Judy Sinclair-Moose of Marcel Colomb First Nation and attached the community profile and literature review developed for inclusion in the environmental impact assessment. Michael Raess indicated that he wanted to schedule a meeting to discuss the contents of the community profile and literature review and that he wanted Marcel Colomb First Nation to review and provide feedback of the materials.	Email - Sent	Marcel Colomb First Nation #328
June 16, 2018, 10:00 AM	Michael Raess of Alamos met with Chief and Council of Marcel Colomb First Nation at the Marcel Colomb First Nation office. Michael Raess brought Judy Sinclair-Moose and Evelyn Sinclair for a site visit to the Project site (Gordon site) to illustrate the proposed scale of the Project. Michael Raess explained potential mitigation measures, reclamation options and what they may look like (e.g., flooding pits and capping/seeding/planting rock piles).	In-Person	Marcel Colomb First Nation #328
June 13, 2018, 05:00 PM	Michael Raess of Alamos invited Chief and Council of Marcel Colomb First Nation to dinner as a thank you for completing the Traditional Land and Resource Use (TLRU) study for the Project. Michael Raess brought all maps and interview data as well as digital and paper copies of the TLRU study, to the dinner, to distribute to study participants. Michael Raess explained that next steps would involve completing the Environmental Impact Statement (EIS) and integrating TLRU study data into the EIS, submitting the EIS for review and approval, Project permitting, deconstruction of existing mine infrastructure, construction of the new mine, and the operation phase. Michael Raess explained that the Project was delayed and no significant work would be completed in the near future. Michael Raess also discussed training and job opportunities. During the dinner, a site visit to the Gordon/MacLellan site was coordinated for June 16, 2018.	In-Person	Marcel Colomb First Nation #328
June 04, 2018, 09:15 AM	Michael Raess of Alamos emailed Mark D'Amato, Band Manager, Marcel Colomb First Nation, to confirm that the email indicating that there were no further requests from the lawyers applied to both the Traditional Land and Resource Use study and information sharing agreement. At 12:04 p.m., Mark D'Amato replied via email to confirm that was the case.	Email - Sent	Marcel Colomb First Nation #328
May 17, 2018	Mark D'Amato, Band Manager of Marcel Colomb First Nation, sent an email to Michael Raess of Alamos in response to Michael Raess' April 27, 2018 email regarding a status update on the legal review of the traditional land and resource use (TLRU) study and associated information sharing agreement. Mark D'Amato indicated that the report was fine and no changes were required.	Email - Received	Marcel Colomb First Nation #328
May 13, 2018	Michael Raess of Alamos called the Marcel Colomb First Nation Band office and spoke with Councillor Judy Sinclair-Moose regarding the traditional land and resource use (TLRU) study. Judy Sinclair-Moose indicated that Chief and Council were absent and therefore could not provide an update regarding legal review of the TLRU study and associated information sharing agreement at this time.	Telephone - Sent	Marcel Colomb First Nation #328
May 8, 2018	Michael Raess of Alamos emailed Mark D'Amato, Band Manager, Marcel Colomb First Nation, to follow up on the April 27, 2018 email regarding an update on the legal review of the traditional land and resource use (TLRU) study and associated information sharing agreement.	Email - Sent	Marcel Colomb First Nation #328
April 27, 2018, 09:26 AM	Michael Raess of Alamos emailed Mark D'Amato, Band Manager, Marcel Colomb First Nation, to request a status update on the legal review of the TLRU study and associated information sharing agreement. Michael Raess called and spoke with Judy Sinclair-Moose of Marcel Colomb First Nation and she indicated she would follow up with Mark D'Amato regarding the legal review.	Email - Sent	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
April 20, 2018, 10:00 AM	Michael Raess of Alamos chaired a meeting with representatives from the Mathias Colomb Cree Nation (MCCN) including Deputy Chief Richard Dumas and Councillors Lorna Bighetty, Darrel Linklater, Shirley Castel, and Gordie Bear, as well as Clarence Bighetty, the MCCN recognized representative for Granville Lake Community, and MCCN members Kara Francois and Judy Sinclair-Moose to discuss a Traditional Land Use (TLU) study. The meeting started with introductions and Michael Raess gave a Project description and update. Richard Dumas talked about the TLU study from Marcel Colomb First Nation (MCFN) and stated that the MCCN TLU study would be separate from MCFN. Richard Dumas noted the potential to integrate the information from the 7 Elders who were interviewed as part of the MCFN TLU study into the MCCN study. In addition, the MCCN TLU Study can be conducted by Stantec. Michael Raess stated that Alamos needs a list of potential Elders to interview. Stantec will then create a proposal and submit it to MCCN for review. MCCN requested an open house where Chief and Council, and possibly Elders, could come, listen to a presentation, have their questions answered and attend a tour of the Project site. Michael Raess recommended that Clarence Bighetty and Pickerel Narrows Cree Nation members be also involved in order to determine if they accept the approach to the MCCN TLU study.	In-Person	Kara Francois, Mathias Colomb Cree Nation, Marcel Colomb First Nation #328, Granville Lake Community
April 16, 2018, 01:00 PM	Michael Raess of Alamos contacted Chief Priscilla Colomb of the Marcel Colomb First Nation (MCFN) regarding the Traditional Land Use (TLU) Study. Michael Raess asked if the TLU Study and associated sharing agreement has been reviewed by the MCFN lawyers. Priscilla Colomb said she would get back to Michael Raess.	Telephone - Sent	Marcel Colomb First Nation #328
March 13, 2018, 02:00 PM	Michael Raess of Alamos met with Marcel Colomb First Nation Chief and Council regarding the traditional land and resource use (TLRU) study report. Chief and Council have signed the Information Sharing Agreement, but it is still undergoing legal review before it can be submitted to Alamos.	In-Person	Mark D'Amato, Marcel Colomb First Nation #328
February 26, 2018, 08:00 PM	Michael Raess of Alamos met with Marcel Colomb First Nation (MCFN) Chief and Council (Chief Priscilla Colomb, Judy Sinclair-Moose, Angel Castel, and Evelyn Sinclair) regarding the Information Sharing Agreement for the MCFN Traditional Land Use (TLU) Study. Chief and Council decided to sign the Information Sharing Agreement and to make the Environmental Assessment version of the TLRU Study a public document. MCFN Chief and Council also discussed sharing the TLU Study with the Mathias Colomb Cree Nation.	In-Person	Marcel Colomb First Nation #328
February 26, 2018, 04:00 PM	Michael Raess of Alamos along with members of council from the Marcel Colomb First Nation (MCFN) including Angel Castel and Evelyn Sinclair to meet with Judy Sinclair-Moose and brought a copy of the MCFN Traditional Land Use Study report to an Elder that participated in the study.	In-Person	Marcel Colomb First Nation #328
February 07, 2018, 10:00 AM	Michael Raess of Alamos was contacted by Chief Priscilla Colomb of the Marcel Colomb First Nation (MCFN) regarding the TK/TLRU Study. Chief Colomb asked for template that can be signed to accept the TK TLRU report and to sign a sharing agreement that facilitates the use of the data within the EIS. Lauren Stead (Stantec) was contacted by Michael Raess to fax this template to MCFN (Fax 356-2330). Chief and Council plan to sign it in Winnipeg. Chief Colomb also asked for Alamos to pay for travel costs to Toronto for Mathias Colomb Cree Nation (MCCN). Michael Raess mentioned the statement from MCCN that MCCN is the mother band and has the full right to make a decision for all LLGP surrounding or potentially affected Indigenous groups. Chief Colomb said that that claim is not accurate. They also discussed the Headman of MCCN as well as a potential meeting on February 20, 2018.	Telephone - Received	Marcel Colomb First Nation #328
January 16, 2018, 03:00 PM	Michael Raess of Alamos met with a Marcel Colomb First Nation community member to discuss a job opportunities with Alamos as and environmental liaison.	In-Person	Marcel Colomb First Nation #328
January 16, 2018, 10:00 AM	Michael Raess of Alamos met with Chief Priscilla Colomb, council member Judy Sinclair-Moose, and council member Evelyn Sinclair of the Marcel Colomb First Nation (MCFN) for their regular meeting to increase communication between MCFN and Alamos. They discussed the potential name for the new Development Corporation steered by the current MCFN leadership. They indicated that Wanda Bighetty is the deputy chief for Mathias Colomb Cree Nation (MCCN). The Chief and council members identified a logging company within MCFN that went bankrupt within a short period and that the researcher involved with Pickerel Narrows Cree Nation (PNCN) was a part of that organization. Michael Raess presented the draft TLRU study prepared by Stantec for the Chief and Council to review and sign-off to be able to use the currently confidential information. Chief Colomb asked about the Environmental Liaison position.	In-Person	Marcel Colomb First Nation #328
January 15, 2018, 05:00 PM	Michael Raess of Alamos met with Chief Priscilla Colomb, Judy Sinclair-Moose, and 10 youth of the Marcel Colomb First Nation (MCFN) regarding the first "DreamTeam" youth meeting at the band office. Michael Raess discussed the importance of a good and complete education, potential job opportunities and indicated that any request for funding form Alamos would have to be proposed formally by the youth.	In-Person	Marcel Colomb First Nation #328, Unidentified Stakeholder

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
December 13, 2017, 11:30 AM	Michael Raess of Alamos met with a community member of Marcel Colomb First Nation #328 (MCFN) regarding working as the environmental liaison for MCFN. The community member also discussed growing up in Pickerel Narrows and stated that they believe that Gordon Bighetty is not recognized as representing the community Pickerel Narrows Cree Nation. This community member identified potential interviewees for the proposed Traditional Land and Resource Use (TLRU) study.	In-Person	John Linklater, Marcel Colomb First Nation #328
December 13, 2017, 10:30 AM	Michael Raess of Alamos met with Judy Sinclair-Moose of the Marcel Colomb First Nation regarding the release and confidentiality of the Traditional Land and Resource Use (TLRU) study. Judy Sinclair-Moose talked to Chief and Council to determine if it was ok for Michael Raess to bring the TLRU study document from Stantec (Saskatoon) to council. Chief and council indicated that there was no problem and they wanted one printed copy and one digital copy to be emailed to Judy Sinclair-Moose to distribute. They also confirmed that the legal name of the reserve is the "Black Sturgeon Reserve".	In-Person	Marcel Colomb First Nation #328
November 24, 2017, 10:30 AM	Michael Raess and Elizabeth (Liz) Martel of Alamos met with Judy Sinclair-Moose, Angel Castel, and Evelyn Sinclair of the Marcel Colomb First Nation (MCFN) as a regular meeting with the purpose of discussing Aboriginal agreements and protocols as well as job opportunities. Michael Raess talked about the TK/TLRU study and that the draft should come out in the next two weeks. Michael Raess passed on information to MCFC about the Aboriginal Environmental Leadership Circle (AELC). He also updated MCFN regarding potential training alliance/workforce readiness program that Alamos would like to establish. He also gave MCFN information on free training opportunities with Workplace Education Manitoba for those community members that needs literacy and/or numeracy training/upgrading. Judy Sinclair-Moose indicated that some youth are taking part in leadership/mentorship programs. Michael Raess encouraged youth to send a proposal/cost estimate to Alamos regarding these programs.	In-Person	Marcel Colomb First Nation #328
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to the Marcel Colomb First Nation. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_marcelcolomb.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Marcel Colomb First Nation #328
September 20, 2017, 10:00 AM	Michael Raess and Elizabeth (Liz) Martel of Alamos met with Chief Priscilla Colomb and Judy Sinclair-Moose of the Marcel Colomb First Nation (MCFN) with the purpose of updating MCFN on the project. Chief Priscilla Colomb and Judy Sinclair-Moose discussed brining school kids to the Gordon site to learn about the Project effects and opportunities.	In-Person	Marcel Colomb First Nation #328
July 28, 2017, 10:00 AM	Michael Raess and Liz Martel of Alamos Gold attended Treaty Days hosted by Marcel Colomb First Nation, which included games and a general celebration at the Black Sturgeon Reserve. Michael Raess and Liz Martel took part and helped Marcel Colomb First Nation in organizing some of the games.	In-Person	Marcel Colomb First Nation #328
June 16, 2017	A member of the Marcel Colomb First Nation (MCFN) was contacted by Michael Raess regarding a potential job position as the environmental liaison. The position would specifically communicate environmental aspects of the Project to the community. The position could also include the sharing of traditional knowledge (e.g., plant use) with Alamos to encourage appreciation of local knowledge.	Telephone - Sent	Marcel Colomb First Nation #328
June 15, 2017, 01:00 PM	Meeting with Marcel Colomb First Nation community members at the Black Sturgeon Reserve. A similar meeting was held on May 30th but due to low attendance this second meeting was set up. Similar to the first meeting, this meeting was to illustrate three main concepts /steps that have to be addressed over the next 1-2 years 1 Marcel Colomb First Nation collaboration during the Environmental Assessment process, 2.Setup of an Impact Benefit Agreement, and 3. Community Preparation to ensure the community is ready and trained when there are project related job openings and business opportunities There were approximately 10 Marcel Colomb First Nation members in attendance, of which most were members that came to the previous presentation (approximately 3-5 additional members).This meeting had more dialogue than the presentation/meeting on May 30, 2017.	In-Person	Marcel Colomb First Nation #328
June 03, 2017, 11:00 AM	Liz Martel and Tanushree Bose from Alamos helped during the Annual Community clean-up at the Black Sturgeon Reserve.	In-Person	Marcel Colomb First Nation #328
June 01, 2017, 08:00 PM	Michael Raess of Alamos gold called Judy Sinclair-Moose of Marcel Colomb First Nation and the two discussed the upcoming Traditional Knowledge study, the Elder’s approval of trip to Pukatawagan as well as current and upcoming events.	Telephone - Sent	Marcel Colomb First Nation #328
May 30, 2017	Butch Amundson and Lauren Stead of Stantec Consulting met with seven Elders in Lynn Lake to review the Traditional Land and Resource Use Study. Stantec shared the compiled interviews and maps and shared hard copies with the Elders. The Elders were given a per diem and gift of tobacco as a thank you for sharing their time.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
May 30, 2017, 01:00 PM	Meeting with Marcel Colomb First Nation community members at the Black Sturgeon Reserve. This meeting was to illustrate three main concepts /steps that have to be addressed over the next 1-2 years 1.Marcel Colomb First Nation collaboration during the Environmental Assessment process, 2.Setup of an Impact Benefit Agreement, and3.Community Preparation to ensure the community is ready and trained when there are project related job openings and business opportunities This meeting was organized based on an earlier meeting around the open house (May 1, 2017) to incorporate the entire Marcel Colomb First Nation community and to commence introduction and discussion of the above mentioned 3 concepts. Chief and Council indicated on May 1, 2017 that we should have a meeting at the reserve to ensure full integration of the Marcel Colomb First Nation community. There were approximately 10 people at the meeting. Due to the low number of members, Alamos and Marcel Colomb First Nation members arranged for an additional meeting/presentation on to be provided on June 15th 2017.The meeting was positive despite the low number of Marcel Colomb First Nation members and Alamos received many questions about concerns and spoke about the importance of collaboration and initiation of training for Marcel Colomb First Nation members.	In-Person	Judy Sinclair-Moose, Marcel Colomb First Nation #328
May 17, 2017, 04:50 PM	Michael Raess of Alamos Gold met with Chief Priscilla Colomb and Councillors, Angel Castel and Evelyn Sinclair of Marcel Colomb First Nation. Michael Raess received a signed Band Council Resolution indicating that there are no concerns with continuing the environmental baseline study, which was required to complete the application for the work permit for future environmental baseline studies.	In-Person	Marcel Colomb First Nation #328
May 16, 2017, 10:30 AM	Michael Raess and Liz Martel of Alamos Gold met with Councillors Judy Sinclair-Moose, Angel Castel, and Evelyn Sinclair and a private citizen from Marcel Colomb First Nation (MCFN) at a regularly scheduled meeting to discuss project updates and increase communication between MCFN and Alamos. Alamos and Chief and Council discussed the upcoming visit by Colin Webster of Alamos on May 29, 2017. Chief and Council identified Crystal Michelle as the new Community Coordinator for the Traditional Land and Resource Use Study to act as a liaison between Stantec and MCFN Elders. Alamos and Chief and Council also discussed potential projects to benefit children and youth in the community, work permit applications for exploration, potential permissions to access trap line areas during exploration, and scheduling the Spring Clean-up at Black Sturgeon.	In-Person	Private Citizen, Marcel Colomb First Nation #328
May 1, 2017	Butch Amundson and Lauren Stead of Stantec Consulting interviewed three Elders in Lynn Lake for the Traditional Land and Resource Use Study. The Elders shared their traditional knowledge and traditional land and resource use information through map biographies and guided questionnaires. The Elders were given a per diem and gift of tobacco as a thank you for sharing their knowledge.	In-Person	Marcel Colomb First Nation #328
May 01, 2017, 05:00 PM	Alamos Gold and Stantec Consulting held the third Lynn Lake Gold Project Open House in Lynn Lake for members of the community to receive general project information and updates on the Environmental Assessment. Alamos Gold and Stantec Consulting made a PowerPoint presentation and answered questions raised by members of the community. Open House handouts were circulated and attendees were asked to complete a survey.	In-Person	Marcel Colomb First Nation #328, Town of Lynn Lake
April 24, 2017, 10:30 AM	Michael Raess and Liz Martel of Alamos Gold met with Councillors Judy Sinclair-Moose, Angel Castel, and Evelyn Sinclair and a private citizen of Marcel Colomb First Nation (MCFN) for a regularly scheduled meeting to discuss project updates and increase communication between Alamos and MCFN. Michael Raess invited Chief and Council to the Alamos Open House scheduled for May 1, 2017 and asked for input or particular topics MCFN would like covered. Michael Raess encouraged Chief and Council to prepare a list of questions that potentially can clarify concerns or general topics to further discuss during the Open House. Michael Raess clarified why Alamos had put up "No Shooting 24hr Active Work Site" signs to prevent hunting along the Gordon mine site access road and indicated that Alamos does not want to discuss hunting, but has safety concerns about shooting in the vicinity of work areas. Alamos and Chief and Council also discussed updates on the workforce database, establishment of the new development corporation, and potential business opportunities. Liz Martel is actively seeking participation from community members in the workforce database update. Judy Sinclair-Moose indicated that that MCFN had asked the Town of Lynn Lake to be integrated into the Tom Cochrane concert for security purposes.	In-Person	Private Citizen, Marcel Colomb First Nation #328
April 21, 2017, 01:00 PM	Michael Raess of Alamos Gold called and spoke with Judy Sinclair-Moose of Marcel Colomb First Nation to schedule a meeting to discuss a number of items related to the Lynn Lake Gold Project. The meeting was scheduled for April 24, 2017 at 10:30 a.m.	Telephone - Sent	Marcel Colomb First Nation #328
April 12, 2017, 04:45 PM	Lauren Stead of Stantec Consulting Ltd. emailed a member of Marcel Colomb First Nation to schedule interviews with three Elders for the Traditional Land and Resource Use Study.	Email - Sent	Marcel Colomb First Nation #328
March 17, 2017, 01:00 PM	Michael Raess of Alamos Gold met with a private citizen from Marcel Colomb First Nation who stopped in at the Alamos Gold office in Lynn Lake. The individual identified their trapline within the Lynn Lake Gold Project leases and requested compensation. Michael Raess indicated that the information would be forwarded to Stantec Consulting Ltd. to be included in the traditional land and resource use study.	In-Person	Private Citizen, Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
March 01, 2017, 10:00 AM	Michael Raess and Liz Martel of Alamos Gold held a regularly scheduled meeting with Chief Priscilla Colomb, Councillors Judy Sinclair-Moose, Angel Castel, and Evelyn Sinclair of Marcel Colomb First Nation to discuss project updates, potential concerns, and upcoming events, developments with Alamos, Chief and Council and the current status of the Traditional Land and Resource Use Study. Chief and Council requested to have three additional Elders interviewed and approved the study to proceed. Angel Castel was identified as the liaison person to schedule additional interviews.	In-Person	Marcel Colomb First Nation #328
February 13, 2017	Chief Priscilla Colomb, councillors Judy Sinclair-Moose, Angel Castel, Evelyn Sinclair, and advisor Mark D'Amato of Marcel Colomb First Nation (MCFN) met with Paolo Toscano, Colin Webster, Nis Engelstad, and Michael Raess of Alamos for an update regarding the LLGP. MCFN wants to work with Alamos and would like to get a good understanding of how Alamos' approach will be different than what was done in the past. Chief Priscilla Colomb commented that they would like to work together and they are interested in training programs. Alamos is glad that they can move forward together and they are committed to have community involvement throughout the project and potential mine operation. Alamos gave a brief history of their company and explained the benefits to MCFN including employment opportunities, improvements to the community well-being, various training opportunities. Alamos wants to ensure the benefits are long term even if the mine is only operating for a short time e.g., training. MCFN raised concerns regarding previous collaborations, changes to hunting areas, and there are burial grounds in the area. Looking forward, Alamos will: share accurate information, frequent good communication, perform a gap analysis of current traditional knowledge studies, illustrate where mine components are located in relation to sacred lands, illustrate mitigation measures and post-reclamation/remediation, and investigate potential collaboration e.g., catering/housekeeping, security, moving dirt, trucking/bus transportation.	In-Person	Marcel Colomb First Nation #328
January 17, 2017, 01:00 PM	Michael Raess and Liz Martel of Alamos Gold met with Chief Priscilla Colomb and Councillors Judy Sinclair-Moose, Angel Castel and Evelyn Sinclair of Marcel Colomb First Nation to discuss project updates and the establishment of a new First Nation development corporation. Alamos and Chief and Council discussed communication preferences, potential business opportunities, building a strong youth and workforce, potential training programs. Liz Martel with work with Chief and Council to create a current workforce database. Alamos and Chief and Council planned for a monthly in-person update meeting	In-Person	Marcel Colomb First Nation #328
December 06, 2016, 12:00 PM	Michael Raess and Liz Martel of Alamos Gold attended a public meeting with Marcel Colomb First Nation. The purpose of the meeting was to get motions moved by Marcel Colomb First Nation members to pursue legal actions and remove certain individuals from Marcel Colomb First Nation. The meeting was cancelled by the RCMP.	In-Person	Marcel Colomb First Nation #328
November 24, 2016, 02:15 PM	Colin Webster of Alamos Gold received an email from Mark D'Amato, Band Manager for Marcel Colomb First Nation in response to his email on November 23, 2016. Mark D'Amato expressed appreciation for Alamos Gold's expression of open meaningful discussions with the duly elected Chief and Council of Marcel Colomb First Nation. Mark D'Amato requested that Alamos Gold provide him with all files, contracts and correspondence between Alamos Gold and Marcel Colomb Development Corporation given issues related to accountability and transparency of their operations. Mark D'Amato also asked that Alamos Gold suspend all communication, negotiation and/or payments to Marcel Colomb Development Corporation. All previous corporate directors have been changed, effective today (November 24, 2016) to Chief Priscilla Colomb, Councillor Evelyn Sinclair, and Councillor Angel Castel. Mark D'Amato indicated that all previous staff and/or directors of Marcel Colomb Development Corporation are no longer authorized to communicate or negotiate on behalf of Marcel Colomb First Nation. Chief and Council of Marcel Colomb First Nation are prepared to meet with Alamos Gold to discuss the Lynn Lake Gold Project and Marcel Colomb First Nation's interests once they have received and reviewed the Project materials. Mark D'Amato requested that Colin Webster forward all materials to him at the earliest convenience.	Email - Received	Marcel Colomb First Nation #328
November 24, 2016, 02:00 PM	Colin Webster of Alamos Gold called and spoke with the newly elected Chief and Council of Marcel Colomb First Nation. Chief and Council stated that Alamos Gold must cease and desist all activities with Marcel Colomb Development Corporation immediately.	Telephone - Sent	Marcel Colomb First Nation #328
November 23, 2016, 03:05 PM	Colin Webster of Alamos Gold emailed Mark D'Amato, Band Manager for Marcel Colomb First Nation indicating that the uncertainty around the community leadership has not afforded Alamos Gold the opportunity to have sustained and meaningful discussions regarding the Lynn Lake Gold Project. Colin Webster requested that Mark D'Amato pass his message on to Chief Colomb so that Alamos Gold can coordinate an initial meeting. Colin Webster indicated that he was available the week of December 12 and 19, 2016.	Email - Sent	Marcel Colomb First Nation #328
November 21, 2016, 10:32 AM	Colin Webster of Alamos Gold emailed Judy Sinclair-Moose, Employee of Marcel Colomb First Nation to introduce himself and try to coordinate a meeting with Chief Priscilla Colomb in December 2016 to provide a Lynn Lake Gold Project update and discuss how Marcel Colomb First Nation leadership would like to move forward with regards to engagement activities. Colin Webster indicated he was available to meet the week of December 12 or 19, 2016.	Email - Sent	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
November 18, 2016	Butch Amundson and Lauren Stead of Stantec Consulting and the Community Coordinator of Marcel Colomb First Nation, interviewed two Elders in Regina, SK for the Traditional Land and Resource Use Study. The Elders shared their traditional knowledge and traditional land and resource use information through map biographies and guided questionnaires. The Elders were given a per diem and gift of tobacco as a thank you for sharing their knowledge.	In-Person	Marcel Colomb First Nation #328, Andrew Colomb
November 16, 2016	Butch Amundson and Lauren Stead of Stantec Consulting and the Community Coordinator of Marcel Colomb First Nation, interviewed two Elders in Winnipeg for the Traditional Land and Resource Use Study. The Elders shared their traditional knowledge and traditional land and resource use information through map biographies and guided questionnaires. The Elders were given a per diem and gift of tobacco as a thank you for sharing their knowledge.	In-Person	Marcel Colomb First Nation #328, Andrew Colomb
October 25, 2016, 01:00 PM	Colin Webster and Paolo Toscano of Alamos Gold and Crispin Smith of rePlan met with a member of the Marcel Colomb Development Corporation (MCDC), Trevor Harding, an independent consultant and Chief Chris Colomb and Councillors of Marcel Colomb First Nation (MCFN) to discuss the Workforce Housing Study being completed by rePlan. Crispin Smith presented a PowerPoint presentation as an introduction to the Workforce Housing Study. MCFN members stressed that they are the most important stakeholder in the Workforce Housing Study and should be engaged as such. MCFN members expressed that they would appreciate Alamos' support to purchase and establish MCFN housing within Lynn Lake. The group determined that the Lynn Lake Town Council and MCFN Chief and Council should meet to discuss the Workforce Housing Study and issues surrounding housing in the town.	In-Person	Trevor Harding, Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
October 21, 2016	Butch Amundson and Lauren Stead of Stantec Consulting and the Community Coordinator of Marcel Colomb First Nation, interviewed an Elder at Black Sturgeon Reserve for the Traditional Land and Resource Use Study. The Elders shared their traditional knowledge and traditional land and resource use information through map biographies and guided questionnaires. The Elder was given a per diem and gift of tobacco as a thank you for sharing their knowledge.	In-Person	Marcel Colomb First Nation #328
October 21, 2016	Butch Amundson and Lauren Stead of Stantec Consulting and the Community Coordinator of Marcel Colomb First Nation, interviewed four Elders in Lynn Lake for the Traditional Land and Resource Use Study. The Elders shared their traditional knowledge and traditional land and resource use information through map biographies and guided questionnaires. The Elders were given a per diem and gift of tobacco as a thank you for sharing their knowledge.	In-Person	Marcel Colomb First Nation #328
October 19, 2016	Butch Amundson and Lauren Stead of Stantec Consulting and the Community Coordinator of Marcel Colomb First Nation, interviewed seven Elders in Pukatawagan, MB for the Marcel Colomb First Nation Traditional Land and Resource Use Study. Elders shared their traditional knowledge and traditional land and resource use information through map biographies and guided questionnaires. Elders were given a per diem and gift of tobacco as a thank you for sharing their knowledge.	In-Person	Marcel Colomb First Nation #328, Andrew Colomb
October 14, 2016, 11:00 PM	Mark Rein of Alamos Gold spoke with Chief Chris Colomb in a social setting at a local venue in Lynn Lake. Mark Rein and Chief Chris Colomb spoke about the upcoming mining conferences in Ottawa and Winnipeg, general project information and the feasibility study. Chief Chris Colomb expressed that he is hoping to see more job opportunities come available locally for MCFN community members.	In-Person	Marcel Colomb First Nation #328
September 27, 2016	Chief Chris Colomb and councillor Douglas Hart of Marcel Colomb First Nation (MCFN) met with Paolo Toscano and Colin Webster of Alamos regarding a project update and the Impact Benefits Agreement (IBA). Colin Webster also stated that Alamos and Marcel Colomb Development Corporation were just starting conversations around training programs and would be working together on a number of items.	In-Person	Marcel Colomb First Nation #328
September 26, 2016	Paolo Toscano, Colin Webster and Michael Raess of Alamos Gold met with Sam Anderson, Sandra Ducharme and Regan Olafson of Marcel Colomb Development Corporation to discuss training programs and funding from the Government, which would start with other sites (e.g., reclamation of Fox Mine) and then move to the Lynn Lake Gold Project. Also discussed at the meeting included job shadowing between Elders and youth, schedule of the Project, details about jobs including job descriptions, numbers, qualifications, transportation and logistics requirements.	In-Person	Marcel Colomb Development Corporation
August 30, 2016	Meeting was held for the purpose of introducing the Alamos senior executive to the Marcel Colomb First Nation Chief and Band Council as well as express to the band the importance the Lynn Lake Gold Project is to Alamos. John McCluskey spoke at length about the importance the Lynn Lake Gold Project	In-Person	Marcel Colomb First Nation #328
August 15, 2016, 12:45 PM	Mark Rein of Alamos Gold had a conversation with a member of MCFN during a chance encounter outside the Town of Lynn Lake office. The member of MCFN asked about current work going on at the project site. Mark Rein indicated that Dorado Drilling would be conducting drilling until Fall 2016. Mark Rein and the member of MCFN also discussed current employees from Marcel Colomb First Nation and potential upcoming job opportunities.	In-Person	Andrew Colomb, Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
August 12, 2016, 01:30 PM	Tanushree Bose of Alamos Gold met with Chief Chris Colomb of MCFN regarding the Alamos CEO's upcoming visit to Lynn Lake. Chief Chris Colomb indicated that he is looking forward to meeting with the Alamos CEO and confirmed the time and place of the meeting.	In-Person	Marcel Colomb First Nation #328
July 28, 2016, 11:00 AM	Mark Rein of Alamos Gold met with Gordon Colomb Jr., Councillor of Marcel Colomb First Nation (MCFN) and former Alamos employee and discussed the potential job opportunities.	In-Person	Marcel Colomb First Nation #328, Unidentified Stakeholder
June 28, 2016, 03:00 PM	Tanushree Bose and Mark Rein of Alamos Gold met with the pump house operator of Marcel Colomb First Nation (MCFN) to discuss potential summer job opportunities for local students. The two also discussed the current political situation of MCFN.	In-Person	Unidentified Stakeholder, Marcel Colomb First Nation #328
June 17, 2016, 03:45 PM	Mark Rein of Alamos Gold met with Gordon Colomb Jr., Councillor of Marcel Colomb First Nation (MCFN) and former Alamos employee. Mark Rein indicated that Alamos may have a potential job opportunity for Gordon if he was interested. Gordon Colomb Jr. expressed interest in doing some fieldwork with Stantec. The two also discussed the current political situation within MCFN.	In-Person	Marcel Colomb First Nation #328
May 10, 2016, 09:15 AM	Angele Watrin-Prodaehl of Stantec Consulting Ltd. was conducting field work with Liz Martel of Marcel Colomb First Nation (also an employee of Alamos Gold). Liz Martel shared traditional knowledge about activities within the Lynn Lake Project area.	In-Person	Marcel Colomb First Nation #328
May 10, 2016, 09:00 AM	Angele Watrin-Prodaehl of Stantec conducted fieldwork accompanied by Liz Martel, Community Liaison of Marcel Colomb Development Corporation (MCDC). Liz Martel identified plant harvesting sites near Lynn Lake.	In-Person	Marcel Colomb First Nation #328
May 10, 2016, 09:00 AM	Angele Watrin-Prodaehl of Stantec conducted fieldwork accompanied by a member of Marcel Colomb First Nation (also an Alamos employee). The MCFN member and Alamos employee shared information regarding wildlife in the Lynn Lake area.	In-Person	Marcel Colomb First Nation #328
April 26, 2016, 07:00 PM	Brad Horne, Karen Mathers, Dave Morgan and Leane Wyenberg of Stantec met with former Chief Andrew Colomb of Marcel Colomb First Nation. Andrew Colomb provided Traditional Knowledge information regarding the effects of the existing mines on fishing.	In-Person	Marcel Colomb First Nation #328
April 18, 2016, 03:00 PM	Tanushree Bose of Alamos Gold and Liz Martel, Community Liaison, MCDC went door to door at the Black Sturgeon Reserve inviting community members to the Open House. Tanushree Bose and Liz Martel will make arrangements with the Marcel Colomb First Nation Band Office to have bus transportation from the Black Sturgeon Reserve to the town of Lynn Lake for the Open House. Many community members expressed interest in the event and are looking forward to seeing the presentation and sharing their knowledge of the area, particularly regarding wildlife and aquatics.	In-Person	Unidentified Stakeholder, Marcel Colomb First Nation #328
March 21, 2016, 01:00 PM	Tanushree Bose of Alamos Gold met with former Chief Douglas Hart to follow up on a previous discussion regarding the Marcel Colomb First Nation (MCFN) Community Meeting. Former Chief Douglas Hart informed Tanushree Bose that the Election Committee and MCFN band members have decided that a re-election should take place in mid May.	In-Person	Marcel Colomb First Nation #328
March 17, 2016, 02:30 PM	Tanushree Bose of Alamos Gold met with former Chief Douglas Hart regarding a Community Meeting held for members of Marcel Colomb First Nation (MCFN) to discuss election results. Tanushree Bose had wanted to attend the meeting, but only MCFN members were invited. Tanushree Bose will follow up with former Chief Douglas Hart following the Community Meeting.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
February 18, 2016, 03:00 PM	Mark Rein of Alamos Gold (Alamos) and Elizabeth Martel, Community Liaison Coordinator for Marcel Colomb First Nation (MCFN) met with Chief Priscilla Colomb, and councillors Evelyn Sinclair, Tricia Colomb and Angel Castel, of MCFN at the Alamos Gold Lynn Lake office. Mark Rein had expressed interest in meeting the new Chief and council of MCFN to Elizabeth Martel who arranged the meeting with Chief Priscilla Colomb. Mark Rein congratulated Chief Priscilla Colomb and the council on their election win. Mark Rein gave the Chief and Council a quick overview of the work Alamos Gold has completed and the current work being done and the plans for the short term. Mark Rein provided an overview of Alamos Gold's goals for the Lynn Lake Project (the Project) and the responsibilities that need to be met on Alamos' part for a project like this to get to the development stage. Chief Priscilla Colomb asked if Alamos was a part of the work that is to happen later this year at the Fox Mine and Mark Rein explained that Alamos Gold is not involved in that project. Mark Rein showed on a map where the Project area was located and also indicated the area that Alamos was covering for the baseline study in addition to the immediate project locations. Chief Priscilla Colomb mentioned that the baseline study covered many of the lakes that band members frequently use for fishing, and other traditional activities. Mark Rein gave Chief Priscilla Colomb a list of some of the MCFN members who were currently working for Alamos and some of the past employees who worked for Alamos and Stantec on Project related activities. Mark Rein spoke about the baseline environmental study being conducted by Stantec and the importance of a study like this for the Lynn Lake Project. Mark Rein also brought the Environmental Committee to their attention and told them who the MCFN members on the committee were. None of the people in the meeting were aware of the Environmental Committee or the members on it. Mark Rein answered a few questions about the work being done by Stantec and listened to concerns expressed by MCFN Chief and Council regarding water quality and marine and terrestrial habitat and the potential side effect on hunting and fishing in the area. Mark Rein mentioned there would be an open house in April and encouraged the Chief and council to think of questions they would like answered about the Project and encouraged them to reach out to Alamos with concerns as soon as possible. Mark Rein was asked to check with Colin Webster and Andrew Cormier about a meeting in Winnipeg on February 25 or 26. Mark Rein was not familiar with the specifics for this meeting and told the Chief and Council he would check and confirm if the Chief and council would be traveling to Winnipeg during this time period and would inform Elizabeth Martel about the specifics to pass along to Chief Priscilla Colomb. Mark Rein emailed Colin Webster and Andrew Cormier after the meeting and was able to confirm that Colin Webster was in the planning meetings during that time in Winnipeg with Marcel Colomb Development Corporation and Stantec.	In-Person	Marcel Colomb First Nation #328
November 09, 2015, 11:00 AM	Tanushree Bose and Mark Rein of Alamos Gold and Elizabeth Martel, Community Liaison Coordinator for Marcel Colomb Development Corporation met with Chief Douglas Hart and Chris Colomb of the Marcel Colomb First Nation at the Government of Manitoba's Mineral Resources Open House. Discussion involved Carlisle Goldfield's intended exploration program on Burnt Timber and North Gate properties and Alamos Gold's feasibility study and potential development of that mine.	In-Person	Marcel Colomb First Nation #328
October 27, 2015, 03:00 PM	Tanushree Bose of Alamos Gold and Elizabeth Martel, Community Liaison Coordinator for the Marcel Colomb Development Corporation met with Chief Douglas Hart of the Marcel Colomb First Nation (MCFN). Chief Douglas Hart has met with the Outside Band Manager regarding MCFN's finances and had more transparent communication on that front. Discussion involved Alamos Gold's hopes to give gifts to children on the reserve, the Environmental Committee, and a possible trip to the Young-Davidson mine so that the two Environmental Committee's can meet and exchange notes.	In-Person	Marcel Colomb First Nation #328
October 27, 2015, 03:00 PM	Tanushree Bose of Alamos Gold Inc. (Alamos) and Elizabeth Martel, Community Liaison Coordinator for Marcel Colomb Development Corporation met with the Health Program Coordinator of Marcel Colomb First Nation. Discussion involved the Environmental Committee's trip to Young-Davidson mine to meet and exchange ideas with the Young-Davidson mine Environmental Committee, and Christmas gift ideas for children on the reserve. The Health Program Coordinator informed Alamos that Trish Colomb resigned from her position as Social Assistance Coordinator for the Marcel Colomb First Nation. The postponement of the open house was discussed with a tentative date of January 17-18, 2016.	In-Person	Marcel Colomb First Nation #328
September 29, 2015, 03:00 PM	Tanushree Bose of Alamos Gold and Elizabeth Martel, Community Liaison Coordinator for Marcel Colomb First Nation (MCFN) met with Chief Douglas Hart, Councillors Chris Colomb and Evelyn Sinclair, and the Health Program Coordinator, of MCFN. Tanushree Bose spoke with Chief Douglas Hart about the Environmental Committee, reiterating that Chief Douglas Hart controls who is on the committee, and that Chief Douglas Hart is allowed to invite whomever to sit on the committee. Chief Douglas Hart said that a private Lynn Lake citizen has been asked to sit on the Environmental Committee. The Health Program Coordinator hopes to set up a monthly bingo game on the reserve and suggested that the event could be used to briefly provide updates from the Environmental Committee. Tanushree Bose met with a private citizen and discussed general project information.	In-Person	Evelyn Sinclair, Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
September 23, 2015, 04:00 PM	Tanushree Bose of Alamos Gold and Elizabeth Martel, Community Liaison Coordinator for Marcel Colomb First Nation (MCFN) met with the Health Program Coordinator, and a member of MCFN at Black Sturgeon Reserve. Tanushree Bose informed the Health Program Coordinator and MCFN member about a Stantec atmospheric monitoring station near the pump house and stated that Stantec will try to regularly check on them. Tanushree Bose spoke about the Environmental Committee, and the Health Program Coordinator reiterated that the information is not being conveyed to the MCFN and suggested a newsletter or website as the community would respond to visual information. Tanushree Bose requested that the Health Program Coordinator nudge Chief Douglas Hart to re-examine the Environmental Committee members to better reflect the community and best transmit the information to the community. The open house in December was also discussed.	In-Person	Kara Francois, Marcel Colomb First Nation #328
September 17, 2015, 02:00 PM	Tanushree Bose of Alamos Gold and Elizabeth Martel, Community Liaison Coordinator for Marcel Colomb First Nation (MCFN) met with the Medical and Social Assistance Coordinator for MCFN. Tanushree Bose informed Medical and Social Assistance Coordinator about the Lynn Lake Project, and that himself, Mark Rein and Elizabeth Martel are always available for questions and concerns. Discussions were had about the environmental assessment and the drill program. Most of the MCFN office staff were in Winnipeg attending a meeting with the Marcel Colomb Development Corporation.	In-Person	Marcel Colomb First Nation #328
September 08, 2015, 10:00 AM	Olive Bailey of Stantec sent an email to Chief Douglas Hart, Marcel Colomb First Nation, to request a telephone interview regarding infrastructure and services and socio-economic conditions for Marcel Colomb First Nation. At 10:08 a.m., Olive Bailey received an email from Chief Douglas Hart stating that he would be available in the afternoon anytime the week of September 8, 2015. At 10:09 a.m., Olive Bailey sent an email to Chief Douglas Hart proposing to hold the telephone interview at 1:00 p.m. on September 8, 2015. At 12:32 p.m., Olive Bailey received an email from Chief Douglas Hart stating that he would be available at that time. At 12:33 p.m., Olive Bailey sent an email to Chief Douglas Hart to confirm the telephone interview. At 1:00 p.m., Olive Bailey called Chief Douglas Hart. Olive Bailey and Chief Douglas Hart discussed his background as Chief and member of council, the population of the Marcel Colomb First Nation, employment and the local economy, and community services, and capacity constraints related to service provision. Chief Douglas Hart reported being optimistic that the Lynn Lake Project will be positive overall and will result in employment, training and economic development opportunities for members of the Marcel Colomb First Nation; however, negative social impacts are also expected, specifically increased alcohol use resulting from increased incomes. Addressing these negative impacts will require more social programming and funding for social programming.	Email - Sent	Marcel Colomb First Nation #328
August 25, 2015, 09:00 AM	Olive Bailey of Stantec sent an email to Chief Douglas Hart of Marcel Colomb First Nation (MCFN), thanking him for rescheduling. At 1:05 p.m., Olive Bailey called Chief Douglas Hart, and was informed by the receptionist for MCFN that Chief Douglas Hart would not be at the office until 2:00 p.m. At 1:12 p.m., Olive Bailey sent an email to Chief Douglas Hart, asking him to call Olive Bailey when Chief Douglas Hart is ready to do the interview. Olive Bailey stated that the telephone interview could be rescheduled to the week of August 31, 2015.	Email - Sent	Marcel Colomb First Nation #328
August 23, 2015, 03:00 PM	Olive Bailey of Stantec sent an email to Chief Douglas Hart of Marcel Colomb First Nation (MCFN), asking to reschedule the telephone interview regarding socio-economic conditions related to MCFN for August 25, 2015 at 1:00 p.m. At 11:34 a.m., Olive Bailey received an email from Chief Douglas Hart, agreeing to reschedule the telephone interview for 1:00 p.m. on August 25, 2015. Chief Douglas Hart indicated that would be the latest he would be available for the interview until the week of August 31, 2015.	Email - Sent	Marcel Colomb First Nation #328
August 20, 2015, 07:00 PM	Olive Bailey of Stantec received an email from Chief Douglas Hart of Marcel Colomb First Nation (MCFN), proposing to hold the telephone interview regarding socio-economic conditions related to MCFN on August 24, 2015 at 1:00 p.m. At 9:21 a.m. on August 21, 2015, Olive Bailey sent an email to Chief Douglas Hart to confirm the telephone interview on August 24, 2015 at 1:00 p.m.	Email - Received	Marcel Colomb First Nation #328
August 18, 2015, 01:00 PM	Olive Bailey of Stantec sent an email to Chief Douglas Hart of Marcel Colomb First Nation (MCFN), to request a telephone interview regarding infrastructure and services and socio-economic conditions for MCFN. Olive Bailey proposed to hold the telephone interview at 2:00 p.m. on August 18, 2015. At 1:51 p.m., Olive Bailey sent an email to Chief Douglas Hart asking if Chief Douglas Hart would be available instead on August 19, 2015 at 10:00 a.m. or 1:00 p.m.	Email - Sent	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
July 30, 2015, 08:00 AM	Mark Rein of Alamos Gold met and spoke with Chief Douglas Hart of Marcel Colomb First Nation (MCFN) and the President of Dorado Drilling informally while walking around in Lynn Lake. Several topics were discussed:1) Project Status - Mark Rein indicated that things were going smoothly and the current work plan was on schedule for this year. Mark Rein also indicated that they were satisfied with the progress made so far. 2) Purpose of the Environmental Baseline Study - Chief Hart asked about the timeline to get the project to an operating mine. Mark Rein commented that the deadline for a feasibility study is November 2017 and that time was required to complete the economic and engineering studies and that the length of time allows for a more complete data set for the Environmental Baseline Studies. Mark Rein said that a production decision would be made after the feasibility study is released and did not commit or suggest any other dates outside of the deadline for the feasibility study.3) Current Employment - The group discussed the current MCFN members employed on the project and about other community members employed by both Alamos Gold and Element Drilling. 4) MCFN Election - Chief Hart spoke about the election win when the President of Dorado Drilling asked about the election campaign. Chief Hart cited needed time to get his campaign in order as a reason for not continuing to work with Element Drilling or taking a position with Stantec position. 5) Relationship with the Town - Mark Rein asked Chief Hart about how he felt about working closer with the Town of Lynn Lake and Lynn Lake Town council. Chief Hart stated that he has positive working relations with town councillor Dave Campbell and Mayor James Lindsay and said he planned on meeting with them to re-establish a working relationship between the Town and the band and agreed the two entities can accomplish more together that they can separately. 6) Relationship with the Outside Band Manager - Chief Hart expressed that he was impressed with the Outside Band Manager and felt that the Outside Band Manager's leadership could provide structure and increase the openness of the band's finances. 7) Marcel Colomb Development Corporation (MCDC) - Chief Hart had not yet met with the MCDC board members but looked forward to discussions with them and learning how the MCDC is allocating the incoming funds and how they would make it back to the community and its members. Chief Hart has a meeting scheduled for August 21st down in Winnipeg with the MCDC board members. . 8) Proposed School on the Reserve - Chief Hart did not feel that the proposed school on the reserve was a priority. Chief Hart noted that the current school would be stronger with all the children in the area attending rather than splitting the children up and as a result the proposed school on the reserve was not in the best interest of the children.	In-Person	Dorado Drilling, Marcel Colomb First Nation #328
July 19, 2015, 11:00 AM	Mark Rein of Alamos Gold met and spoke with Chief Douglas Hart of Marcel Colomb First Nation (MCFN). Mark Rein asked Chief Douglas Hart for updated contact information and was provided with a phone number and email address. Chief Douglas Hart will be acquiring a cell phone so he can be reached while out of town on business. Plans were made to speak again when Chief Douglas Hart returns to Lynn Lake from Winnipeg during the week of July 27 to August 1.	In-Person	Marcel Colomb First Nation #328
July 15, 2015, 10:00 AM	Carlisle Goldfields hosted a tour and gave a presentation on the Lynn Lake Project for industry analysts and Carlisle Goldfield's Board of Directors. Mark Rein of Alamos Gold Inc. and outgoing Chief Andrew Colomb and new Chief-elect Douglas Hart of Marcel Colomb First Nation (MCFN) were in attendance. Mark Rein spoke with Andrew Colomb and Andrew inquired about the work program and how some of the MCFN members who were currently employed on the project were doing. Mark stated that several of the MCFN employees have been reliable hard workers and that Alamos Gold has been pleased with the workers they presently employ. Mark stated that the drilling and core processing were progressing well and that they were making headway in catching up to the drills. Mark also spoke with Douglas Hart and congratulated him on his election victory. Mark and Douglas agreed to have a sit down conversation to discuss the project.	In-Person	Andrew Colomb, Marcel Colomb First Nation #328
June 26, 2015, 02:00 PM	Mark Rein of Alamos Gold Inc. and Elizabeth Martel, Community Liaison of Marcel Colomb First Nation (MCFN) met with Cameron Francois, MCFN Water Treatment Plant Operator, during a site visit to the Black Sturgeon Reservation in order to scout out potential sites for the proposed air quality monitoring station. One of the potential sites was the water treatment plant. During the site visit, potential site locations were discussed for the equipment as well as the potential for vandalism, theft and tampering. Cameron Francois gave a tour of the water treatment plant and explained how the plant functions. Cameron Francois also discussed why Mark D'Amato did not want the water truck and the sewage truck to go to town to deliver water and collect cuttings at the Alamos Gold core shack for reasons that the wear and tear on the band's trucking equipment would be too high.	In-Person	Marcel Colomb First Nation #328
June 20, 2015, 04:00 PM	Abraham Drost of Carlisle Goldfields Ltd. called and spoke with Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) regarding potential business opportunities along the Pukatawagan rail corridor between Lynn Lake and Pukatawagan. Chief Andrew Colomb invited Abraham Drost and Bruce Reid of Carlisle Goldfields Ltd. to take a railway tour and meet some of his family/business associates to discuss potential business opportunities around the possible mine development. Abraham Drost noted being potentially available on July 14, 2015 and agreed to confirm by email. Abraham Drost asked Chief Andrew Colomb about the overall level of satisfaction of MCFN with the Lynn Lake Project. Chief Andrew Colomb indicated that that as long as MCFN people perceive a positive benefit, they will be content to see things proceed. Abraham Drost asked Chief Andrew Colomb about the overall level of satisfaction of MCFN with the Lynn Lake Project. Chief Andrew Colomb indicated that that as long as MCFN people perceive a positive benefit, they will be content to see things proceed.	Telephone - Sent	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
June 15, 2015, 02:00 PM	Ryan Weston of Carlisle Goldfields Ltd. met with two members of Marcel Colomb First Nation (MCFN) regarding potential job opportunities with Carlisle Goldfields Ltd. Ryan Weston stated that no jobs were currently available, but that they should drop their resume's off with Elizabeth Martel, Community Liaison Coordinator of MCFN.	In-Person	Marcel Colomb First Nation #328
June 02, 2015, 11:00 AM	John Fitzgerald, Nancy Duquet-Harvey, Mark Rein, Jennifer Greville of Alamos Gold Inc. and Elizabeth (Liz) Martel, Community Liaison Coordinator of Marcel Colomb First Nation (MCFN) held a meeting with two Environment Committee members from MCFN, Chief Andrew Colomb, and a member of Marcel Colomb Development Corporation (MCDC). Nancy Duquet-Harvey made a presentation covering Environment Committee roles, learning opportunities and 2015 environmental baseline studies. Chief Andrew Colomb raised various concerns including water quality monitoring, compensation for loss of land use for trapline holders and post-mining legacy. A discussion of having the environmental baseline studies maps available at Lynn Lake office for general information and mark-up by MCFN community members took place. Liz Martel committed to having copies of all Stantec work plans made available and to provide additional detail to community members if required. The group discussed the need for meaningful community input, which will require having data available at the Lynn Lake office. The importance of identifying f Liz Martel as a source of information for the community and her availability was identified as something to communicate to the larger community. DOCUMENTS PROVIDED: 20150602 MCFN Environment Committee.pptxConcerns raised:1. Water quality monitoring. 2. Compensation for loss of land use (traplines). 3. Post-mining legacy. 4. MCFN understanding of Environmental Baseline Studies work and subsequent analysis, permitting process. 5.Design/Construction/Operation/Closure of a Mine. Concerns 1-3. Discussed and addressed during the meeting. Concerns 4-5 remain and will be subject to ongoing conversation.	In-Person	Bethany Colomb, Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
May 30, 2015, 01:00 PM	Mark Rein of Alamos Gold Inc. and Elizabeth (Liz) Martel, Community Liaison of Marcel Colomb First Nation (MCFN) and Environmental Committee members, Chief Andrew Colomb, and two members of MCFN were taken for a tour of the Farley Lake and MacLellan mine sites. Chief Andrew Colomb expressed concern at Carlisle Goldfield's drilling contractor of choice, Blackhawk Drilling, and stated that they have never come forward to speak with him or the Marcel Colomb Development Corporation (MCDC). The Chief expressed concern that Alamos Gold had previously set a precedent by not consulting with MCFN before bringing in Dorado Drilling and now the same approach was being taken with bringing in Blackhawk Drilling as a contractor prior to contacting MCFN. Mark Rein explained that Chris Rockingham of Alamos Gold Inc. did notify Sam Anderson of MCDC prior to bringing in the second drill contract and that an attempt had been made through the proper channels. Mark Rein also explained that Alamos Gold Inc. did not have authority under the joint venture agreement to choose contractors on behalf of Carlisle Goldfields Ltd. Chief Andrew Colomb suggested that the height of the waste dumps may not be an issue if there is potential for a post-mine development that could bring a potential economic spin-off; Chief Andrew Colomb suggested it could be used as a ski hill. Chief Andrew Colomb also suggested that the open pit could be used for fish farming post-operation. The components of the former mine were identified and the workflow of a mine was discussed with the tour participants. The tour continued to the MacLellan mine and the components of the underground mine were explained. For the most part the questions raised were more about operational items and workflow items rather than questions about long term impact or other concerns. At the conclusion of the tour, Chief Colomb and Mark Rein discussed the merger between AuRico Gold and Alamos Gold. Chief Colomb expressed that he would prefer consistency as far as AuRico personnel on the project and noted that he would be willing to assist this transition where possible.	In-Person	Bethany Colomb, Marcel Colomb First Nation #328
May 15, 2015, 02:00 PM	Elizabeth Martel, Community Liaison of Marcel Colomb First Nation, contacted a Marcel Colomb First Nation Band Office staff member to inquire about water delivery after not receiving the weekly water delivery to the Lynn Lake Project core shack. The Band Office Staff member information Elizabeth Martel that Outside Band Manager had requested a meeting with Jennifer Greville, of Alamos Gold Inc., earlier in the week. Jennifer Greville however was not aware of that request. Mark Rein of Alamos Gold contacted Greenwaters Consulting to develop a solution. The water delivery stoppage occurred right before the May long weekend and no other alternative source of water could be secured for the weekend. The end result was that going forward water delivery will be done by Mid-North trucking.	Telephone - Sent	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
May 05, 2015, 01:00 PM	Elizabeth (Liz) Martel, Community Liaison Coordinator of Marcel Colomb First Nation (MCFN) introduced herself to members of MCFN and advised them how they could contact her regarding job opportunities that are available on the Lynn Lake Project. Liz Martel requested that MCFN members bring resumes in to apply for available jobs.	In-Person	Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
May 05, 2015, 07:00 AM	John Fitzgerald of Alamos Gold Inc. sent an email to Chief Andrew Colomb of Marcel Colomb First Nation (MCFN), three members of Marcel Colomb Development Corporation (MCDC), and Jennifer Greville, Mark Rein and Nancy Duquet-Harvey of Alamos Gold Inc. seeking confirmation that MCFN environment committee members would be attending the Young Davidson site visit on May 25-26 or 26-27, 2015. It was noted that Cory Hart Councillor with MCFN and Elizabeth Martel of Lynn Lake Project had confirmed their availability to attend the site visit. Chief Andrew Colomb replied requesting that John Fitzgerald call him. John Fitzgerald called Chief Andrew Colomb and learned that Chief Andrew Colomb and Bethany Colomb were unavailable for the site visit. Chief Andrew Colomb suggested that the existing gate should be left at Farley Lake and an additional gate installed at the junction with Hwy 391. John Fitzgerald responded by email to Chief Andrew Colomb and copied Regan Olafson and Peter Karelse of Carlisle Goldfields that a second gate is only justified if the project moves ahead and there is activity at Farley Lake, otherwise the gate will need to be relocated to the Hwy 391 junction as per local Conservation Officer request. John Fitzgerald sent an email suggesting the week of June 15 or June 22, 2015 for the site visit. Chief Andrew Colomb replied requesting that John Fitzgerald call him. John Fitzgerald called Chief Andrew Colomb and learned that Chief Andrew Colomb and Bethany Colomb are unavailable for the site visit. Chief Andrew Colomb suggested that the existing gate should be left at Farley Lake and an additional gate installed at the junction with Hwy 391. John Fitzgerald responded by email to Chief Andrew Colomb and copied Regan Olafson and Peter Karelse of Carlisle Goldfields that a second gate is only justified if the project moves ahead and there is activity at Farley Lake, otherwise the gate needs to be relocated to the Hwy 391 junction as per local Conservation Officer request. John Fitzgerald sent an email suggesting the week of June 15 or June 22, 2015 for the site visit.	Email - Received	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
April 28, 2015, 10:30 AM	Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) emailed John Fitzgerald of Alamos Gold Inc. requesting Elizabeth Martel's (Community Liaison) job description and expressing concern that MCFN members are not being hired by Lynn Lake Project. John Fitzgerald responded by email and attached Elizabeth Martel's employment agreement, which included all duties/responsibilities and a list of all local hires and their First Nation affiliation. Five of the eight people hired to work in the core shed are MCFN members and two of the other three people are members of other First Nations. Stantec requires four personnel and at that point one of the positions had been filled by a MCFN member and all other candidates were MCFN members. John Fitzgerald stated that of the 42 resumes received eight were from MCFN members. John Fitzgerald also stated that the Lynn Lake Project is not obliged to hire exclusively MCFN members and that he feels Alamos is making a reasonable effort in this regard.	Email - Received	Marcel Colomb First Nation #328
April 26, 2015, 11:45 AM	Jennifer Greville of Alamos Gold Inc. called and left a message for Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) to discuss a planned site visit to Farley Lake for Environmental Committee members. Chief Andrew Colomb returned the call and spoke with Jennifer Greville and Jennifer informed the Chief that the road conditions at the site were poor and said the Environmental Committee members will be contacted to plan either an information session or site visit in the next week. Chief Andrew Colomb replied that he would be away but will arrange an alternate.	Telephone - Sent	Marcel Colomb First Nation #328
April 23, 2015, 07:00 AM	Chief Andrew Colomb of Marcel Colomb First Nation (MCFN), a member of Marcel Colomb Development Corporation (MCDC) and John Fitzgerald of Alamos Gold Inc. had a meeting to discuss the possibility of MCFN and MCDC partnering with Dorado Drilling. John Fitzgerald indicated an immediate need to bring in another drilling contractor to complete the on-ice drilling, and noted it was his intention to provide MCFN and MCDC the opportunity to partner as per the Exploration Agreement. John Fitzgerald explained his role as project manager to ensure a cost effective (i.e. lower capex) design for all infrastructure and facilities hence the proposed TSF location, proposed alternative access road and proposed waste-stockpile locations. John Fitzgerald and the member of MCDC discussed outstanding issues related to the access trail and test pit contract, both agreeing to work to finalize terms by 1 May, 2015.The MCDC member asked about remaining drilling requirements for 2015 and John Fitzgerald provided a mid-August 2015 drill completion date. The drilling completion dates are required to ensure the resource models can be updated by early-Q4 so they can be used to verify open pit mining potential. It was also mentioned that this will provide a strong indication of project economics. Concerns identified during April 20th meetings were resolved. 1- Explanation for the partnering relationship discussed in news release was provided2 - Opportunity to partner with Dorado Drilling was facilitated3- It was agreed that Elizabeth Martel works for both MCFN/MCDC and Lynn Lake Project (Alamos Gold & Carlisle).	In-Person	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
April 22, 2015, 01:00 PM	John Fitzgerald of Alamos Gold Inc., Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) and a member of Marcel Colomb Development Corporation had a meeting to discuss trail and test pitting scope and contract terms. John Fitzgerald noted that access trail requirements are likely to decrease, particularly related to potential quarry and borrow pit locations. Contract terms were generally agreed upon and rates for ATV versus Argo were flagged for further discussion. Chief Andrew Colomb identified concerns regarding the lack of consultation regarding Dorado Drilling's involvement and the lack of partnering opportunities. John Fitzgerald explained the emergency nature of Dorado Drillings involvement. That in combined with John Fitzgerald being on vacation contributed to the oversight in consultation on that mater. .Chief Andrew Colomb noted the lack of mention of MCFN in the AuRico-Alamos merger press release, while Lynn Lake Project is continually referenced even though the town does not have the same partnership as between MCFN and AuRico-Carlisle. John Fitzgerald explained that the Lynn Lake Project is referring to the joint partnership between AuRico and Carlisle, not with the Town of Lynn Lake. John Fitzgerald suggested that Farley Lake property be renamed by MCFN to both put their mark on the Project and to avoid the negative associations with the historic Farley Mine. It was noted that the gate on Farley Lake access road to be moved closer to highway Chief Andrew Colomb asked whether current human health will be measured as part of the Environmental Baseline Study (EBS). John Fitzgerald replied that this is assessed through the Human Health & Ecological Risk Assessment (HHERA) study for the EBS work. The opportunity to produce lingonberries on a commercial scale was discussed. Chief Andrew Colomb mentioned that commercial production from the land is not the MCFN traditional approach. John Fitzgerald mentioned that further consideration should be given as this could represent a sustainable business opportunity beyond any potential mine life.	In-Person	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
April 21, 2015, 11:00 AM	John Fitzgerald, Mark Rein and Jennifer Greville of Alamos Gold Inc., as well as Elizabeth Martel, Community Liaison of Lynn Lake Project made a PowerPoint presentation to Chief Andrew Colomb, and two members of Marcel Colomb First Nation (MCFN) outlining the following: Environment Committee members, roles, and expectations; Young-Davidson Mine; geotechnical-hydrogeological permit application; environmental baseline studies; and next steps, including confirming membership, training MCFN members and the next meeting date. Chief Andrew Colomb indicated a number of concerns1.MCFN not mentioned in AuRico-Alamos merger news release.2.MCDC/MCFN not provided opportunity to partner with Dorado Drilling.3. Elizabeth Martel's role as MCFN Community Liaison. John Fitzgerald invited Chief Andrew Colomb, two members of MCFN and Liz Martel to take a helicopter tour of both sites the following day, which they all attended along with a member of Marcel Colomb Development Corporation (MCDC). The requirement to train MCFN Environmental Committee members was discussed with subject matter lessons (based on Stantec's Environmental Baseline Study scope of work) and site visits identified as ways to tackle this issue. Training would include Elizabeth Martel given her Community Liaison role. The PowerPoint presentation was emailed to Elizabeth Martel on April 23, 2015 to provide to MCFN Environment Committee members. Next meeting arranged for June 2-3, 2015.	In-Person	Bethany Colomb, Marcel Colomb First Nation #328
April 13, 2015, 11:30 AM	Chris Rockingham of Alamos Gold Inc. (Alamos) received a call from Chief Andrew Colomb of Marcel Colomb First Nation (MCFN). Chief Andrew Colomb discussed the use of a second diamond drill contractor who was not endorsed by MCFN and to ask what had happened to prompt Alamos Gold to bring in this contractor. Chris Rockingham explained that the contractor endorsed by MCFN was not performing to expectations or to reasonable industry standards. With the requirements to drill holes from the ice Alamos had to do something quickly to increase productivity. The second contractor did not diminish the size of the contract for the MCFN endorsed contractor. Chief Andrew Colomb acknowledged Alamos' position but requested that the topic have further discussion. Chris Rockingham indicated to Chief Andrew Colomb that Alamos was now starting to hire MCFN members and associates now that a Community Liaison was in place. Chief Andrew Colomb would like to show Chris Rockingham and John Fitzgerald the railway line into the traditional territory once the snow melts and invited them fishing.	Telephone - Received	Marcel Colomb First Nation #328
April 13, 2015, 10:10 AM	John Fitzgerald of Alamos Gold Inc. emailed two members of Marcel Colomb Development Corporation (MCDC) and Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) to inform them of the proposed AuRico-Alamos merger, and ask if they would like to discuss. John Fitzgerald attached the Alamos and AuRico merger press release and PowerPoint presentation to the email. John Fitzgerald noted that the primary contacts, John Fitzgerald and Chris Rockingham, may not change, although Chris Rockingham may be joining the new company. MCDC members expressed concern that both John Fitzgerald and Chris Rockingham would leave the Lynn Lake Joint Venture project. One of the MCDC members followed up with a phone call and discussion. Sam Anderson followed up with a phone call and discussion.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
April 02, 2015, 10:00 PM	Mark Rein of Alamos Gold Inc. had an impromptu meeting with Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) and a private citizen of Lynn Lake regarding the community liaison position. The private citizen noted that he did not have a telephone and requested that Mark Rein come over to the citizen's residence to arrange an interview for the community liaison position. Mark Rein indicated that he was leaving Lynn Lake the following morning, but would have Jennifer Greville of Alamos Gold Inc. follow up regarding an interview for the community liaison position.	In-Person	Douglas Hart, Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
April 01, 2015, 01:30 PM	John Fitzgerald of Alamos Gold Inc. emailed a member of Marcel Colomb Development Corporation (MCDC) and Rui Couto of Golder Associates and copied Chief Andrew Colomb of Marcel Colomb First Nation (MCFN), and two additional members of MCDC to discuss potential quarry and borrow pit locations and associated test work. Regan Olafson has received insight on potential locations from MCFN Elders, and this information will be useful to Golder to finalize potential test work locations. John Fitzgerald attached Golder's proposed test work locations.	Email - Sent	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
April 01, 2015, 01:05 PM	John Fitzgerald of Alamos Gold Inc. emailed Chief Andrew Colomb of Marcel Colomb First Nation (MCFN), three members of Marcel Colomb Development Corporation (MCDC) and copied Chris Rockingham of Alamos Gold Inc. regarding need for access trail construction and test pits for the summer 2015 geotechnical and hydrogeological investigations related to the work permit application. John Fitzgerald noted that access trail construction needed to begin in early May 2015, and stated that Golder and Stantec were currently working on access trail construction sequence. John Fitzgerald requested that MCDC send contact details for any construction partner they wish to have involved in the work so that scope information can be provided as it becomes available.	Email - Sent	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
April 01, 2015, 12:55 PM	John Fitzgerald of Alamos Gold Inc. emailed Chief Andrew Colomb of Marcel Colomb First Nation (MCFN), two members of Marcel Colomb Development Corporation (MCDC) and copied Chris Rockingham of Alamos Gold Inc. asking if MCDC had partnered with a drilling company for the upcoming overburden drilling program.	Email - Sent	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
March 31, 2015	John Fitzgerald of Alamos Gold Inc. emailed Chief Andrew Colomb of Marcel Colomb First Nation (MCFN), two members of Marcel Colomb Development Corporation (MCDC) and copied Chris Rockingham of Alamos Gold Inc. a draft letter of support for the 2015 geotechnical and hydrogeological work permit application. John Fitzgerald suggested that MCFN and MCDC review, edit and sign the draft letter of support so the letter could be included with the mid-April 2015 work permit application submission. John Fitzgerald noted that access trail construction and test pitting work is involved with the geotechnical and hydrogeological fieldwork, and that a MCDC partner business would be involved in this work.	Email - Sent	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
March 31, 2015, 06:05 PM	John Fitzgerald of Alamos Gold Inc. emailed Chief Andrew Colomb of Marcel Colomb First Nation (MCFN), Sam Anderson of Marcel Colomb Development Corporation (MCDC) and copied Chris Rockingham of Alamos Gold Inc. and Sandra Ducharme of MCDC to propose compensation amounts for MCFN Environment Committee members. Chief Andrew Colomb responded to the email and stated the compensation amounts proposed were suitable.	Email - Sent	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
March 31, 2015, 04:00 PM	Jennifer Greville of Alamos Gold Inc. called Cory Hart, Councillor of Marcel Colomb First Nation (MCFN) to follow up about the Environment Committee meeting scheduled for April 1, 2015, and whether specific members of MCFN could attend. Jennifer Greville left a message with an unidentified person who stated that Cory Hart was out of town, and was unsure when he would be returning to Lynn Lake.	Telephone - Sent	Marcel Colomb First Nation #328
March 30, 2015, 11:00 AM	Chris Rockingham of Alamos Gold Inc. received a call from Chief Andrew Colomb of Marcel Colomb First Nation requesting financial assistance towards funeral expenses for an Elder that passed away the previous week. The discussion was preceded by an explanation of Aboriginal Affairs and Northern Development policy with respect to funding funeral expenses. Chief Andrew Colomb provided background information regarding Marcel Colomb First Nation and the funeral home in Thompson, and provided the Funeral Director's cell phone number. Chris Rockingham agreed to give the matter consideration.	Telephone - Received	Marcel Colomb First Nation #328
March 29, 2015, 07:30 PM	Jennifer Greville of Alamos Gold Inc. called Cory Hart of Marcel Colomb First Nation (MCFN) to plan an environmental committee meeting for Wednesday, April 1, 2015 at 4:00 PM at the Alamos Gold office. Jennifer Greville requested that one of the MCFN members call once the meeting date was confirmed with the other committee members.	Telephone - Sent	John Colomb, Bethany Colomb, Marcel Colomb First Nation #328
March 26, 2015, 01:00 PM	Open House held in Winnipeg, MB for members of the Marcel Colomb First Nation (MCFN) to discuss the project. Alamos Gold Inc. and Stantec representatives were in attendance to answer questions about the project. Twelve questionnaires were filled out and submitted. On the questionnaire, 5 participants identified as members of MCFN, 2 participants did not identify as members of MCFN, and 5 participants did not answer. Questionnaire responses: What do you think are the most important components to focus on as part of the Environmental Study? (responses rated as a 4 or 5 (5 being very important))- Air Quality: 11- Wildlife and Fish Habitat: 11- Ground and Surface Water: 11- Plants: 11- Traditional Land and Resource Use: 10- Employment: 9- Contracts and Business Opportunities: 7- Training and Job Skills: 11- Noise: 9- Increased Traffic: 7- Impacts to Land and Resource Use: 9- Tailings and Waste Rock Management: 9Comments and Concerns:- Prioritize opportunities in education, employment and information flow for MCFN members- It would be very advantageous to hold additional information sessions for MCFN members and for people who live, work and interact with MCFN- Long term impact on freshwater supply - volume, quality and cost of remediation - in event of environment disaster- Community members should be involved in the Environmental study- Moose and caribou population- Attended to learn more about job availability- Will it affect the water on the reserve and traplines? Will it look like the water in Winnisk(sp?), MB.	In-Person	Marcel Colomb First Nation #328, Judy Caribou, Howard Paul Colomb, Mike Cooke, R. Irwin Kehler, Kelly Linklater, Peter Gorzen, David Caribou, Helen B. Colomb

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
March 26, 2015, 10:00 AM	Chris Rockingham, Nancy Duquet-Harvey and Jennifer Greville of Alamos Gold Inc. were to meet with members of the Marcel Colomb First Nation Environmental Committee, Cory Hart, John Colomb, and Bethany Colomb in Lynn Lake. The Environmental Committee meeting was to discuss the overall process for the Environment Committee as well as the specifics for the Geotechnical Investigations around both the Farley Lake and the MacLellan site. The members of the Marcel Colomb First Nation Environmental Committee were not aware of the date and time of the meeting and did not attend.	In-Person	John Colomb, Bethany Colomb, Marcel Colomb First Nation #328
March 25, 2015, 04:00 PM	Open House held in Lynn Lake, MB for members of the Marcel Colomb First Nation (MCFN) and Lynn Lake community to discuss the Project. Alamos Gold and Stantec representatives were in attendance to answer questions about the project. Sixteen questionnaires were filled out and submitted. On the questionnaire,13 participants did not identify as members of MCFN, and 3 participants did not answer. Questionnaire responses: What do you think are the most important components to focus on as part of the Environmental Study? (responses rated as a 4 or 5 (5 being very important))- Air Quality: 11- Wildlife and Fish Habitat: 15- Ground and Surface Water: 14- Plants: 12- Traditional Land and Resource Use: 9- Employment: 11- Contracts and Business Opportunities: 11- Training and Job Skills: 12- Noise: 9- Increased Traffic: 6- Impacts to Land and Resource Use: 15- Tailings and Waste Rock Management: 16Suggestions:- Have information pertaining to studies next to maps so questions are answered without asking.- Further discussion of long-term plans.- No info on El Mine. Comments and Concerns:- Have the feelings of the people of Lynn Lake been taken into consideration? They have been told before that things were coming only to be disappointed.- Open and ongoing communication with Lynn Lake residents would be well appreciated.- Put it back in the same condition you found it.- Economic development for the town. Economic exit plan to minimize local impacts.- Concerns with non-mineral waste management (i.e.. garbage volumes) and creating high demands on municipal landfill, municipal water and wastewater usage.- Would greatly benefit the community if mining resumed.- What if there is an impact from the mine on the quality of water? Will you continue with your project?	In-Person	Marcel Colomb First Nation #328, Paul Grimmer, Gunter Hildebrandt, James Lindsay, Elizabeth (Liz) Martel, Tuula Pohjolainen, Randy Reierson, Ollie Romanow, Pat Campbell, Marianne Jantz-Olson, Glynna Lewis, Kal Manna, Marcel Padoucey
March 16, 2015, 03:00 PM	Conference call between Chris Rockingham of Alamos Gold Inc. (Alamos), a member of Marcel Colomb Development Corporation, and Chief Andrew Colomb and a member of Marcel Colomb First Nation to clarify the role of and costs assumed by each party for the Environmental Monitor as defined in the Exploration Agreement. Chief Andrew Colomb spoke about having had a bad experience with the Province and Environmental Monitoring/reporting. Chris Rockingham noted that it was Alamos' intent to be open and transparent with all environmental data so the experience would be different. The group conducted planning for the first meeting of Environmental Management Committee at the Alamos Gold offices in Lynn Lake and discussed details about the Urban Open House in Winnipeg on March 26, 2015.	Telephone - Sent	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
March 13, 2015, 01:15 PM	John Fitzgerald and Chris Rockingham of Alamos Gold Inc. received an email from a member of Marcel Colomb Development Corporation (MCDC), which was also sent to a second member of MCDC and Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) with identifying potential candidates for various Lynn Lake Project positions (MCFN Community Liaison, Alamos Gold core-related roles, and Stantec EBS-related roles). It was noted that additional contact information for the candidate would be forthcoming. Three MCFN Environment Committee members were identified. John Fitzgerald replied requesting an additional two candidates for core cutting/technician roles, and asked that the MCFN Environment Committee members be informed of the initial meeting around the open house (25 March). John Fitzgerald also mentioned that the fifth Stantec position is only required in December 2015 so interviews will be deferred. Cory Hart MCFN council member asked via email when interviews would be conducted. John Fitzgerald replied interviews would start the following week.	Email - Received	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
March 10, 2015, 02:40 PM	John Fitzgerald of Alamos Gold Inc. emailed three members of Marcel Colomb Development Corporation (MCDC) and Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) a list of updated job postings for field assistants relating to Stantec's environmental baseline work. The original list of 13 positions had been rationalized to 5 positions.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
March 06, 2015, 03:10 PM	John Fitzgerald of Alamos Gold Inc. emailed three members of Marcel Colomb Development Corporation (MCDC) and Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) a its of job postings for field assistants relating to Golder Associate's 2015 geotechnical fieldwork. John Fitzgerald requested MCDC and MCFN provide a list of candidates to be interviewed by Alamos Gold staff. John Fitzgerald also mentioned that general introductions and job-specific training will be provided to all hires.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
March 05, 2015, 03:30 PM	John Fitzgerald of Alamos Gold Inc. emailed three members of Marcel Colomb Development Corporation (MCDC) and Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) the posters for the March 25, 2015 Lynn Lake community open house. John Fitzgerald requested that MCDC assist with putting up the posters at the MCFN reserve and general circulation. John Fitzgerald noted that the plan also to mail the posters to all post box holders in Lynn Lake.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
March 05, 2015, 03:30 PM	John Fitzgerald of Alamos Gold Inc. emailed three members of Marcel Colomb Development Corporation (MCDC) and Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) a list of 13 job postings for field assistants relating to Stantec's 2015 environment baseline work.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
March 05, 2015, 03:10 PM	John Fitzgerald of Alamos Gold Inc. emailed three members of Marcel Colomb Development Corporation (MCDC) and Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) with two job descriptions that outline requirements for core cutter and core technician roles with Lynn Lake Project.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
March 05, 2015, 08:30 AM	John Fitzgerald of Alamos Gold Inc. emailed two members of Marcel Colomb Development Corporation (MCDC) and Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) listing two potential overburden drilling partners which had been identified by Golder Associates (Lynn Lake Project geotechnical consultant). The full contact information for these drilling companies was provided. John Fitzgerald provided a document outlining drill requirements and noted that documentation for this work would be available by the planned open houses (25-26 March) so Alamos Gold could discuss with MCDC/MCFN.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
March 04, 2015, 07:30 AM	Representatives from Alamos Gold Inc., Marcel Colomb First Nation and Marcel Colomb Development Corporation chartered a flight from Toronto to Kirkland Lake where they were met by the Environmental Manager at Young Davidson Mine, and a First Nation Environmental Technician at the Young Davidson Mine. The group drove to Young Davidson Mine in Matachewan where a general introduction to the mine was provided followed by a site tour of the Mill, Paste Back Fill Plant, open pit, waste dumps, ore stock pile, and tailings storage facility. Tour was followed by a lunch with a number of Matachewan First Nation Elders, Councillors and Young Davidson employees. Mine Manager at Young Davidson Mine gave a general project overview followed by a discussion about how the Matachewan First Nation has been engaged with by Alamos Gold including; employment and business opportunities and involvement of the Environment Committee from the Matachewan First Nation. .	In-Person	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation, Element Drilling
March 01, 2015, 05:00 PM	John Fitzgerald, Chris Rockingham, Scott Perry, Peter MacPhail, Robert Chausse and Chris Bostwick of Alamos Gold Inc., Abraham Drost and Peter Karelse of Carlisle Goldfields Ltd. met with Chief Andrew Colomb of Marcel Colomb First Nation, three members of Marcel Colomb Development Corporation (MCDC), and Minister Dave Chomniak, and three Government of Manitoba - Department of Mineral Resources staff members, while attended a Manitoba mining reception. The Alamos Gold executives introduced themselves to Chief Andrew Colomb and the MCDC board members. John Fitzgerald discussed ongoing work (drill) permit challenges with the Department of Mineral Resources staff. The Manitoba government offered to provide assistance in resolving permit challenges.	In-Person	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation, Government of Manitoba - Manitoba Mineral Resources
March 01, 2015, 11:55 AM	John Fitzgerald of Alamos Gold Inc. two members of Marcel Colomb Development Corporation (MCDC) and Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) to inform them of the need for overburden drilling over summer of 2015 as part of the geotechnical and hydrogeological investigations for proposed mine facilities, and to inquire if MCDC had a partner for this type of work. John Fitzgerald also mentioned that documentation to describe this work would be available by end of March so MCDC/MCFN could review ahead of submitting the work permit application to the Manitoba Government. the one of the MCDC members replied by email that MCDC/MCFN wanted to be involved.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
February 20, 2015, 08:50 AM	John Fitzgerald of Alamos Gold Inc. emailed Chief Andrew Colomb of Marcel Colomb First Nation and two members of Marcel Colomb Development Corporation suggesting the community open house occurs during the week of March 23, 2015 and the possibility of a separate open house at the MCFN reserve. John Fitzgerald also listed the various project-related aspects that would be presented. The date March 25, 2015, 4-8 pm, was finalized. John Fitzgerald subsequently raised the issue of having the first Environment Committee meeting around the same time.	Email - Sent	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
February 20, 2015, 08:40 AM	John Fitzgerald of Alamos Gold Inc. emailed a member of Marcel Colomb Development Corporation (MCDC) requesting resumes for all people interested in and recommended for the Community Liaison position. Email also copied a second member of Marcel Colomb Development Corporation and Chief Andrew Colomb of Marcel Colomb First Nation.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328
February 19, 2015, 05:20 PM	John Fitzgerald of Alamos Gold Inc. emailed a member of Marcel Colomb Development Corporation (MCDC) providing a PowerPoint presentation of the tailings storage facility (TSF) location scoping study results, with area B2/B1 being the preferred option. John Fitzgerald asked that the MCDC member identify potential quarry and borrow pit locations in close proximity. This same email sent by John Fitzgerald was forwarded on February 21, 2015 to two members of Marcel Colomb First Nation, Chief Andrew Colomb of Marcel Colomb First Nation for information, explaining the need for acid rock drainage / metal leaching on potential quarry and borrow pit material. In addition, John Fitzgerald explained the need for the various scoping studies to finalize study areas for the various Environmental Baseline Study aspects.	Email - Sent	Marcel Colomb Development Corporation, Marcel Colomb First Nation #328

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
February 19, 2015, 09:00 AM	John Fitzgerald, Nancy Duquet-Harvey and Jennifer Greville of Alamos Gold Inc., Craig Johnston, Karen Mathers and Scott Chapman of Stantec, Sheryl Rosenberg of Thompson Dorfman Sweatman LLP and Mike Ounpuu an independent consultant, attended a meeting with Chief Andrew Colomb of Marcel Colomb First Nation (MCFN), three members of Marcel Colomb Development Corporation (MCDC), two Government of Manitoba - Department of Mineral Resources staff members, and two Winsor of Government of Manitoba - Conservation and Water Stewardship staff members. Meeting attendees introduced themselves and voiced concerns about aspects of the Environmental Baseline Study (EBS) and other project concerns. Karen Mathers provided an introductory presentation on the EBS work to be conducted. Government departments discussed various regulatory processes. A number of concerns were raised by MCFN and MCDC during the meeting: 1) Ongoing delays with project permitting. 2) Post-mining, long-term environmental concerns. 3) Training requirements and potential government support. 4) Need involvement from MCFN for EBS to be successful. 5) Need to ensure natural springs protected. 6) MCFN concerns not being listened to and addressed meaningfully. 7) Historic dump sites in the bush. 8) Confidentiality of Aboriginal Traditional Knowledge. 9) Cumulative effects in Cockeram Lake due to historic tailings seepage and potential MacLellan effects. John Fitzgerald identified concerns about unclear permitting process due to differing provincial and funeral reporting requirements.	In-Person	Government of Manitoba - Manitoba Mineral Resources, Government of Manitoba - Department of Conservation and Water Stewardship, Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
February 18, 2015, 10:30 AM	John Fitzgerald, Nancy Duquet-Harvey and Jennifer Greville of Alamos Gold Inc., Bruce Reid of Carlisle Goldfields Ltd., Craig Johnston, Karen Mathers and Scott Chapman of Stantec, Sheryl Rosenberg of Thompson Dorfman Sweatman LLP and Mike Ounpuu an independent consultant, attended a meeting with Chief Andrew Colomb and Basil Colomb of the Marcel Colomb First Nation (MCFN), and Sam Anderson, Niles Whitesell and Regan Olafson of Marcel Colomb Development Corporation (MCDC). Chief Andrew Colomb introduced himself and provided a history of MCFN including a list of concerns. Chief Andrew Colomb mentioned that despite past problems, he is positive about the future providing everyone works together and MCFN is fully involved in the Lynn Lake Project. All attendees introduced themselves. Karen Mathers gave an overview of the proposed Environmental Baseline Study (EBS) work. Sam Anderson mentioned that MCDC is working to ensure full MCFN participation in the Lynn Lake Project. Nancy Duquet-Harvey described the administrative nature of the Community Liaison role, and that MCFN members with more traditional knowledge will be needed to help with EBS fieldwork. Regan Olafson asked how EBS results will be communicated to MCFN, and a discussion followed regarding the role of the Environment Committee. Timing for MCFN and Lynn Lake community open houses was discussed, with the week of March 23 chosen, and the EBS, feasibility study drill program and regional exploration program are to be presented. While separate open houses were discussed, a single open house was subsequently held on March 25 in Lynn Lake. Chief Andrew Colomb raised a number of concerns: 1) Lack of previous consultation from mining and hydro companies.2) Lack of training for MCFN members. 3) Lack of opportunities and amenities for MCFN causing social problems. 4) Lack of MCFN capacity to benefit from mine development. 5) Poor water quality due to mining affecting fisheries. 6) Impacts on land and animals due to mining. 7) Compensation for impact on traditional activities.8) Long term impacts of mining, 50-100 years after mining ceases. 9) Concern that no single MCFN person can fulfill Community Liaison role. 10) Need to keep Winnipeg-based MCFN members informed of future potential job opportunities. 11) Environment Committee will not understand EBS results.	In-Person	Basil Colomb, Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
February 11, 2015, 09:00 PM	Chief Andrew Colomb of Marcel Colomb First Nation (MCFN) called and spoke with Mark Rein of Alamos Gold Inc. to ask whether Mark Rein was returning to Winnipeg the following day on the government aircraft, following the consultation meetings with the Manitoba Government and MCFN. Mark Rein stated that he was staying in Lynn Lake, but that there was an extra seat on the plane. Chief Andrew Colomb stated that he was looking for a spot for John Colomb, private citizen of MCFN, to travel to Winnipeg. Chief Andrew Colomb and John Colomb both flew out on the government aircraft the following day.	Telephone - Received	John Colomb, Marcel Colomb First Nation #328
January 30, 2015	Chris Rockingham of Alamos Gold Inc. emailed Abraham Drost of Carlisle Goldfields Limited, Chief Andrew Colomb of Marcel Colomb First Nation and Sam Anderson of Marcel Colomb Development Corporation that all parties had signed the Exploration Agreement. Signed by Alamos Gold on January 26, 2015 by Chris Rockingham, Carlisle Goldfields on January 30, 2015 by Abraham Drost after review by the Board of Directors, Marcel Colomb First Nation on January 30, 2015 by Chief Andrew Colomb after review by Council and advice from MCDC, and Marcel Colomb Development Corporation on January 30, 2015 by Sam Anderson after review by MCDC Board and advice from Gerry Kerr.	Email - Sent	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation

Table 3B-1 Summary of Communications: Marcel Colomb First Nation

Communication date	Communication summary	Communication method	Stakeholder
January 13, 2015, 01:00 PM	John Fitzgerald, Chris Rockingham, Nancy Duquet-Harvey and Jennifer Greville of Alamos Gold Inc. (Alamos), Abraham Drost, Peter Karelse and Ryan Weston of Carlisle Goldfields Ltd. and Amanda Heydorn of Carlisle Goldfields Ltd. attended a meeting with members of the Marcel Colomb First Nation including Chief Andrew Colomb, Niles Whitesell of Marcel Colomb Development Corporation and Ryan Leaman of Element Drilling. Chief Andrew Colomb (speaking Cree) introduced the Alamos and Carlisle Goldfields team members to the community. Chris Rockingham provided an overview of Alamos Gold including experience in working with First Nations. Abraham Drost reviewed Carlisle Goldfield's history in Lynn Lake and welcomed Alamos Gold. Peter Karelse provided an overview of Carlisle Goldfield's planned 2015 exploration program. Amanda Heydorn provided an overview of the upcoming airborne geophysics survey. Following the introductions and overviews, everyone had a cooked meal followed by a door prize draw.	In-Person	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation, Element Drilling
January 13, 2015, 10:00 AM	John Fitzgerald, Chris Rockingham, Nancy Duquet-Harvey and Jennifer Greville of Alamos Gold Inc., Abraham Drost, Peter Karelse and Ryan Weston of Carlisle Goldfield Ltd. and Amanda Heydorn of CGG attended a meeting with Marcel Colomb First Nation (MCFN) Chief Andrew Colomb, Council members Evelyn Sinclair and Priscilla Colomb, and Niles Whitesell of Marcel Colomb Development Corporation (MCDC). Chief Andrew Colomb provided a detailed history of Marcel Colomb First Nation and highlighted his interest in education and training, particularly for younger MCFN members. Chief Andrew Colomb mentioned MCFN and MCDC's relationship with Element Drilling, requesting an opportunity for Element Drilling to provide an open book bid for 2015 drilling. John Fitzgerald agreed to this request providing the bid met Alamos expectations in terms of being competitive and Element Drilling being capable of completing the work on schedule. Everyone present introduced themselves including a short biography (personal and professional). Chris Rockingham provided an overview of Alamos and related First Nation experience. Nancy Duquet-Harvey provided an overview of Alamos' approach to environmental work and First Nation engagement, including the possible establishment of an Environment Committee with MCFN members and a Community Liaison position. Amanda Heydorn provided an overview of the upcoming airborne geophysics survey.	In-Person	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
November 27, 2014, 07:00 PM	Chris Rockingham of Alamos Gold Inc. was invited by Chief Andrew Colomb of the Marcel Colomb First Nation (MCFN) to attend the Christmas dinner for the MCFN at the Marlborough Hotel in Winnipeg. Chief Andrew Colomb introduced Alamos Gold and asked Chris Rockingham to say a few words about who Alamos Gold is and what the plan is for the Lynn Lake project. Chris Rockingham spoke to many First Nation members about their personal experiences in northern Manitoba and their stories of why they are now in Winnipeg.	In-Person	Marcel Colomb First Nation #328
November 27, 2014, 02:00 PM	Chris Rockingham of Alamos Gold Inc. (Alamos) provided an introduction to the Chief and Councillors of Marcel Colomb First Nation (MCFN) about Alamos with a focus on Alamos' history with First Nations in both Ontario at Young Davidson and in British Columbia at Kemess mine and now the Kemess Underground Project. Chris Rockingham introduced what Alamos would like to do in Lynn Lake with respect to a feasibility study and ultimately, if successful, what a mine in Lynn Lake would look like and what opportunities there would be for the MCFN and the community in general. Chris fully acknowledged the need for engagement with MCFN and the role of Alamos relative to the government responsibility.	In-Person	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation
November 19, 2014, 06:00 PM	John Fitzgerald, Chris Rockingham, Chris Bostwick, and Chris Richter of Alamos Gold Inc. had a dinner meeting in Winnipeg with Chief Andrew Colomb of Marcel Colomb First Nation (MCFN), and two members of the Marcel Colomb Development Corporation (MCDC) and Ryan Leaman of Element Drilling to introduce Alamos staff to MCFN, MCDC board members and the drilling contract partner.	In-Person	Marcel Colomb First Nation #328, Marcel Colomb Development Corporation, Element Drilling

Table 3B-2 Summary of Communications: Mathias Colomb Cree Nation

Community Reference	Communication date	Communication title	Communication summary	Communication method	Stakeholder
MCCN	May 5, 2020	2020-05-05 Email - Sent to Mathias Colomb Cree Nation	Chief Lorna Bighetty of Mathias Colomb Cree Nation (MCCN) was contacted by Lauren Stead of Stantec with a letter and information package for their review. The letter provided an explanation for why Alamos was requesting feedback on both the exercise of MCCN's Indigenous and Treaty rights, and how the Project may potentially affect the exercise of those rights. The package provided a partial draft copy of the Indigenous and Treaty Rights Assessment which Alamos intended to submit to the Impact Assessment Agency of Canada (IAAC) as part of the Lynn Lake Gold Project Environmental Impact Statement (EIS) for MCCN's review. The letter and package of information was also sent by registered mail.	Email - Sent	Mathias Colomb Cree Nation
MCCN	April 28, 2020	2020-04-28 Mail - Sent with Lorna Bighetty, Mathias Colomb Cree Nation, about Engagement	Stantec on behalf of Alamos sent an information package to leadership of Mathias Colomb Cree Nation Chief and Council regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Mathias Colomb Cree Nation
Granville Lake	March 15, 2020	2020-03-15 Text/SMS - Received with Clarence Bighetty, Granville Lake Community, about Consultation, Traditional Land Use Studies	Headman Clarence Bighetty of the Granville Lake Community contacted Michael Raess of Alamos to discuss the status of LLGP. Michael Raess stated that they are assessing the situation with COVID-19 and that Alamos had to leave site because of the virus and travel restrictions. He also stated that the only engagement with Mathias Colomb Cree Nation (MCCN) continues through the lawyers. MCCN has requested funding for a Traditional Land and Resource Use (TLRU) study. Headmar Clarence Bighetty stated that he would like to be a part of the TLRU study. Michael Raess asked if he had heard from MCCN leadership. Headman Clarence Bighetty stated that he had talked to Chief, but has not received any information.	Text/SMS - Received	Granville Lake Community
MCCN	March 3, 2020	Mail - Sent with Mathias Colomb Cree Nation	Mathias Colomb Cree Nation was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the Lynn Lake Gold Project, the letter provided a summary of engagement between Alamos and MCCN, anticipated schedule for submissior of the EIS and the opportunity for MCCN to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	Mathias Colomb Cree Nation
MCCN	January 22, 2020	Mail - Sent with Mathias Colomb Cree Nation	Chief Lorna Bighetty and the Mathias Colomb Cree Nation was sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the even to answer questions and provide information.	Mail - Sent	Mathias Colomb Cree Nation
Granville Lake	January 19, 2020	2020-01-19 Text/SMS - Received with Clarence Bighetty, Granville Lake Community, about Indigenous Hunting, Trapping & Fishing, Open House.	Headman Clarence Bighetty of the Granville Lake Community contacted Michael Raess of Alamos asking about the status of LLGP. Michael Raess indicated that there will be an Open House on February 4, 2020 that he could attend for a project update. Michael Raess also informed Headman Clarence Bighetty that Mathias Colomb Cree Nation (MCCN) has not allowed any engagement with the exception of engagement through their lawyers. Michael Raess also stated that Alamos is continuing to work towards a training and employment program. Headman Clarence Bighetty indicated that the Granville Lake Community would like to be a part of the training. He also shared that trapping was good, but the prices are bad. Michael Raess asked if Headman Clarence Bighetty had talked to MCCN leadership lately and wanted to confirm the correct mailing address c/o Leaf Rapids Box 203 R0B 1W0. Headman Clarence Bighetty stated that he has not talked to MCCN leadership.	Text/SMS - Received	Granville Lake Community
MCCN	November 12, 2019	2019-11-12 Email - Sent with Mathias Colomb Cree Nation, about Engagement, Traditional Land Use Studies	A budget for a Traditional Land and Resource Use (TLRU) study was approved (through legal) in November 2019 and is currently in the hands of Mathias Colomb Cree Nation (MCCN). Alamos has paid 40% of the proposed TLRU study budget. An update from MCCN, MCCN legal or Firelight about the TLRU study is not available and it is unclear if the TLRU study has commenced. This study is led by the Firelight Group.	Email - Sent	Mathias Colomb Cree Nation
Granville Lake	August 29, 2019	2019-08-29 Text/SMS - Sent with Clarence Bighetty, Granville Lake Community, about Water Resources, Engagement, Job Opportunities	Headman Clarence Bighetty of the Granville Lake Community was contacted by Michael Raess of Alamos to arrange a date for the surface water monitoring program Headman Clarence Bighetty was going to assist as a guide to the fieldwork that Stantec would be conducting and using his boat. The fieldwork was scheduled for September 7, 2019 in Granville Lake. Clarence Bighetty asked Michael Raess if he had heard from the Marcel Colomb Cree Nation and he had not.	Text/SMS - Sent	Granville Lake Community
Granville Lake	August 23, 2019	2019-08-23 Text/SMS - Received with Clarence Bighetty, Granville Lake Community, about Engagement, Water Resources	Headman Clarence Bighetty of Granville Lake Community contacted Michael Raess of Alamos to ask how Granville Lake could be integrated into the Alamos training programs. He would like youth to have access to training to be prepared if/when the Lynn Lake Gold Project (LLGP) mine opens. Michael Raess indicated that Alamos had to discuss everything through the Mathias Colomb Cree Nation, but he could talk to Manitoba Keewatinowi Okimakanak Inc. (MKO) about options when he met with MKO regarding the Marcel Colomb First Nation training partnership program.	Text/SMS - Received	Granville Lake Community
Granville Lake	July 24, 2019	2019-07-24 Text/SMS - Sent with Clarence Bighetty, Granville Lake Community, about Engagement, Water Resources	Headman Clarence Bighetty of Granville Lake Community was contacted by Michael Raess of Alamos regarding guiding for Stantec's surface water monitoring program. The field work was arranged to be conducted in Granville Lake on July 24, 2019.	Text/SMS - Sent	Granville Lake Community
Granville Lake	July 19, 2019	2019-07-19 In-Person with Phillip Bighetty, Barren Lands First Nation, Isaac Laponsee, Community of Brochet, Clarence Bighetty, Granville Lake Community, Evangeline Moose, Town of Leaf Rapids, Eustache Sinclair, Marcel Colomb First Nation, Laura Montgomery, Northwest Manitoba Community Futures Development, Mike Dumas, O-Pipon-Na-Piwin Cree Nation, about Traditional Knowledge, Engagement	Michael Raess of Alamos was invited by the North West Community Futures Development Corporation to meet and present the Lynn Lake Gold Project (LLGP) on July 19, 2019. Communities sitting on the board included representatives from Council of many of the Indigenous communities that Alamos was engaging with including the Community of Brochet, Barren Lands First Nation (Brochet Reserve), Community of Leaf Rapids, Marcel Colomb First Nation, Granville Lake, and O-Pipon-Na-Piwin Cree Nation. Michael Raess of Alamos explained that Alamos would continue to share Project updates for public through Open Houses (next in November 2019). Alamos would specifically send an invitation to the surrounding communities including the Community of Brochet and Leaf Rapids. With respect to Indigenous Community Members, Michael Raess explained that Alamos encouraged leadership to communicate all shared information to the members and to relay all potential questions and concerns back to Alamos. Michael Raess also added that Alamos would be sending out packages in September 2019 summarizing all current data and data gaps for each Indigenous Community to verify the data for the Environmental Impact Statement.	In-Person	Marcel Colomb First Nation #328, Northwest Manitoba Community Futures Development Corporation, O-Pipon-Na-Piwin Cree Nation, Barren Lands First Nation, Granville Lake Community, Town of Leaf Rapids, Community of Brochet

Table 3B-2 Summary of Communications: Mathias Colomb Cree Nation

Community Reference	Communication date	Communication title	Communication summary	Communication method	Stakeholder
MCCN	July 18, 2019	2019-07-18 Email - Received with Tyler Hunt, Northwest Manitoba Community Futures Development Corporation, Ralph Caribou, Mathias Colomb Cree Nation, about Engagement, Traditional Knowledge	Ralph Caribou, Councilor of the Mathias Colomb Cree Nation was invited to attend a meeting on July 19, 2019 with the Northwest Manitoba Community Futures Development Corporation (Northwest). Michael Raess was contacted by Tyler Hunt, Manager of Northwest stating that Ralph Caribou had contacted Tyler Hunt to say that he would not be able to attend the meeting on July 19th, 2019 and that Ralph Caribou would like to schedule a meeting with Michael Raess at Lynn Lake when the rail line was fixed. Michael Raess contacted Ralph Caribou and sent some possible dates however the two were unable to find a date that worked.	Email - Received	Northwest Manitoba Community Futures Development Corporation, Mathias Colomb Cree Nation
MCCN	May 28, 2019	2019-05-28 Telephone - Sent with Valerie Whyte, Mathias Colomb Cree Nation, about Engagement, Traditional Knowledge	Valerie Whyte, Councilor of Mathias Colomb Cree Nation (MCCN) was contacted by Michael Raess of Alamos to find out if MCCN would like to continue to engage. Valerie Whyte was not available. Michael Raess also contacted the office administration to talk to the Chief or other Councilors, but no one was available. Michael Raess would like to determine if there could be a different contact person.	Telephone - Sent	Mathias Colomb Cree Nation
Granville Lake	May 28, 2019	2019-05-28 Text/SMS - Sent with Clarence Bighetty, Granville Lake Community, about Engagement, Traditional Knowledge, Water Resources	Headman Clarence Bighetty of Granville Lake Community was contacted by Michael Raess of Alamos to ask if Stantec could use Clarence Bighetty as a guide for a surface water monitoring program. Clarence Bighetty arranged to meet a representative of Stantec in Granville Lake on June 3, 2019. Clarence Bighetty noted that there was currently no working phone at Granville Lake, which may make communication difficult.	Text/SMS - Sent	Granville Lake Community
Granville Lake	April 9, 2019	2019-04-09 Text/SMS - Received with Clarence Bighetty, Granville Lake Community, about Traditional Land Use Studies, Engagement	Headman Clarence Bighetty of the Granville Lake community contacted Michael Raess of Alamos to ask if he had made any progress with Mathias Colomb Cree Nation Chief and Council regarding the Project and Traditional Land and Resource Use studies. Michael Raess responded to say that he had not.	Text/SMS - Received	Granville Lake Community
MCCN	March 15, 2019	2019-03-15 Telephone - Sent with Valerie Whyte, Mathias Colomb Cree Nation, about Traditional Ecological Knowledge, Engagement	Michael Raess of Alamos contacted Valerie Whyte, Councilor of Mathias Colomb Cree Nation to determine if they would like to continue to engage with the Project. Valerie Whyte was not available and it was suggested that perhaps someone else could be contacted on Council. Michael Raess noted that Chief had mandated that Valerie Whyte was the contact person. Michael Raess would contact the Chief to discuss another contact person, if possible.	Telephone - Sent	Mathias Colomb Cree Nation
MCCN	March 12, 2019	2019-03-12 Telephone - Sent with Valerie Whyte, Mathias Colomb Cree Nation, about Traditional Ecological Knowledge, Engagement	Michael Raess of Alamos contacted Valerie Whyte, Councilor of Mathias Colomb Cree Nation to ask if they would like to continue to engage on the Project. She was not available at that time, so Michael Raess called back and she again was not available.	Telephone - Sent	Mathias Colomb Cree Nation
MCCN	February 7, 2019	2019-02-07 Telephone - Sent with Mathias Colomb Cree Nation, and their contact Valerie Whyte, about Engagement, Traditional Ecological Knowledge	Michael Raess of Alamos called Valarie Whyte, Councilor for Mathias Colomb Cree Nation to determine interest in continuing Project engagement. Valarie Whyte indicated she was travelling and would return Michael Raess's call Friday February 8, 2019. No phone call was received. Michael Raess would continue to reach out to Mathias Colomb Cree Nation to continue engagement.	Telephone - Sent	Mathias Colomb Cree Nation
MCCN	January 18, 2019	2019-01-18 Email - Sent with Valerie Whyte, Mathias Colomb Cree Nation, Lorna Bighetty, Mathias Colomb Cree Nation, about Engagement	Michael Raess of Alamos Gold emailed Chief Lorna Bighetty and Councillor Valerie Whyte of Mathias Colomb Cree Nation to determine if they would like to continue to engage on the Project.	Email - Sent	Mathias Colomb Cree Nation
Granville Lake	January 12, 2019	2019-01-12 In-Person with Clarence Bighetty, Granville Lake Community, about Traditional Land Use Studies	Michael Raess of Alamos Gold met with Clarence Bighetty, Headman of Granville Lake Community. Michael Raess stated that he had not heard from Mathias Colomb Cree Nation and was planning to reach out to determine if they would like to continue to engage on the Project. Clarence Bighetty stated he would continue to talk to Mathias Colomb Cree Nation Chief and Council about continuing to engage with Alamos Gold, and would provide Michael Raess with any updates. Clarence Bighetty indicated that he would like to continue to engage and complete a Traditional Knowledge (TK) study, at least for Granville Lake.	In-Person	Granville Lake Community
Granville Lake	January 7, 2019	2019-01-07 Telephone - Received with Clarence Bighetty, Granville Lake Community, about Engagement	Michael Raess of Alamos Gold received a telephone call from Clarence Bighetty, Headman of Granville Lake Community to determine if Michael Raess had heard from Mathias Colomb Cree Nation leadership. Michael Raess indicated that he had not heard from Chief and Council, but would send an email to see if Chief and Council would like to continue to engage on the Project. Michael Raess stated that Stantec was conducting the winter surface water quality program on Granville Lake the week of January 7, 2019 and that Michael Raess could come for a visit on the same helicopter. Clarence Bighetty and Michael Raess agreed to meet on January 12, 2019.	Telephone - Received	Granville Lake Community
MCCN	December 14, 2018	2018-12-14 In-Person with David Bighetty, Mathias Colomb Cree Nation	Michael Raess of Alamos Gold had an impromptu meeting with David Bighetty of Mathias Colomb Cree Nation (MCCN). David Bighetty agreed with Clarence Bighetty that Granville Lake had the potential to be more affected by the Lynn Lake Gold Project compared with Pukatawagan (MCCN) because Granville Lake was downstream of the proposed mine. David Bighetty asked Michael Raess if he would help to come to an agreement by approaching Mathias Colomb Cree Nation Chief and Council through him. Michael Raess indicated that he would not do so because he was waiting to hear from Council before continuation of the engagement process.	In-Person	Mathias Colomb Cree Nation
Granville Lake	November 15, 2018	2018-11-15 Telephone - Received with Clarence Bighetty, Granville Lake Community	Michael Raess of Alamos Gold received a telephone call from Clarence Bighetty, Headman of Granville Lake Community regarding the cancelled meeting in Pukatawagan. Clarence Bighetty and Michael Raess agreed to wait until they heard back from Chief and Council of Mathias Colomb Cree Nation before arranging a new meeting date.	Telephone - Received	Granville Lake Community

Table 3B-2 Summary of Communications: Mathias Colomb Cree Nation

Community Reference	Communication date	Communication title	Communication summary	Communication method	Stakeholder
MCCN	November 14, 2018	2018-11-14 Telephone - Received with Ralph Caribou, Mathias Colomb Cree Nation	Ralph Caribou, Councilor of Mathias Colomb Cree Nation called and spoke with Michael Raess of Alamos Gold regarding the cancelled meeting in Pukatawagan. Ralph Caribou stated that Chief and Council were not aware of the meeting and that Alamos should offer more time for organizing a meeting. Michael Raess explained that Clarence Bighetty, Headman of Granville Lake Community requested and organized the meeting and that Clarence Bighetty indicated that Chief and Council had agreed to meet; therefore, Michael Raess assumed that the meeting was approved by Chief and Council. Ralph Caribou indicated that the meeting was poorly organized and more planning was needed for the first meeting. Michael Raess explained that Alamos has been engaging with Mathias Colomb Cree Nation for over a year and that he met with the newly elected Chief and Council in Winnipeg. At that meeting, Chief and Council had indicated that no knowledge sharing would take place without a written agreement about compensation. Michael Raess indicated that he would like to continue moving forward on communication and engagement. Ralph Caribou asked about the potential benefits and opportunities if the Lynn Lake Gold Project is built. Michael Raess responded stating that the Project would offer business opportunities for surrounding communities, training and job opportunities, and monitoring opportunities. Michael Raess stated that Alamos Gold is engaging with 12 Indigenous groups. Ralph Caribou expressed interest in coordinating an open house in Lynn Lake where all 12 communities are in attendance. Michael Raess stated it was a good idea but not sure if it would be feasible to organize a meeting where all 12 communities would come to Lynn Lake.	Telephone - Received	Mathias Colomb Cree Nation
Granville Lake	November 14, 2018	2018-11-14 Telephone - Sent with Ralph Caribou, Mathias Colomb Cree Nation, Clarence Bighetty, Granville Lake Community	Due to weather the meeting in Pukatawagan was cancelled by Clarence Bighetty, Headman of Granville Lake Community. Clarence Bighetty called Councillor Ralph Caribou of Mathias Colomb Cree Nation to state that he would not be able to come for the meeting.	Telephone - Sent	Mathias Colomb Cree Nation, Granville Lake Community
Granville Lake	November 14, 2018	2018-11-14 In-Person with Clarence Bighetty, Granville Lake Community	Due to weather the meeting in Pukatawagan was cancelled by Clarence Bighetty, Headman of Granville Lake Community. Michael Raess of Alamos Gold met with Clarence Bighetty to provide an update on the Project. Michael Raess explained the federal requirements and that Alamos must communicate through Mathias Colomb Cree Nation Chief and Council even if Granville Lake Community would like to continue with the study. Clarence Bighetty explained that Granville Lake Community would like to split off from Mathias Colomb Cree Nation, but Michael Raess stated that he needed to see documentary evidence to discuss traditional land use independent of Mathias Colomb Cree Nation leadership before Alamos could speak exclusively with Granville Lake Community. Clarence Bighetty explained that Granville Lake Community is going to be directly affected by the Project, not Pukatawagan.	In-Person	Granville Lake Community
Granville Lake	November 13, 2018	2018-11-13 Email - Sent with Clarence Bighetty, Granville Lake Community	Michael Raess of Alamos Gold emailed Clarence Bighetty, Headman of Granville Lake Community to confirm he had a charter arranged for the meeting with Mathias Colomb Cree Nation on November 14, 2018. Michael Raess indicated that the charter would arrive in Pukatawagan at 9:45 a.m. and asked Clarence Bighetty to organize a shuttle to and from the airport. Michael Raess told Clarence Bighetty to meet at the Lynn Lake airport by 9:00 a.m. and let him know if he would like to mee before to discuss the meeting.	Email - Sent	Granville Lake Community
Granville Lake	November 12, 2018	2018-11-12 Telephone - Received with Clarence Bighetty, Granville Lake Community	Michael Raess of Alamos Gold received a telephone call from Clarence Bighetty, Headman of Granville Lake Community, regarding the meeting scheduled with Mathias Colomb Cree Nation Chief and Council in Pukatawagan on November 14, 2018. Clarence Bighetty indicated that a full caucus will be there to meet with him and Alamos Gold. Michael Raess indicated that he is waiting for a charter quote and approval, which would be available the following day (November 13, 2018).	Telephone - Received	Granville Lake Community
Granville Lake	November 10, 2018	2018-11-10 Telephone - Received with Clarence Bighetty, Granville Lake Community	Michael Raess of Alamos Gold received a call from Clarence Bighetty, Headman of Granville Lake Community to request a meeting with Mathias Colomb Cree Nation in Pukatawagan on November 14, 2018 to discuss further engagement on the Lynn Lake Gold Project. Michael Raess stated that this meeting would have to be requested by Clarence Bighetty because the last time Michael Raess spoke with Chief and Council he was told to wait to be contacted by Mathias Colomb Cree Nation leadership before initiating further engagement. Further, Mathias Colomb Cree Nation indicated they do not want to provide any information before having an Impact Benefit Agreement (IBA) in place. Clarence Bighetty organized the meeting and requested travel expense reimbursement. Michael Raess indicated that that would have to be paid through Mathias Colomb Cree Nation and that only travel from Leaf Rapids would be considered.	Telephone - Received	Granville Lake Community
Granville Lake	November 2, 2018	2018-11-02 Telephone - Received with Clarence Bighetty, Granville Lake Community, about Traditional Knowledge	Michael Raess of Alamos Gold received a telephone call from Clarence Bighetty, Headman of Granville Lake Community requesting a summary of the meeting with Mathias Colomb Cree Nation Chief and Council in Winnipeg on October 19, 2018. Michael Raess summarized the email for Clarence Bighetty. Clarence Bighetty expressed concern that Granville Lake will potentially lose its voice if we do not continue with the Traditional Knowledge (TK) study as previously discussed. Clarence Bighetty stated he would like to meet with Mathias Colomb Cree Nation Chief and Council to discuss continuation of the TK study.	Telephone - Received	Granville Lake Community
MCCN	October 30, 2018	2018-10-30 Email - Received with Lorna Bighetty, Mathias Colomb Cree Nation, about Engagement	Michael Raess of Alamos Gold received an email from Chief Lorna Bighetty of Mathias Colomb Cree Nation in reply to his email from October 29, 2018. Chief Lorna Bighetty thanked Michael Raess for the update. Michael Raess replied via email thanking Chief Lorna Bighetty for the response and indicating he looked forward to hearing from Valerie Whyte, Councillor of Mathias Colomb Cree Nation regarding further engagement.	Email - Received	Mathias Colomb Cree Nation
MCCN	October 29, 2018	2018-10-29 Email - Sent with Lorna Bighetty, Mathias Colomb Cree Nation, about Engagement	Michael Raess of Alamos Gold emailed Chief Lorna Bighetty of Mathias Colomb Cree Nation to clarify that he is waiting for Valerie Whyte, Councillor of Mathias Colomb Cree Nation, to provide the go ahead to continue engagement on the Lynn Lake Gold Project.	Email - Sent	Mathias Colomb Cree Nation

Table 3B-2 Summary of Communications: Mathias Colomb Cree Nation

Community Reference	Communication date	Communication title	Communication summary	Communication method	Stakeholder
MCCN	October 19, 2018	2018-10-19 In-Person with Floyd North, Mathias Colomb Cree Nation, Mathias Colomb Cree Nation, and their contact Gordie Bear, Mathias Colomb Cree Nation, about Engagement and Traditional Land Use Studies	Michael Raess of Alamos Gold and Butch Amundson of Stantec Consulting met with the Chief and Council including Chief Lorna Bighetty and Councillors Gordon Bear, Valerie Whyte, Shirley Bighetty, Shirley Castel, Wanda Bighetty of Mathias Colomb Cree Nation (MCCN) as well as Floyd North at 12:20 pm, in Winnipeg, Manitoba on Friday, October 19, 2018. Michael Raess introduced himself and congratulated the Chief and Council on their election. Michael Raess provided an overview and update of the Project including location, existing conditions at the site, planned construction, EA and permitting process, potential effects, and the desire to collaborate on traditional knowledge sharing. Michael Raess stated that this was follow-up to a meeting in Pukatawagan with Lorna Bighetty, Gordie Bear, Darrell Linklater, Wanda Bighetty and Richard Dumas where they discussed adding more Elder interviews to the existing MCFN study and scheduling the interviews. Several of the Councillors expressed concern that Stantec and Alamos had been in Pukatawagan speaking with Elders without the consent of the Chief and Council at the time. Councillor Valerie Whyte indicated that the land itself is sacred to the people of MCCN and the concept of a “sacred site” is not compatible with their world view. Valerie Whyte added that Alamos must take a new approach to engagement that involves arriving at an accommodation agreement before discussing traditional knowledge sharing. Floyd North indicated that MCCN had several existing TLU studies already. Butch discussed the reasons for asking for MCCN to share traditional knowledge and traditional land use information including providing time depth to base line studies, observations regarding intangible aspects of traditional practice and an opportunity to learn about where and what people currently harvest, their travel routes and the locations of cultural practices. Floyd North stated that the collection of traditional land use information, in his experience with other mining developments, was more likely to be used as evidence that MCCN members may not harvest within the project footprint and therefore be used against them in the negotiation of an accommodation agreement. Floyd expressed a desire to review the baseline data collected for the project and an opportunity for an independent consultant to conduct studies and compare results. Alamos Gold understood that an accommodation agreement would be necessary before any advancement on information sharing. MCCN asserted that they were the Mother Band in the region and that the Project is in their traditional territory. Michael Raess inquired about the possibility of a joint accommodation agreement with MCFN but Councillor Valerie Whyte stated that it was inappropriate to suggest how they approached accommodation. Councillor Gordon Bear suggested that the Province should clean up the existing abandoned mine sites in the north before permitting any new mines. Several of the Councillors asked about how many times Alamos had engaged with MCCN. Michael responded that he had visited the community twice but had made many attempts to arrange meetings and that he hoped he could meet the Chief and Council in Pukatawagan in the future. Two of the Councillors stated that they had registered their objection to the project at a meeting in Toronto and several others stated that they were generally against mining projects in the region. Others stated that mining in the region may be feasible if MCCN had a controlling share in the mine. Several Councillors questioned Canadian Environmental Assessment Agency (CEAA) requirements to talk with other Indigenous communities, asserting that the Project is in their traditional territory. Floyd North described this as a tactic used by the federal government to create disputes among First Nations over traditional territory. Chief Bighetty said that Valerie Whyte would be the contact for the Project and that she would contact Michael Raess to discuss next steps.	In-Person	Mathias Colomb Cree Nation
Granville Lake	October 11, 2018	2018-10-11 Telephone - Received with Clarence Bighetty, Granville Lake Community	Michael Raess of Alamos Gold received a voicemail from Clarence Bighetty, Headman of Granville Lake Community, indicating that he would like to be present during the October 19, 2018 meeting with the newly elected Chief and Council of Mathias Colomb Cree Nation. Michael Raess left numerous messages but was unable to contact Clarence Bighetty.	Telephone - Received	Granville Lake Community
MCCN	October 10, 2018	2018-10-10 Telephone - Sent with Darrel Linklater, Mathias Colomb Cree Nation, Clarence Bighetty, Granville Lake Community	Michael Raess of Alamos Gold telephoned and spoke with Darrell Linklater, Councillor of Mathias Colomb Cree Nation, to follow up on the recent election results. Michael Raess indicated that he would like to meet with the newly elected Chief and Council to continue Alamos Gold's engagement initiative. Michael Raess and Darrell Linklater tried to coordinate a meeting in Pukatawagan, Manitoba but Chief Lorna Bighetty did not have availability. Darrell Linklater suggested that a meeting take place on October 19, 2018 in Winnipeg. The meeting agenda would include a Project update and approval request for the community profile and associated reference documents which Alamos planned to incorporate into the Environmental Impact Statement for the Project. Michael Raess suggested that Butch Amundson of Stantec attend to answer any questions or concerns with respect to the proposed Traditional Knowledge study.	Telephone - Sent	Mathias Colomb Cree Nation
MCCN	September 17, 2018	2018-09-17 Text/SMS - Sent with Richard Dumas, Mathias Colomb Cree Nation	Michael Raess of Alamos Gold sent a text message to Richard Dumas, Deputy Chief of Mathias Colomb Cree Nation to inquire about scheduling a meeting for September 19, 20 or 21, 2018. Richard Dumas replied indicating that their Annual General Assembly was scheduled for September 20, 2018. Michael Raess replied to inquire whether Chief and Council had created a list of Elders that would be interviewed for the Project. Richard Dumas replied that they had not. Michael Raess suggested that it may be best to wait until after the elections on October 4, 2018. Richard Dumas replied in the affirmative.	Text/SMS - Sent	Mathias Colomb Cree Nation
MCCN	September 11, 2018	2018-09-11 Text/SMS - Sent with Richard Dumas, Mathias Colomb Cree Nation	Michael Raess of Alamos Gold sent a text message to Richard Dumas, Deputy Chief of Mathias Colomb Cree Nation, to follow up on scheduling a meeting in Pukatawagan for September 19, 20 or 21, 2018. Michael Raess asked Richard Dumas what day would be preferred for Chief and Council to meet with him.	Text/SMS - Sent	Mathias Colomb Cree Nation
MCCN	September 10, 2018	2018-09-10 Text/SMS - Sent with Richard Dumas, Mathias Colomb Cree Nation	Michael Raess of Alamos Gold sent a text message to Richard Dumas, Deputy Chief of Mathias Colomb Cree Nation, to follow up on scheduling a meeting in Pukatawagan for the week of September 10, 2018. Michael Raess asked Richard Dumas what day would work best for the meeting. Richard Dumas replied that Chief and Council were busy the entire week. Michael Raess replied to propose September 19, 20 or 21, 2018 for a meeting date. Richard Dumas agreed but did not specify what day would work best.	Text/SMS - Sent	Mathias Colomb Cree Nation
MCCN	August 29, 2018	2018-08-29 Text/SMS - Sent with Richard Dumas, Mathias Colomb Cree Nation	Michael Raess of Alamos Gold sent a text message to Richard Dumas, Deputy Chief of Mathias Colomb Cree Nation, to determine a location for the meeting in Winnipeg on August 30, 2018. Richard Dumas replied that the meeting was cancelled. Michael Raess replied asking to schedule a new date for the meeting. It was agreed that Michael Raess would visit Pukatawagan, Manitoba the week of September 10, 2018.	Text/SMS - Sent	Mathias Colomb Cree Nation
MCCN	August 23, 2018	2018-08-23 Email - Sent with Richard Dumas, Mathias Colomb Cree Nation, about Engagement	Michael Raess of Alamos emailed Deputy Chief Richard Dumas and former Chief Arlen Dumas of Mathias Colomb Cree Nation (MCCN) to discuss the community profile and associated reference documents which Alamos planned to incorporated into the Environmental Impact Statement for the Project.	Email - sent	Mathias Colomb Cree Nation
MCCN	August 23, 2018	2018-08-23 Email - Sent with Richard Dumas, Mathias Colomb Cree Nation, Darrel Linklater, Mathias Colomb Cree Nation	Michael Raess of Alamos Gold emailed Richard Dumas, Deputy Chief of Mathias Colomb Cree Nation, and Darrel Linklater, Councillor of Mathias Colomb Cree Nation, to follow up on scheduling a meeting for August 30, 2018 in Winnipeg.	Email - Sent	Mathias Colomb Cree Nation

Table 3B-2 Summary of Communications: Mathias Colomb Cree Nation

Community Reference	Communication date	Communication title	Communication summary	Communication method	Stakeholder
MCCN	August 23, 2018	2018-08-23 Telephone - Sent with Richard Dumas, Mathias Colomb Cree Nation, Darrel Linklater, Mathias Colomb Cree Nation, about General Project Information, Indigenous & Treaty Rights	Michael Raess of Alamos Gold called and spoke with Darrel Linklater, Councillor of Mathias Colomb Cree Nation to follow up on progress of the Traditional Knowledge study, as well as the establishment of a list of Elder interviewees. Darrel Linklater indicated that Chief and Council would be meeting in Winnipeg on August 30, 2018 and that the Lynn Lake Gold Project was a component of the agenda. Darrel Linklater suggested that Michael Raess contact Richard Dumas, Deputy Chief of Mathias Colomb Cree Nation, to coordinate a meeting. Michael Raess called Richard Dumas but there was no response.	Telephone - Sent	Mathias Colomb Cree Nation
MCCN	August 22, 2018	2018-08-22 Email - Sent with Darrel Linklater, Mathias Colomb Cree Nation	Lauren Stead of Stantec emailed Darrel Linklater of Mathias Colomb Cree Nation to follow up on the email Michael Raess of Alamos Gold sent on July 24, 2018 regarding traditional knowledge study interviews and site visit.	Email - Sent	Mathias Colomb Cree Nation
MCCN	August 16, 2018	2018-08-16 Text/SMS - Sent with Wanda Bighetty, Mathias Colomb Cree Nation, about Traditional Knowledge, Traditional Land Use Studies	Michael Raess of Alamos Gold texted Wanda Bighetty, Deputy Chief of Mathias Colomb Cree Nation to inquire if there had been any progress on the coordination of the Traditional Knowledge study. Wanda Bighetty replied back indicating she would prioritize this.	Text/SMS - Sent	Mathias Colomb Cree Nation
MCCN	July 24, 2018	2018-07-24 Email - Sent with Darrel Linklater, Mathias Colomb Cree Nation, Richard Dumas, Mathias Colomb Cree Nation, about Engagement, Traditional Land Use Studies	Deputy Chief Richard Dumas and councilor Darrel Linklater of Mathias Colomb Cree Nation (MCCN) were contacted by Michael Raess of Alamos with a copy of the proposal for Stantec to conduct a Traditional Land and Resource Use (TLU) study for the Lynn Lake Gold Project. Michael Raess asked for a list of Elders that MCCN would like to include in the TLU study to set up a date in August for the Elder interviews. In addition, Michael Raess would organize a site visit to the LLGP for Chief and council in the fall after the Elder interviews and asked if there were any dates they preferred.	Email - Sent	Mathias Colomb Cree Nation
MCCN	July 17, 2018	2018-07-17 Email - Sent with Darrel Linklater, Mathias Colomb Cree Nation, about Traditional Land Use Studies	Lauren Stead of Stantec emailed Darrel Linklater, Councilor, Mathias Colomb Cree Nation following up on her previous email from July 10th, which discussed arranging a meeting to discuss the proposed Traditional Land Use study and a proposed visit to the mine site.	Email - Sent	Mathias Colomb Cree Nation
MCCN	July 10, 2018	2018-07-10 Email - Sent with Darrel Linklater, Mathias Colomb Cree Nation, about Traditional Land Use Studies	Lauren Stead of Stantec sent an email to Darrel Linklater, Councillor, Mathias Colomb Cree Nation regarding the Traditional Land Use (TLU) Study and visit to the mine site. Darryl Linklater of Mathias Colomb Cree Nation replied at 3:39 PM, indicating he would urge council to meet to discuss. Lauren Stead of Stantec replied at 3:43 PM clarifying the two items to be discussed- site visit to view the proposed mine site and completion of a Traditional Land Use Study (TLU). Lauren Stead indicated the site visit and TLU study would be organized at Mathias Colomb Cree Nation's convenience, and requested a list of interviewees for the TLU Study, which would be conducted in Pukatawagan.	Email - Sent	Mathias Colomb Cree Nation
MCCN	June 18, 2018	2018-06-18 Email - Sent with Darrel Linklater, Mathias Colomb Cree Nation, about Traditional Land Use Studies	Lauren Stead of Stantec Consulting Ltd. emailed Darrel Linklater, Councillor, Mathias Colomb Cree Nation regarding the site visit and traditional land use study for the Lynn Lake Gold Project. Lauren Stead asked whether Darrel Linklater had a chance to discuss the Project with the rest of Council. Darryl Linklater responded on June 19th at 2:00 PM indicating that council would discuss on July 6, 2018.	Email - Sent	Mathias Colomb Cree Nation
MCCN	June 8, 2018	2018-06-08 Email - Sent with Darrel Linklater, Mathias Colomb Cree Nation, about Traditional Land Use Studies, Engagement	Lauren Stead of Stantec Consulting Ltd. emailed Darrel Linklater, Councillor, Mathias Colomb Cree Nation regarding the site visit and traditional land use study for the Lynn Lake Gold Project. Lauren Stead attached the traditional land use study proposal that was previously sent to Deputy Chief Richard Dumas for review. Lauren Stead stated that 10 to 15 interviews were proposed and requested that Darrel Linklater send a list of potential interviewees. Lauren Stead recommended July 9 and 21 or August 12 and 24, 2018 for the traditional land use study site visit.	Email - Sent	Mathias Colomb Cree Nation
MCCN	June 6, 2018	2018-06-06 Fax - Received with Darrel Linklater, Mathias Colomb Cree Nation, about Indigenous & Treaty Rights	Michael Raess of Alamos Gold received a fax addressed to Judy Sinclair of Alamos Gold, from Councillor Darrel Linklater, for Mathias Colomb Cree Nation. The fax included the confirmation of Appointment of Head Man Clarence Bighetty for the Mathias Colomb Cree Nation Annual General Assembly, held in Pukatawagan, Manitoba September 19 to 22, 2016. The communication also stated David Bighetty and Brenda Traverse were appointed as council members of Granville Lake.	Fax - Received	Mathias Colomb Cree Nation
MCCN	May 22, 2018	2018-05-22 Email - Sent with Richard Dumas, Mathias Colomb Cree Nation, about Traditional Land Use Studies	Michael Raess of Alamos sent Deputy Chief Richard Dumas of Mathias Colomb Cree Nation a Facebook message to follow-up on the traditional land and resource use (TLRU) study proposal for the Project.	Email - Sent	Mathias Colomb Cree Nation
MCCN	May 18, 2018	2018-05-18 Telephone - Sent with Richard Dumas, Mathias Colomb Cree Nation, about Traditional Land Use Studies	Michael Raess of Alamos called the Mathias Colomb Cree Nation Band office to discuss the traditional land and resource use (TLRU) study proposal for the Project; however, Deputy Chief Richard Dumas was not present.	Telephone - Sent	Mathias Colomb Cree Nation
MCCN	May 14, 2018	2018-05-14 Email - Sent with Richard Dumas, Mathias Colomb Cree Nation, Clarence Bighetty, Granville Lake Community, John Linklater, about Traditional Land Use Studies, General Project Information	Michael Raess of Alamos emailed Deputy Chief Richard Dumas of Mathias Colomb Cree Nation (MCCN) to request an update on the approval of the traditional land and resource use (TLRU) study proposal. Michael Raess asked for a list of Elders that should be interviewed and about potential dates to schedule the interviews. Clarence Bighetty, Headman of the Granville Lake Community called and spoke with Michael Raess and recommended 3 to 5 Elder interviews for Granville Lake. Clarence Bighetty indicated that he would not be available in June 2018 due to commercial fishing.	Email - Sent	John Linklater, Mathias Colomb Cree Nation, Granville Lake Community
MCCN	May 10, 2018	2018-05-10 Email - Received with Jennifer Howe, Canadian Environmental Assessment Agency (CEAA), about Indigenous & Treaty Rights, Engagement	Jennifer Howe, Project Manager with the Canadian Environmental Assessment Agency (CEAA) contacted Karen Mathers of Stantec regarding Indigenous Community engagement between Mathias Colomb Cree Nation (MCCN) and Pickerel Narrows Cree Nation (PNCN). CEAA has determined that the rights are being held by MCCN and until there is a referendum between the two communities, it will continue to be that way. Therefore Alamos is encouraged to engage with both MCCN and Gordon Bighetty Jr.; however, the group Gordon Bighetty Jr. represents will be considered under public engagement. The community of Granville Lake, where Gordon Bighetty Jr. asserted to be representing PNCN will be represented by Clarence Bighetty (the Headman through MCCN). Clarence Bighetty's preferred community name is Granville Lake (vs PNCN).	Email - Received	CEAA

Table 3B-2 Summary of Communications: Mathias Colomb Cree Nation

Community Reference	Communication date	Communication title	Communication summary	Communication method	Stakeholder
MCCN	April 20, 2018	2018-04-20 In-Person with Richard Dumas, Mathias Colomb Cree Nation, Lorna Bighetty, Mathias Colomb Cree Nation, Darrel Linklater, Mathias Colomb Cree Nation about Traditional Land Use Studies, General Project Information	Michael Raess of Alamos chaired a meeting with representatives from the Mathias Colomb Cree Nation (MCCN) including Deputy Chief Richard Dumas and councilors Lorna Bighetty, Darrel Linklater, Shirley Castel, and Gordie Bear, as well as Clarence Bighetty, the MCCN recognized representative for Granville Lake Community, and MCCN members Kara Francois and Judy Sinclair-Moose to discuss a Traditional Land Use (TLU) study. The meeting started with introductions and Michael Raess gave a Project description and update. Richard Dumas talked about the TLU study from Marcel Colomb First Nation (MCFN) and stated that the MCCN TLU study would be separate from MCFN. Richard Dumas noted the potential to integrate the information from the 7 Elders who were interviewed as part of the MCFN TLU study into the MCCN study. In addition, the MCCN TLU Study can be conducted by Stantec. Michael Raess stated that Alamos needs a list of potential Elders to interview. Stantec will then create a proposal and submit it to MCCN for review. MCCN requested an open house where Chief and Council, and possibly Elders, could come, listen to a presentation, have their questions answered and attend a tour of the Project site. Michael Raess recommended that Clarence Bighetty and Pickerel Narrows Cree Nation members be also involved in order to determine if they accept the approach to the MCCN TLU study.	In-Person	Mathias Colomb Cree Nation Granville Lake Community
MCCN	April 17, 2018	2018-04-17 Telephone - Sent with Wanda Bighetty, Mathias Colomb Cree Nation, about Indigenous Agreements & Protocols, General Project Information	Michael Raess of Alamos contacted councilor Wanda Bighetty of Mathias Colomb Cree Nation to ensure that Chief and Council will be present for the meeting on April 20, 2018 to discuss the Traditional Land Use (TLU) Study. Michael Raess coordinated a vehicle to be picked up at the airport.	Telephone - Sent	Mathias Colomb Cree Nation
Granville Lake	April 16, 2018	2018-04-16 Telephone - Sent with Clarence Bighetty, Granville Lake Community, about Indigenous Agreements & Protocols, Job Opportunities	Michael Raess of Alamos contacted Clarence Bighetty, headman of the Granville Lake Settlement to invite him to come to Pukatawagan for a meeting with Mathias Colomb Cree Nation Chief and Council. Clarence Bighetty accepted and they arranged plans accordingly.	Telephone - Sent	Granville Lake Community
MCCN	April 12, 2018	2018-04-12 Email - Received with Richard Dumas, Mathias Colomb Cree Nation, about Traditional Land Use Studies, Engagement, Regulatory Requirements	Michael Raess of Alamos contacted Deputy Chief Richard Dumas of the Mathias Colomb Cree Nation (MCCN) regarding meeting on April 20, 2018 in Pukatawagan to discuss the Traditional Land Use Study.	Email - Received	Mathias Colomb Cree Nation
PNCN	March 15, 2018	2018-03-15 Telephone - Sent with Jennifer Howe, Canadian Environmental Assessment Agency (CEAA), about Consultation, Regulatory Requirements, Indigenous and Treaty Rights	Karen Mathers of Stantec hosted a conference call with Jennifer Howe of the Canadian Environmental Assessment (CEA) Agency, Michael Raess of Alamos, and Butch Amundson and Lauren Stead of Stantec regarding information that has been gathered on the representation of Pickerel Narrows Cree Nation (PNCN). After the meeting, Jennifer Howe contacted Karen Mathers to state that Clarence Bighetty is a part of the Mathias Colomb Cree Nation and Gordon Bighetty Jr. is a part of a separate community, PNCN.	Telephone - Sent	CEAA
PNCN	March 15, 2018	Meeting to clarify regarding representation of Pickerel Narrows Cree Nation (PNCN)	Karen Mathers of Stantec hosted a conference call with Jennifer Howe of the Canadian Environmental Assessment Agency (CEAA), Michael Raess of Alamos, and Butch Amundson and Lauren Stead of Stantec regarding information that has been gathered on the representation of Pickerel Narrows Cree Nation (PNCN). Karen Mathers (KM) of Stantec started the meeting by asking Jennifer Howe (JH) of CEAA to share information she has gathered regarding representation of PNCN. JH explained that she has spoken with Gordon Bighetty Jr. of PNCN who asserts the right to be identified as a community separate from Mathias Colomb Cree Nation (MCCN). JH explained that Gordon Bighetty Jr. explained that community members originally living in the settlement of Granville Lake moved to Leaf Rapids after a protest regarding water quality. JH has also spoken to Clarence Bighetty, who has informed CEAA that he is the Headman of a community of people at Granville Lake, but that his interests in regard to the LLGP are represented by MCCN. Clarence has requested that he be kept informed throughout the engagement and consultation process. Michael Raess (MR) shared information he has gathered through conversations with members of the communities. MR explained that it has been reported to him that Gordon Bighetty Jr. does not currently live in Leaf Rapids (resides in Pine Falls, MB). MR also noted that to his knowledge, Gordon Bighetty Jr. is a member of MCCN and that Gordon Bighetty Jr. and Clarence Bighetty are uncle and nephew. It has been reported to MR that Clarence Bighetty and his immediate family are the only people that still live in the community at Granville Lake. Deputy Chief Richard of MCCN has instructed MR that Alamos should only be engaging with Clarence Bighetty because he is recognized as the leadership representative of the Granville Lake community. JH was not previously aware that there was contention between Clarence Bighetty and Gordon Bighetty Jr. or that Gordon Bighetty Jr. does not live in Leaf Rapids and is a member of MCCN. JH reiterated that CEAA's regulatory process is not a rights determining process and therefore accepts Gordon Bighetty Jr.'s assertion of rights at face value. JH also reiterated that Clarence Bighetty had indicated to her that CEAA should consult with MCCN and notify him as the process progresses and that that would cover his interests. KM asked JH about her recommendations moving forward with the collection of Traditional Land Use information. JH explained that she was unable to make an informed decision about that topic at this time. JH stated that conversations regarding potential impacts of the Project should move forward with all interested communities and their representatives to accurately represent all sides and interests. JH explained that in the regulatory process, CEAA would provide participant funding for reviewing the Environmental Impact Statement (EIS) and that CEAA is currently working to establish that funding process. JH noted that MCCN and PNCN (represented by Gordon Bighetty Jr.) may receive separate funding for review. MR posed a question about the governance structure of PNCN. JH explained Gordon Bighetty Jr.'s perspective that PNCN has always been a separate community from MCCN and that he wants it to remain that way and be recognized as such. JH will ask Gordon Bighetty Jr. whom he represents. KM noted that Alamos and Stantec will not move forward with scoping a Traditional Land Use Study with PNCN at this time, given the confusion as to who represents the community. Butch Amundson (BA) suggested that a Traditional Land Use Study could proceed if Gordon Bighetty Jr. and Clarence Bighetty were to be willing to cooperate and collaborate on one study that represented the community members of Granville Lake/PNCN. JH agreed that this was a reasonable approach and noted that she would be having additional conversations with both Gordon Bighetty Jr. and Clarence Bighetty, keeping in mind that there is contention between the two.	Telephone	CEAA - re: Mathias Colomb Cree Nation/ Pickerel Narrows Cree Nation/ Granville Lake
Granville Lake	March 15, 2018	2018-03-15 Telephone - Sent with Clarence Bighetty, Granville Lake Community	Michael Raess of Alamos called Clarence Bighetty, Headman of Granville Lake Community to confirm he does not want to separate Granville Lake from Mathias Colomb Cree Nation. Clarence Bighetty is a registered member of Mathias Colomb Cree Nation.	Telephone - Sent	Granville Lake Community

Table 3B-2 Summary of Communications: Mathias Colomb Cree Nation

Community Reference	Communication date	Communication title	Communication summary	Communication method	Stakeholder
MCCN	March 15, 2018	2018-03-15 Telephone - Sent with David Bighetty, Mathias Colomb Cree Nation, about Indigenous Agreements & Protocols, Engagement, Regulatory Requirements	Michael Raess of Alamos contacted David Bighetty of the Mathias Colomb Cree Nation (MCCN) regarding clarification that all members of the Granville Lake community and Pickerel Narrows Cree Nation (PNCN) are associated with and registered through MCCN. David Bighetty further clarified that the Granville Lake Community Headman would be Clarence Bighetty as that was what Deputy Chief Richard Dumas had indicated.	Telephone - Sent	Mathias Colomb Cree Nation
MCCN	March 15, 2018	2018-03-15 Telephone - Sent with Richard Dumas, Mathias Colomb Cree Nation, about Indigenous Agreements & Protocols, Traditional Land Use Studies	Michael Raess of Alamos contacted Deputy Chief Richard Dumas of Mathias Colomb Cree Nation (MCCN) regarding arranging a meeting in Pukatawagan. A visit to Pukatawagan was scheduled as part of the traditional land and resource use (TLRU) report validation process. Seven Elders who were interviewed as part of the Marcel Colomb First Nation (MCFN) TLRU. The seven Elders were initially interviewed as recommended by MCFN leadership (the seven Elders are ancestors of MCFN but live in Pukatawagan). The timing did not work out so the meeting was postponed until summer 2018.	Telephone - Sent	Mathias Colomb Cree Nation
PNCN	February 23, 2018	2018-02-23 Email - Sent with Jennifer Howe, Canadian Environmental Assessment Agency (CEAA), Cheryl Prosser, Government of Manitoba, about Indigenous & Treaty Rights, Indigenous Agreements	Karen Mathers of Stantec contacted Jennifer Howe of the Canadian Environmental Assessment Agency (CEAA) and Cheryl Prosser of Indigenous and Northern Relations (INR) regarding sharing a letter (June 13, 2017) and email chain from the Deputy Chief Richard Dumas of Mathias Colomb Cree Nation (MCCN). The email clarifies that Clarence Bighetty is recognized as the headman for Granville Lake/ Pickerel Narrows Cree Nation (PNCN).	Email (sent)	CEAA and INR
MCCN	February 22, 2018	2018-02-22 Email - Received with Richard Dumas, Mathias Colomb Cree Nation, about Indigenous Agreements & Protocols, Traditional L…	Michael Raess of Alamos was contacted by Richard Dumas of Mathias Colomb Cree Nation with a letter noting that the representative for Granville Lake is Clarence Bighetty.	Email - Received	Mathias Colomb Cree Nation
Granville Lake	February 19, 2018	2018-02-19 In-Person with Clarence Bighetty, Granville Lake Community, about Traditional Land Use Studies	Michael Raess of Alamos met with Clarence Bighetty of Granville Lake / Pickerel Narrows Cree Nation (PNCN) and had a quick informal chat. Clarence Bighetty was surprised that Michael Raess had not yet received the document providing clarity about the leadership of PNCN. The document should be sent from the Manitoba Keewatinowi Okimakanak Inc. directly. Michael Raess also briefly touched the topic of an traditional land and resource use study. Clarence Bighetty provided another phone number that Michael Raess could contact him on.	In-Person	Granville Lake Community
PNCN	February 12, 2018	2018-02-12 Email - Received with Pickerel Narrows Cree Nation, about Traditional Land Use Studies	Michael Raess of Alamos was contacted by a third party researcher of Pickerel Narrows Cree Nation (PNCN) regarding the TK/TLRU study for the Project. Michael Raess replied and asked who would be interviewed for the TK/TLRU study. The researcher replied and stated that Chief Gordon Bighetty Jr. will reply with a list of Elders as soon as possible.	Email - Received	Pickerel Narrows Cree Nation
MCCN	February 2, 2018	2018-02-02 In-Person with David Bighetty, Mathias Colomb Cree Nation, about Regulatory Requirements	Michael Raess of Alamos met with an individual hired by Mathias Colomb Cree Nation (MCCN) to work for Granville as well as two community members of Leaf Rapids. The MCCN representative suggested that he is aware of a leadership confusion at Pickerel Narrows Cree Nation (PNCN). He also stated that he recognized a specific headman. The two individuals also discussed the PNCN leadership with Michael Raess and how to contact the headman.	In-Person	Mathias Colomb Cree Nation, Unidentified Stakeholder
PNCN	February 1, 2018	2018-02-01 Telephone - Received with Gordon Bighetty Jr., Pickerel Narrows Cree Nation, about Traditional Knowledge, Traditional Land Use Studies	Michael Raess of Alamos was contacted by Chief Gordon Bighetty Jr. of Pickerel Narrows Cree Nation (PNCN) regarding the revised budget for the traditional land use (TLU) study.	Telephone - Received	Pickerel Narrows Cree Nation
PNCN	January 30, 2018	2018-01-30 Email - Received with Pickerel Narrows Cree Nation	Michael Raess of Alamos was contacted by a third party researcher for Pickerel Narrows Cree Nation (PNCN) regarding the TK/TLRU study proposal budget.	Email - Received	Pickerel Narrows Cree Nation
MCCN	January 27, 2018	2018-01-27 Telephone - Sent with Richard Dumas, Mathias Colomb Cree Nation	Michael Raess of Alamos called and spoke with Richard Dumas of Mathias Colomb Cree Nation to clarify who the headman for Granville Lake / Pickerel Narrow Cree Nation is. Richard Dumas indicated that Clarence Bighetty is the headman, and not Gordon Bighetty Jr. Richard Dumas stated he would forward document to prove Clarence Bighetty's status.	Telephone - Sent	Mathias Colomb Cree Nation
MCCN	January 26, 2018	2018-01-26 In-Person with Mathias Colomb Cree Nation, about Traditional Land Use Studies, Indigenous Agreements	Michael Raess of Alamos had a meeting in Toronto with Mathias Colomb Cree Nation (MCCN) and their legal representatives. They discussed the Impact Benefits Agreement and a proposal to conduct a traditional land and resource use (TLRU) study through Firelight. Concerns that were voiced include the legacy of mines in and near Lynn Lake as well as that there are trappers that could be impacted. Deputy Chief Richard Dumas indicated that MCCN is the "Mother Band" and that Marce Colomb First Nation (MCFN) is considered to be under the umbrella of MCCN. Further concerns included that MCCN would like to preserve the land and that any disturbance would have to be negotiated through MCCN. An Impact Benefits Agreement (IBA) was discussed where there are two parallel stages: the EA process and the IBA itself. The IBA should be based on a mutual respectful relationship and cover revenue sharing, process Agreements (funding) and a confidential agreement. Colin Webster of Alamos indicated that there are a total of 13 communities and that Alamos will have to engage with all to learn the level of impact. It was also confirmed that Clarence Bighetty is the Headman for Granville Lake (PNCN).	In-Person	Mathias Colomb Cree Nation
PNCN	January 18, 2018	2018-01-18 Email - Sent with Gordon Bighetty Jr., Pickerel Narrows Cree Nation, John Lovell (Jack), about Traditional Land Use Studies, Indigenous Agreements	Michael Raess of Alamos sent an email to Chief Gordon Bighetty Jr. of the Pickerel Narrows Cree Nation (PNCN) regarding a proposal to conduct the traditional land use (TLU) Study for the Project. Michael Raess attached the proposal and asked for a list of potential participants/Elders as well as a contact for the Community Liaison position. The third party researcher for PNCN responded and stated that they received the document and will review.	Email - Sent	John Lovell, Pickerel Narrows Cree Nation

Table 3B-2 Summary of Communications: Mathias Colomb Cree Nation

Community Reference	Communication date	Communication title	Communication summary	Communication method	Stakeholder
PNCN	January 16, 2018	2018-01-16 In-Person with Gordon Bighetty Sr., Pickerel Narrows Cree Nation, about Indigenous & Treaty Rights, Traditional Land Use…	Michael Raess met with a Pickerel Narrows Cree Nation (PNCN) community member regarding PNCN leadership. The community member confirmed that Gordon Bighetty Jr. was chosen to represent the community . Michael Raess informed the community member that there will likely be interviews for a Traditional Land and Resource Use (TLRU) study.	In-Person	Pickerel Narrows Cree Nation
PNCN	December 11, 2017	2017-12-11 Email - Sent with John Lovell (Jack), Gordon Bighetty Jr., Pickerel Narrows Cree Nation, about Engagement, Traditional Knowledge, Traditional Use Studies	Michael Raess of Alamos was contacted by a third party researcher for Pickerel Narrows Cree Nation (PNCN). Michael Raess replied sharing that Alamos would like to gain traditional knowledge and traditional resource use information from PNCN and proposed to set up a call between PNCN, yourself, Stantec, and Alamos to discuss a preferred approach with respect to the traditional knowledge and traditional resource use study.	Email - Sent	John Lovell, Pickerel Narrows Cree Nation
PNCN	November 24, 2017	2017-11-24 In-Person with Gordon Bighetty Jr., Pickerel Narrows Cree Nation	Michael Raess of Alamos received a resolution from Pickerel Narrows Cree Nation (PNCN) stating that Gordon Bighetty Jr. is the representative for any communication with Granville Lake / Pickerel Narrow Cree Nation. The resolution states that Gordon Bighetty Jr. was appointed acclamation to be Chief/Headman, signed June 12, 2017.	In-Person	Pickerel Narrows Cree Nation
PNCN	November 24, 2017	2017-11-24 In-Person with Gordon Bighetty Jr., Pickerel Narrows Cree Nation	Michael Raess of Alamos met with Chief Gordon Bighetty Jr. of the Pickerel Narrows Cree Nation (PNCN) with the purpose of discussing Indigenous agreements and protocols as well as general project information. Chief Gordon Bighetty Jr. requested to talk about the need to establish a Terms of Reference including compensation for traditional land use and a guarantee for employment. Michael Raess explained that Alamos would like PNCN to share Indigenous knowledge and concerns in order to be able to assess potential mining impacts on PNCN. Chief Gordon Bighetty Jr. indicated that they have someone that the PNCN community works with in regards to traditional knowledge. Michael Raess will provide PNCN with guidelines/template for incorporating PNCN information into the Environmental Impact Statement (EIS). Chief Gordon Bighetty Jr. also indicated that PNCN would be interested in taking part in the training alliance with Alamos. He also invited Michael Raess to come and visit the PNCN in the summer to visit the community and some places for cleansing.	In-Person	Pickerel Narrows Cree Nation
PNCN	November 22, 2017	2017-11-22 Mail - Sent with Gordon Bighetty Jr., Pickerel Narrows Cree Nation, about Engagement, General Project Information	Jordan Toth of Stantec Consulting Ltd. (Stantec) sent a package to Chief Gordon Bighetty Jr. of Pickerel Narrows Cree Nation (PNCN) with that includes the open house handout.	Mail - Sent	Pickerel Narrows Cree Nation
MCCN	November 21, 2017	2017-11-21 Email - Received with Jennifer Howe, Canadian Environmental Assessment Agency (CEAA), Richard Dumas, Mathias Colomb Cree Nation, about Regulatory Requirements, Engagement	Karen Mathers of Stantec was forwarded an email received by Jennifer Howe of CEAA from Richard Dumas of the Mathias Colomb Cree Nation regarding their comments on the draft EIS guidelines. Richard Dumas attached a letter, a list of concerns in order of priority, and tracked changes in the draft EIS guideline document.	Email - Received	Canadian Environmental Assessment Agency (CEAA), Mathias Colomb Cree Nation
PNCN	November 15, 2017	2017-11-15 Email - Sent with Gordon Bighetty Jr., Pickerel Narrows Cree Nation, about Engagement, General Project Information	Jordan Toth of Stantec sent an email to Chief Gordon Bighetty Jr. of the Pickerel Narrows Cree Nation (PNCN) introducing herself and attaching an introductory letter introducing Alamos and Stantec's role on the project as well as some preliminary information regarding the Project location.	Email - Sent	Pickerel Narrows Cree Nation
PNCN	November 15, 2017	2017-11-15 In-Person with Gordon Bighetty Jr., Pickerel Narrows Cree Nation, about Indigenous Agreements & Protocols, Engagement, Project Engineering	Gordon Bighetty Jr. of Pickerel Narrows Cree Nation met with Michael Raess of Alamos in Winnipeg. Gordon Bighetty noted that Pickerel Narrows is the preferred community name and requested that emails be sent to gordybighetty@hotmail.ca. Gordon Bighetty Jr. noted that Pickerel Narrows is going through the legal processes to separate from Mathias Colomb Cree Nation. Gordon Bighetty Jr. noted that before the 1960s Pickerel Narrows Cree Nation was independent but combined with Mathias Colomb Cree Nation under the influence of the Canadian government. Members of the Pickerel Narrows community were displaced mostly to Leaf Rapids because of drinking water issues. Gordon Bighetty Jr. noted that Clarence Bighetty Jr. is the only member living in Leaf Rapids and recommended that Clarence should not be a point of contact for the Pickerel Narrows community. Gordon Bighetty Jr. noted that Pickerel Narrows Cree Nation is based on a strong fishing and trapping background and anything related to water and fish up to the Keewatin River was seen as a huge importance. Gordon Bighetty Jr. expressed concern about the exact project location and potential project impacts.	In-Person	Pickerel Narrows Cree Nation
PNCN	November 11, 2017	2017-11-11 In-Person with Gordon Bighetty, Pickerel Narrows Cree Nation, about Indigenous Agreements & Protocols, General Project Information	Michael Raess of Alamos met with Chief Gordon Bighetty Jr. of Pickerel Narrows Cree Nation (PNCN). Chief Gordon Bighetty Jr. gave some general information on the PNCN community including that they have a strong fishing and trapping background. He was concerned to figure out the exact project location.	In-Person	Pickerel Narrows Cree Nation
PNCN	November 1, 2017	2017-11-01 Email - Received with Jennifer Howe, Canadian Environmental Assessment Agency (CEAA), about Engagement, General Project Information	Michael Raess of Alamos was contacted by Jennifer Howe of the Canadian Environmental Assessment Agency (CEAA) regarding the contact information for Pickerel Narrows Cree Nation (PNCN) Chief Gordon Bighetty Jr.	E-mail	Pickerel Narrows Cree Nation
MCCN	October 18, 2017	2017-10-18 Mail - Sent with Mathias Colomb Cree Nation	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to Chief and Council of Mathias Colomb Cree Nation. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with Mathias Colomb Cree Nation regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_mathiascolomb.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Mathias Colomb Cree Nation

Table 3B-3 Summary of Communications: Nisichawayasihk Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
May 6, 2020, 10:19 AM	Gord Dumas, Executive Director of Nisichawayasihk Cree Nation (NCN) contacted Lauren Stead of Stantec to acknowledge the receipt of the Draft Indigenous and Treaty Rights Assessment of the LLGP EIS. Gord Dumas stated that due to the ongoing COVID-19 imposed State of Emergency lockdown, NCN and leadership are currently committing all of their available resources on managing the crisis. Therefore, it is unlikely that the draft will be reviewed under the suggested timeline. At 10:29 am on May 6, 2020 Lauren Stead responded thanking Gord Dumas for his reply and that she understood the current situation is challenging.	Email - Received	Nisichawayasihk Cree Nation
May 5, 2020, 08:45 AM	Chief Marcel Moody of Nisichawayasihk Cree Nation (NCN) was contacted by Lauren Stead of Stantec with a letter and information package for their review. The letter provided an explanation for why Alamos was requesting feedback on both the exercise of NCN's Indigenous and Treaty rights, and how the Project may potentially affect the exercise of those rights. The package provided a partial draft copy of the Indigenous and Treaty Rights Assessment which Alamos intended to submit to the Impact Assessment Agency of Canada (IAAC) as part of the Lynn Lake Gold Project Environmental Impact Statement (EIS) for NCN's review. The letter and package of information was also sent by registered mail.	Email - Sent	Nisichawayasihk Cree Nation
April 28, 2020	Stantec on behalf of Alamos sent an information package to leadership of Nisichawayasihk Cree Nation Chief and Council regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community’s exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Nisichawayasihk Cree Nation
March 19, 2020, 05:19 PM	Gord Dumas, Executive Director of Nisichawayasihk Cree Nation (NCN), was contacted by Michael Raess of Alamos regarding needing a digital map of the regional management area (RMA). Michael Raess also sent along Alamos' COVID-19 update, stating that Alamos is in the midst of demobilizing out of Lynn Lake. Gord Dumas responded sending along a pdf of the NCN RMA lands.	Email - Sent	Nisichawayasihk Cree Nation
February 7, 2020, 02:28 PM	Gord Dumas, Executive Director of Nisichawayasihk Cree Nation (NCN) Lands, Environment and Resources was contacted by Michael Raess of Alamos to thank the community for completing preparations for the open house. Michael Raess arranged for payment of the catering. Michael Raess also asked if there was any immediate feedback from the community. Gord Dumas replied that the open house generated some interest in the potential economic and employment opportunities.	Email - Sent	Nisichawayasihk Cree Nation
February 3, 2020	As requested by Nisichawayasihk Cree Nation leadership, Alamos and Stantec presented a community meeting in Nelson House on Monday, February 3, 2020.	Open House	Nisichawayasihk Cree Nation
January 22, 2020, 02:44 PM	Gord Dumas, Executive Director of Nisichawayasihk was contacted by Michael Raess of Alamos to confirm the location of the multiplex and whether he had confirmation as to the Chief and Council meeting before the Open House. Gord Dumas replied that Chief and Council had not yet confirmed a meeting prior to the Open House.	Email - Sent	Nisichawayasihk Cree Nation
January 15, 2020, 04:12 PM	Gord Dumas, Executive Director of Nisichawayasihk Cree Nation (NCN) contacted Michael Raess of Alamos to state that the multiplex is confirmed for the Open House on February 3, 2020 from 1-4 pm. Michael Raess sent the poster to be added to the community newsletter.	Email - Received	Nisichawayasihk Cree Nation
January 13, 2020, 06:57 AM	Gord Dumas, Executive Director of Nisichawayasihk Cree Nation (NCN) contacted Michael Raess of Alamos and stated that February 3rd, 2020 for the Open House would likely work, but he still doesn't have final confirmation from Chief and Council.	Email - Received	Nisichawayasihk Cree Nation
January 12, 2020, 02:47 PM	Gord Dumas, Executive Director of Nisichawayasihk Cree Nation was contacted by Michael Raess of Alamos to inform him that Chief and Council would like to be carbon copied on all communication. Gord Dumas replied to confirm that he always keeps Chief and Council informed. Michael Raess forwarded the email from Gord Dumas to Chief Moody. Michael Raess also asked Chief Marcel Moody if leadership requires a separate open house meeting in the community or if a Chief and Council meeting would be more appropriate. Chief Marcel Moody replied that he and the community have no interest in attending the open house in Lynn Lake and that there should be one at NCN instead. Chief Marcel Moody also asked when there would be time for a Chief and Council meeting. Michael Raess replied that Alamos could meet with Chief and Council before the open house on February 3rd at 1 pm.	Email - Sent	Nisichawayasihk Cree Nation, Marcel Moody
January 10, 2020, 04:26 PM	Chief Marcel Moody of Nisichawayasihk Cree Nation (NCN) was contacted by Michael Raess of Alamos to confirm that the NCN Resource Management Board (RMB) can speak on behalf of the community and leadership. Chief Marcel Moody replied and stated that he had no issue with the RMB as long as Chief and Council is copied on the email.	Email - Sent	Nisichawayasihk Cree Nation
January 2, 2020, 12:00 PM	Michael Raess of Alamos contacted Gord Dumas, Executive Director of Nisichawayasihk Cree Nation to again request clarification and assurance regarding consent from Chief and Council that Gord Dumas can speak on behalf of Nisichawayasihk Cree Nation leadership.	Email - Sent	Nisichawayasihk Cree Nation

Table 3B-3 Summary of Communications: Nisichawayasihk Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
December 16, 2019, 01:00 PM	Gord Dumas, Executive Director of the Nisichawayasihk Cree Nation (NCN) and board members of the NCN Resource Management Board (RMB) met with Michael Raess of Alamos to discuss concerns regarding LLGP. NCN and the NCN RMB are requesting a separate open house in Nelson House with Alamos representatives that understand the engineering, design, and process as well as Alamos executives. The meeting was in response to the December updated engagement letters that went out to the communities. Previous engagement had focused on business and training opportunities whereas Gord Dumas requested engagement through the NCN Land, Environment and Resources Department and RMB. Michael provided a Project update (presentation) and indicated that Alamos is engaging with 12 Indigenous communities. Michael also illustrated that Alamos does not "consult" with communities. Canada has the Duty to consult and Alamos is required to engage. Michael briefly spoke about the ongoing training and employment program with MCFN and that MCFN is open to include other communities as long as MCFN has first priority. The main concerns are: -Highway portion through NCN's Resource Management Area (approx. 200km). -protection of resources based on potential impacts of vehicle accidents along PR391. -increased traffic (number of increased traffic on this section of PR391). -transport of hazardous material (provide a list of transported hazardous material). -impact on road condition (worry of road deterioration similar to what happened on highway to Gillam). -introduction of invasive species by vehicles (weeds etc.). -ensuring proper qualifications and ensuring procedures are followed for drivers -creating check stops before entering the resource area (have NCN involved in the check stops). -proper spill response plans for this section of highway. -mandate to rebuild the highway . Michael indicated that most traffic will be between the two mine sites and that there would be limited traffic through NCN's RMB compared to that. He continued to illustrate that the anticipated traffic is well within the Highway specs of PR 391, that Alamos is corresponding with the Ministry of Infrastructure to determine if any changes to the existing Highway is necessary. As it is a Provincial Highway, Alamos would have no jurisdictions and could not implement mitigations without consent from the Province. PR391 is a public highway. Michael indicated that the Environmental Impact Assessment (EIA) is analyzing potential impacts to flora and fauna, the air quality, greenhouse gases and potential impacts of accidents. Applicable mitigations will be in place as part of the EIA. Michael emphasized that Alamos has to follow guidelines, Acts and other regulations and that the Environmental Impact Statement (EIS) will provide detailed mitigations for any potential impact. The proposed Open House in Nelson House will be the best opportunity for NCN to talk to experts about specific concerns. Gord Dumas also sent an email specifying the meeting outcomes: As noted at the meeting NCN delegates shared the following potential adverse environmental impacts, concerns /issues associated with proposed project as follows:• Increase traffic on PR#391, resulting in further deterioration of main access roads.• NCN Resource Management Area (RMA) is directly adjacent to proposed project site, resulting in traditional land and resources user issues/concerns.• Atmospheric environment and surface/ground water quality. • Potential release of hazardous materials into environment, resulting from transportation of dangerous goods through RMA• Terrestrial and aquatic impacts – species at risk , fisheries act, migratory birds, big game species, invasive species, etc. • Human health• Employment and training opportunities• No meaningful Section 35 consultation Please ensure that this information is incorporated into EIS submission. NCN is looking forward to hosting Alamos representatives for an open house in NCN to share more information regarding the proposed Lynn Lake Gold Project early in the new year (2020).	In-Person	Nisichawayasihk Cree Nation, Nisichawayasihk Cree Nation Resource Management Board (NCN RMB)
December 11, 2019, 02:45 PM	Gord Dumas, Executive Director of the Nisichawayasihk Cree Nation (NCN) contacted Michael Raess of Alamos regarding follow up for the mailed out updated introductory packages. Gord Dumas stated that NCN is very interested in discussing the engagement to date, Project updates, and the next steps for LLGP.	Email - Received	Nisichawayasihk Cree Nation
December 4, 2019	Chief Marcel Moody of the Nisichawayasihk Cree Nation (NCN) was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and NCN, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for NCN to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	Nisichawayasihk Cree Nation
December 04, 2019, 11:00 AM	Michael Raess of Alamos emailed the Indigenous Communities regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and each community, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for each community to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Email - Sent	Nisichawayasihk Cree Nation

Table 3B-3 Summary of Communications: Nisichawayasihk Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
September 7, 2019, 04:00 PM	Michael Raess, Manager of Environment and Community Relations for Alamos Gold Inc., received a text from Jody Linklater with Atoskiwin Training and Employment Center, asking for updated information from Alamos Gold Inc. Jody Linklater elaborated that Atoskiwin Training and Employment Center and Nisichawayasihk Cree Nation had submitted a proposal to build triplexes as the accommodation during development. Nisichawayasihk Cree Nation was beginning to question the level of consultation as they had not heard from Alamos Gold Inc. in some time. Michael Raess replied that the Project had not progressed significantly as the profit margin had not significantly increased, but that the Environmental Impact reporting was being conducted. Michael Raess indicated that several emails had been sent throughout the year but a reply was never received. Alamos Gold Inc. was working on a summary of all engagement to date and would share this information. He mentioned that this document will also include next steps and what remained to be completed. Michael Raess also clarified that Alamos Gold Inc. cannot take part in the consultation process and that it was the responsibility of the Band and the government only. Michael Raess finished his response by mentioning that the proposal was part of an accommodation study and was not part of a tendering process. Alamos Gold Inc. would assess what the best accommodation was once the Project was moving forward. Considering the poor water and sewer infrastructure in Lynn Lake, he indicated that building in town was not likely.	Text/SMS - Received	Atoskiwin Training and Employment Center, Nisichawayasihk Cree Nation, Jody Linklater
March 5, 2019, 01:00 PM	Michael Raess of Alamos contacted Chief Marcel Moody of Nisichawayasihk Cree Nation and two members of Atoskiwin Training and Employment Center to find out if they would be open to a meeting in March, 2019.	Email - Sent	Atoskiwin Training and Employment Center, Nisichawayasihk Cree Nation
February 8, 2019, 02:47 PM	Michael Raess of Alamos emailed Jody Linklater of Atoskiwin Training and Employment Centre, Chief Marcel Moody and Leonard Linklater of the Nisichawaysihk Cree Nation to discuss the rescheduling of a meeting with Chief and Council to get a project update and discuss potential business opportunities.	Email - Sent	Atoskiwin Training and Employment Center, Nisichawayasihk Cree Nation
January 8, 2019, 01:00 pm	Michael Raess of Alamos met with Chief Marcel Moody of the Nisichawayasihk Cree Nation (NCN) with the purpose of discussing general Project information and engagement. Leonard was there visiting, as we were waiting for the other to arrive. Michael discussed with Leonard about ATEC and their educational philosophy and training success. Michael understands that NCN would like to be incorporated into a partnership to build housing for the LLGP through one of ATEC's carpenter training program. After waiting for two hours at ATEC for Chief and Jody to finish an other meeting, Michael decided to reschedule the meeting. The planned meeting was postponed thereafter to potentially occur on the 15th or 16th of January. January 11th: Michael followed up (email), but did not hear back. January 15th: Michael emailed to find out if the meeting would occur on January 16th. Michael did not hear back. In this email, he also proposed for alternate dates in February (between February 4th and 11th).	In-Person	Atoskiwin Training and Employment Center, Nisichawayasihk Cree Nation
January 7, 2019	Michael Raess of Alamos Gold called and spoke with Chief Marcel Moody of Nisichawayasihk Cree Nation to confirm the meeting scheduled for January 8, 2019. The meeting was confirmed for 1:00 p.m.	Telephone - Sent	Nisichawayasihk Cree Nation
January 5, 2019	Michael Raess of Alamos Gold received a telephone call from Jody Linklater of Nisichawayasihk Cree Nation to find out if there were any updates about the Project. Michael Raess stated that he would meet with Nisichawayasihk Cree Nation on January 8, 2019 to present the updates. Michael Raess requested that Chief Marcel Moody or Council members be present at the meeting.	Telephone - Received	Nisichawayasihk Cree Nation
August 24, 2018, 06:15 PM	Michael Raess of Alamos Gold emailed Marcel Moody, Chief of Nisichawayasihk Cree Nation, to congratulate him and council on the re-election. DOCUMENT PROVIDED: NCN-20180824-election	Email - Sent	Nisichawayasihk Cree Nation
August 23, 2018	Michael Raess of Alamos Gold emailed Marcel Moody, Chief of Nisichawayasihk Cree Nation to follow up on the August 14, 2018 email regarding scheduling a meeting to discuss the community profile and associated references which Alamos planned to incorporated into the EIS for the Project.	Email - Sent	Nisichawayasihk Cree Nation
August 14, 2018, 06:00 PM	Michael Raess of Alamos Gold emailed Marcel Moody, Chief of Nisichawayasihk Cree Nation to coordinate a meeting to discuss the community profile and associated references. Michael Raess also planned to give a Project update.	Email - Sent	Nisichawayasihk Cree Nation
February 8, 2018, 11:00 AM	Michael Raess of Alamos was contacted by Paul Toupin of InnovEduca Consulting Services hired by Nisichawayasihk Cree Nation (NCN) regarding housing options, the training alliance program, and setting up a meeting.	Telephone - Received	Nisichawayasihk Cree Nation
October 19, 2017, 10:00 AM	Michael Raess of Alamos met with Chief Marcel Moody of the Nisichawayasihk Cree Nation (NCN) with the purpose of discussing general Project information and engagement. Chief Marcel Moody indicated that NCN is not directly impacted by the Project and that engagement with Alamos would likely be minimal. Chief Marcel Moody was interested in finding opportunities for NCN businesses to be involved with the project as well as job opportunities for NCN members. Michael Raess delivered the introductory letter and Project information package.	In-Person	Nisichawayasihk Cree Nation

Table 3B-3 Summary of Communications: Nisichawayasihk Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
October 19, 2017, 09:00 AM	Michael Raess of Alamos met with Jim Moore and members of ATEC and Chief Marcel Moody or Nisichawayasihk Crew Nation (NCN) with the purpose of touring the Atoskiwin Training and Employment Center (ATEC). They discussed funding options and budget for training opportunities. Michael Raess requested more information regarding funding and programs offered at ATEC. ATEC and NCN would like to closely collaborate with affected Indigenous groups to enhance funding and streamline the educational process.	In-Person	Atoskiwin Training and Employment Center, Nisichawayasihk Cree Nation
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to Chief and Council of Nisichawayasihk Cree Nation. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with Nisichawayasihk Cree Nation regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_nisichawayasihk.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Nisichawayasihk Cree Nation

Table 3B-4 Summary of Communications: O-Pipon-Na-Piwin Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
May 4, 2020, 03:31 PM	Chief Shirley Ducharme of O-Pipon-Na-Piwin Cree Nation (OPCN) was contacted by Lauren Stead of Stantec to provide a letter and information package for OPCNs review. The letter provided an explanation for why Alamos was requesting feedback on both the exercise of OPCNs Indigenous and Treaty rights, and how the Project may potentially affect the exercise of those rights. The package provided a partial draft copy of the Indigenous and Treaty Rights Assessment which Alamos intended to submit to the Impact Assessment Agency of Canada (IAAC) as part of the Lynn Lake Gold Project Environmental Impact Statement (EIS) for OPCNs review. The same package was sent by registered mail. The same package was sent by registered mail.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
April 28, 2020	Stantec on behalf of Alamos sent an information package to leadership of O-Pipon-Na-Piwin Cree Nation Chief and Council regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	O-Pipon-Na-Piwin Cree Nation
March 25, 2020, 05:33 PM	Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) was contacted by Michael Raess of Alamos regarding the rescheduling of the open house. Michael Raess stated that he assumed that the rescheduled open house date would be postponed due to COVID-19.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
March 4, 2020, 03:55 PM	Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) contacted Michael Raess of Alamos regarding finding a new date for the open house. The new date was proposed for April 29, 2020.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
February 3, 2020, 11:05 AM	Mike Dumas, Executive Director or O-Pipon-Na-Piwin Cree Nation (OPCN) sent an email to Michael Raess of Alamos stating that the February 5, 2020 Open House would be cancelled due to a death in the community.	Email - Received	O-Pipon-Na-Piwin Cree Nation
January 22, 2020, 12:42 PM	Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) was contacted by Michael Raess of Alamos to ask if there will be a Chief and Council meeting prior to the Open House.	Email - Received	O-Pipon-Na-Piwin Cree Nation
January 16, 2020, 12:00 PM	Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) contacted Michael Raess of Alamos to confirm that an Open House on February 5th, 2020 at 1 pm worked for Chief and Council. Michael Raess had questions regarding logistics of the Open House. Mike Dumas confirmed that they would do the catering and provide an invoice.	Email - Received	O-Pipon-Na-Piwin Cree Nation
January 14, 2020, 09:51 AM	Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation was contacted by Michael Raess of Alamos regarding the Open House in February 2020.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
January 6, 2020, 01:32 PM	Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) was contacted by Michael Raess of Alamos to ask if Chief and Council would be available for an Open House on February 5th or 6th, 2020. Mike Dumas replied at 2:00 pm stating that Chief and Council will have a meeting the next week and availability to attend the open house will be discussed.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
January 2, 2020, 11:52 AM	Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) was contacted by Michael Raess of Alamos to explain that Alamos is planning an Open House in February, 2020. Mike Dumas responded at 1:36 pm and stated he will respond by January 7, 2020 if Chief and Council and the community are available.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
December 4, 2019	Chief Shirley Ducharme of O-Pipon-Na-Piwin Cree Nation (OPCN) was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and OPCN, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for OPCN to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	O-Pipon-Na-Piwin Cree Nation

Table 3B-4 Summary of Communications: O-Pipon-Na-Piwin Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
December 4, 2019, 11:00 AM	Michael Raess of Alamos emailed the Indigenous Communities regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and each community, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for each community to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Email - Sent	Marcel Colomb First Nation #328, Sayisi Dene First Nation, Nisichawayasihk Cree Nation, O-Pipon-Na-Piwin Cree Nation, Barren Lands First Nation, Northlands Denesuline First Nation, Chief Bartholomew J. Tsannie - Hatchet Lake Denesuline First Nation
December 4, 2019, 10:54 AM	Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) was contacted by Michael Raess of Alamos to provide an updated Project Information package. The email and information packaged stated that, "Alamos Gold Inc. (Alamos) is nearing completion of the environmental assessment for the proposed Lynn Lake Gold Project (the Project), which will result in the submission of an Environmental Impact Statement (EIS) to the Impact Assessment Agency of Canada (formerly the Canadian Environmental Assessment Agency) in spring 2020 for a federal review under the Canadian Environmental Assessment Act, 2012. Alamos would like to provide an update on the Project, a summary of engagement with your community to date, and outline the next steps and opportunities for continued engagement on the Project. Should you have any questions or comments about the Project or the engagement process, please contact me (contact information below). A hard copy of the attached letter will follow via registered mail to Chief and Council." The purpose of this letter is to request that OPCN verify the summary of engagement activities and confirm Alamos' list of community interests is correct.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
July 19, 2019, 10:00 AM	Michael Raess of Alamos was invited by the North West Community Futures Development Corporation to meet and present the Lynn Lake Gold Project (LLGP) on July 19, 2019. Communities sitting on the board included representatives from Council of many of the Indigenous groups that Alamos was engaging with including the Community of Brochet, Barren Lands First Nation (Brochet Reserve), Community of Leaf Rapids, Marcel Colomb First Nation, Granville Lake, and O-Pipon-Na-Piwin Cree Nation. Michael Raess of Alamos explained that Alamos would continue to share Project updates for public through Open Houses (next in November 2019). Alamos would specifically send an invitation to the surrounding communities including the Community of Brochet and Leaf Rapids. With respect to Indigenous Community Members, Michael Raess explained that Alamos encouraged leadership to communicate all shared information to the members and to relay all potential questions and concerns back to Alamos. Michael Raess also added that Alamos would be sending out packages in September 2019 summarizing all current data and data gaps for each Indigenous Community to verify the data for the Environmental Impact Statement.	In-Person	Marcel Colomb First Nation #328, Northwest Manitoba Community Futures Development Corporation, O-Pipon-Na-Piwin Cree Nation, Barren Lands First Nation, Granville Lake Community, Town of Leaf Rapids, Community of Brochet
March 24, 2019, 09:00 AM	Michael Raess of Alamos contacted Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation to discuss water flow from the mine into different water bodies. A figure to explain that water does not flow into Barrington Lake where the TLE lands are, but instead south into Churchill river, was attached.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
March 18, 2019, 01:00 PM	Michael Raess of Alamos met with Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation and Council to meet the new elected leadership and introduce them to the Lynn Lake Gold Project (LLGP). They discussed potential concerns including water quality and impacts to resources. Michael Raess stated that the previous leadership determined there was no traditional practices at the two planned mine sites and the Council agreed. However, Council noted that some traditional land entitlement lands were close to the Gordon site. Michael Raess stated he would resend them the community profile and reference file from the EIS for their approval. He explained the Project potential impacts, mitigations, and potential business opportunities. Council requested an open house in South Indian Lake.	In-Person	O-Pipon-Na-Piwin Cree Nation
March 15, 2019, 11:00 AM	Michael Raess of Alamos contacted Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation to follow-up regarding a meeting with Chief and Council. Mike Dumas replied and stated that Council (without Chief) could meet March 18, 2019 at the Band Office.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
March 5, 2019, 01:00 PM	Michael Raess of Alamos contacted Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation regarding the new Chief and Council and asked if they would like to meet, and what time would work best for that discussion.	Email - Sent	O-Pipon-Na-Piwin Cree Nation

Table 3B-4 Summary of Communications: O-Pipon-Na-Piwin Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
February 8, 2019, 01:00 PM	Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) telephoned Michael Raess of Alamos to set up a meeting in South Indian Lake sometime in March. Michael Raess asked if he should give a presentation about the Project to Chief and Council for OPCN or if Mike Dumas would be presenting.	Telephone - Received	O-Pipon-Na-Piwin Cree Nation
January 15, 2019, 01:40 PM	Michael Raess of Alamos Gold emailed Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation to determine if he was available to continue engagement on the Project through the newly elected leadership. Mike Dumas replied via email indicating his availability and that the new Chief and Council were in place. Michael Raess replied via email asking if he should come to present the Project to Chief and Council or if Mike Dumas would inform leadership. Michael Raess proposed some potential meeting dates. Michael Raess also forwarded the community profile as a reminder for review and approve for inclusion in the environmental impact assessment.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
November 13, 2018, 01:00 PM	Michael Raess of Alamos Gold met with newly-elected Chief Shirley Ducharme of O-Pipon-Na-Piwin Cree Nation. Michael Raess updated Chief Ducharme about the Lynn Lake Gold Project and stated that he has been in communication with Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation previously. Chief Ducharme indicated that she would like to wait to further engage until Council is re-elected around December 24, 2018. Chief Ducharme indicated that communication will continue through Mike Dumas.	In-Person	O-Pipon-Na-Piwin Cree Nation
November 13, 2018, 08:30 AM	Michael Raess of Alamos Gold called and spoke with the Band Office Clerk (name of individual unknown) of O-Pipon-Na-Piwin Cree Nation to request confirmation of the meeting with the newly elected Chief at 1:00 p.m. that day (November 13, 2018). The clerk confirmed.	Telephone - Sent	O-Pipon-Na-Piwin Cree Nation
October 12, 2018, 02:00 PM	Michael Raess of Alamos Gold attempted to contact Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation, but was advised by Esther Moose, Electoral Office, that Mike Dumas was on sick leave until mid-November, 2018. Esther Moose advised that Chief Shirley Ducharme was elected on November 13, 2018 and that Council would be re-elected on December 7, 2018. Michael Raess asked if he should wait to continue engagement until Mike Dumas was back or until Council was elected. Esther Moose suggested that Michael Raess meet with Chief Shirley Ducharme before then. A meeting was scheduled with Chief Shirley Ducharme on November 13, 2019 at 1:00 p.m. in South Indian Lake. The meeting would be to introduce the Lynn Lake Gold Project to the newly elected Chief, discuss traditional practices around the Project area, and review the community profile.	Telephone - Sent	O-Pipon-Na-Piwin Cree Nation
September 19, 2018, 11:00 AM	Michael Raess called Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation but was unable to reach him.	Telephone - Sent	O-Pipon-Na-Piwin Cree Nation
August 23, 2018, 02:00 PM	Michael Raess of Alamos Gold telephoned Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation to discuss the community profile and associated reference documents which Alamos planned to incorporated into the EIS for the Project. Michael Raess asked if the Chief and Council had any input with regards to the community profile and reference usage agreement. Based on communication with the band office, Michael Raess learned that Mike Dumas was not available until mid-September, 2018. Michael Raess followed up with an email requesting an update from Mike Dumas.	Telephone - Sent	O-Pipon-Na-Piwin Cree Nation
February 15, 2018, 11:00 AM	Michael Raess of Alamos was invited to meet with Chief and Council of the O-Pipon-Na-Piwin Cree Nation (OPCN) to have a traditional lunch at the OPCN band office. Unfortunately, Chief and Council were not available last minute and Michael Raess ended up meeting with Mike Dumas, executive director of OPCN instead. Michael Raess gave the presentation originally intended for Chief and Council to Mike Dumas and the two discussed the Lynn Lake Gold Project. Mike Dumas indicated that the initial engagement on the Project has been meaningful and has given him the opportunity to have an open communication channel with Alamos. Mike Dumas reiterated that there are no current or historical traditional practices occurring in the Project area.	In-Person	O-Pipon-Na-Piwin Cree Nation
February 11, 2018	Michael Raess of Alamos emailed Mike Dumas, Executive Director of O-Pipon-Na Piwin Cree Nation (OPCN), to confirm the meeting scheduled on February 15, 2018 with Chief and Council. On February 12, Mike Dumas replied via email to confirm the meeting.	Email - Sent	O-Pipon-Na-Piwin Cree Nation

Table 3B-4 Summary of Communications: O-Pipon-Na-Piwin Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
January 26, 2018, 09:29 AM	Michael Raess of Alamos was contacted by Mike Dumas, Executive Director of O-Pipon-Na Piwin Cree Nation (OPCN) to follow up on items discussed Michael Raess's visit to OPCN on January 25, 2018. Mike Dumas scheduled a meeting with OPCN Chief and Council for February 15, 2018 at 11:00 pm with a lunch to follow. Michael Raess responded with an email on January 27, 2018 at 7:39 am and asked Mike Dumas to confirm that based on Mike Dumas' knowledge, OPCN does not currently conduct traditional practices in the area potentially affected by LLGP. Michael Raess restated the need to set up a communication channel to focus on how OPCN can share concerns or give input into the Project. Michael Raess provided a brief overview of the presentation planned for the February 15th meeting with OPCN Chief and Council. Michael Raess requested that OPCN submit an estimate for lunch costs which Alamos can cover.	Email - Received	O-Pipon-Na-Piwin Cree Nation
January 25, 2018, 10:00 AM	Michael Raess of Alamos met with Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) regarding the Lynn Lake Gold Project (the Project). Michael Raess received a tour of the community and band office. Mike Dumas indicated that he and Chief and Council have reviewed the Project materials and that the Project area is not currently high on the importance list for Chief and Council. Mike Dumas indicated that the Project area has not and is not currently being used for traditional practices. Mike Dumas indicated that OPCN is interested in workforce and business opportunities. Michael Raess sent a follow up email to Mike Dumas to establish a communication channel to through which OPCN can share any concerns and provide input on the Project. Michael Raess noted that he is plans to visit OPCN and present to Chief and Council on February 15, 2018.	In-Person	O-Pipon-Na-Piwin Cree Nation
January 23, 2018, 09:48 AM	Jordan Toth of Stantec called and spoke with Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation regarding scheduling a meeting to discuss the Lynn Lake Project (LLGP). Jordan Toth committed to sending an email to Mike Dumas with Michael Raess of Alamos Gold's contact information so they could schedule a meeting. At 10:00 a.m., Jordan Toth emailed Mike Dumas and provided Michael Raess' contact information.	Telephone - Sent	O-Pipon-Na-Piwin Cree Nation
January 17, 2018, 03:00 PM	Michael Raess of Alamos received a phone call from Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) and scheduled an in-person meeting for Thursday, January 25, 2018 at the OPCN band office.	Telephone - Received	O-Pipon-Na-Piwin Cree Nation
January 17, 2018, 09:17 AM	Jordan Toth of Stantec received a telephone call from Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation (OPCN) regarding the Lynn Lake Gold Project (the Project). Mike Dumas stated that OPCN is interested in the Project and would like to schedule a meeting for the end of February 2018. Mike Dumas stated that he would present the Project information package, which had been received earlier, to Chief and Council and call Jordan Toth back the week of January 22, 2018 to schedule a date for the meeting.	Telephone - Received	O-Pipon-Na-Piwin Cree Nation
January 11, 2018, 09:40 AM	Jordan Toth of Stantec called and left a voicemail for Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation. Jordan Toth requested a call back to discuss the Lynn Lake Gold Project.	Telephone - Sent	O-Pipon-Na-Piwin Cree Nation
January 08, 2018, 10:05 AM	Jordan Toth of Stantec called and spoke with Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation. Jordan Toth inquired whether Mike Dumas had the opportunity to review the Lynn Lake Gold Project information package. Mike Dumas stated that he would present the Project information package to Chief and Council and requested that Jordan Toth call him back on January 10, 2018.	Telephone - Sent	O-Pipon-Na-Piwin Cree Nation
November 22, 2017, 03:00 PM	Jordan Toth of Stantec emailed Mike Dumas, the executive director of O-Pipon-Na-Piwin Cree Nation with the purpose of sending him project information and continue communication regarding the Project. Jordan Toth attached a letter and information document regarding Alamos and the Project.	Email - Sent	O-Pipon-Na-Piwin Cree Nation
November 22, 2017, 12:00 PM	Jordan Toth of Stantec called and spoke with Mike Dumas, Executive Director of O-Pipon-Na-Piwin Cree Nation to confirm receipt of the Lynn Lake Gold Project information package that was sent on October 18, 2017. Mike Dumas stated that he could not find the Project information package so Jordan Toth committed to sending it by email.	Telephone - Sent	O-Pipon-Na-Piwin Cree Nation
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to Chief and Council of O-Pipon-Na-Piwin Cree Nation. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with O-Pipon-Na-Piwin Cree Nation regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_opiponnapiwin.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	O-Pipon-Na-Piwin Cree Nation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
May 22, 2020, 8:25 PM	Morrissa Boerchers, consultation project manager for the Manitoba Metis Federation was contacted by Karen Mathers of Stantec with the proposed text in relation to the community profile for the Manitoba Metis Federation in Chapter 3 (Engagement chapter) of the Environmental Impact Statement. Karen Mathers welcomes any suggested edits.	Email - Sent	Manitoba Metis Federation
May 22, 2020, 10:30 AM	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF), Morrissa Boerchers, Consultation Project Manager, and Jade Dewar of MMF along with Murray Trachtenberg, legal counsel for MMF and Scott Mackay, Nicole Fraser, and Leah Culver of Shared Value Solutions (SVS) met with Michael Raess, Colin Webster, and Paolo Toscano of Alamos, Joëlle Lecours-Bouchard as legal counsel for Alamos, and Karen Mathers, Butch Amundson, Aurora Van Buren, and Colin Buchanan of Stantec. They discussed the findings of the Manitoba Metis Traditional Knowledge, Land Use, and Occupancy study (MTKLUOS) completed by SVS for MMF. SVS reviewed the MTKLUOS advising that its purpose was to identify where and how Metis people are using the LLGP areas. Stantec committed to review the country foods examined in the Human Health Risk Assessment (HHRA) and advise MMF whether or not those foods listed in the MTKLUOS was included in the HHRA. In addition, Stantec will advise MMF what parts of the animals were considered in the HHRA. Alamos and MMF agreed that they would set up a separate follow-up call to discuss next steps. At 11:58 am Karen Mathers followed up with Marci Riel via email after the meeting to ask if MMF would be able to provide the finalized community profile for the EIS. Morrissa Boerchers responded at 3:42 pm stating that it may be best to use the information in the MMF MTKLUOS for the LLGP Final Report. At 8: 25pm Karen Mathers responded with draft MMF profile intended to be included in the EIS, as the information from the MTKLUOS would need to be modified in order to be incorporated into the EIS. Karren Mathers noted that she welcomed any suggested edits.	Telephone - Sent	Manitoba Metis Federation
May 21, 2020, 9:22 AM	Morrissa Boerchers, consultation project manager with the Manitoba Metis Federation was contacted by Michael Raess of Alamos replying to the May 15, 2020 email regarding the conference call on Friday May 22, 2020. Michael Raess responded stating that it is Alamos' understanding that Shared Value Solutions will present on the Manitoba Metis Knowledge, Land Use and Occupancy Study (MMKLUOS) approach and findings to Alamos and Stantec. The Agenda was further clarified to be a discussion about MLOUS approach and results.	Email - Sent	Manitoba Metis Federation
May 19, 2020, 01:42 PM	Morrissa Boerchers, consultation project officer of Manitoba Metis Federation (MMF) contacted Michael Raess of Alamos with suggested edits to the revised EIS package (sent on May 13, 2020).	Email - Received	Manitoba Metis Federation
May 13, 2020, 1:54 PM	Morrissa Boerchers, consultation project manager for the Manitoba Metis Federation was contacted by Joëlle Lecours-Bouchard of Alamos regarding setting a date for the meeting with MMF, Shared Value Solutions (SVS), Stantec and Alamos to discuss the Manitoba Métis Knowledge, Land Use, and Occupancy Study (MMKLUOS). May 14, 2020 at 1:17 pm on Thursday May 14, 2020 Morrissa Boerchers responded stating that they are available on Friday May 22, 2020 in the morning if that works for Alamos and Stantec. May 15, 2020 at 9:44 am on Friday May 15, 2020 Joëlle Lecours-Bouchard responded requesting a list of participants and a time for the conference call the following Friday May 22, 2020. May 15, 2020 at 9:52 am Morrissa Boerchers responded that 9:30 AM CDT works for MMF and SVS and attached a list of attendees and their email addresses.	Email - Sent	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
May 13, 2020, 01:11 PM	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF) was contacted by Michael Raess of Alamos to request that MMF review and comment on the revised EIS package. In the updated version developed in order to address the issues which MMF had identified Alamos had; • endeavored to distinguish between Métis Nations and First Nations and Métis Rights and Treaty Rights •provided more detail about the Government of Manitoba Métis Policy, Manitoba Metis Federation Agreement on Metis Natural Resource Harvesting, the Recognized Metis Harvesting Area, Manitoba Metis Federation Metis Laws of the Harvest to provide more context on Métis Rights • acknowledged Metis Federation of Manitoba as the democratic, self-governing representative body of the Manitoba Métis Community • included a footnote to explain how Metis and Métis are variously used in the document •left yellow highlighted text to indicate where changes have been made	Email - Sent	Manitoba Metis Federation
May 8, 2020, 10:05 AM	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation was contacted by Joëlle Lecours-Bouchard regarding setting up a meeting following the delivery of the Manitoba Métis Knowledge, Land Use, and Occupancy Study (MMKLUOS). The parties (supported by MMF, SVS, Stantec, Alamos and the lawyers) agreed to host an initial meeting in Toronto to discuss the findings. Joëlle Lecours-Bouchard suggested a conference call given the COVID-19 situation and asked what dates next week would work for MMF.	Email - Sent	Manitoba Metis Federation
May 7, 2020	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF) along with Morrissa Boerchers and Jasmine Langhan of MMF had a teleconferences with Paolo Toscano, Colin Webster, and Michael Raess of Alamos, Joëlle Lecours-Bouchard and Nils Engelstad, legal counsel for Alamos, and Karen Mathers, Butch Amundson, Lauren Stead, Aurora Van Buren, and Colin Buchanan of Stantec regarding the letter dated April 28, 2020 and the Environmental Impact Statement Chapter 19 sections. The meeting started with introductions, at which time the MMF indicated they were not comfortable with Alamos' legal counsel being present. Alamos' legal counsel left the meeting. The MMF indicated several issues they had with the letter correspondence. They also stated that the EIS section does not mitigate the concerns of the MMF. The MMF would like to see the EIS Chapter 19 separated out into content relating to Indigenous Nations and Métis Nations. Stantec advised that no disrespect was intended and committed to revising and reworking sections 19.7.2.2 and 19.7.2.8 of the EIS. Stantec will send revised draft sections to MMF for review and comment.	Teleconference	Manitoba Metis Federation
May 5, 2020, 09:30 AM	Marci Riel of Manitoba Metis Federation (MMF) called Karen Mathers of Stantec regarding receipt of the letter and Indigenous Peoples chapter of the EIS. Marci Riel left a message stating that she was very concerned that the letter was asking for her comment on the MMF's Indigenous and Treaty Rights. She assumes that this is an error and not Stantec's intention to send a letter outlining how the MMF will respond to their concerns about rights that they don't have as opposed to rights that they do have. She requested that Karen Mathers call her back. At 11:14 am on May 5, 2020 Karen Mathers called Marci Riel regarding the voicemail. They decided to have a call the following day or Thursday. Marci Riel advised that everything about what Stantec sent in the package is inappropriate for MMF. For example, she the language in the letter was addressed to First Nations instead of Métis. Marci Riel clarified that Indigenous Rights and Treaty Rights are one and the same. She also stated that the term "communities" is not correct and the proper term is "nations." Marci Riel advised that Stantec and Alamos must understand that based on everything to date, it is her intention to send a letter to IAAC after the EIS is filed advising that Alamos has not completed what is required in the guidelines as it pertains to MMF and as such the EIS should be considered non-concordant. She is happy to discuss these issues and concerns.	Voicemail	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
May 5, 2020, 08:48 AM	Marci Riel of the Manitoba Metis Federation (MMF) was contacted by Lauren Stead of Stantec with a letter and information package for their review. The letter provided an explanation for why Alamos was requesting feedback on both the exercise of MMF's Indigenous and Treaty rights, and how the Project may potentially affect the exercise of those rights. The package provided a partial draft copy of the Indigenous and Treaty Rights Assessment which Alamos intended to submit to the Impact Assessment Agency of Canada (IAAC) as part of the Lynn Lake Gold Project Environmental Impact Statement (EIS) for MMF's review. The letter and package of information was also sent by registered mail.	Email - Sent	Manitoba Metis Federation
May 1, 2020	Marci Riel, Director of Energy and Infrastructure, Morrissa Boerchers, Consultation Project Manager, and Murray Trachtenberg, legal council of the Manitoba Metis Federation (MMF) met with Michael Raess, Paolo Toscano, Colin Webster, Joëlle Lecours-Bouchard , Nils Engelstad of Alamos via teleconference. They discussed that Alamos thought the use of the study (including shapefiles) for our EIS was sufficiently covered in the Contribution Agreement. MMF stated that although it is covered, the language only contemplates if MMF decides to provide the shapefiles to Alamos. MMF only provided the MLOUS.	Telephone - Sent	Manitoba Metis Federation
April 28, 2020	Stantec on behalf of Alamos sent an information package to leadership of Manitoba Metis Federation Director Marci Riel regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Manitoba Metis Federation
April 4, 2020, 10:04 AM	Morrissa Boerchers, Consultation Project Officer of the Manitoba Métis Federation (MMF) contacted Michael Raess of Alamos to provide MMF's Information Sharing Agreement. Joëlle Lecours-Bouchard, Corporate Counsel of Alamos replied that Alamos had received and reviewed MMF's proposed Information Sharing Agreement. Joëlle asked to setup a call to discuss this further as Alamos fully agrees that MMF retains all of the intellectual property rights in the traditional use information collected as part of the study but that Alamos thought the use of the study (including shapefiles) for our EIS was sufficiently covered in the Contribution Agreement.	Email - Received	Manitoba Metis Federation
March 31, 2020	Morrissa Boerchers, Consultation Project Officer of the Manitoba Métis Federation (MMF) was contacted by Michael Raess of Alamos to request a timeline on when Alamos can expect the shapefiles related to the MLOUS mapping data. Morrissa replied that that the Information Sharing Agreement is with legal counsel and that it would be provided soon. Michael sent an email inquiring about what the Information Sharing Agreement (ISA) adds to the Contribution Agreement (CA). Alamos further understands from the CA (attached) that the information can be used for the EA and includes sharing of the Shapefiles. Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF) replied that the agreement currently in place between the MMF and Alamos does not include the sharing of Shapefiles. Marci was also wondering what the purpose is to require the shapefiles. Michael replied that the purpose for Alamos to use the information, is to integrate data into the EIS as part of the EA process. Understanding Metis exercise of rights is essential to the EA and Alamos would like to integrate the information MMF have provided as accurate as possible. The shapefiles are essential to ensure accuracy when integrating data into the EIS. Michael also stated that Alamos's interpretation of the standing CA gives Alamos the right to use the shapefiles.	Email - Sent	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
March 11, 2020, 12:57 PM	Morrissa Boerchers, Consultation Project Officer of the Manitoba Métis Federation (MMF) contacted Michael Raess of Alamos to indicated that MMF is working on the Information sharing agreement and that shapefiles would be released at that point.	Email - Received	Manitoba Metis Federation
March 4, 2020, 4:00 PM	Morrissa Boerchers, Consultation Project Officer of the Manitoba Métis Federation (MMF) was contacted by Michael Raess of Alamos to request the shapefiles related to the MLOUS mapping data. These shapefiles were requested to ensure accuracy when implementing data into the EIS.	Email - Sent	Manitoba Metis Federation
March 4, 2020, 3:52 PM	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF) contacted Colin Webster, Paolo Toscano, and Michael Raess of Alamos with MMF's final report "Manitoba Métis Knowledge, Land Use, and Occupancy Study (MMKLUOS) Lynn Lake Gold Mine Project". Marci Riel explained that this report presents further interview data and analysis; comments and validation from the Community meeting in Thompson, MB; and a suite of recommendations. MMF trusts that the report will aid Alamos in their Environmental Impact Statement submission and give them a better understanding of the Metis Nation's Manitoba Metis Community.	Email - Sent	Manitoba Metis Federation
March 3, 2020	The Manitoba Metis Federation (MMF) was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the Lynn Lake Gold Project, the letter provided a summary of engagement between Alamos and MMF, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for MMF to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Metis Rights.	Mail - Sent	Manitoba Metis Federation
January 22, 2020	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation was sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the even to answer questions and provide information.	Mail - Sent	Manitoba Metis Federation
January 15, 2020, 08:25 AM	Marci Riel, Director of Energy and Infrastructure at Manitoba Metis Federation was contacted by Paolo Toscano of Alamos to request the shapefiles associated with the Interim Traditional Land Use Report.	Email - Sent	Manitoba Metis Federation
December 31, 2019, 07:36 AM	Marci Riel, Director of Energy and Infrastructure at the Manitoba Metis Federation (MMF) contacted Paolo Toscano of Alamos to submit a copy of the Interim Traditional Knowledge Land Use and Occupancy study completed by Shared Value Solutions for MMF.	Email - Received	Manitoba Metis Federation
October 8, 2019, 12:47 PM	Morrissa Boerchers, consultation project manager with the Manitoba Metis Federation was contacted by Colin Webster of Alamos regarding the contribution agreement and the Metis Land Use and Occupancy Study (MLUOS). Colin Webster stated that they will have a meeting with MMF and Alamos before Alamos files the Environmental Impact Statement following the submission of the draft and final MLUOS.	Email - Sent	Manitoba Metis Federation
October 3, 2019, 03:40 PM	Morrissa Boerchers, Consultation Project Officer of the Manitoba Métis Federation (MMF) was contacted by Paolo Toscano of Alamos to send the signed Contribution Agreement back to MMF. Michael Raess of Alamos explained that his understanding is that the MMF Land Use and Occupancy Study will not be completed until mid-December 2019 and therefore the information in the study will not be incorporated into the Environmental Impact Statement, but may be filed as an amendment.	Email - Sent	Manitoba Metis Federation
July 24, 2019, 02:10 PM	Marci Riel, Director of Energy and Infrastructure for the Manitoba Métis Federation, emailed Paolo Toscano, Director of Projects for Alamos Gold Inc. with the draft Contribution Agreement for Alamos Gold Inc. to review. On August 1, 2019, Marci followed up on the review, and on August 6, 2019, Paolo informed that Alamos Gold Inc.'s lawyers were away and would complete the review as soon as possible. The marked Contribution Agreement was sent to Manitoba Métis Federation on September 5, 2019 for review.	Email - Received	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
July 18, 2019, 02:03 PM	Marci Riel, Director of Energy and Infrastructure at the Manitoba Métis Federation (MMF) was contacted by Michael Raess of Alamos and was provided the second version of the MMF Community Profile for review. Marci Riel responded July 24, 2019 that she continues to have significant concerns regarding the information selected for the Community Profile and stated that she could re-draft the document. Marci Riel wanted to know when the Community Profile review was needed by. Michael Raess responded that the re-write would be needed by the end of September, 2019.	Email - Sent	Manitoba Metis Federation
July 17, 2019	Marci Riel, Director of Energy and Infrastructure at the Manitoba Métis Federation (MMF) was contacted by Paolo Toscano of Alamos to ask for a timeline on the Contribution Agreement.	Email - Sent	Manitoba Metis Federation
June 26, 2019, 12:38 PM	Marci Riel, Director of Energy and Infrastructure at the Manitoba Métis Federation (MMF) was contacted by Paolo Toscano of Alamos to provide clarification on Marci's requests stated in an email June 24, 2019 in regards to the Environmental Impact Statement. Marci Riel replied thanking him for the clarification of the filing date. The final date for submission of information in order for it to be included in the Environmental Impact Statement will be September 30, 2019. MMF would add this date to the contribution agreement draft and send it to Alamos as soon as possible.	Email - Sent	Manitoba Metis Federation
June 26, 2019, 12:36 PM	Jasmine Langhan, engagement and consultation coordinator for the Manitoba Metis Federation (MMF) was contacted by Paolo Toscano of Alamos with an update on the community profile for inclusion in the Environmental Impact Statement. Stantec has revised the community profile and it is currently under review with Alamos. Alamos will provide it to MMF shortly.	Email - Sent	Manitoba Metis Federation
June 26, 2019, 3:16 PM	Jasmine Langhan, engagement and consultation coordinator with the Manitoba Metis Federation contacted Paolo Toscano asking when they can expect the reworked community profile.	Email - Received	Manitoba Metis Federation
June 24, 2019	Marci Riel, Director of Energy and Infrastructure at the Manitoba Métis Federation was contacted by Paolo Toscano of Alamos with the expected filing date for the Environmental Impact Statement (EIS) of March 2020. Marci Riel responded wanting more information. Specifically, she wanted to know the final date for submission of traditional knowledge information in order for it to be included in the EIS filing. In addition, she wanted to know the dates that the valued components will be selected and when Alamos will be providing the updated community profile for review and when Alamos needed comments back on that material.	Email - Sent	Manitoba Metis Federation
June 18, 2019, 01:00 PM	Marci Riel, director of Energy and Infrastructure for the Manitoba Métis Federation (MMF) contacted Paolo Toscano of Alamos requesting clarification regarding the timeline for the Environmental Impact Statement. This information was requested to draft the Contribution Agreement, which was required by MMF before commencement of the MLOUS.	Email - Received	Manitoba Metis Federation
June 3, 2019, 1:18 PM	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation contacted Paolo Toscano of Alamos replying to their May 27, 2019 email regarding a draft Contribution Agreement. Marci Riel agreed that they can prepare a draft Contribution Agreement for Alamos' review.	Email - Received	Manitoba Metis Federation
May 27, 2019, 09:25 AM	Marci Riel, director of energy and infrastructure of Manitoba Métis Federation (MMF) was contacted by Paolo Toscano of Alamos approving the MLOUS proposal. Marci Riel replied that MMF had received the approval from Paolo Toscano. MMF required a Contribution Agreement to be in place between MMF and Alamos prior to starting the Traditional Land Use (TLRU) Study. In addition, the TLRU study required significant up front costs in order to begin the interviews, the MMF would require 50% of the funding to be provided upon signing. Paolo Toscano requested a draft contribution agreement from MMF for Alamos lawyers to review. Marci Riel agreed to provide a draft contribution agreement.	Email - Received	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
May 3, 2019, 01:17 PM	Marci Riel, Director of Energy and Infrastructure of Manitoba Métis Federation, contacted Paolo Toscano of Alamos to send the final component of the budget for approval to complete the Traditional Knowledge study. Manitoba Métis Federation had identified the citizens to be interviewed and was prepared to move forward as soon as they received approval from Alamos.	Email - Sent	Manitoba Metis Federation
April 29, 2019, 10:05 AM	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF) was contacted by Paolo Toscano of Alamos regarding the traditional knowledge work with MMF. Paolo Toscano requested an updated timeline for when Alamos can expect the revised proposal for the Metis Land Use and Occupancy Study (MLUOS).	Email - Sent	Manitoba Metis Federation
March 27, 2019, 10:00 AM	Marci Riel, Director of Energy and Infrastructure Manitoba Métis Federation (MMF) contacted Paolo Toscano of Alamos regarding the status of the Traditional Land Use Studies. The MMF had found participants, were determining expenses and would have a proposal ready for Alamos to review prior to April 10, 2019.	Email - Received	Manitoba Metis Federation
March 26, 2019, 7:15 AM	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation was contacted by Paolo Toscano of Alamos regarding the timeline for the Metis Land Use and Occupancy study (MLUOS).	Email - Sent	Manitoba Metis Federation
February 22, 2019, 05:00 PM	Tyler Hunt, a local Métis citizen of the Manitoba Métis Federation contacted Michael Raess of Alamos with a question regarding the Traditional Knowledge and Land Use Study being conducted by the Manitoba Métis Federation. Tyler Hunt was curious if Michael Raess knew the person that was conducting the interviews on Métis harvesting. Michael Raess responded that he did know the person conducting the interviews, Jade Dewar, the Community Projects Coordinator for the Manitoba Métis Federation. Michael Raess indicated that they are likely contacting Tyler Hunt because they would like to interview a local representative.	Email - Received	Manitoba Metis Federation
January 14, 2019, 01:00 PM	Paolo Toscano of Alamos received an email from Marci Riel, Director of Manitoba Metis Federation thanking Paolo Toscano for his January 13, 2018 email regarding the TLRU study cost estimate approval. Marci Riel indicated that she is still working on the cost estimate for the travel and accommodation associated with conducting the interviews and community consultation meeting and would forward it to Paolo Toscano once it was available.	Email - Received	Manitoba Metis Federation
January 7, 2019, 09:50 AM	Paolo Toscano of Alamos emailed Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF), with the signed memo outlining the costs MMF provided for the TLRU study. Paolo Toscano requested a complete proposal and contract details from Shared Value Solutions.	Email - Sent	Manitoba Metis Federation
December 18, 2018, 07:00 AM	Paolo Toscano of Alamos emailed Marci Riel, Director of Manitoba Metis Federation in response to the revised cost estimate for the TLRU study emailed on December 13, 2018. Paolo Toscano indicated he would approve the cost estimate for the TLRU study.	Email - Sent	Manitoba Metis Federation
December 13, 2018, 04:00 PM	Paolo Toscano of Alamos Gold received an email from Marci Riel, Director of Manitoba Metis Federation, with a revised cost estimate for the TLRU study for Paolo Toscano to approve. Marci Riel noted that changes to the cost estimate were made as per the meeting in Winnipeg.	Email - Received	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
November 27, 2018, 09:50 AM	Paolo Toscana, Colin Webster and Michael Raess of Alamos along with Karen Mathers and Butch Amundson of Stantec met with Jade Dewar, Jasmine Langhan, Marci Riel and Morrissa Boerchers of Manitoba Métis Federation (MMF) to continue engagement efforts for the Lynn Lake Gold Project. The agenda included: project update; discussion of Traditional Land and Resource Use (TLRU) study scope; contract opportunities; and community profile. Alamos provided a Project update, stating that Alamos was still analyzing the economic feasibility of the Project and the environment impact statement would not be filed until late 2019 at the earliest. MMF provided an update on their TLRU study, noting that they would be using Shared Value Solutions for the study. MMF would reduce the number of interviews to 15-20 and eliminate pretest (10 interviews) as long as adjustments could be made should there be issues with the questionnaires, participants, etc. Existing TLRU studies provide a catalogue of available TK information regarding the north (e.g., Wuskawtim, Keeyask, Bipole III). MMF did not wish to invite knowledge holders with no experience of the Project area. The TLRU process would take about 16 weeks. Alamos Gold stated that contract opportunities were currently not for tender. The earliest for major tenders would be 2020 for the 2020/2021 construction season. MMF would like to discuss mandatory minimums for Indigenous content in procurement as soon as possible for such things as camp tenders. Policy to promote MMF members first but advocates for 100% Indigenous content. Regarding the draft community profile, MMF was concerned that the profile was too localized and specific, failing to consider the Métis as a whole throughout Manitoba. MMF recommended reviewing the MMF websites and including the MMF Supreme Court decision to define the Métis. Butch Amundson committed to adding specific content accordingly and send to MMF.	In-Person	Manitoba Metis Federation
November 20, 2018	Lauren Stead of Stantec contacted Marci Riel of MMF to emphasize that the community profile was meant as an early draft and that community input would be welcomed. Lauren suggested to discuss the draft during the in-person meeting November 27.	Email - Sent	Manitoba Metis Federation
November 19, 2018	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF) responded that she and MMF are displeased with the submitted community profile.	Email - Received	Manitoba Metis Federation
October 24, 2018, 11:14 AM	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF) was contacted by Paolo Toscano of Alamos regarding the October 17, 2018 email and suggested dates for the meeting in Winnipeg, MB. At 10:49 AM Marci Riel responded confirming that November 27, 2018 works for the MMF to meet.	Email - Sent	Manitoba Metis Federation
October 15, 2018, 11:14 AM	Marci Riel, Director of Energy and Infrastructure Manitoba Metis Federation (MMF) was contacted by Paolo Toscano of Alamos sharing that he and Colin Webster were planning a trip to Winnipeg in November 2018 and they were hoping to meet up with MMF there is interest. Marci Riel responded at 10:27 AM thanking Paolo Toscano for the email and stating that the MMF is interested in continuing discussions with Alamos about LLGP and looks forward to finalizing a process that will ensure a full, proper and meaningful engagement of the MMF on behalf of the Manitoba Métis Community. Marci Riel asked to be advised when he will be in Winnipeg and she will confirm availability with others at the MMF.	Email - Sent	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
June 19, 2018, 09:30 AM	Paolo Toscana and Michael Raess of Alamos along with Karen Mathers and Lauren Stead of Stantec met with Stephen Howatt, Morrissa Boerchers, Marshall Birch and Jade Dewar, Consultation Project Officers for Manitoba Metis Federation (MMF) to discuss the TLRU study proposal for the Lynn Lake Gold Project. MMF expressed concerns about the number of interviews suggested in Alamos Gold's response to their original proposal. Alamos responded that they are open to an additional 2-3 interviews, but that 10-20 additional interviews would not be approved. Alamos Gold indicated that they have a finite fund and need to be fair to other communities conducting TLRU studies for the Project. Alamos indicated a willingness to conduct a site tour with local MMF representatives as an engagement activity rather than as part of the TLRU study scope. Alamos indicated that with other communities in the area, TLRU studies had been conducted as a mapping activity and site tours had been conducted to orient representatives with the site and collected feedback on potential concerns. Alamos indicated that access was difficult at the mine site which created a liability issue. Alamos did not see value in walking vast areas in the Project area for the TLRU study. Michael Raess was on site 20 days a month and could facilitate a site visit for MMF representatives in the Lynn Lake/Leaf Rapids and Thompson area. Alamos and MMF discussed Tables 4 and 5 of the proposal. Alamos' understanding was that federal funding was provided to cover the tasks outlined in those tables. MMF indicated that federal funding would not fully cover Tables 4 and 5 of their proposal. MMF said in most cases they needed to piece together funding from several sources. Alamos indicated that they were willing to discuss it if a shortfall was identified, but that federal funding should be considered first. MMF indicated that there were limitations on federal funding but committed to applying for as much federal funding as possible to cover the tasks in Tables 4 and 5.MMF referenced a budget previously submitted to Alamos to conduct community meetings. Alamos was under the impression the fees included in the proposal currently being discussed were inclusive. MMF clarified that they had previously submitted a budget separate from the Shared Value Solutions scope that included the facilitation of community meetings. Alamos asked for clarification on the objective of the separate community meeting process. MMF indicated that community meetings were a venue to share project information and have community members ask questions and register concerns. MMF indicated that regional meetings were held throughout the summer and the meetings held in The Pas and Thompson could be used as venues to share project information and collection questions/concerns from community members. MMF committed to reviewing the proposal to identify efficiencies. MMF asked about potential economic development opportunities associated with the Project. MMF asked about the timeline on potential partnership opportunities. Alamos indicated that they needed to get the project into the next phase and there was work to be done to get there – likely 6 months out. Alamos confirmed that MMF would be on all bidders' lists and indicated that they needed to know what services and relationships MMF had to offer. Alamos suggested reviewing Feasibility Study results – this would provide an idea of opportunities that would exist (i.e., trucking opportunities, borrow source materials, etc.). Alamos provided an update on the current status of the Project, including that results of feasibility study were not as promising as hoped, but that they were reevaluating to improve economics of the Project. Alamos requested that MMF confirm their willingness to share GIS information as a shapefile. Alamos indicated that the data needed to be accessible and would have liked MMF to collaborate with Stantec. MMF indicated that they were willing to share GIS information as a shapefile and have GIS specialists with extensive experience. Alamos reiterated the need for project specific area information and that there needed to be benefit for the project in completing the TLRU study and that it could not be a vast northern regional study. MMF indicated that cumulative project impacts were substantial to MMF and the study needed to consider that. Alamos understood the need for regional context but did not need high level of detail on areas 100s of km away from the Project asked if there would be a camp associated with the mines. Alamos responded that a camp would be established either in town or at the mine site. Stantec provided copies of the draft MMF community profile and annotated bibliography for sources to be reviewed and used for the environmental impact statement.	In-Person	Manitoba Metis Federation
June 18, 2018, 02:00 PM	Marci Riel of Manitoba Metis Federation contacted Paolo Toscano of Alamos requesting a draft agenda and list of attendees for the meeting scheduled for June 19th. Paolo Toscano replied to Marci Riel of Manitoba Metis Federation (MMF) apologizing for not providing the meeting materials previously. Paolo Toscano explained that the meeting would focus on the proposed Traditional Land Use Study work plan, other topics could be discussed as identified by MMF during the meeting. Paolo Toscano noted that the meeting Michael Raess and Paolo Toscano of Alamos and Lauren Stead and Karen Mathers of Stantec would attend the meeting.	Email - Sent	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
May 18, 2018	Marci Riel Director, for Manitoba Métis Federation followed up with Paolo Toscano of Alamos for a meeting request and draft agenda for a meeting to discuss the proposed budget and workplan for the TLRU study. Marci Riel requested clarity as to who would be in attendance at the meeting.	Email - Received	Manitoba Metis Federation
May 14, 2018, 11:12 AM	Paolo Toscano of Alamos emailed Jasmine Langhan of Manitoba Metis Federation and carbon copied Marci Riel, Morrissa Boerchers and Stephen Howatt of Manitoba Metis Federation, Colin Webster and Michael Raess of Alamos and Butch Amundson, Lauren Stead, Jordan Toth and Karen Mathers of Stantec. Paolo Toscano asked if Jasmine Langhan had any comments on the TLRU study proposal which Alamos had provided and asked if a meeting should be scheduled to discuss the proposal. Marci Riel replied via email to apologize for the delay and provided a revised workplan and budget for the TLRU study and noted that Manitoba Metis Federation is looking forward to meeting with Alamos to discuss. Paolo Toscano replied via email to thank Marci Riel for the materials and noted that Alamos would review the revised proposal and provide a list of possible meeting dates.	Email - Sent	Manitoba Metis Federation, Marci Riel
April 25, 2018, 02:00 PM	Paolo Toscano of Alamos contacted Jasmine Langhan, Engagement & Consultation Coordinator Manitoba Métis Federation to see if the team had a chance to review the TLRU proposal Alamos sent to Manitoba Métis Federation on March 26, 2018.	Email - Sent	Manitoba Metis Federation
March 26, 2018, 09:02 AM	Paolo Toscano of Alamos Gold sent an email to Jasmine Langhan, Engagement and Consultation Coordinator of Manitoba Metis Federation (MMF) to provide Alamos Gold's Traditional Knowledge (TLRU) study proposal response for the Lynn Lake Gold Project.	Email - Sent	Manitoba Metis Federation
February 28, 2018, 09:00 AM	Colin Webster of Alamos held a conference call with Manitoba Metis Federation (MMF). Marci Riel of MMF stated that it is important to keep communicating about the Project. Colin Webster of Alamos indicated that the Project is outside the Recognized Metis Harvesting Area. Marci Riel of the MMF responded that the MMF asserts the Aboriginal right to harvest according to Section 35 of the Constitution Act (1982). Colin Webster of Alamos relied that Alamos acknowledges that MMF asserts these rights and is willing to support a Traditional Land and Resource Use Study (TLRU) suggesting that the current study as proposed by MMF is of a more ambitious scope than may be warranted by the size and nature of the Project. Marci Riel of MMF responded that MMF would welcome and consider a proposal from Alamos to fund a TLRU study. Colin Webster of Alamos replied that such a proposal would be prepared and submitted to MMF by mid-March, 2018.	Telephone - Sent	Manitoba Metis Federation, Jasmine Langhan, Morrissa Boerchers, Marci Riel
February 27, 2018	Michael Raess of Alamos received a letter from Tyler Hunt, a local Métis citizen (Manitoba Metis Federation [MMF]) regarding Métis harvesting in the Lynn Lake area. Tyler Hunt indicated that with a Métis Harvester Card that he must conduct his hunting/fishing/trapping according to the Manitoba Sustainable Development as no agreement has been reached between the MMF and the Province of Manitoba to designate Game Hunting Area 9 as a recognized Métis -Natural Resource Harvesting Zone. The MMF will reimburse for any licenses purchased.	Mail - Received	Manitoba Metis Federation
February 26, 2018, 11:19 AM	Paolo Toscano of Alamos Gold emailed Jasmine Langhan, Engagement and Consultation Coordinator of Manitoba Metis Federation (MMF) to provide the teleconference call details for the meeting scheduled for February 28, 2018 at 9:00 a.m. At 12:24 p.m., Jasmine Langhan replied via email thanking Paolo Toscano for the teleconference call details and asked if Alamos Gold had any other agenda points to discuss besides MMF's Traditional Knowledge (TLRU) study proposal. At 1:31 p.m., Paolo Toscano replied via email indicating Alamos Gold was planning to discuss the proposal only, so no need for a formal agenda unless there were other items that MMF wanted to discuss. At 2:48 p.m., Jasmine Langhan replied via email thanking Paolo Toscano for the response.	Email - Sent	Manitoba Metis Federation
February 23, 2018, 11:20 AM	Michael Raess of Alamos was contacted by Ashley Obleman of the Manitoba Metis Federation (MMF) regarding a Lynn Lake local MMF Citizenship listing.	Email - Received	Manitoba Metis Federation
February 22, 2018, 02:00 PM	Michael Raess of Alamos met with Tyler Hunt, a local Métis citizen (Manitoba Metis Federation [MMF]) regarding Métis Harvesting in the Lynn Lake area. Tyler Hunt discussed Métis rights in Lynn Lake.	In-Person	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
February 21, 2018, 10:53 AM	Paolo Toscano of Alamos sent an email to Jasmine Langhan, Engagement and Consultation Coordinator of Manitoba Metis Federation (MMF) to indicate that Alamos Gold is available for a meeting the afternoon of February 28, 2018. At 11:58 a.m., Jasmine Langhan replied via email indicating that February 28, 2018 no longer worked for MMF. Jasmine Langhan requested that Alamos propose new dates. At 12:24 p.m., Paolo Toscano replied via email asking if March 1, 2018 was available. At 1:33 p.m., Jasmine Langhan replied via email stating MMF was not available March 1, 2018. Jasmine Langhan suggested a teleconference on February 28, 2018, otherwise they would need to look into alternative dates in March 2018. At 3:30 p.m., Paolo Toscano replied via email indicating that they don't want to delay the discussion any further so Alamos would like to schedule a teleconference call meeting on February 28, 2018. Paolo Toscano asked Jasmine Langhan what time worked best for MMF. At 6:01 p.m. Jasmine Langhan replied via email indicating that MMF was available at 9:00 a.m. and asked that Paolo Toscano forward the conference call details.	Email - Sent	Manitoba Metis Federation
February 21, 2018, 10:00 AM	Michael Raess of Alamos met with a local Métis citizen regarding Métis traditional land use in the Lynn Lake area. They also discussed harvester cards, hunting zones, and hunting licenses and tags.	In-Person	Manitoba Metis Federation
February 20, 2018, 09:05 AM	Paolo Toscano of Alamos sent an email to Jasmine Langhan, Engagement and Consultation Coordinator of Manitoba Metis Federation (MMF) to follow up on his February 7, 2018 email regarding scheduling a meeting to discuss the TLRU study proposal submitted by MMF. Paolo Toscano asked if MMF had settled on a date. At 11:47 a.m., Jasmine Langhan replied via email indicating MMF was available anytime between 9:30 and 11:00 a.m. on February 27, 2018, or between 9:30 and 11:00 a.m. or 1:30 to 3:00 p.m. on February 28, 2018.	Email - Sent	Manitoba Metis Federation
February 07, 2018, 09:55 AM	Paolo Toscano of Alamos sent an email to Jasmine Langhan, Engagement and Consultation Coordinator of Manitoba Metis Federation (MMF) to suggest dates for meeting to discuss the TLRU study proposal. Paolo Toscano asked if MMF was available for a meeting on February 21, 27, 28 or March 1, 2018.	Email - Sent	Manitoba Metis Federation
February 1, 2018, 11:45 AM	Paolo Toscano of Alamos sent an email to Jasmine Langhan, Engagement and Consultation Coordinator of Manitoba Metis Federation (MMF), in follow up to the TLRU study proposal that was sent on December 15, 2017. Paolo Toscana apologized for the delay in responding to MMF's TLRU study proposal and stated Alamos hopes to get back to MMF with comments/questions in the next week. In addition, Alamos would like to arrange a meeting with MMF in mid to late February 2018.At 2:56 p.m., Jasmine Langhan replied via email thanking Paolo Toscana for the response. Jasmine Langhan asked Alamos Gold to suggest a couple dates for the meeting in February.	Email - Sent	Manitoba Metis Federation
January 31, 2018, 04:10 PM	Paolo Toscano of Alamos Gold received an email from Jasmine Langhan, Engagement and Consultation Coordinator of Manitoba Metis Federation, in follow up to the TLRU study proposal that was sent on December 15, 2017. Jasmine Langhan asked for an update on Alamos' review.	Email - Received	Manitoba Metis Federation
December 15, 2017, 09:44 AM	Michael Raess of Alamos received an email from Jasmine Langhan, Engagement and Consultation Coordinator for Manitoba Metis Federation in reply to the November 30, 2017 email regarding the TLRU study proposal for the Lynn Lake Gold Project. Jasmine Langhan attached the MMF TLRU study proposal for Alamos' review. At 1:41 p.m., Colin Webster of Alamos replied via email indicating that Alamos would require a detailed breakdown for each line item in the proposal. At 2:23 p.m., Marci Riel of MMF replied via email attaching the detailed proposal from Shared Value Solutions, indicating it was inadvertently omitted from the previous email.	Email - Received	Manitoba Metis Federation
November 30, 2017, 10:31 AM	Michael Raess of Alamos Gold emailed Jasmine Langhan, Engagement and Consultation Coordinator of Manitoba Metis Federation (MMF) to request an update on the proposal for the Traditional Land and Resource Use (TLRU) study for the Lynn Lake Gold Project.	Email - Sent	Manitoba Metis Federation

Table 3B-5 Summary of Communications: Manitoba Metis Federation

Communication date	Communication summary	Communication method	Stakeholder
October 27, 2017, 10:30 AM	Colin Webster, Michael Raess and Paolo Toscano of Alamos Gold along with Butch Amundson of Stantec met with Jade Dewar, Jasmine Langhan, Manon Soulard, Marci Riel, Morrissa Boerchers and Stephen Howatt of Manitoba Metis Federation (MMF) to introduce the Lynn Lake Gold Project. MMF indicated that their engagement on the Project will focus on consideration of the impacts of the Project on the environment and on Métis exercise of rights; whether the Project is environmentally sustainable; and consideration of the economic benefits of the Project to Metis citizens. MMF described their capacity to provide construction services through Métis N4 Construction Inc., a profit share capital company wholly owned by MMF. Colin Webster asked whether MMF will work with First Nations businesses. Marci Riel responded that Métis N4 Construction focuses on 100% Indigenous content and try to hire locally as much as possible. Marci Riel emphasized that the current focus is on the environmental assessment. If impacts to the environment and Métis peoples' exercise of rights are adequately mitigated, then the focus will shift to economic goals' expressed concerns arising from the draft Canadian Environmental Assessment Agency Guidelines, including adequate engagement with Métis citizens. Colin Webster asked whether there are rights-bearing Métis in the Project area and Marci Riel responded that Métis rights are not geographically based. Jasmine Langhan asked whether any traditional knowledge studies were currently underway for the Project. Colin Webster stated that Alamos is current working with Marcel Colomb First Nation. Colin Webster asked about Resolution 8. Marci Riel explained that Resolution 8 leaves decisions regarding consultation and accommodation with the President so that Locals cannot make or break decisions that affect all citizens of the MMF. March Riel stated that there are impacts on current use to harvesters who are active in project areas but there are also impacts to collective rights because the presence of the Project removes future opportunities to exercise rights in the project area. Métis people are highly mobile, have far reaching family connections and can exercise their harvesting rights anywhere. Marci Riel added that specific communication needs will help facilitate the process. Butch Amundson commented that a community specific engagement plan is intended to address specific communication needs. Marci expressed MMF's desire to share information is advance of the environmental impact statement (EIS) filing. MMF will be retaining Shared Value Solutions for the environmental assessment/Traditional Knowledge sharing process. MMF expects that the proponent would fund the engagement process and TLRU study. Marci Riel asked when Alamos would require TK information to be included in the EIS. Butch Amundson responded late spring 2018. Marci Riel indicated that a TLRU study will take about 12 weeks to complete. Butch Amundson asked if shape files of TK information can be shared. Marci Riel responded that sharing digital information is possible with the correct information sharing agreements in place. Marci Riel indicated that MMF will be looking for procurement targets for MMF business interests and offers to assist Alamos with developing an Indigenous procurement policy for the Project. MMF wishes to focus on procurement, not participation. Colin Webster recommended communication about any potential joint venture agreements in advance of committing to partners.	In-Person	Manitoba Metis Federation
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to the Manitoba Metis Federation. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_mmf.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Manitoba Metis Federation
October 3, 2017, 08:43 AM	Paolo Toscano of Alamos received an email from Morrissa Boerchers of the Manitoba Métis Federation (MMF) on behalf of Jasmine Langhan with a letter from the MMF regarding the Project. Karen Mathers of Stantec replied to Morrissa Boerchers and asked for an introductory meeting between Alamos and MMF. A meeting was set for October 27 at 10:30 am at the MMF office in Winnipeg, Manitoba.	Email - Sent	Manitoba Metis Federation

Table 3B-6 Summary of Communications: Peter Ballantyne Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
June 26, 2020, 1:56 PM	Candace Merasty of the Peter Ballantyne Cree Nation (PBCN) was contacted by Butch Amundson of Stantec regarding the Traditional Land and Resource Use (TLRU) study completed by Stantec in Kinoosao for the LLGP in August 2018. Butch Amundson was following up on whether the Information Sharing Agreement will be signed to allow PBCN's TLRU study to contribute to the effects assessment in the Environmental Impact Statement (EIS).	Email - Sent	Peter Ballantyne Cree Nation
May 5, 2020, 08:33 AM	Chief Peter A. Beatty and Candace Merasty of Peter Ballantyne Cree Nation (PBCN) was contacted by Lauren Stead of Stantec with a letter and information package for their review. The letter provided an explanation for why Alamos was requesting feedback on both the exercise of PBFN's Indigenous and Treaty rights, and how the Project may potentially affect the exercise of those rights. The package provided a partial draft copy of the Indigenous and Treaty Rights Assessment which Alamos intended to submit to the Impact Assessment Agency of Canada (IAAC) as part of the Lynn Lake Gold Project Environmental Impact Statement (EIS) for PBFN's review. The letter and package of information was also sent by registered mail. On May 5, 2020 at 2:02 pm Candace Merasty replied and stated that she would forward the email on to Chief Peter Beatty.	Email - Sent	Peter Ballantyne Cree Nation
April 28, 2020	Stantec on behalf of Alamos sent an information package to leadership of Peter Ballantyne Cree Nation Chief and Council regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Peter Ballantyne Cree Nation
April 24, 2020, 02:07 PM	Candace Merasty, executive assistant of the Peter Ballantyne Cree Nation (PBCN) was contacted by Lauren Stead of Stantec to follow up to the email from October 8, 2019 to see if they had a chance to review the information sharing agreement and the completed project-specific traditional land and resource use (TLRU) study. Lauren Stead stated that the environmental impact statement is being submitted in May 2020 and that it would be unfortunate if the PBCN TLRU study could not be included. Candace Merasty replied at 2:27 pm stating she will forward the email to Chief Peter A. Beatty.	Email - Sent	Peter Ballantyne Cree Nation
March 3, 2020, 10:08 AM	Candace Merasty of Peter Ballantyne Cree Nation was contacted by Lauren Stead of Stantec as a follow-up to their email on October 8, 2019 regarding reviewing the Traditional Land Use report and associated information sharing agreement.	Email - Sent	Peter Ballantyne Cree Nation
February 12, 2020, 02:30 PM	Chief Peter A. Beatty and Candace Merasty of Peter Ballantyne Cree Nation were contacted by Lauren Stead of Stantec to discuss the information sharing agreement for the completed Project-specific traditional land use study (follow up to the October 8, 2019 email). Neither were available and Lauren Stead left a message with the administrative assistant requesting a return phone call.	Telephone - Sent	Peter Ballantyne Cree Nation
February 5, 2020, 01:45 PM	Chief Peter Beatty of the Peter Ballantyne Cree Nation was contacted by Lauren Stead of Stantec on his cell phone to discuss the information sharing agreement for the completed Project-specific traditional land use study. Chief Peter Beatty was unavailable and Lauren Stead was unable to leave a voicemail. Lauren Stead sent a text message to Chief Peter Beatty at 1:46 pm requesting that he call to discuss.	Telephone - Sent	Peter Ballantyne Cree Nation
February 5, 2020, 01:30 PM	Chief Peter Beatty and Candace Merasty, executive assistant of the Peter Ballantyne Cree Nation were contacted by Lauren Stead of Stantec to discuss the information sharing agreement for the completed Project-specific traditional land use study (a follow up to the October 8, 2019 email). Neither were available as they were at a meeting in Edmonton. Lauren Stead left a message with the administrative assistant requesting a return phone call.	Telephone - Sent	Peter Ballantyne Cree Nation
January 23, 2020, 11:00 AM	Chief Peter Beatty and Candace Merasty, executive assistant of Peter Ballantyne Cree Nation were contacted by Lauren Stead of Stantec to discuss the information sharing agreement for the completed Project-specific traditional land use study (a follow up to the October 8th, 2019 email). Neither were available and Lauren Stead left a message with the administrative assistant requesting a return phone call.	Telephone - Sent	Peter Ballantyne Cree Nation
January 22, 2020	Chief Peter Beatty of the Peter Ballantyne Cree Nation was sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the even to answer questions and provide information.	Mail - Sent	Peter Ballantyne Cree Nation

Table 3B-6 Summary of Communications: Peter Ballantyne Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
January 13, 2020, 11:00 AM	Darrin Morin, Councilor of Peter Ballantyne Cree Nation (PBCN) was contacted by Michael Raess of Alamos because Alamos/Stantec has not able contact the Chief. Michael Raess stated that Alamos would like Chief and Council to review and release the Traditional Land and Resource Use (TLRU) study and to continue with the engagement process. Darrin Morin suggested that Alamos call the Chief directly and provided his cell phone number.	Telephone - Sent	Peter Ballantyne Cree Nation
January 10, 2020	A member of Peter Ballantyne Cree Nation (PBCN) was contacted by Michael Raess of Alamos to try and find a contact for an alternative council member to continue engagement as councilor Darrin Morin no longer wants to be the contact person for LLGP.	Email - Sent	Peter Ballantyne Cree Nation
December 4, 2019	Chief Peter Beatty of Peter Ballantyne Cree Nation (PBCN) was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and PBCN, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for PBCN to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	Peter Ballantyne Cree Nation
October 22, 2019, 09:32 AM	Councilor Darrin Morin of the Peter Ballantyne Cree Nation (PBCN) was contacted by Michael Raess of Alamos regarding the meeting which Lauren Stead of Stantec had with Darrin Morin in Saskatoon on October 8, 2019. Darrin Morin indicated that he is too busy to invest time in LLGP if there are no benefits to the community. Darrin Morin indicated that he does not want to be involved in LLGP anymore and that all communications should be directed to the PBCN secretariat instead.	Telephone - Received	Peter Ballantyne Cree Nation
October 8, 2019, 11:01 AM	Candace Merasty of the Peter Ballantyne Cree Nation was contacted by Lauren Stead of Stantec regarding the July meeting with Chief and Council in Kinoosao. At that time, Chief Peter Beatty indicated that Chief and Council supported communication about the project being sent through the Councilors representing Southend. Lauren Stead explained her meet with Councilor Darrin Morin on October 8, 2019 and his indication that his current workload does not allow for him to continue engaging with Alamos Gold regarding the LLGP. Darrin Morin indicated that he would like to see the traditional land use information collected with members of the community of Kinoosao incorporated into the environmental assessment for the LLGP, but that he did not have the time to review the report and associated information sharing agreement. Councilor Morin directed Lauren Stead to contact Candace Merasty to inquire if the Chief could sign off on the information sharing agreement. Lauren Stead attached a copy of the report and the information sharing agreement for the Chief to review. Copies of this report had also distributed during the meeting in July.	Email - Sent	Peter Ballantyne Cree Nation
October 08, 2019, 10:00 AM	Darrin Morin, Councilor of the Peter Ballantyne Cree Nation (PBCN) along with a community member from PBCN met with Lauren Stead of Stantec at the Stantec office in Saskatoon. Councilor Darrin Morin expressed that he did not have capacity to review the traditional land use study report or further engagement regarding the LLGP without receiving a direct benefit for his community. Councilor Darrin Moring identified that he had a lot of other responsibilities and was not able to prioritize a task that did not result in further investment or benefit for PBCN. Lauren Stead asked if he wanted to see the information gathered into the traditional land use study report incorporated into the EIS and explained that without an information sharing agreement that information could not be used. Councilor Darrin Morin understood and stated that he would like to see the information from the traditional land use study report incorporated into the environmental assessment, but that he was not able to review and sign the information sharing agreement. Councilor Darrin Morin directed Lauren Stead to contact the Chief's Executive Assistant or the other PBCN Councilor representing the community of Southend for further engagement matters.	In-Person	Peter Ballantyne Cree Nation
October 07, 2019, 04:35 PM	Darrin Morin, Councilor of the Peter Ballantyne Cree Nation was contacted by Lauren Stead of Stantec regarding the LLGP. Darrin Morin asked if he could stop by the Saskatoon Stantec office to meet with Lauren Stead the following day. They planned to meet at the Stantec office when Darrin Morin was available.	Text/SMS - Sent	Peter Ballantyne Cree Nation
September 30, 2019, 11:39 AM	Darrin Morin, Councilor of the Peter Ballantyne Cree Nation (PBCN) was contacted by Lauren Stead of Stantec to confirm that he received the Traditional Land Use Study. Darrin Morin responded saying he had looked at it and was wondering what the next step was. Lauren Stead stated that they need to discuss if there are any report edits needed as well as establishing an information sharing agreement. Lauren Stead asked if PBCN was comfortable with the information in the Traditional Land Use Study being used in the environmental impact statement (EIS).	Email - Sent	Peter Ballantyne Cree Nation
September 17, 2019, 11:41 AM	Darrin Morin, Councilor of Peter Ballantyne Cree Nation (PBCN) was contacted by Lauren Stead of Stantec to determine if Darrin Morin had a chance to review the Traditional Land Use Study (TLUS) report.	Email - Sent	Peter Ballantyne Cree Nation
September 17, 2019, 11:41 AM	Darrin Morin, Councilor of Peter Ballantyne Cree Nation was contacted by Lauren Stead of Stantec to see if he had a chance to review the traditional land use study report.	Email - Sent	Peter Ballantyne Cree Nation

Table 3B-6 Summary of Communications: Peter Ballantyne Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
August 25, 2019, 12:58 PM	Darrin Morin, Councilor of Peter Ballantyne Cree Nation (PBCN) was contacted by Lauren Stead of Stantec regarding the updated Traditional Land Use Study (TLUS) report. Lauren Stead attached the report and requested that Darrin Morin forward it to the other PBCN Councilor.	Email - Sent	Peter Ballantyne Cree Nation
August 20, 2019, 08:52 AM	Darrin Morin, Councilor of Peter Ballantyne Cree Nation (PBCN) was contacted by Lauren Stead of Stantec regarding the Traditional Land Use Study (TLUS) report stating that she had integrated comments from Chief and Council.	Email - Sent	Peter Ballantyne Cree Nation
July 10, 2019, 11:00 AM	Chief Peter Beatty and Council including Councilor Darrin Morin of Peter Ballantyne Cree Nation (PBCN) met in Kinoosao with Michael Raess of Alamos. The meeting started with Michael Raess presenting on Lynn Lake Gold Project (LLGP) and Stantec followed-up with a presentation on the traditional knowledge study that was conducted in 2018. It was determined that Darrin Moring could speak for Chief and Council regarding the traditional knowledge study. PBCN requested minor changes to the traditional knowledge study report. The next step would be for Stantec to make the changes and then PBCN would need to sign off on the study. Stantec recommended signing an information sharing agreement as well. PBCN also requested a written document/contract specifying that PBCN would be guaranteed employment as part of LLGP.	In-Person	Peter Ballantyne Cree Nation
July 8, 2019, 12:47 PM	Darrin Morin, Councilor of the Peter Ballantyne Cree Nation contacted Lauren Stead of Stantec to discuss logistics for the July 10, 2019 meeting.	Text/SMS - Received	Peter Ballantyne Cree Nation
July 5, 2019, 05:12 PM	Candace Merasty, Executive Secretary of the Peter Ballantyne Cree Nation contacted Lauren Stead, Engagement Discipline Lead of Stantec with the approved agenda for the July 9-10, 2019 meetings.	Email - Received	Peter Ballantyne Cree Nation
July 3, 2019, 02:29 PM	Candace Merasty, Executive Secretary of the Peter Ballantyne Cree Nation contacted Lauren Stead, Engagement Discipline Lead of Stantec confirming that she would be attending and what topic she would be presenting in at the meeting on July, 2019 in Kinoosao, SK. Lauren Stead responded and stated that she would attend and present on July 11, 2019 at 11 am with Michael Raess of Alamos and Jordan Hennig of Stantec. They will be presenting on Lynn Lake Gold Project and the information gathered from Peter Ballantyne Cree Nation members during a meeting held with the community in Kinoosao at the end of the summer in 2018.	Email - Received	Peter Ballantyne Cree Nation
June 27, 2019, 09:20 AM	Darrin Morin, Councilor of the Peter Ballantyne Cree Nation was contacted by Lauren Stead of Stantec regarding the meeting in Kinoosao in July. Darrin Morin responded that she should check with Candace Merasty. They also discussed the fee for hiring a boat and confirmed that $1000 round trip was reasonable. Lauren Stead confirmed that Stantec and Alamos representatives will meet at the dock on Wednesday morning in Southend. Darrin Morin also notified Lauren Stead that there will be a fishing derby that ends at 5:30 pm on Wednesday and that their boat guide would likely want to attend with them. The fee for the derby is $50 and they would need a fishing license, a life jacket, a rod and tackle, rain gear, and a blanket.	Text/SMS - Sent	Peter Ballantyne Cree Nation
June 18, 2019, 08:51 AM	Darrin Morin, Councilor of the Peter Ballantyne Cree Nation was contacted by Lauren Stead of Stantec to see if he was able to confirm the schedule of events for the Chief and Council meeting in Kinoosao at the beginning of July. Lauren Stead confirmed that they have to hire a boat. Darrin Morin replied that he will get back to her early next week with the schedule.	Text/SMS - Sent	Peter Ballantyne Cree Nation
May 07, 2019, 11:15 AM	Candace Merasty of Peter Ballantyne Cree Nation was contacted by Lauren Stead of Stantec to provide Lauren's contact information and to thank Candace Merasty for adding Stantec and Alamos to the agenda for the meeting in July, 2019.	Telephone - Sent	Peter Ballantyne Cree Nation
April 24, 2019, 11:08 AM	Lauren Stead of Stantec contacted Candace Merasty, Secretary to the Chief of the Peter Ballantyne Cree Nation to confirm the meeting date and agenda for July, but she was not available.	Telephone - Sent	Peter Ballantyne Cree Nation
April 24, 2019, 10:23 AM	Lauren Stead of Stantec contacted councilor Darrin Morin to confirm the receipt of the Traditional Land and Resource Use Report. Darrin Morin responded and stated that he had received the draft and that it would be reviewed at the meeting in Kinoosao with Chief and Council, which was to be held in July. He provided contact information for the Chief's secretary and requested that Lauren use her to confirm dates and the agenda.	Text/SMS - Sent	Peter Ballantyne Cree Nation
April 17, 2019, 09:11 AM	Darrin Morin, Councilor of Peter Ballantyne Cree Nation (PBCN) was contacted by Lauren Stead of Stantec apologizing for not attaching the Traditional Land Use Study (TLUS) report to the March 22, 2019 email. Lauren Stead attached the TLUS draft report.	Email - Sent	Peter Ballantyne Cree Nation
April 16, 2019, 01:38 PM	Lauren Stead of Stantec contacted Councilor Darrin Morin of the Peter Ballantyne Cree Nation to check on the status of review of the Traditional Land and Resource Use Report. Darrin Morin responded and stated that the last email he received did not have a report attached. Lauren Stead responded and attached the report.	Text/SMS - Sent	Peter Ballantyne Cree Nation

Table 3B-6 Summary of Communications: Peter Ballantyne Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
March 22, 2019, 02:21 PM	Lauren Stead of Stantec contacted Darrin Morin, Councilor of Peter Ballantyne Cree Nation to follow up to see if he had reviewed the document "Traditional Land and Resource Use Study for Peter Ballantyne Cree Nation, Saskatchewan: Community Version". She also asked about the scheduled June 11 and 12, 2019 meetings.	Email - Sent	Peter Ballantyne Cree Nation
February 8, 2019, 09:22 AM	Lauren Stead of Stantec, emailed Councillor Darrin Morin of Peter Ballantyne Cree Nation, inquiring whether he, council or community members had any further Project-related questions. Lauren Stead also indicated that Stantec has been drafting a report of the information gathered from the meeting with community members in Kinoosao and that the report would be ready for review the following week. At 12:03 p.m. Councillor Darrin Morin responded, inviting Lauren Stead to the Chief and Council meeting on June 11th and 12th, 2019 in Kinoosao. Councillor Darrin Morin indicated 14 Councillors and the Chief will be present at the meeting and requested Stantec provide an update on the LLGP Project at that time. At 12:06 p.m. Lauren Stead acknowledged the receipt of the email.	Email - Sent	Peter Ballantyne Cree Nation
August 23, 2018, 03:42 PM	Lauren Stead of Stantec sent a text message to Darrin Morin, Councilor of Peter Ballantyne Cree Nation at Southend to reschedule a follow-up meeting as requested by Darrin Morin following the community meeting in Kinoosao on August 20, 2018. Darrin Morin had planned to be in Saskatoon the following week and Lauren Stead extended an invitation to lunch. Darrin Morin responded that he would let Lauren Stead know when he planned to be in Saskatoon and they would make arrangements for a lunch meeting to discuss next steps for the traditional land use study.	Text/SMS - Sent	Peter Ballantyne Cree Nation
August 20, 2018	Meeting in Kinoosao to conduct TKTLRU interviews with members. TKTLRU study was performed by Stantec. Michael Raess of Alamos presented the Lynn Lake Gold project (LLGP) to the community prior to the interviews. Lauren Stead, Jordan Hennig and Butch Amundson of Stantec interviewed Ron Olson, Otto Olson and Floyd Olson regarding traditional land use in the Lynn Lake Gold Project Area.	In-Person	Peter Ballantyne Cree Nation
August 19, 2018, 08:59 PM	Lauren Stead of Stantec received a text message from Darrin Morin, Councilor of Peter Ballantyne Cree Nation at Southend to confirm that Stantec representatives had arrived in Southend. Lauren Stead responded at 9:00 p.m. that Lauren Stead, Butch Amundson, and Jordan Hennig of Stantec had arrived in Southend. Darrin Morin responded to confirm departure from the dock at the Nordic Lodge for August 20 at 7:00 a.m. On August 20, 2018 at 6:58 a.m. Lauren Stead sent a text message to Darrin Morin clarifying which dock at the Nordic Lodge they would be meeting at.	Text/SMS - Received	Peter Ballantyne Cree Nation
August 14, 2018, 09:30 AM	Lauren Stead of Stantec sent a text message to Darrin Morin, Councilor of Peter Ballantyne Cree Nation at Southend to confirm departure time from Southend for a community meeting in Kinoosao scheduled for Monday, August 20, 2018. On August 17, 2018 at 12:47 pm Lauren Stead received a response from Darrin Morin stating that he planned to leave Southend at 7:00 a.m. in order to be back in Southend by 3:00 p.m. that same day. Lauren Stead responded via text message at 12:48 p.m. confirming what time Michael Raess of Alamos should meet us in Kinoosao. Darrin Morin responded that Michael Raess should plan to be in Kinoosao at 9:30 a.m.	Text/SMS - Sent	Peter Ballantyne Cree Nation
August 10, 2018, 10:40 AM	Lauren Stead of Stantec received an email from Darrin Morin, Councillor for Peter Ballantyne Cree Nation regarding the community meeting scheduled for August 20, 2018 at 5:00 p.m. Darrin Morin indicated that he would need to depart from Kinoosao earlier that day to attend the community meeting. At 10:53 a.m., Lauren Stead replied via email and requested clarification regarding the expectations of Alamos/Stantec to attend or present at the community meeting. At 11:30 a.m., Darrin Morin replied via email and indicated there was no expectation for Alamos/Stantec to attend and that it would affect his planned departure time from Kinoosao. At 11:39 a.m., Lauren Stead replied via email indicating that Alamos/Stantec could leave any time the morning of August 20, 2018 to have more time in Kinoosao and make it back for the 5:00 p.m. meeting.	Email - Received	Peter Ballantyne Cree Nation
August 10, 2018, 09:35 AM	Lauren Stead of Stantec telephoned Candance Merasty, Interim Executive Secretary of Peter Ballantyne Cree Nation to request clarification regarding Stantec/Alamos' participation in the meeting scheduled for August 20, 2018. Candance Merasty was unavailable to take the call and Lauren Stead left a message with the administrative assistant.	Telephone - Sent	Peter Ballantyne Cree Nation
August 9, 2018, 09:47 PM	Lauren Stead of Stantec received an electronic meeting invite from Candace Merasty, Interim Executive Secretary of Peter Ballantyne Cree Nation for a community meeting to be held in Southend on August 20, 2018 at 5:00 p.m.	Email - Received	Peter Ballantyne Cree Nation
August 7, 2018, 12:11 PM	Lauren Stead of Stantec emailed Darrin Morin, Councillor for Peter Ballantyne Cree Nation to confirm that accommodations had been booked for the Stantec and Alamos team for August 19-21, 2018. Lauren Stead explained that Alamos would present a Project overview and Stantec would conduct the traditional land use workshop and interviews. Lauren Stead attached a copy of the standard questions used for traditional land use interviews and asked Darrin Morin to review. Lauren Stead confirmed that a cheque request for the meal had been requested. DOCUMENT PROVIDED: tlu_interview_questions.pdf	Email - Sent	Peter Ballantyne Cree Nation

Table 3B-6 Summary of Communications: Peter Ballantyne Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
July 10, 2018, 10:00 AM	Michael Raess of Alamos Gold called Darrin Morin, Council for Peter Ballantyne Cree Nation to inquire about a potential Project related meeting in Kinoosao. Darrin indicated that a Chief and Council meeting would be held that week, and would provide a response regarding a potential Project meeting the following week. Darrin agreed to providing at least 1 week notification for the meeting. Traveling to the meeting in Kinoosao would involve first traveling to Southend and then taking an approximately 2.5hr boat ride to Kinoosao.	Telephone - Sent	Peter Ballantyne Cree Nation
July 7, 2018, 12:00 PM	Lauren Stead of Stantec received a text message from Darrin Morin, Councillor of Peter Ballantyne Cree Nation at Southend, confirming logistics for a traditional land use workshop scheduled for August 20, 2018 in Kinoosao. Darrin Morin requested that Stantec bring a cheque to cover the cost of lunch during the workshop. Lauren Stead confirmed the dates and times of travel and that a cheque request would be submitted.	Text/SMS - Received	Peter Ballantyne Cree Nation
June 20, 2018, 11:00 AM	Michael Raess of Alamos Gold called Darrin Morin of Peter Ballantyne Cree Nation. The community of Southend was being evacuated due to a wildfire so the conversation was brief. Michael Raess asked whether any additional Open House questionnaires were completed and if there were any further questions or concerns about the LLGP. Darrin Morin noted that no more questionnaires were completed since the Open House and there had not been any further questions or concerns from the community about the LLGP.	Telephone - Sent	Peter Ballantyne Cree Nation
June 19, 2018, 01:00 PM	Michael Raess of Alamos Gold (Alamos) called Darrin Morin of Peter Ballantyne Cree Nation to inquire about Open House questionnaires completed after the closing of the open house and if there were any further questions or concerns about the Lynn Lake Gold Project (LLGP). Further, Michael Raess wanted to clarify if there was any Peter Ballantyne Cree Nation traditional practices within the LLGP area, based on knowledge from community members from Southend and Kinoosao. Michael Raess wanted to clarify if the request to meet in Kinoosao included Traditional Knowledge interview components or if Michael Raess would present the LLGP and submit questionnaires similar to the approach taken to the open house completed in Southend. Michael left a message as there was no answer.	Telephone - Sent	Peter Ballantyne Cree Nation
June 04, 2018, 08:57 AM	Lauren Stead of Stantec Consulting Ltd. emailed Darrin Morin, Councillor, Peter Ballantyne Cree Nation, to thank him for the Lynn Lake Gold Project information meeting held in Southend. Lauren Stead provided Michael Raess' contact information as requested.	Email - Sent	Peter Ballantyne Cree Nation
May 31, 2018, 04:00 PM	On May 31, 2018, Alamos Gold and Stantec in partnership with the Saskatchewan Ministry of Highways and Infrastructure hosted a community meeting regarding two development projects in the north that have the potential to affect the community of Peter Ballantyne Cree Nation (PBCN). Alamos was invited to present information about the Lynn Lake Gold Project (LLGP) to interested community members by Darrin Morin, PBCN Councilor at Southend. Approximately 20 members from Peter Ballantyne Cree Nation were in attendance.	In-Person	Peter Ballantyne Cree Nation
May 31, 2018, 11:48 AM	Lauren Stead of Stantec text messaged Darrin Morin, Councillor of Peter Ballantyne Cree Nation (PBCN) at Southend to let him know Stantec and Alamos representatives were enroute to Southend for the community meeting. Darrin Morin responded that the location of the community meeting had been changed to the youth centre and requested Lauren Stead send a text message when back in cell coverage near Southend. Lauren Stead sent a text message at 3:26 p.m. that Stantec and Alamos representatives were arriving in Southend. Darrin Morin responded that Lauren Stead should phone him. Lauren Stead telephoned Darrin Morin at 3:33 p.m. to arrange a meeting place prior to the community meeting.	Text/SMS - Sent	Peter Ballantyne Cree Nation
May 24, 2018, 12:31 PM	Lauren Stead of Stantec emailed Darrin Morin, Councillor of Peter Ballantyne Cree Nation (PBCN) at Southend a poster advertising the community open house scheduled for May 31, 2018. Lauren Stead requested that Darrin Morin distribute the poster as appropriate. Darrin Morin responded at 1:07 p.m. to confirm receipt of the poster and asked if the cheque for the meal during the community meeting would be available for pick up. Lauren Stead responded at 1:11 p.m. that the cheque was not yet ready and would be brought to Southend the day of the community meeting.	Email - Sent	Peter Ballantyne Cree Nation

Table 3B-6 Summary of Communications: Peter Ballantyne Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
May 22, 2018, 10:28 AM	Lauren Stead of Stantec emailed Darrin Morin, Councillor of Peter Ballantyne Cree Nation (PBCN) at Southend to confirm the venue for the community meeting scheduled for May 31, 2018. Darrin Morin responded via text message at 10:37 a.m. that the meeting will be held at the band hall on May 31, 2018 at 4:30 p.m. and asked if Alamos Gold would be willing to pay for a community dinner. Lauren Stead responded via text message at 10:39 a.m. requesting an estimate of attendance and cost for the meal. Darrin Morin responded via text message at 10:39 a.m. that we should except 50 to 60 people in attendance and provided and estimated cost for the meal. Lauren Stead asked if PBCN could provide an invoice for the meal and asked if Darrin Morin would prefer a formal presentation about the Project or a more casual come and go style with poster boards. Darrin Morin indicated that he would send an invoice via email and requested that the Alamos representative make a formal presentation about the Project. Darrin Morin also indicated that he would let Ted Merasty, PBCN Lands Manager, know about the plans for the community meeting. Lauren Stead thanked Darrin Morin for updating Ted Merasty and asked if the Chief would be in attendance at the meeting. Darrin Morin said he was unsure if the Chief would be able to attend, but that he would let Lauren Stead know. At 12:55 p.m. Lauren Stead received an email from Darrin Morin with the invoice for the meal during the community meeting. Darrin Morin requested that the cheque be ready on Friday, May 25, 2018 for pick up.	Email - Sent	Peter Ballantyne Cree Nation
May 16, 2018, 02:00 PM	Lauren Stead of Stantec received an email from Darrin Morin, Councillor of Peter Ballantyne Cree Nation at Southend asking if May 31, 2018 at 4:30 p.m. would work for a community meeting regarding the Lynn Lake Gold Project. Lauren Stead confirmed via email at 8:26 a.m. on May 17, 2018 that May 31, 2018 at 4:30 p.m. would work.	Email - Received	Peter Ballantyne Cree Nation
May 16, 2018, 01:30 PM	Lauren Stead of Stantec emailed Darrin Morin, Councillor for Peter Ballantyne Cree Nation to follow up on the May 8, 2018 email regarding scheduling a date for the community meeting the last week of May 2018. Lauren Stead attached the Project introductory letter and information package.	Email - Sent	Peter Ballantyne Cree Nation
May 14, 2018, 11:30 AM	Lauren Stead of Stantec called Darrin Morin, Councillor of Peter Ballantyne Cree Nation at Southend and left a voicemail message to confirm receipt of her email and discuss a community meeting in Southend. Darrin Morin returned the call at 11:50 a.m. and confirmed that he received the email, but had not had the opportunity to review the project information provided. Darrin Morin will contact the Chief's Administrative Assistant to discuss a date the last week of May for a community meeting in Southend. Darrin Morin confirmed his email address and cell phone number and said email and text were the best way to get in contact with him. At 11:54 a.m. Lauren Stead sent Darrin Morin a text message to provide her cell phone number. Darrin Morin replied at 11:56 a.m. confirming he received the text message.	Telephone - Sent	Peter Ballantyne Cree Nation
May 8, 2018, 03:19 PM	Lauren Stead of Stantec sent an email to Ted Merasty and Darrin Morin of Peter Ballantyne Cree Nation in response to Ted Merasty's email on May 8, 2018. Lauren Stead explained that Stantec is currently working with two proponents, Ministry of Highways and Infrastructure and Alamos Gold on two separate projects that have the potential to affect the Peter Ballantyne Cree Nation community at Southend. Lauren Stead attached introductory letters and information packages for both projects and proposed that both proponents host joint community meetings in Southend to share information about their respective projects. Lauren Stead asked if there was an evening during the last week of May 2018 that would work.	Email - Sent	Peter Ballantyne Cree Nation, Ted Merasty Peter Ballantyne Cree Nation- Lands Manager
May 8, 2018, 3:03 pm	Ted Merasty, Lands Manager of Peter Ballantyne Cree Nation (PBCN), responded to Lauren Stead's email from May 4, 2018 to introduce the new PBCN Councillor from Southend, Darrin Morin. Ted Merasty confirmed that he will be able to attend any future meetings that may be held in Southend.	Email - Received	Peter Ballantyne Cree Nation
May 4, 2018, :300 PM	Lauren Stead of Stantec emailed Ted Merasty, Lands Manager of Peter Ballantyne Cree Nation (PBCN), suggesting possible dates for a community meeting in Southend, SK. Suggested dates included May 17, 2018, and May 28-31, 2018 or any weekend date if that would better accommodate PBCN.	Email - Sent	Peter Ballantyne Cree Nation
April 26, 2018, 09:11 PM	Lauren Stead of Stantec sent a text message to Ted Merasty, Lands Manager of Peter Ballantyne Cree Nation to propose May 9 or 10, 2018 as possible dates for a community meeting in Southend.	Text/SMS - Sent	Peter Ballantyne Cree Nation
March 19, 2018, 02:37 PM	Lauren Stead of Stantec sent a text message to Ted Merasty, Lands Manager of Peter Ballantyne Cree Nation to confirm if he had received her email about scheduling community meetings in Southend at the end of April. Ted Merasty responded via text message at 3:40 p.m. that he had not received Lauren Stead's email, but that the end of April would be good timing for a community meeting in Southend. Lauren Stead responded at 3:41 p.m. requesting that Ted Merasty propose a couple of specific dates that would work for the community at the end of April.	Text/SMS - Sent	Peter Ballantyne Cree Nation
March 5, 2018, 03:15 PM	Lauren Stead of Stantec emailed Ted Merasty, Lands Manager and cc'd Chief Peter Beatty of Peter Ballantyne Cree Nation (PBCN) to follow up on the information package provided in person to Ted Merasty.	Email - Sent	Peter Ballantyne Cree Nation

Table 3B-6 Summary of Communications: Peter Ballantyne Cree Nation

Communication date	Communication summary	Communication method	Stakeholder
February 13, 2018, 03:00 PM	Lauren Stead of Stantec spoke with Ted Merasty, Lands Manager of Peter Ballantyne Cree Nation opportunistically following a meeting regarding another project. Ted Merasty was not familiar with the LLGP, but noted that Ben Merasty would likely delegate the Project to Ted Merasty for review. Ted Merasty suggested a community meeting to be held in Southend at the end of April and will follow up with Ben Merasty regarding the project.	In-Person	Peter Ballantyne Cree Nation
January 30, 2018, 09:57 AM	Lauren Stead of Stantec emailed Ben Merasty, Executive Director of Peter Ballantyne Cree Nation to follow up on introductory letter which had been sent earlier..	Email - Sent	Peter Ballantyne Cree Nation
January 24, 2018, 01:45 PM	Lauren Stead of Stantec called and spoke to Ben Merasty, Executive Director of Peter Ballantyne Cree Nation (PBCN), to confirm receipt of the LLGP introductory letter sent by Alamos in October 2017. Ben Merasty indicated that he did not recall receiving the letter via mail or email. Lauren Stead forwarded the letter to Ben Merasty via email at 1:50 p.m. and requested that Ben Merasty call if PBCN would like to set up a meeting with Alamos.	Telephone - Sent	Peter Ballantyne Cree Nation
January 24, 2018, 01:40 PM	Lauren Stead of Stantec called and left a message for Adrienne McCallum, Executive Assistant of Peter Ballantyne Cree Nation, to confirm receipt of the LLGP introductory letter sent by Alamos in October 2017.	Telephone - Sent	Peter Ballantyne Cree Nation
January 11, 2018, 01:55 PM	Lauren Stead of Stantec called and left a message for Adrienne McCallum, Executive Assistant of Peter Ballantyne Cree Nation, to confirm receipt of the LLGP introductory letter sent by Alamos in October 2017.	Telephone - Sent	Peter Ballantyne Cree Nation
January 9, 2018, 10:17 AM	Lauren Stead of Stantec emailed Chief Peter Beatty, Adrienne McCallum (Chief's Executive Assistant/Executive Secretary), and Ben Merasty (Executive Director) of Peter Ballantyne Cree Nation to confirm receipt of the Alamos introductory letter and to inquire about following up with Councilors Simon Jobb and Kevin Morin of Southend as indicated by Cornelius Ballantyne in our January 3, 2018 meeting. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_peterballantyne.pdf	Email - Sent	Peter Ballantyne Cree Nation, Adrienne McCallum, Ben Merasty
January 3, 2018, 01:30 PM	Lauren Stead and Butch Amundson of Stantec met with Cornelius Ballantyne, Councilor, and Dale Reid of Peter Ballantyne Cree Nation on a topic unrelated to LLGP, but took the opportunity to also discuss the introductory letter sent by Alamos on October 18, 2017. Cornelius Ballantyne indicated that the LLGP Project area was within the traditional territory of the Peter Ballantyne Cree Nation community at Southend and provided two contacts to discuss conducting a Project-specific TLU Study.	In-Person	Dale Reid, Peter Ballantyne Cree Nation
November 22, 2017, 12:00 PM	Jordan Toth of Stantec called Peter Ballantyne Cree Nation to confirm receipt of the Lynn Lake Gold Project introductory letter and Project information package sent on October 18, 2017, but there was no answer and no option to leave a voicemail.	Telephone - Sent	Peter Ballantyne Cree Nation
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to Chief and Council of Peter Ballantyne Cree Nation. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with Peter Ballantyne Cree Nation regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_peterballantyne.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Peter Ballantyne Cree Nation

Table 3B-7 Summary of Communications: Barren Lands First Nation

Communication date	Communication summary	Communication method	Stakeholder
May 5, 2020, 08:17 AM	Chief John Clarke of Barren Lands First Nation (BLFN) was contacted by Lauren Stead of Stantec with a letter and information package for their review. The letter provided an explanation for why Alamos was requesting feedback on both the exercise of BLFN's Indigenous and Treaty rights, and how the Project may potentially affect the exercise of those rights. The package provided a partial draft copy of the Indigenous and Treaty Rights Assessment which Alamos intended to submit to the Impact Assessment Agency of Canada (IAAC) as part of the Lynn Lake Gold Project Environmental Impact Statement (EIS) for BLFN's review. The letter and package of information was also sent by registered mail.	Email - Sent	Barren Lands First Nation
April 28, 2020	Stantec on behalf of Alamos sent an information package to leadership of Barren Lands First Nation Chief and Council regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Barren Lands First Nation
January 22, 2020	Chief and council of Barren Lands First Nation were sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the evening to answer questions and provide information.	Mail - Sent	Barren Lands First Nation
December 4, 2019	Chief John Clark of Barren Lands First Nation (BLFN) was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and BLFN, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for BLFN to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	Barren Lands First Nation
December 4, 2019, 11:00 AM	Michael Raess of Alamos emailed the Indigenous Communities regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and each community, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for each community to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Email - Sent	Barren Lands First Nation
July 19, 2019, 10:00 AM	Michael Raess of Alamos was invited by the North West Community Futures Development Corporation to meet and present the Lynn Lake Gold Project (LLGP) on July 19, 2019. Communities sitting on the board included representatives from Council of many of the Indigenous groups that Alamos was engaging with including the Community of Brochet, Barren Lands First Nation (Brochet Reserve), Community of Leaf Rapids, Marcel Colomb First Nation, Granville Lake, and O-Pipon-Na-Piwin Cree Nation. Michael Raess of Alamos explained that Alamos would continue to share Project updates for public through Open Houses (next in November 2019). Alamos would specifically send an invitation to the surrounding communities including the Community of Brochet and Leaf Rapids. With respect to Indigenous Community Members, Michael Raess explained that Alamos encouraged leadership to communicate all shared information to the members and to relay all potential questions and concerns back to Alamos. Michael Raess also added that Alamos would be sending out packages in September 2019 summarizing all current data and data gaps for each Indigenous Community to verify the data for the Environmental Impact Statement.	In-Person	Marcel Colomb First Nation #328, Northwest Manitoba Community Futures Development Corporation, O-Pipon-Na-Piwin Cree Nation, Barren Lands First Nation, Granville Lake Community, Town of Leaf Rapids, Community of Brochet
February 8, 2019, 03:00 PM	Chief John Clarke of the Barren Lands First Nation contacted Michael Raess of Alamos to say that he has been too busy to review files Michael had sent him in regards to their in person meeting last fall. Michael resent the files for his review.	Email - Received	Barren Lands First Nation

Table 3B-7 Summary of Communications: Barren Lands First Nation

Communication date	Communication summary	Communication method	Stakeholder
October 12, 2018, 05:00 PM	Michael Raess of Alamos Gold emailed Chief John Clarke of Barren Lands First Nation to ask for a status update regarding approval of the community profile, to determine if there was any traditional practices within the Lynn Lake Gold Project area, and to summarize a proposed timeline for the Project as requested by Chief and Council during the September 18, 2018 meeting.	Email - Sent	Barren Lands First Nation
September 18, 2018, 11:00 AM	Michael Raess of Alamos Gold met with Chief John Clarke, Billy Linklater, Councillor, Georgina Custer, Councillor, and Gilbert Custer, Housing Manager of Barren Lands First Nation in Brochet. Michael Raess provided a high level presentation of the Lynn Lake Gold Project. Chief and Council indicated that they received federal funding for the Lynn Lake Gold Project but weren't sure what the funding was for. Michael Raess indicated that the funding could be used for a third party review of the environmental assessment process. Michael Raess asked whether Chief and Council was aware of any present or historic traditional practices within the Lynn Lake Gold Project footprint. Chief and Council indicated that they would need to confirm with Elders regarding potential traditional practices in the project area. Chief and Council indicated that their biggest concerns were effects on air quality, water quality, and barren-ground caribou, due to their reliance on caribou meat. Michael Raess explained that the project could not result in adverse water quality conditions at Barren Lake First Nation due to the location upstream of the project. Michael Raess indicated that air quality could be a concern and that it would be regulated through permits to monitor air quality throughout operations. Chief and Council noted that the biggest positive of the project was job creation. Chief John Clarke stated that the Barren Lands First Nation land manager might have more questions or concerns once the project information had been further reviewed. Chief and Council requested further information about next steps for the project. Michael Raess presented the community profile and literature review and requested that Chief and Council review the documents and provide feedback and approval to use in the environmental impact assessment. Chief and Council requested a copy of the presentation and to resend the community profile and literature review. Michael Raess sent the presentation, community profile and literature review via email.	In-Person	Barren Lands First Nation
September 12, 2018, 02:03 PM	Michael Raess of Alamos Gold emailed Chief John Clarke of Barren Lands First Nation to follow up on details for the September 18, 2018 meeting in Brochet. Michael Raess indicated that he would be flying in via float plane on September 18, 2018 at 8:45 a.m. and asked if someone would be able to pick him up. Michael Raess also asked if there was anything that he should be prepared to speak about in particular. At 2:06 p.m., Chief John Clarke replied via email indicating that he would pick up Michael Raess. At 2:08 p.m., Michael Raess replied via email stating he was looking forward to meeting.	Email - Sent	Barren Lands First Nation
Aug 24, 2018, 04:05 PM	Michael Raess of Alamos Gold emailed Chief John Clarke of Barren Lands First Nation to follow up on Chief John Clarke's request for a meeting on September 18, 2018 in Brochet. Michael Raess confirmed his availability for the meeting. Michael Raess stated that the meeting would consist of a Project overview and asked Chief John Clarke if there were additional topics he would like discussed. At 4:47 p.m., Chief John Clarke replied via email indicating that the meeting would be scheduled for 9:00 a.m. to 12:00 p.m. on September 18, 2018.	Email - Sent	Barren Lands First Nation
August 23, 2018, 06:30 PM	Michael Raess of Alamos Gold emailed Chief John Clarke of Barren Lands First Nation to discuss the community profile and associated reference documents which Alamos planned to incorporate into the EIS for the Project. Michael Raess requested that Barren Lands First Nation review the documents and provide feedback. Michael Raess also inquired about scheduling a meeting with Chief and Council and community members in Brochet in the fall. At 7:13 p.m., Chief John Clarke replied via email indicating that he would like a meeting on September 18, 2018 in Brochet.	Email - Sent	Barren Lands First Nation
February 20, 2018, 09:00 AM	Michael Raess of Alamos Gold called and spoke with Chief John Clarke of Barren Lands First Nation to arrange an in-person meeting to introduce the Lynn Lake Gold Project. Chief Clarke indicated that he was not available for a meeting, but that he may be in Lynn Lake for the Winter Carnival and be able to meet then.	Telephone - Sent	Barren Lands First Nation
January 23, 2018, 12:35 PM	Michael Raess of Alamos Gold emailed Chief John Clarke of Barren Lands First Nation to express interest in scheduling a meeting in Brochet once the road opens to introduce the Lynn Lake Gold Project.	Email - Sent	Barren Lands First Nation

Table 3B-7 Summary of Communications: Barren Lands First Nation

Communication date	Communication summary	Communication method	Stakeholder
January 23, 2018, 12:35 PM	Michael Raess of Alamos Gold emailed Chief John Clarke of Barren Lands First Nation to confirm his email address and thank him for the telephone call the today.	Email - Sent	Barren Lands First Nation
January 23, 2018, 12:15 PM	Michael Raess of Alamos Gold called and spoke with Chief John Clarke of Barren Lands First Nation (BLFN) to discuss the Lynn Lake Gold Project. Michael Raess asked if the Project introductory letter and information package had been received and whether Chief and Council had reviewed it and if there were any questions or concerns. Michael Raess asked if Barren Lands First Nation have in the past or are currently conducting traditional practices within the proposed footprint of the Project, and if Barren Lands First Nation has any traditional knowledge information relating to the Project. Chief John Clarke indicated verbally that BLFN has no traditional practices in the project area, but is interested in potential training opportunities. Chief John Clarke wanted another copy of the introductory letter sent via email and to set up an in-person meeting with Chief and Council.	Telephone - Sent	Barren Lands First Nation
January 22, 2018, 03:45 PM	Lauren Stead of Stantec called and spoke with the Administrative Assistant for Barren Lands First Nation. The Administrative Assistant indicated that Charmaine Cook, Band Manager of Barren Lands First Nation, was out of the office, but should be back the following morning.	Telephone - Sent	Barren Lands First Nation
January 19, 2018, 02:30 PM	Lauren Stead of Stantec called and spoke with the Administrative Assistant for Barren Lands First Nation. The Administrative Assistant stated that the Chief is currently out of the office. The Administrative Assistant transferred the call to the Charmaine Cook, Band Manager of Barren Lands First Nation and Lauren Stead left a voicemail requesting a call back.	Telephone - Sent	Barren Lands First Nation
November 22, 2017	Jordan Toth of Stantec called Barren Lands First Nation to confirm receipt of the Lynn Lake Gold Project introductory letter and Project information package sent on October 18, 2017, but there was no answer and no option to leave a voicemail.	Telephone - Sent	Barren Lands First Nation
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to Chief and Council of Barren Lands First Nation. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with Barren Lands First Nation regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_barrenlands.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Barren Lands First Nation

Table 3B-8 Summary of Communications: Métis Nation – Saskatchewan Northern Region 1

Communication date	Communication summary	Communication method	Stakeholder
May 6, 2020, 12:04 PM	Earl Cook, Director of Métis Nation - Saskatchewan Northern Region 1 was contacted by Butch Amundson of Stantec to confirm that he received the registered mail delivery and attached a digital copy of the draft Indigenous and Treaty Rights Assessment of the LLGP EIS letter and package. Butch Amundson also mentioned that after restrictions are lifted they can meet to discuss LLGP.	Email - Sent	Métis Nation - Saskatchewan Eastern Region 1
April 28, 2020	Stantec on behalf of Alamos sent an information package to Director Earl Cook of Métis Nation - Saskatchewan Northern Region 1 regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Métis Nation - Saskatchewan Northern Region 1
January 22, 2020	Earl Cook, Director of the Metis Nation - Saskatchewan Northern Region 1 was sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the even to answer questions and provide information.	Mail - Sent	Métis Nation - Saskatchewan Northern Region 1
December 4, 2019	Earl Cook, Director of the Metis Nation - Saskatchewan Northern Region 1 was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and Metis Nation - Saskatchewan Northern Region 1 , anticipated schedule for submission of the Environmental Impact Statement and the opportunity for Metis Nation - Saskatchewan Northern Region 1 to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	Métis Nation - Saskatchewan Northern Region 1
February 12, 2019, 02:45 PM	Butch Amundson of Stantec Consulting Ltd. telephoned Earl Cook, Regional Director of Métis Nation of Saskatchewan, Northern Region 1, inquiring about comments or concerns from the community regarding the Project. Earl Cook responded that the Project was too distant from the community to be of concern to its members' traditional practices. Butch Amundson then followed up with an email to confirm that Métis Nation of Saskatchewan, Northern Region 1 has no concerns regarding their community members' traditional practices with regard to the proposed LLGP.	Telephone - Sent	Métis Nation - Saskatchewan Northern Region 1
August 10, 2018, 10:35 AM	Butch Amundson of Stantec emailed Earl Cook, Regional Director of Métis Nation - Saskatchewan Northern Region 1 to discuss the community profile and associated reference documents which Alamos planned to incorporated into the EIS for the Project. Butch Amundson attached drafts of the community profile and literature review for his review and comment. DOCUMENTS PROVIDED: llgp_eis_community_profile_mns_er1_20180619.pdf; llgp_lit_review_mns_er1_20180810.pdf	Email - Sent	Métis Nation - Saskatchewan Northern Region 1

Table 3B-8 Summary of Communications: Métis Nation – Saskatchewan Northern Region 1

Communication date	Communication summary	Communication method	Stakeholder
April 27, 2018, 02:30 PM	Butch Amundson (Butch) of Stantec Consulting Ltd. (Stantec) telephoned Earl Cook , Regional Director, Northern Region 1, Metis Nation-Saskatchewan (MN-S NR1) regarding the proposed Alamos Lynn Lake Gold Project (the Project). Butch asked Earl Cook if he had received the letter introducing the Project. Earl Cook said that he had received the letter. Butch explained that the Canadian Environmental Assessment Agency (CEAA) had identified MN-S NR1 as an Indigenous group potentially affected by the Project. Butch asked Earl Cook if he would like to receive more information and or meet with the proponent to discuss the Project. Earl Cook responded that he believes that Metis citizens of MN-S Eastern Region 1 (ER1) are more likely to be concerned or affected by the Project due to the proximity of its member communities. Butch Amundson responded that ER1 was also identified by CEAA as a potentially affected Indigenous group. Earl Cook indicated that he believed the distance, being upstream in the direction of regional stream flow, and lack of easy access to the Project area, makes it unlikely that members of MN-S NR1 have concerns regarding the Project. He advised contacting the Regional Director of ER1 and Butch Amundson responded that he would. As follow-up, Butch Amundson will send an email to earlcook@mns.work to acknowledge that Earl Cook has been accurately represented in this communication. Butch Amundson also committed to providing a Project information package to the email and answering any questions Earl Cook may have or forward any requests for more information to Alamos. Following the phone call, an email from Butch Amundson to Earl Cook detailing the phone conversation, with the Alamos Handout attached.	Telephone - Sent	Métis Nation - Saskatchewan Northern Region 1
January 8, 2018, 10:45 AM	Jordan Toth of Stantec called Earl Cook, Director of Métis Nation - Saskatchewan Northern Region 1 regarding the Lynn Lake Gold Project (LLGP); however, there was no answer and no option to leave a voicemail. At 11:02 a.m., Jordan Toth sent a follow-up email with Michael Raess of Alamos Gold copied on the email to confirm that Earl Cook received the LLGP introductory letter and Project information package and to schedule a conference call to discuss how Métis Nation - Saskatchewan Northern Region 1 would like to be engaged on the Project.	Telephone - Sent	Métis Nation - Saskatchewan Northern Region 1
November 22, 2017, 11:56 AM	Jordan Toth of Stantec emailed Earl Cook, Director of Métis Nation - Saskatchewan Northern Region 1 regarding the Lynn Lake Gold Project (LLGP). Jordan Toth attached the introductory letter and Project information package. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_mns_north.docx; 0H3_April2017_Handout_FINAL (002).pdf	Email - Sent	Métis Nation - Saskatchewan Northern Region 1
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to the Director of Métis Nation - Saskatchewan Northern Region 1. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with Métis Nation - Saskatchewan Northern Region 1 regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_mns_north.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Métis Nation - Saskatchewan Northern Region 1

Table 3B-9 Summary of Communications: Métis Nation – Saskatchewan Eastern Region 1

Communication date	Communication summary	Communication method	Stakeholder
May 6, 2020, 12:04 PM	Ryan Carriere, Director of Métis Nation - Saskatchewan Eastern Region 1 was contacted by Butch Amundson of Stantec to confirm that he received the registered mail delivery and attached a digital copy of the draft Indigenous and Treaty Rights Assessment of the LLGP EIS letter and package. Butch Amundson also mentioned that after restrictions are lifted they can meet to discuss LLGP.	Email - Sent	Métis Nation - Saskatchewan Eastern Region 1
April 28, 2020	Stantec on behalf of Alamos sent an information package to Director Ryan Carriere of Métis Nation - Saskatchewan Eastern Region 1 regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Métis Nation - Saskatchewan Eastern Region 1
January 22, 2020	Ryan Carrier, Director of the Métis Nation - Saskatchewan Eastern Region 1 was sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the even to answer questions and provide information.	Mail - Sent	Métis Nation - Saskatchewan Eastern Region 1
December 4, 2019	Ryan Carrier, Director of the Métis Nation - Saskatchewan Eastern Region 1 was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and Métis Nation - Saskatchewan Eastern Region 1, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for Métis Nation - Saskatchewan Eastern Region 1to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	Métis Nation - Saskatchewan Eastern Region 1
July 17, 2019, 6:52 PM	Butch Amundson of Stantec Consulting Ltd. emailed Ryan Carriere, Director of the Métis Nation Saskatchewan Eastern Region 1 asking if there was a desire in the Region for a presentation by Alamos regarding the Lynn Lake Gold Project	Email - Sent	Métis Nation - Saskatchewan Eastern Region 2
February 12, 2019, 02:30 PM	Butch Amundson of Stantec Consulting Ltd. telephoned Ryan Carriere, Director of the Métis Nation Saskatchewan Eastern Region 1 and left a message regarding the need for any follow up discussions to their previous meeting. Butch send an email with the same message.	Telephone - Sent	Métis Nation - Saskatchewan Eastern Region 1
November 1, 2018, 09:00 AM	Ryan Carriere, Regional Director, Métis Nation-Saskatchewan, Eastern Region 1, met with Butch Amundson of Stantec to follow-up from our communications in April, May, August and September of 2018. Ryan Carriere will be meeting with the Sandy Bay Local after their election next week to discuss their potential concerns regarding potential project effects and what traditional uses may be in the project area. Ryan Carriere estimates the meeting will be in mid November. He expected that the local hunters will be most concerned about effects on the migration of woodland caribou.	In-Person	Métis Nation - Saskatchewan Eastern Region 1

Table 3B-9 Summary of Communications: Métis Nation – Saskatchewan Eastern Region 1

Communication date	Communication summary	Communication method	Stakeholder
September 6, 2018, 03:30 PM	Butch Amundson of Stantec received a call from Ryan Carriere, Regional Director of Métis Nation - Saskatchewan Eastern Region 1, to follow up on communications from April, May, and August of 2018. Ryan Carriere indicated that he was conducting due diligence regarding the information he had received about the Project and intended to meet with the Sandy Bay Local to discuss their potential concerns regarding Project effects and what traditional uses may have been in the Project area. Ryan Carriere indicated that he may have been able to meet with Stantec staff the evening of September 12, 2018 to discuss information needs with Stantec.	Telephone - Received	Métis Nation - Saskatchewan Eastern Region 1
August 10, 2018, 10:30 AM	Butch Amundson of Stantec emailed Ryan Carriere, Regional Director of Métis Nation - Saskatchewan Eastern Region 1 to discuss the community profile and associated reference documents which Alamos planned to incorporate into the Environmental Impact Statement for the Project. DOCUMENTS PROVIDED: llgp_eis_community_profile_mns_er1_20180619.pdf; llgp_lit_review_mns_er1_20180810.pdf	Email - Sent	Métis Nation - Saskatchewan Eastern Region 1
August 10, 2018, 09:35 AM	Butch Amundson of Stantec telephoned Ryan Carrier, Regional Director of Métis Nation - Saskatchewan Eastern Region 1. There was no answer so Butch Amundson left a voicemail message with contact information and committed to following up via email.	Telephone - Sent	Métis Nation - Saskatchewan Eastern Region 1
May 18, 2018, 02:06 PM	Butch Amundson of Stantec Consulting Ltd. called and spoke with Ryan Lee Carriere, Regional Director, Métis Nation - Saskatchewan Eastern Region 1 to discuss the Project introductory letter from Alamos Gold dated October 18, 2017. Ryan Lee Carriere asked Butch Amundson to resend the introductory letter and information package. Ryan Lee Carriere stated that he will have a consultant review the information and get back to Butch Amundson with recommended next steps.	Telephone - Sent	Métis Nation - Saskatchewan Eastern Region 1
May 9, 2018, 10:53 AM	Butch Amundson of Stantec Consulting Ltd. telephoned Ryan Lee Carriere, Regional Director, Métis Nation-Saskatchewan Eastern Region 1 and left a message requesting he return the call.	Telephone - Sent	Métis Nation - Saskatchewan Eastern Region 1
May 2, 2018, 11:51 AM	Butch Amundson of Stantec Consulting Ltd. emailed Ryan Lee Carriere, Regional Director, Métis Nation-Saskatchewan Eastern Region 1 in follow-up to the voicemail that Butch Amundson left on May 1, 2018. Butch Amundson provided a copy of the introductory letter from Alamos Gold, dated October 18, 2017 and asked if Métis Nation-Saskatchewan Eastern Region 1 was in receipt of it. Butch Amundson also attached the information package regarding the proposed Lynn Lake Gold Project that was presented at the most recent open house in Lynn Lake. Butch Amundson welcomed Ryan Lee Carriere to reach out if Métis Nation-Saskatchewan Eastern Region 1 has any questions or wishes to arrange a meeting with Alamos representatives. Attachments included: Alamos Letter_of_Introduction.pdf; OH3_April2017_Handout_FINAL (002).pdf	Email - Sent	Métis Nation - Saskatchewan Eastern Region 1
May 1, 2018, 02:45 PM	Butch Amundson of Stantec Consulting Ltd. telephoned Ryan Lee Carriere, Regional Director, Métis Nation-Saskatchewan Eastern Region 1 and left a message to return the call.	Telephone - Sent	Métis Nation - Saskatchewan Eastern Region 1

Table 3B-9 Summary of Communications: Métis Nation – Saskatchewan Eastern Region 1

Communication date	Communication summary	Communication method	Stakeholder
April 30, 2018, 09:00 AM	Butch Amundson of Stantec Consulting Ltd. telephoned Ryan Carriere, Regional Director, Métis Nation-Saskatchewan and left a message to return the call.	Telephone - Sent	Métis Nation - Saskatchewan Eastern Region 1
January 8, 2018, 11:38 AM	Jordan Toth of Stantec emailed Ryan Carriere of the Métis Nation of Saskatchewan to introducing herself and the Lynn Lake Gold Project. Jordan Toth attached an introductory letter and a handout with preliminary Project information.	Email - Sent	Métis Nation - Saskatchewan Eastern Region 1
January 8, 2018, 10:30 AM	Jordan Toth of Stantec called and left a voicemail for Ryan Lee Carriere, Director of Métis Nation - Saskatchewan Eastern Region 1 to confirm receipt of the Lynn Lake Gold Project (LLGP) introductory letter and Project information package sent on October 18, 2017.At 10:38 a.m., Jordan Toth sent a follow-up email and attached the LLGP introductory letter and Project information package. Jordan Toth introduced Michael Raess of Alamos Gold and copied him on the email. Jordan Toth committed to following up with Ryan Lee Carriere to discuss how Métis Nation - Saskatchewan Eastern Region 1 wants to be engaged on the Project.	Telephone - Sent	Métis Nation - Saskatchewan Eastern Region 1
November 22, 2017, 12:00 PM	Jordan Toth of Stantec called Ryan Lee Carriere, Director of Métis Nation - Saskatchewan Eastern Region 1 to confirm receipt of the Lynn Lake Gold Project introductory letter and Project information package sent on October 18, 2017, but there was no answer and no option to leave a voicemail.	Telephone - Sent	Métis Nation - Saskatchewan Eastern Region 1
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to the Director of Métis Nation - Saskatchewan Eastern Region 1. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with Métis Nation - Saskatchewan Eastern Region 1 regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_mns_east.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Métis Nation - Saskatchewan Eastern Region 1

Table 3B-10 Summary of Communications: Hatchet Lake First Nation

Communication date	Communication summary	Communication method	Stakeholder
May 05, 2020, 08:21 AM	Chief Bartholomew J. Tsannie of Hatchet Lake Denesuline First Nation (HLDFN) was contacted by Lauren Stead of Stantec with a letter and information package for their review. The letter provided an explanation for why Alamos was requesting feedback on both the exercise of HLDFN's Indigenous and Treaty rights, and how the Project may potentially affect the exercise of those rights. The package provided a partial draft copy of the Indigenous and Treaty Rights Assessment which Alamos intended to submit to the Impact Assessment Agency of Canada (IAAC) as part of the Lynn Lake Gold Project Environmental Impact Statement (EIS) for HLDFN's review. The letter and package of information was also sent by registered mail.	Email - Sent	Hatchet Lake Denesuline First Nation, Bartholomew Tsannie
April 28, 2020	Stantec on behalf of Alamos sent an information package to leadership of Hatchet Lake First Nation Chief and Council regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Hatchet Lake Denesuline First Nation
January 22, 2020	Chief Bartholomew Tsannie of Hatchet Lake First Nation was sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the even to answer questions and provide information.	Mail - Sent	Hatchet Lake Denesuline First Nation
December 4, 2019	Chief Bartholomew J. Tsannie of the Hatchet Lake Denesuline First Nation (HLFN) was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and HLFN, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for HLFN to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	Hatchet Lake Denesuline First Nation
Dec 04, 2019, 11:00 AM	Michael Raess of Alamos emailed the Indigenous Communities regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and each community, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for each community to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Email - Sent	Hatchet Lake Denesuline First Nation
Dec 04, 2019, 10:15 AM	Shea Shirley, environmental land use planner for Ya'thi Nene Land and Resource Office representing the Hatchet Lake Denesuline First Nation (HLFN) was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and HLFN, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for HLFN to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Email - Sent	Hatchet Lake Denesuline First Nation

Table 3B-10 Summary of Communications: Hatchet Lake First Nation

Communication date	Communication summary	Communication method	Stakeholder
November 21, 2019, 01:00 PM	George Tsannie, councilor of the Hatchet Lake Denesuline First Nation (HLFN) was contacted by Michael Raess of Alamos to determine if Shea Shirley should be engaged with directly as a representative for HLFN for LLGP. George Tsannie confirmed that Shea Shirley is representing HLFN for environmental work. He indicated that Michael Raess should contact councillor Paul Denechezhe to discuss the letter summarizing the ongoing engagement for LLGP with Shea Shirley. Michael Raess contacted Shea Shirley to introduce himself and sent her links to the Project Description and the feasibility study. Shea Shirley will be in Hatchet Lake November 28, 2019 and wanted to get as much information as possible to be able to talk about LLGP. Paul Denechezhe called back and confirmed what George Tsannie had stated regarding Shea Shirley, that Shea Shirley works for Ya'thi Nene Land and Resource Office representing HDFN for matters related to the duty to consult, education and training, and environmental aspects.	Telephone - Sent	Paul Denechezhe, Hatchet Lake Denesuline First Nation
November 20, 2019, 02:45 PM	Jennifer Howe, environmental assessment officer at the Canadian Environmental Assessment Agency (CEAA) contacted Michael Raess of Alamos indicating that she was contacted by Shea Shirley from the Ya'thi Nene Lands and Resource Office who represents Hatchet Lake Dene and they would like more information from the LLGP. They would like a shapefile to be able to use their GIS software to get some background on the Project.	Email - Received	Shea Shirley, Impact Assessment Agency of Canada, Hatchet Lake Denesuline First Nation
August 23, 2018, 06:00 PM	Michael Raess of Alamos emailed George Tsannie, Councilor of Hatchet Lake Denesuline First Nation to discuss the community profile and the associated references which Alamos planned to incorporated into the EIS for the Project.	Email - Sent	Hatchet Lake Denesuline First Nation
May 15, 2018	Michael Raess of Alamos Gold emailed George Tsannie, Councillor of Hatchet Lake Denesuline First Nation to confirm he received the April 30, 2018 email that contained the Project information package. Michael Raess asked George Tsannie to distribute the information to Chief and Council and community members.	Email - Sent	Hatchet Lake Denesuline First Nation
April 30, 2018, 11:00 AM	Michael Raess of Alamos called and spoke with Chief Bartholomew J. Tsannie of Hatchet Lake Denesuline First Nation (HLDFN) to discuss the Lynn Lake Gold Project. Chief Bartholomew J. Tsannie stated that he was unavailable due to upcoming elections, but indicated that George Tsannie, Councillor for HLDFN, would be able to represent him. Michael Raess committed to sending the Project information package to George Tsannie. George Tsannie indicated that HLDFN is not currently conducting traditional practices in the area potentially affected by the Project. George Tsannie noted that in the past HLDFN had more interactions in the Lynn Lake area. George Tsannie explained that HLDFN hunted caribou at South Indian Lake in winter of 2018 and therefore is concerned about potential impacts to barren ground caribou herds. HLDFN used to boat over Reindeer Lake and come shopping in Lynn Lake, likely 20 years ago. George Tsannie indicated that HLDFN has work experience with mining and would be interested in employment opportunities. Michael Raess emailed the introductory letter and Project information package to George Tsannie and asked that he distribute the information to Chief and Council and community members.	Telephone - Sent	Hatchet Lake Denesuline First Nation, Chief Bartholomew J. Tsannie - Hatchet Lake Denesuline First Nation
April 24, 2018, 11:00 AM	Michael Raess of Alamos contacted Chief Bartholomew J. Tsannie of Hatchet Lake Denesuline First Nation (HLDFN) to discuss the Lynn Lake Gold Project (the Project) and ensure that HLDFN had received the Project information package and introductory mail. Michael Raess also planned to ask if HLDFN currently or historically conducted traditional land use practices within the Project area and to discuss preferred ways of correspondence. Chief Tsannie indicated that Monday April 30, 2018 at 11:00 a.m. would be a better time for a discussion and provided a contact number.	Telephone - Sent	Hatchet Lake Denesuline First Nation, Bartholomew Tsannie
January 24, 2018, 02:15 PM	Lauren Stead of Stantec called the Hatchet Lake Denesuline First Nation Band Office to confirm receipt of the Lynn Lake Gold Project introductory letter and Project information package sent on October 18, 2017. The Administrative Assistant indicated that the Executive Assistant was not in the office this week and that the Chief was currently busy. The Administrative Assistant took Lauren Stead's contact information and said she would have the Chief call back when he was free.	Telephone - Sent	Hatchet Lake Denesuline First Nation

Table 3B-10 Summary of Communications: Hatchet Lake First Nation

Communication date	Communication summary	Communication method	Stakeholder
January 19, 2018, 02:20 PM	Lauren Stead of Stantec called the Hatchet Lake Denesuline First Nation Band Office to confirm receipt of the Lynn Lake Gold Project introductory letter and Project information package sent on October 18, 2017. Lauren Stead spoke to the Administrative Assistant who indicated that the Chief and the Lands Manager were not in the office. Lauren Stead asked about whether the letter had been received and the Administrative Assistant said to check with the Executive Assistant, who was also not in the office.	Telephone - Sent	Hatchet Lake Denesuline First Nation
November 22, 2017	Jordan Toth of Stantec called Hatchet Lake Denesuline First Nation to confirm receipt of the Lynn Lake Gold Project introductory letter and Project information package sent on October 18, 2017, but there was no answer and no option to leave a voicemail.	Telephone - Sent	Hatchet Lake Denesuline First Nation
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to Chief and Council of Hatchet Lake Denesuline First Nation. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with Hatchet Lake Denesuline First Nation regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_hatchetlake.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Hatchet Lake Denesuline First Nation

Table 3B-11 Summary of Communications: Northlands Denesuline First Nation

Communication date	Communication summary	Communication method	Stakeholder
May 4, 2020, 03:41 PM	Chief Simon Denechezhe of Northlands Denesuline First Nation (NDFN) was contacted by Lauren Stead of Stantec with a letter and information package for their review. The letter provided an explanation for why Alamos was requesting feedback on both the exercise of NDFN's Indigenous and Treaty rights, and how the Project may potentially affect the exercise of those rights. The package provided a partial draft copy of the Indigenous and Treaty Rights Assessment which Alamos intended to submit to the Impact Assessment Agency of Canada (IAAC) as part of the Lynn Lake Gold Project Environmental Impact Statement (EIS) for NDFN's review. The same package was sent by registered mail. The letter and package of information was also sent by registered mail.	Email - Sent	Northlands Denesuline First Nation
April 28, 2020	Stantec on behalf of Alamos sent an information package to leadership of Northlands Denesuline First Nation Chief and Council regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Northlands Denesuline First Nation
January 22, 2020	Chief Simon Denechezhe of Northlands Denesuline First Nation was sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the even to answer questions and provide information.	Mail - Sent	Northlands Denesuline First Nation
December 4, 2019	Chief Simon Denechezhe of Northlands Denesuline First Nation (NDFN) was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and NDFN, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for NDFN to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	Northlands Denesuline First Nation
Dec 4, 2019, 11:00 AM	Michael Raess of Alamos emailed the Indigenous Communities an updated information package that outlined the previous engagement and next steps for the Project.	Email - Sent	Marcel Colomb First Nation #328, Sayisi Dene First Nation, Nisichawayasihk Cree Nation, O-Pipon-Na-Piwin Cree Nation, Barren Lands First Nation, Northlands Denesuline First Nation, Chief Bartholomew J. Tsannie - Hatchet Lake Denesuline First Nation
March 11, 2019, 11:00 AM	Michael Raess of Alamos contacted Simon Denechezhe, Councilor of Northlands Denesuline First Nation to follow up regarding a potential meeting date. Michael Raess was concerned that the winter road was scheduled to close March 21, but Simon Denechezhe replied that Chief and Council had applied for an extension to the road.	Email - Sent	Northlands Denesuline First Nation
March 5, 2019, 12:20 PM	Michael Raess of Alamos contacted Simon Denechezhe, Council member of the Northlands Denesuline First Nation to follow up to see if he had identified a potential date to meet.	Email - Sent	Northlands Denesuline First Nation
February 14, 2019, 02:55 PM	Michael Raess of Alamos contacted Simon Denechezhe, councilor of Northlands Denesuline First Nation to find out what date works best for a meeting. Simon Denechezhe replied stating that he will check with Chief and Council.	Email - Sent	Northlands Denesuline First Nation
February 7, 2019, 08:45 PM	Michael Raess of Alamos called Simon Denechezhe, Council for Northlands Denésuline First Nation to request an in-person meeting in Lac Brochet in March. Simon Denechezhe requested that Michael Raess put the request in an email. Michael Raess noted that he had not yet visited this community and would like to present on the Lynn Lake Gold Project (LLGP), and to respond to any questions or concerns from the Nation. Simon Denechezhe responded to Michael Raess's email indicating he would follow up with Chief and Council to confirm a date (possibly the week of March 11, 2019). Simon Denechezhe noted that he emailed Jennifer Howe (Canadian Environmental Assessment Agency) to inform her of Michael Raess's intent to visit the community.	Email - Received	Northlands Denesuline First Nation

Table 3B-11 Summary of Communications: Northlands Denesuline First Nation

Communication date	Communication summary	Communication method	Stakeholder
February 7, 2019, 08:45 PM	Simon Denechezhe, Council member of Northlands Denesuline First Nation emailed Michael Raess of Alamos in response to a email on April 27, 2018 to see if Chief and Council would like an in-person meeting in Lac Brochet in March 2019. The meeting would include a short presentation on the Project and then have time to address any questions or concerns. Simon Denechezhe emailed that Chief and Council determined the best date would be during the week of March 11, 2019. He also indicated that he had emailed Jennifer Howe of the Canadian Environmental Assessment Agency to inform her that Michael Raess planned to visit the community. The visit would be dependent on the condition of the winter road.	Email - Received	Northlands Denesuline First Nation
January 23, 2019, 03:00 PM	Michael Raess of Alamos called and spoke with Joe Dantlouze, Councilor of Northlands Denesuline First Nation, to discuss the proposed Lynn Lake Gold Project. Joe Dantlouze indicated that he was busy at the time and requested that Michael Raess call him back in the evening or the following day.	Telephone - Sent	Northlands Denesuline First Nation
August 23, 2018, 06:00 PM	Michael Raess of Alamos Gold emailed Simon Denechezhe, Council member of Northlands Denesuline First Nation, and Nelson Nataweyous, Acting Chief of Northlands Denesuline First Nation to discuss the community profile and the associated references which Alamos planned to incorporated into the EIS for the Project.	Email - Sent	Northlands Denesuline First Nation
April 27, 2018, 01:28 PM	Michael Raess of Alamos emailed Simon Denechezhe, Councillor, Northlands Denesuline First Nation, in reply to his April 10, 2018 email. Michael Raess asked whether Northlands Denesuline First Nation would like Alamos to facilitate a small meet and greet, a Project presentation, or a community scale open house. Simon Denechezhe replied via email stating that Chief and Council would like to have an initial meeting with Michael Raess, possibly followed by a community open house. Simon Denechezhe indicated that he would get back to Michael Raess with a proposed date.	Email - Sent	Northlands Denesuline First Nation
April 10, 2018, 12:57 PM	Michael Raess of Alamos was contacted by Simon Denechezhe, councilor of the Northlands Denesuline First Nation (NDFN), confirming that he had received Michael's introductory email would like to keep an open communication channel between all parties. Simon Denechezhe stated that NDFN does not have concerns about the Lynn Lake Gold Project at this time, but invited Michael Raess to come and meet the NDFN Council and community members	Email - Received	Northlands Denesuline First Nation
March 19, 2018, 10:47 AM	Michael Raess of Alamos contacted Council member Simon Denechezhe and acting Chief Nelson Nataweyous of Northlands Denesuline First Nation (NDFN) regarding a follow up to their phone conversation on March 16, 2018. Michael Raess also attached the LLGP introductory letter and open house handout.	Email - Sent	Northlands Denesuline First Nation
March 16, 2018, 10:00 AM	Michael Raess of Alamos called Simon Denechezhe, Council member, and acting Chief Nelson Nataweyous of Northlands Denesuline First Nation (NDFN) regarding general Lynn Lake Gold Project information. Michael Raess asked if NDFN has or had any traditional practices within the Project area. Simon Denchezhe and Chief Nelson Nataweyous indicated that NDFN does not have and is not currently conducting traditional practices in the area potentially affected by the Project. Michael Raess indicated that he will continue to provide NDFN with Project updates and potential training and workforce opportunities.	Telephone - Sent	Northlands Denesuline First Nation
January 19, 2018, 02:40 PM	Lauren Stead of Stantec called Northlands Denesuline First Nation to confirm receipt of the Lynn Lake Gold Project introductory letter and Project information package sent on October 18, 2017. Lauren Stead got a busy signal on both numbers.	Telephone - Sent	Northlands Denesuline First Nation
November 22, 2017, 12:00 PM	Jordan Toth of Stantec called Northlands Denesuline First Nation to confirm receipt of the Lynn Lake Gold Project introductory letter and Project information package sent on October 18, 2017, but an appropriate community contact was not identified.	Telephone - Sent	Northlands Denesuline First Nation
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to Chief and Council of Northlands Denesuline First Nation. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with Northlands Denesuline First Nation regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_northlands.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Northlands Denesuline First Nation

Table 3B-12 Summary of Communications: Sayisi Dene First Nation

Communication date	Communication summary	Communication method	Stakeholder
May 4, 2020, 03:38 PM	Chief and Council of Sayisi Dene Nation (SDN) was contacted by Lauren Stead of Stantec with a letter and information package for their review. The letter provided an explanation for why Alamos was requesting feedback on both the exercise of SDN's Indigenous and Treaty rights, and how the Project may potentially affect the exercise of those rights. The package provided a partial draft copy of the Indigenous and Treaty Rights Assessment which Alamos intended to submit to the Impact Assessment Agency of Canada (IAAC) as part of the Lynn Lake Gold Project Environmental Impact Statement (EIS) for SDN's review. The same package was sent by registered mail. The letter and package of information was also sent by registered mail.	Email - Sent	Sayisi Dene First Nation
April 28, 2020	Stantec on behalf of Alamos sent an information package to leadership of Sayisi Dene Nation Chief and Council regarding their review of the draft Indigenous and Treaty rights assessment section of the Lynn Lake Gold Project Environmental Impact Statement. Alamos and Stantec request feedback from community leadership regarding the community's exercise of Indigenous and Treaty rights and how the LLGP may potentially affect the exercise of those rights. Any feedback provided by the community will be shared with the Impact Assessment Agency of Canada in supplemental filings to the Environmental Impact Statement.	Mail - Sent	Sayisi Dene First Nation
January 22, 2020	Chief Tony Powderhorn and the Sayisi Dene First Nation was sent an invitation from Michael Raess of Alamos to an open house to present the results of the Environmental Impact Statement for the Lynn Lake Gold Project. The open house will be held on Tuesday February 4, 2020 from 3 to 8 pm in Lynn Lake, Manitoba. Representatives from Alamos and Stantec will be available throughout the even to answer questions and provide information.	Mail - Sent	Sayisi Dene First Nation
December 4, 2019	Chief Tony Powderhorn of Sayisi Dene First Nation was sent a letter from Michael Raess of Alamos regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the Lynn Lake Gold Project, the letter provided a summary of engagement between Alamos and Sayisi Dene First Nation, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for Sayisi Dene First Nation to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Mail - Sent	Sayisi Dene First Nation
December 4, 2019, 11:00 AM	Michael Raess of Alamos emailed the Indigenous Communities regarding the LLGP Project update as the EIS is nearing completion. In addition to providing background on the LLGP, the letter provided a summary of engagement between Alamos and each community, anticipated schedule for submission of the Environmental Impact Statement and the opportunity for each community to identify concerns not previously shared regarding potential adverse effects of the Project on their ability to exercise Treaty or Aboriginal Rights.	Email - Sent	Sayisi Dene First Nation

Table 3B-12 Summary of Communications: Sayisi Dene First Nation

Communication date	Communication summary	Communication method	Stakeholder
August 23, 2018, 06:00 PM	Michael Raess of Alamos Gold emailed Chief Tony Powderhorn of Sayisi Dene First Nation to discuss the community profile and associated reference documents which Alamos planned to incorporated into the Environmental Impact Statement for the Project.	Email - Sent	Sayisi Dene First Nation
March 16, 2018, 09:00 AM	Michael Raess of Alamos drove on the winter road from Lynn Lake to Tadoule Lake where he met with Tashena Moise of Sayisi Dene First Nation (SDFN) regarding LLGP and shared an introductory Project letter and open house flyer. Michael Raess had intended to meet with Chief and Council, but no one was available despite meeting arrangements. Michael Raess indicated that Alamos is working towards a regional training partnership and will keep SDN informed on any opportunities. He reiterated that if they have any questions or concerns to contact him.	In-Person	Sayisi Dene First Nation
January 16, 2018, 02:30 PM	Michael Raess of Alamos contacted Chief Tony Powderhorn of Sayisi Dene First Nation (SDFN) to confirm SDFN had received the correspondence about the Lynn Lake Gold Project (LLGP). Chief Powderhorn was asked if he was aware of any historic traditional activities of the SDFN around the LLGP and he indicated that there are no connections to the LLGP area. Chief Powderhorn said that the SDFN would like to be integrated in future labour opportunities. Michael Raess informed Chief Powderhorn that Alamos is working towards a regional training partnership and would keep the SDFN informed. Michael Raess followed up the conversation with an email to Chief Powderhorn to document the conversation. The email was undeliverable so Michael Raess sent an email to the SDFN clerk.	Telephone - Sent	Sayisi Dene First Nation
October 18, 2017, 12:00 PM	Jordan Toth of Stantec, on behalf of Alamos, mailed an introductory letter and Project information package to Chief and Council of Sayisi Dene First Nation. The letter introduced the Lynn Lake Gold Project (LLGP) and the Project team committed to following up with Sayisi Dene First Nation regarding how the community would like to be engaged on the Project. DOCUMENTS PROVIDED: Alamos Letter_of_Introduction_Rev Final_sayisidene.docx; 0H3_April2017_Handout_FINAL (002).pdf	Mail - Sent	Sayisi Dene First Nation
July 25, 2017, 11:30 AM	Michael Raess of Alamos was called by Chief Tony Powderhorn of the Sayisi Dene First Nation to discuss general project information. Chief Tony Powderhorn requested additional information regarding Project construction which Michael Raess indicted would be made available as the project progressed.	Telephone - Received	Sayisi Dene First Nation

Appendix 3C OPEN HOUSE MATERIALS

OPEN HOUSE

WHO:
AuRico Gold &
Carlisle Goldfields (LLJV)

WHEN:
March 25, 2015 4-8 pm

WHAT:
2015 Environmental Baseline and Exploration Programs

WHERE:
Corner Pocket Hall

WHY:
To share information and solicit feedback/input on the planned 2015 work

Coffee, tea and light snacks will be served !

AuRico Gold

CARLISLE
GOLDFIELDS

Stantec

AuRico Gold

Lynn Lake Joint Venture

The purpose of this project is to:

Develop the MacLellan and Farley Lake Properties

Welcome! Thank you for taking the time to attend today's Open House regarding the Lynn Lake Joint Venture Project. We are interested in discussing the Project, answering questions and making note of any comments you wish to provide. Please refer to the attached pages of this handout for maps of the Project sites.

Who is AuRico Gold?

AuRico Gold Inc. is a Canadian company with operating mines in Ontario (Young-Davidson Underground), Mexico (El Chanate open pit) and the Kemess Underground Project in British Columbia. AuRico has entered into a joint venture agreement with Carlisle Goldfields Limited to develop the MacLellan and Farley Lake properties in Lynn Lake, Manitoba.

What is involved?

The project will involve the redevelopment of MacLellan and Farley Lake properties as open pit mines. The current plan is to develop all mine infrastructure at MacLellan, including a central processing plant, associated infrastructure, waste rock and low grade ore stockpiles, and a tailings management facility. Infrastructure at the Farley Lake property will be limited to the open pit(s), waste rock and low grade ore stockpiles, and minor supporting infrastructure for equipment storage and maintenance. The current estimates are for a mine capacity of 30 Mt with a processing rate of up to 8,000 tpd with an estimated 10-year mine life. The first stage of the Project is to collect sufficient data to complete a Feasibility Study that is to evaluate whether or not the Project is viable from a technical, environmental, social and financial perspective. Following which, the Project will undergo the applicable Provincial and Federal permit review.

Both properties were previously mined with varying degrees of rehabilitation and closure. The Farley Lake property has undergone reclamation while the MacLellan property has been in a care and maintenance status for many years. Some historical facilities still remain at the MacLellan property. Baseline studies, particularly of soils, hydrology, geochemistry, hydrogeology, aquatics and terrestrial environment, will be considering these historic activities because they provide field-scale data on potential effects that could result from future mining activities even though mining operations today are very different than they once were.

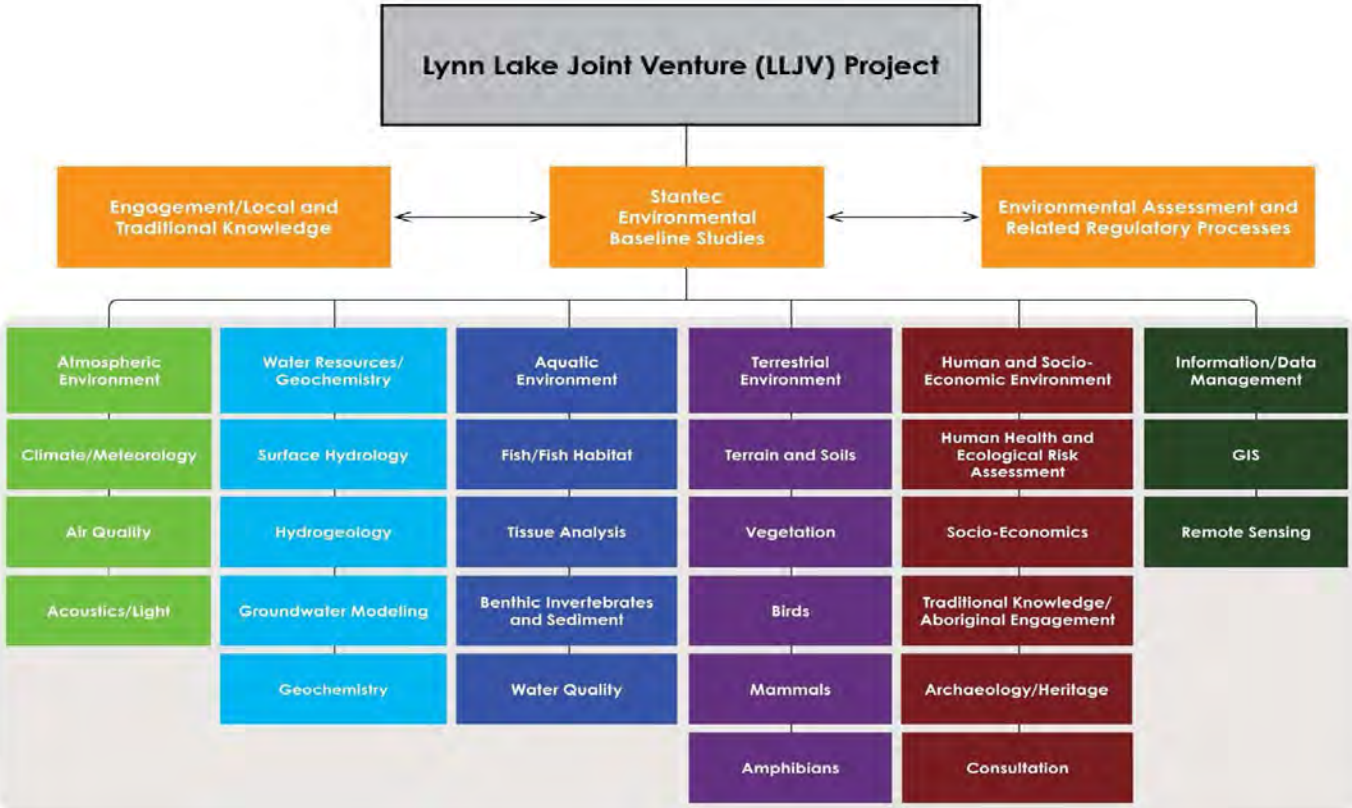
To support the Project, AuRico retained Golder Associates Ltd. to complete siting studies for potential locations for the mine infrastructure at the two properties. Stantec has then been retained to complete environmental baseline studies.

What's happening in Lynn Lake in 2015?

- First program to start will be approximately 20,000 metres (~100 holes) of diamond drilling at Farley Lake and MacLellan. It is anticipated that drilling will take 4-6 months starting in March, 2015.
- Field evaluation of potential mill or processing plant sites, tailings storage facility and other infrastructure. This will involve test pits and geotechnical/condemnation drilling likely over the summer months.
- Environmental baseline surveys, predominantly from March through September, covering a variety of disciplines such as water quality, fish and wildlife, meteorology, air and noise.
- Traditional Land Use studies are also being discussed with Marcel Colomb First Nation.

CARLISLE GOLDFIELDS

Stantec



Atmospheric Environment

Environmental baseline studies of the atmospheric environment include a review of existing climate conditions, monitoring of baseline conditions for air quality, noise and ambient light. The fieldwork for these studies is planned to occur between June and August.

Water Resources/Geochemistry

To determine baseline data for water resources, monitoring of natural variability in water levels and flows is planned over different seasons, particularly for the Keewatin and Hughes rivers. Surveys include a snow depth survey that will take place in late March 2015 and early 2016, and the deployment of equipment to gather water level and flow information around the Project properties. Water quality aspects are being covered by the aquatic environment studies. To look at baseline groundwater conditions, a drilling and monitoring well installation program will take place in June 2015 and the snow free seasons thereafter. Watershed and groundwater models will also be developed for each mine site to support understanding of changes to the baseline condition with future mine operation for the Feasibility study and regulatory permitting processes. A geochemistry baseline study will also be conducted to classify material exposed by former mine operations (where present) and evaluate material that is expected to be exposed by the Project, determine tonnages of problematic materials, if any, to understand mitigation requirements.

Aquatic Environment

Environmental baseline studies of the aquatic environment includes assessment of water quality, fish habitat, fish populations and fish tissue testing to document existing conditions in water bodies around the Project sites. Benthic invertebrates and sediment testing are also part of the biological monitoring program as invertebrates serve as a biological indicator that reflect the overall condition of the aquatic environment. Aquatic environment surveys will take place in the spring and fall of 2015 and 2016.

Terrestrial Environment

The assessment of environmental baseline conditions for the terrestrial environment includes soils and terrain, vegetation, birds, mammals and amphibians. Rare plant surveys and inventories of botanical species will be conducted during specific flowering periods. Bird, mammal and amphibian surveys will also be conducted at specific times to determine the occurrence, distribution and habitat use of a number of key species considered important to local land users, regulators, the scientific community and the public. Bird surveys are planned for June and fall of 2015 or 2016. Mammals will be surveyed through remote camera traps, winter ground-based truck surveys and aerial ungulate surveys during the early and late winter 2015/2016. Breeding pond amphibian surveys are planned for May 2015 and 2016.

Human and Socio-Economic Environment

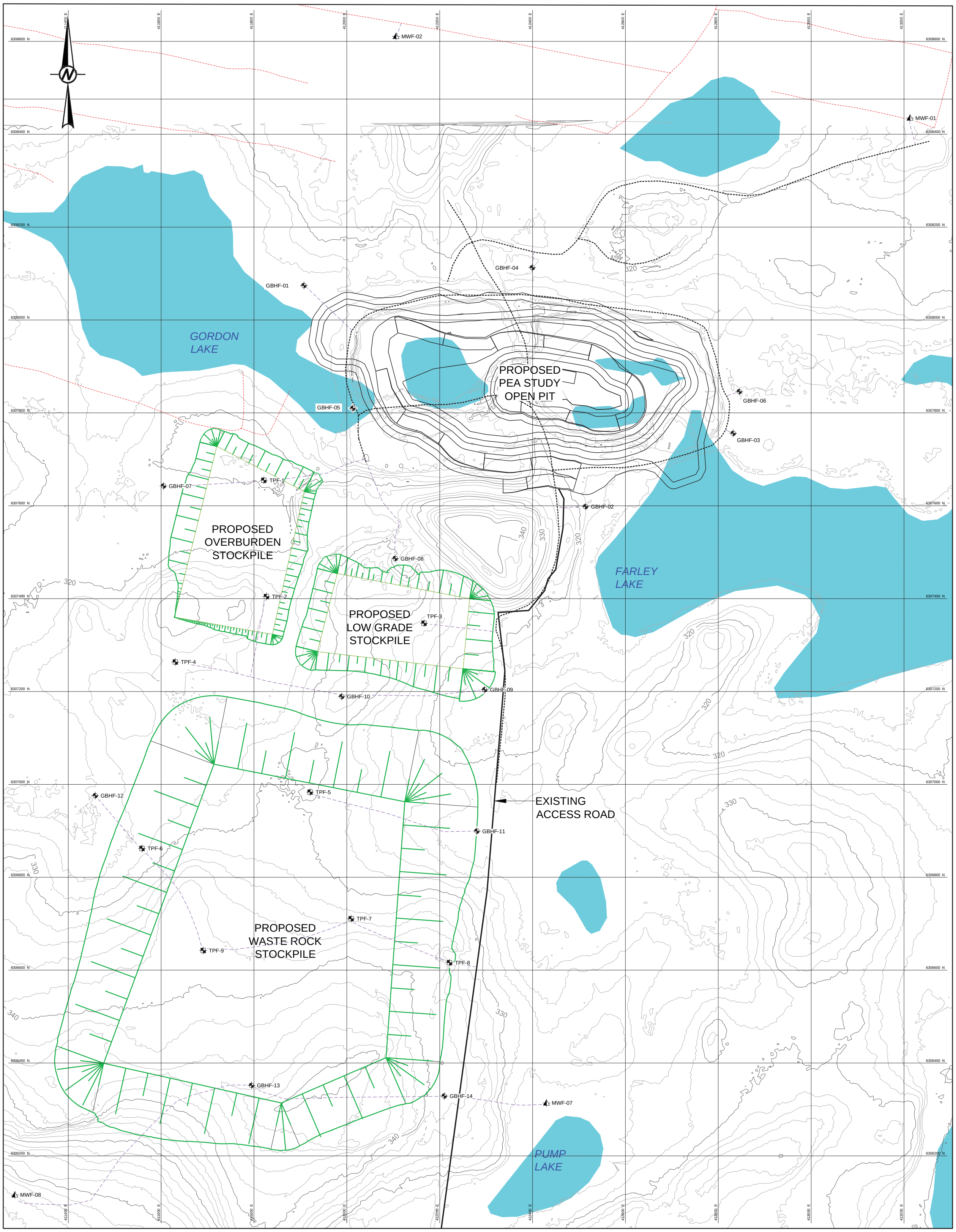
The completion of a Human Health & Ecological Risk Assessment takes into account potential health impacts by examining land use in surrounding areas, consumption of country foods and use of traditional medicines. Sampling of soil, vegetation, soil invertebrates and small mammals are planned in concert with the other baseline studies over the summer of 2015. The Socio-Economic component will consider potential effects of the Project on people in these main areas: economy, employment, business, infrastructure and services. A demographic analysis will assist in forecasting the demand for future infrastructure and services. Heritage resources will be assessed during the summer of 2015 in the Project area with a focus in those areas of moderate to high heritage resource potential and where subsurface disturbance may be proposed by the future Project development. Ongoing consultation is planned to include actively sharing and discussing the environmental baseline program with the all of the Project stakeholders to solicit continued dialogue and feedback on the Project.

Information/Data Management

Geographic Information Systems (GIS) and the products they produce will be an integral part of the Project. The GIS team will support all other disciplines with the production of models, mapping, figures and data management.

How can you get involved?
Please contact LLJVengages@stantec.com

Path: \\golder.gds\gal\Mississauga\SIM\Clients\Aurico\MacLellan_Mine\99_PROJ\1418706_Scoping_Study\40_PROD\0008_Public_Consultation\ | File Name: 1418706-0008-CM-0002A.dwg



0 200 400

1:4,000 METRES

LEGEND

PROPOSED BOREHOLE

PROPOSED TESTPIT

PROPOSED BOREHOLE (BY STANTEC)

PROPOSED OPEN PIT

PROPOSED STOCKPILE LAYOUT

PROPOSED INVESTIGATION ACCESS TRAIL

TOPOGRAPHIC CONTOUR (2m INTERVAL)

WATERBODY

EXISTING ROAD

EXISTING TRAIL

NOTE:

GRID IS REFERENCED TO UTM NAD83 ZONE 14. ELEVATIONS ARE GEODETIC

REFERENCE:

0.5m LIDAR MAPPING PROVIDED BY CLIENT FILENAME Lynn_Lake_East.DXF

MINING CLAIM BOUNDARIES PROVIDED BY CLIENT, FILENAME Farley claims.DXF

MINING LEASE BOUNDARIES PROVIDED BY CLIENT, FILENAME Farley Leases.DXF

STANTEC PROPOSED INVESTIGATION LOCATIONS PROVIDED IN Stantec_Proposed_MW_and_Hydrology_Locations_Farley_20150310.xlsx.

CLIENT
LYNN LAKE JOINT VENTURE

PROJECT
LYNN LAKE PROJECT
LYNN LAKE, MANITOBA

CONSULTANT

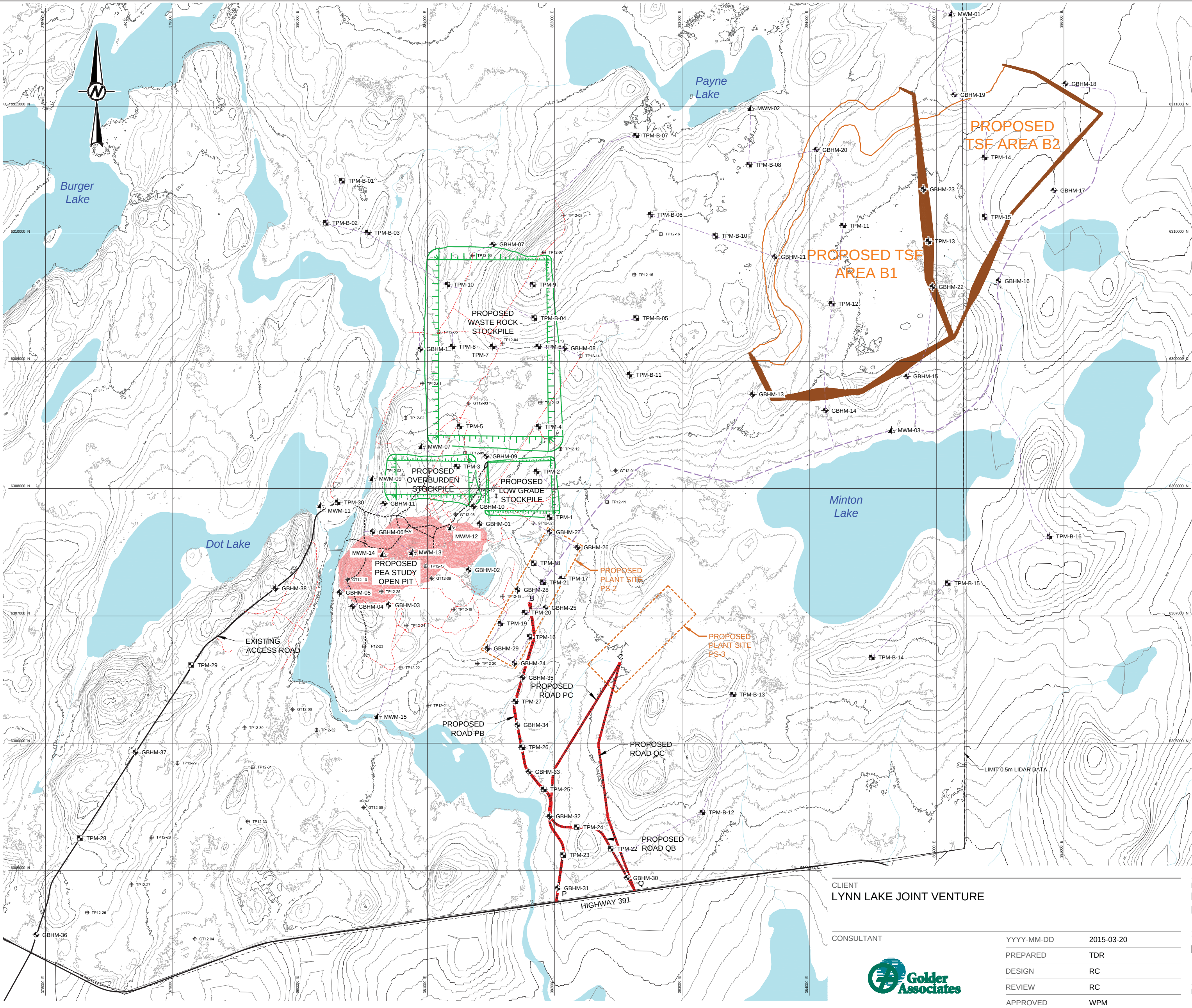
Golder Associates

YYYY-MM-DD	2015-03-19
PREPARED	TDR
DESIGN	RC
REVIEW	RC
APPROVED	WPM

TITLE
PROPOSED GENERAL ARRANGEMENT PLAN
FARLEY LAKE SITE

PROJECT No.	PHASE	Rev.	FIGURE
1418706	1000	A	2A

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



LEGEND

- PROPOSED OPEN PIT
- PROPOSED TAILINGS STORAGE FACILITY OUTLINE
- PROPOSED WASTE ROCK STOCKPILE
- PROPOSED TAILINGS DAM
- PROPOSED PLANT SITE LOCATION
- PROPOSED SITE ACCESS ROAD
- PROPOSED ROAD TO TSF
- PROPOSED INVESTIGATION ACCESS TRAIL
- PROPOSED BOREHOLE
- PROPOSED TESTPIT
- PROPOSED BOREHOLE (BY STANTEC)
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING BOREHOLE
- EXISTING TEST PIT
- TOPOGRAPHIC CONTOUR (2m INTERVAL)
- WATERBODY

NOTE:

GRID IS REFERENCED TO NAD83 ZONE 14. ELEVATIONS ARE GEODETIC.

REFERENCE:

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0.5m LIDAR MAPPING PROVIDED BY CLIENT FILENAME Lynn_Lake_West.DXF

PROPOSED OPEN PIT LAYOUT PROVIDED BY CLIENT FILENAME macauqnoinf1300basecase.DWG

MINING CLAIM BOUNDARIES PROVIDED BY CLIENT, FILENAME MacLellan claims.DXF

MINING LEASE BOUNDARIES PROVIDED BY CLIENT. FILENAME MacLellan leases.DXF.

BOREHOLES AND TEST PIT LOCATIONS LOCATIONS PROVIDED BY CLIENT, FILENAMES Table 1 - 2012 Geotech Drillhole Summary.XLSX AND Table 2 - 2012 Test Pit Summary.XLSX. RESPECTIVELY.

STANTEC PROPOSED INVESTIGATIONS PROVIDED IN Stantec_Proposed_MW_and_Hydrology_Locations_MacLellan_20150310.xlsx.

0 500 1,000
1:15,000 METRES

CLIENT
LYNN LAKE JOINT VENTURE

PROJECT
LYNN LAKE PROJECT
LYNN LAKE, MANITOBA

CONSULTANT

YYYY-MM-DD	2015-03-20
PREPARED	TDR
DESIGN	RC
REVIEW	RC
APPROVED	WPM

TITLE
PROPOSED GENERAL ARRANGEMENT PLAN MACLELLAN SITE

PROJECT No.	PHASE	Rev.	FIGURE
1418706	1000	A	1A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

Path: \\golder.gds\gal\Mississauga\SIM\Clients\Aurico\MacLellan_Mine\99_PROJ\1418706_Scoping_Study\40_PROD\0008_Public_Consultation\ | File Name: 1418706-0008-CM-0001A.dwg

Open House Questionnaire

March 26, 2015

AuRico Gold

What do you think are the most important components to focus on as part of the Environmental Study?

	1 (Not Important)	2	3 (Somewhat Important)	4	5 (Very Important)
Air Quality	○	○	○	○	○
Wildlife and Fish Habitat	○	○	○	○	○
Ground and Surface Water	○	○	○	○	○
Plants	○	○	○	○	○
Traditional Land and Resource Use	○	○	○	○	○
Employment	○	○	○	○	○
Contracts and Business Opportunities	○	○	○	○	○
Training and Job Skills	○	○	○	○	○
Noise (impacts on people, wildlife, etc.)	○	○	○	○	○
Increased Traffic	○	○	○	○	○
Impacts to Land and Resource Use	○	○	○	○	○
Tailings and Waste Rock Management	○	○	○	○	○

Are there any other important components that should be studied as part of the Environmental Assessment?

What was your main reason for attending this Open House?

Please rate how helpful this Open House was to you:

	1 (Not helpful)	2	3 (Somewhat helpful)	4	5 (Very helpful)
Open House	○	○	○	○	○

If you answered "Not helpful" to "Somewhat helpful", how can we do better next time?

Do you have any additional questions, comments or concerns?

Would you like to have someone follow up with you regarding your questions, comments or concerns? If so, please include your contact information below. Providing your contact information also enters you into a door prize draw.

○ Yes

○ No

Name:

Email

Mailing Address

Phone Number

Are you a member of Marcel Colomb First Nation? (optional)

○ Yes

○ No

OPEN HOUSE

WHO:
Alamos Gold Inc. and
Stantec Consulting Ltd.

WHEN:
Tuesday, April 26, 2016 5-7:30 pm
Presentation starting at 5:30 pm

WHAT:
Lynn Lake Gold Project Update

WHERE:
Corner Pocket Hall
467 Sherritt Ave.

WHY:
To share information and solicit feedback/input

If you are unable to attend the Open House but have questions or would like some further information, please contact LLGPengages@stantec.com

Coffee, tea, and light snacks will be served

ALAMOS GOLD INC.

Stantec

Alamos Gold Inc.

Welcome! Thank you for taking the time to attend today's Open House regarding the Lynn Lake Gold Project. We are interested in discussing the Project, answering questions and making note of any comments you wish to provide.

PUBLIC CONSULTATION • APRIL 2016

Who is Alamos Gold Inc?

Alamos is a Canadian-based intermediate gold producer with diversified production from three operating mines in North America, including the Young-Davidson Mine in northern Ontario, Canada, and the Mulatos and El Chanate Mines in Sonora, Mexico. In July 2015, AuRico Gold and Alamos Gold merged companies and then in January 2016, Alamos consolidated full ownership of the Lynn Lake Gold Project (formerly a joint venture) through its acquisition of Carlisle Goldfields.

What is involved?

The project will involve the redevelopment of the MacLellan and Farley Lake properties as open pit mines. The current plan is to develop all mine infrastructure at MacLellan, including a central processing plant, associated infrastructure, waste rock and low grade ore stockpiles, and a tailings management facility. Infrastructure at the Farley Lake property will be limited to the open pit(s), waste rock and low grade ore stockpiles, and minor supporting infrastructure for equipment storage and maintenance.

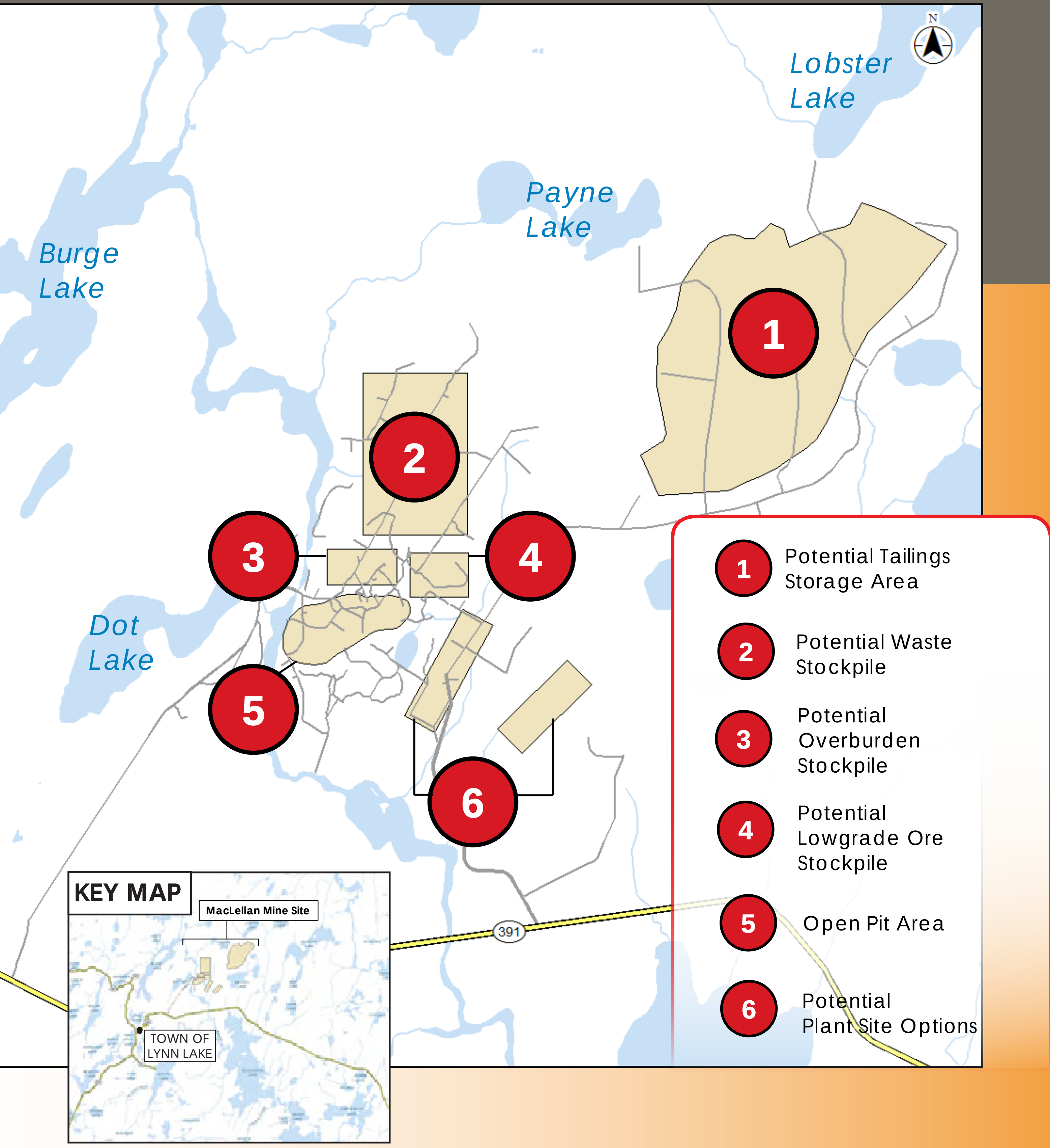
The first stage of the Project is to collect sufficient data to complete a Feasibility Study that will evaluate whether or not the Project is viable from a technical, environmental, social and financial perspective. Following which, the Project will undergo the applicable Provincial and Federal permit reviews.

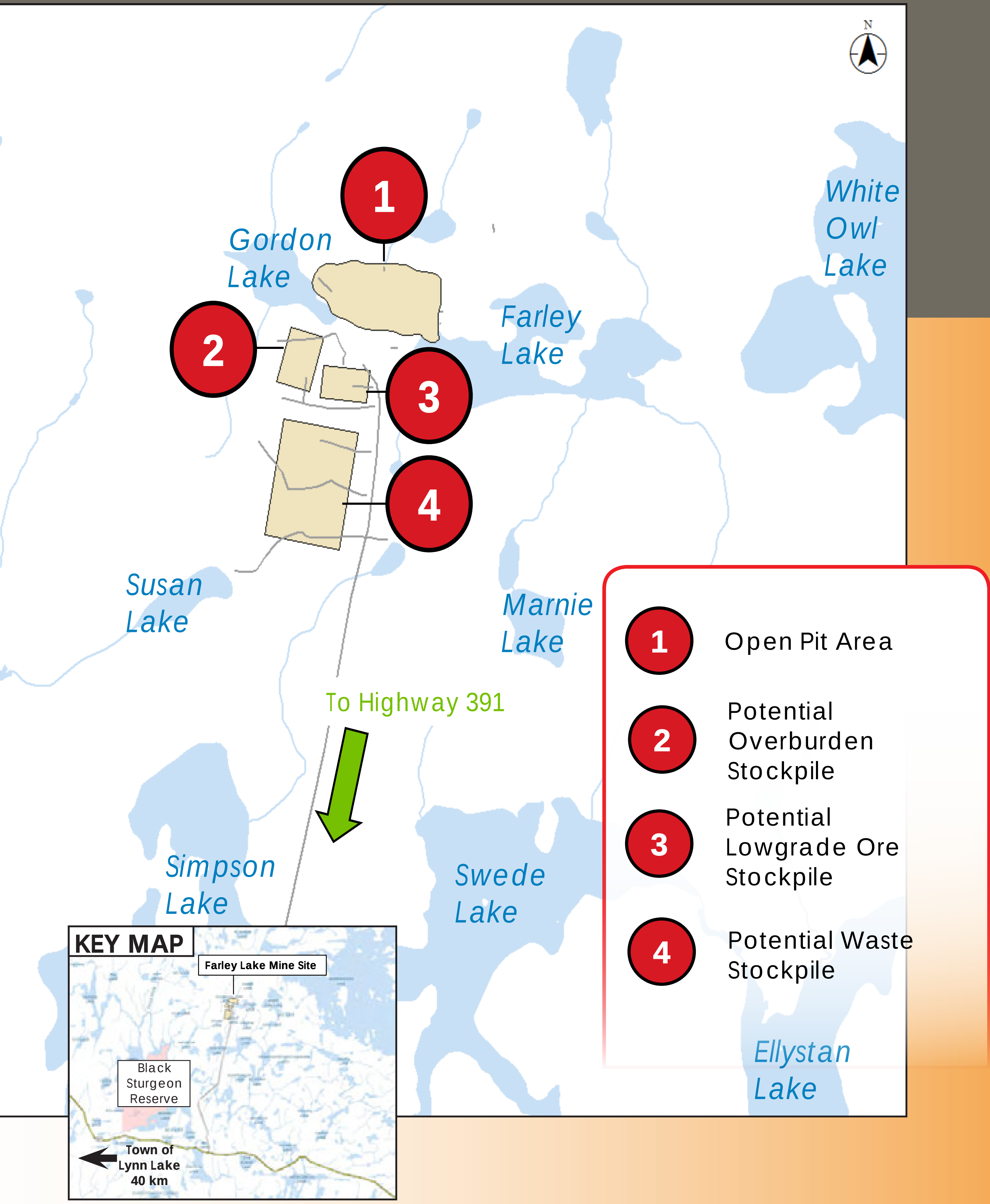
Pre-feasibility studies for the Project have been ongoing. A full Feasibility Study is planned for completion by spring 2017. Stantec has been retained to complete the environmental baseline studies (2015-2016) while Golder has been working on studies for siting the potential mine infrastructure.

The purpose of this project is to:

Redevelop the MacLellan and Farley Lake Gold Mines

Stantec


N
Lobster Lake
Payne Lake
Burge Lake
Dot Lake
1
2
3
4
5
6
391
KEY MAP
MacLellan Mine Site
TOWN OF LYNN LAKE
1 Potential Tailings Storage Area
2 Potential Waste Stockpile
3 Potential Overburden Stockpile
4 Potential Lowgrade Ore Stockpile
5 Open Pit Area
6 Potential Plant Site Options


N
1
2
3
4
Gordon Lake
Farley Lake
White Owl Lake
Susan Lake
Marnie Lake
To Highway 391
Simpson Lake
Swede Lake
Ellystan Lake
KEY MAP
Farley Lake Mine Site
Black Sturgeon Reserve
Town of Lynn Lake 40 km
1 Open Pit Area
2 Potential Overburden Stockpile
3 Potential Lowgrade Ore Stockpile
4 Potential Waste Stockpile

Lynn Lake Gold Project Environmental Baseline Study Topics

Atmospheric Environment	Water Resources/ Geochemistry	Aquatic Environment	Terrestrial Environment	Human and Socio-Economic Environment	Information/Data Management
Climate/ Meteorology	Surface Water Hydrology	Fish/ Fish Habitat	Terrain and Soils	Socio-Economics	GIS/ Mapping
Air Quality	Groundwater Hydrogeology	Tissue Analysis	Vegetation and Wetlands	Human Health and Ecological Risk Assessment	Remote Sensing
Noise	Water Resources Modeling	Benthic Invertebrates and Sediment	Birds	Archaeology/ Heritage	
Light	Geochemistry	Water Quality	Mammals	Stakeholder Consultation	
			Amphibians	Traditional Knowledge/ Traditional Land & Resource Use	

Both properties were previously mined with varying degrees of rehabilitation and closure. Some historical facilities still remain at the MacLellan site. The baseline studies started in 2015 are considering both the natural environmental setting and the historic activities. The historic activities in particular provide field-scale data on potential effects that could result from future mining activities, even though mining operations today are very different than they once were.

Terrestrial Environment

Objective: To characterize the terrestrial environment around the Project sites by looking at:

- Soils and terrain through surveys and mapping.
- Vegetation and wetlands through rare plant surveys and vegetation community and habitat characterization.
- Amphibian populations with breeding surveys (including species at risk) and wetland water quality characterization.
- Bird populations and assemblages through breeding, waterbird and raptor nest surveys (including species at risk).
- Mammal species and populations in the area (including listed and at risk species) with winter tracking, aerial surveys, trail cameras and bat investigations.

Aquatic Environment

Objective: To understand and characterize the aquatic environment around the Project sites by looking at:

- Critical habitats used by fish for spawning, rearing, and overwintering.
- The distribution, relative abundance and density of fish in area lakes and streams.
- Current concentrations of metals in the water, sediments, and fish tissues from the natural environment and/or past area mining activities.
- The aquatic food web linking algae, invertebrates, and plankton communities to fish valued by people
- Habitat that may be temporarily or permanently altered by the proposed Project.

Water Resources/Geochemistry

Objectives: To understand the flow of water on the surface and in the ground in the local environment and understand how water quality may change as it interacts with the geology.

Water Resources/ Geochemistry (con't)

Surface Water:

- Monitor field gauges set up to measure flow at different sites in the study area.
- Field Data collection to create a surface water model to simulate current and future surface water flows.

Groundwater

- Drilling and monitoring well installations to understand the geology and groundwater in the study area.
- Water level and water quality monitoring to create a groundwater model to simulate current and future groundwater flow.

Geochemistry

- Understand the chemical nature of the rocks in the area and use field and laboratory testing to assess chemical leaching from the rocks.

GIS/Information Management

Geographic Information Systems (GIS) and the products they produce will be an integral part of the Project. The GIS team supports all other disciplines with the production of models, mapping, figures and data management.

Atmospheric Environment

Objective: To understand and characterize the atmospheric environment around the Project sites by looking at existing climate conditions and baseline air quality, noise and ambient light.

How can you get involved ?

Please contact:
LLGPengages@stantec.com

Alamos Gold Inc.

Traditional Knowledge/ Traditional Land and Resource Use

Objective: Gather information willing to be shared by First Nation participants to inform the future Environmental Assessment regarding:

- Current and future land and resource use.
- Traditional knowledge including ecological observations.
- Recommended mitigations.

Human and Socio-Economic Environment

Objective: To understand the human and socio-economic environment and setting for the proposed Project, which will allow the potential effects of the Project on people in these main areas to be characterized: health, economy, employment, business, infrastructure and services. Demographic analysis will also help forecast future demand for infrastructure and services.

The Heritage Resources assessment completed in 2015 as part of the Human and Socio-Economic Environment concluded a low potential for heritage resources in the proposed component development areas at both Project sites.

What's happening in Lynn Lake in 2016?

Many environmental baseline studies were completed in 2015. 2016 activities are focused on augmenting the 2015 findings and/or gathering additional information to support the future Project environmental assessment and permitting reviews.

Atmospheric Environment
Due to forest fire bias in 2015, the ambient air quality monitoring program is being continued. The fieldwork will occur between June and October.

Terrestrial Environment
A second year of amphibian, bird and mammal surveys will be completed in the area of the Project sites. The fieldwork will occur between May and December.

Aquatic Environment
There will be continued monthly water quality sampling, a spring survey to document spawning runs of large-bodied fish species (e.g., pike, white sucker, walleye); a summer survey to sample algae, plankton, and fish communities; and a fall survey to sample benthic invertebrates and sediments - all within lakes and streams upstream and downstream of the Project sites. The fieldwork has been ongoing periodically since January and will continue through to December.

Water Resources/Geochemistry Environment
A second year of surface water, groundwater and geochemistry studies will be completed to continue to understand natural variability in water quality, levels and flows. The fieldwork started in April and will continue through October.

Human and Socio-Economic Environment
Baseline sampling of plants, soil, soil organisms and small mammals will be undertaken. The work will be conducted in conjunction with other baseline sampling programs and the Traditional Knowledge/Traditional Land and Resource Use Study. The majority of the work will be conducted between July and September. The baseline sampling programs will provide the information necessary to complete the human health and ecological risk assessment component of the Environmental Assessment submission for the Project.

Traditional Knowledge/Traditional Land and Resource Use
The Lynn Lake Gold Project will be engaging with Marcel Colomb First Nation regarding Traditional Knowledge and Traditional Land and Resource Use including Elder and harvester interviews and map biographies. This work may result in additional follow-up Heritage and Archaeology work as well. The timing for this work is still being established.

Alamos Gold Inc.

QUESTIONNAIRE – APRIL 26, 2016 – Lynn Lake Open House #2

How did you hear about this Open House ?

What was your main reason for attending tonight ?

Considering the information you have been provided with this evening, what do you feel are the most important environmental aspects being studied?

	1 (Not Important)	2	3 (Somewhat Important)	4	5 (Very Important)
Air Quality					
Wildlife and Fish Habitat					
Surface and Groundwater					
Plants					
Traditional Land and Resource Use					
Employment					
Contracts and Business Opportunities					
Training and Job Skills					
Noise (impacts on people, wildlife, etc.)					
Increased Traffic					
Impacts to Land and Resource Use					
Tailings and Waste Rock Management					

Are there any other important environmental or other components that should be studied?

Did you attend the first Open House in 2015?

Yes

No

If yes, did you prefer the format of the first Open House (informal drop in style) or this one (formal presentation style)?

First Open House

Second Open House

Please rate how helpful this Open House was to you :

	1 (Not Important)	2	3 (Somewhat Important)	4	5 (Very Important)
Open House					

If you answered “somewhat helpful” or “not helpful”, how can we do better next time?

Do you have any additional questions, comments or concerns?

Would you like to have someone follow up with you regarding your questions, comments or concerns? If so, please include your contact information below. **Providing your contact information also enters you into a draw for a door prize.**

Yes

No

Name:

Email:

Mailing Address and Phone Number:

Are you a member of Marcel Colomb First Nation? (optional)

Yes No

ALAMOS GOLD INC.

Stantec

OPEN HOUSE

WHO:
Alamos Gold Inc. and
Stantec Consulting Ltd.

WHEN:
Monday, May 1, 2017 5-7:30 pm
Presentation starting at 5:30 pm

WHAT:
Lynn Lake Gold Project Update

WHERE:
Corner Pocket Hall
467 Sherritt Ave.

WHY:
To share information and solicit feedback/input

If you are unable to attend the Open House but have questions or would like some further information, please contact LLGPengages@stantec.com

Coffee, tea, and light snacks will be served

ALAMOS GOLD INC.

Stantec

Alamos Gold Inc.

Welcome! Thank you for taking the time to attend today's Open House regarding the Lynn Lake Gold Project. We are interested in discussing the Project, answering questions and making note of any comments you wish to provide.

PUBLIC CONSULTATION • MAY 2017

Who is Alamos Gold Inc?

Alamos is a Canadian-based intermediate gold producer with diversified production from three operating mines in North America, including the Young-Davidson Mine in northern Ontario, Canada, and the Mulatos and El Chanate Mines in Sonora, Mexico. Alamos Gold consolidated full ownership of the Lynn Lake Gold Project (which was formerly a joint venture) in January 2016.

What is involved?

The project will involve the redevelopment of the MacLellan and Gordon (formerly called 'Farley Lake') properties as open pit mines. The current plan is to develop mine infrastructure at MacLellan that includes a central processing plant, associated infrastructure, mine rock and low grade ore stockpiles, and a tailings management facility. Infrastructure at the Gordon property will be limited to an open pit, mine rock and low grade ore stockpiles, and minor supporting infrastructure for equipment storage and maintenance.

The first stage of the Project has involved collecting sufficient data to complete a Feasibility Study that will evaluate whether or not the Project is viable from a technical, environmental, social and financial perspective. This study is nearing conclusion (Fall 2017). Assuming the Project is found to be feasible, it will then undergo applicable Provincial and Federal permit reviews.

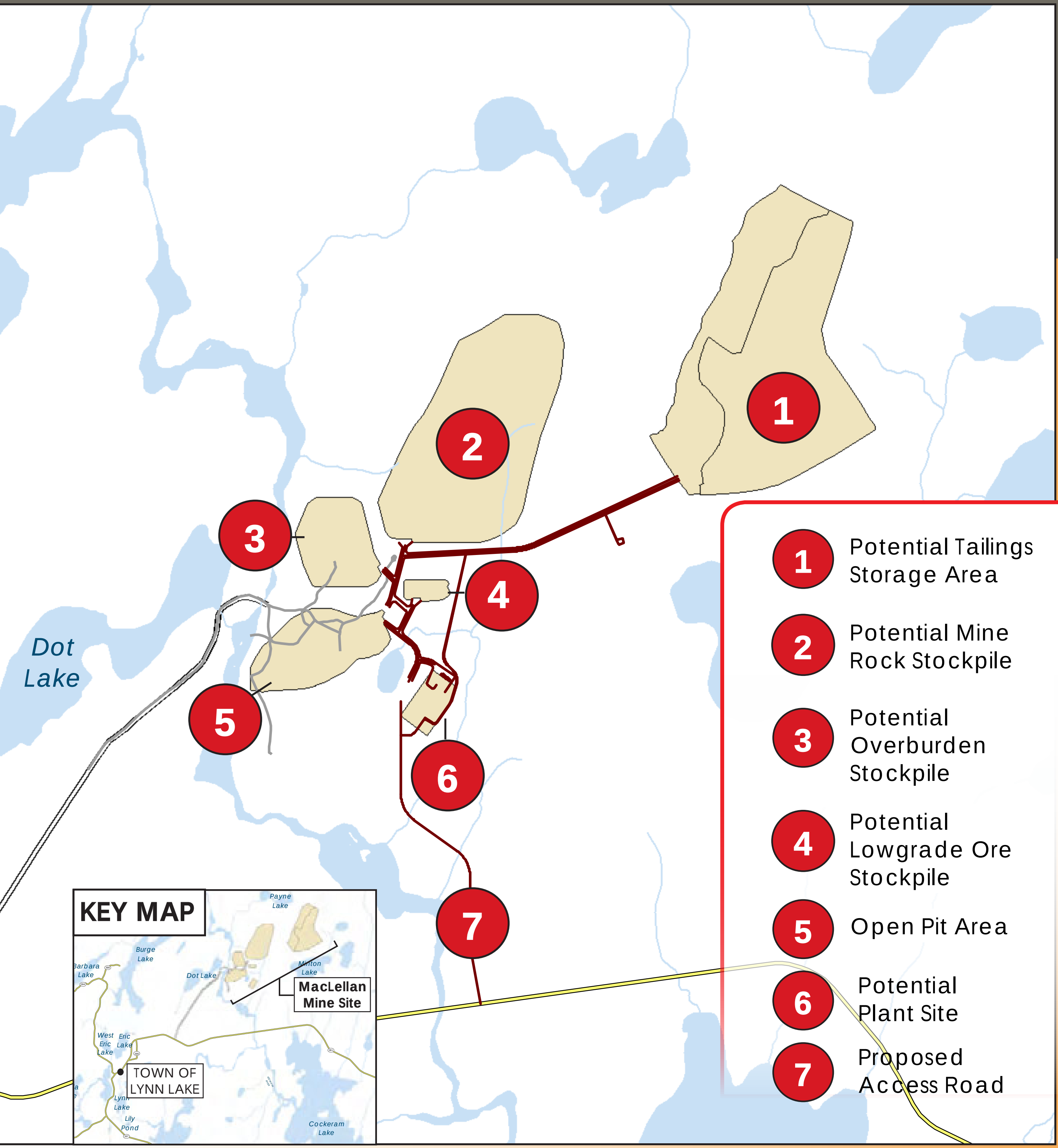
Stantec was retained to complete environmental baseline studies (2015-2016) and is now starting to assess the potential environmental effects of the Project. Golder has been working on geotechnical studies and supporting the siting of the potential mine infrastructure.

The purpose of this Project is to:

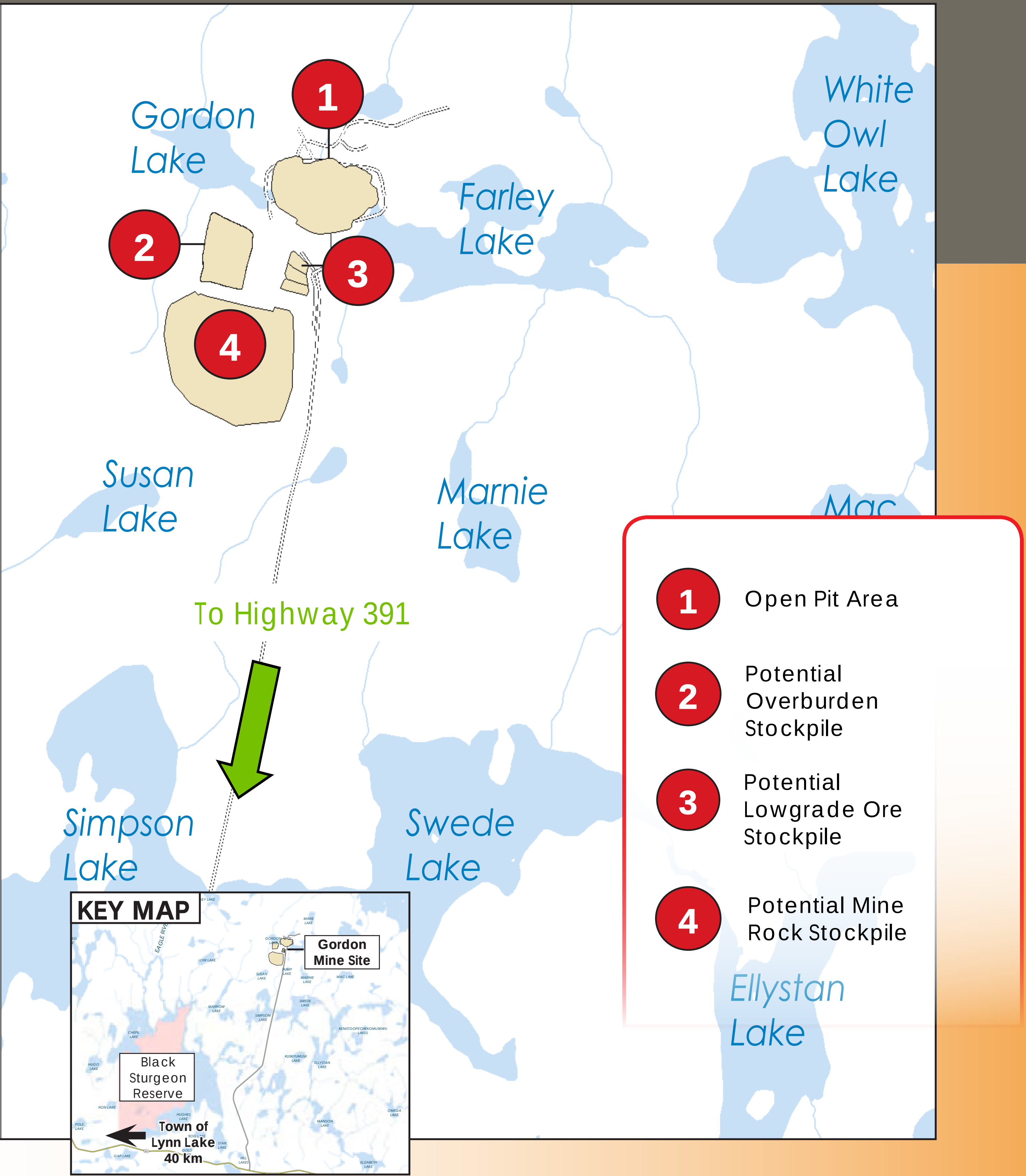
Redevelop the MacLellan and Gordon (formerly 'Farley Lake') Gold Mines

Stantec

PROPOSED GENERAL ARRANGEMENT PLAN- MACLELLAN SITE



PROPOSED GENERAL ARRANGEMENT PLAN- GORDON SITE



Lynn Lake Gold Project
Environmental Baseline Study Topics

Atmospheric Environment	Water Resources/ Geochemistry	Aquatic Environment	Terrestrial Environment	Human and Socio-Economic Environment
Climate/ Meteorology	Surface Water Hydrology	Fish/ Fish Habitat	Terrain and Soils	Socio-Economics
Air Quality	Groundwater Hydrogeology	Tissue Analysis	Vegetation and Wetlands	Human Health and Ecological Risk Assessment
Noise	Water Resources Modeling	Benthic Invertebrates and Sediment	Birds	Archaeology/ Heritage
Light	Geochemistry	Water Quality	Mammals	Stakeholder Consultation
			Amphibians	Traditional Knowledge/ Traditional Land & Resource Use

GIS / Information Management / Remote Sensing

Both properties were previously mined with varying degrees of rehabilitation and closure. Some historical facilities still remain at the MacLellan site. The baseline studies completed have considered both the natural environmental setting and the historical activities. The historical activities in particular provide field-scale data on potential effects that could result from future mining activities, even though mining operations today are very different than they once were.

Terrestrial Environment

Objective: To characterize the terrestrial environment around the Project sites.

The Terrestrial Environment baseline work did not identify any unique or important/sensitive wildlife habitat or features within the area that will be disturbed by the proposed Project development and operation.

Wildlife inhabiting the area include moose, gray wolf, American marten, mallard, bald eagle, ruby-crowned kinglet, and boreal chorus frog. Eight species at risk were observed within the larger regional study area around the Project. Potential Project effects to wildlife and the overall Terrestrial Environment will be a focus of the Environmental Assessment.

Aquatic Environment

Objective: To understand and characterize the aquatic environment around the Project sites.

The Aquatic Environment baseline work did not identify any unique aquatic habitats that will be altered or destroyed by the proposed Project development and operation. A total of 17 fish species were captured or observed during the two years of baseline field work; none of these species are listed as endangered or threatened by the Manitoba Conservation Data Centre. Potential Project effects on fish and fish habitat due to alteration of lake and stream habitats, changes to stream flows and lake levels, and changes to water quality will be the focus of the Environmental Assessment.

Water Resources/ Geochemistry

Objectives: To understand the flow of water on the surface and in the ground in the local environment and understand how water quality may change as it interacts with the geology.

The Water Resources and Geochemistry Environment baseline work has characterized the existing environment surface water, groundwater, and geochemistry, including lake levels, stream flow, and water quality. Potential Project effects to the supply and quality of surface water and groundwater will be a focus of the Environmental Assessment and models are being developed to support the assessment.

Traditional Knowledge/ Traditional Land and Resource Use

Objective: Gather information willing to be shared by Indigenous people to inform the future Environmental Assessment regarding:

- Current and future land and resource use.
- Traditional knowledge including ecological observations.
- Recommended mitigations.

Human and Socio-Economic Environment

Objective: To understand the human and socio-economic environment and setting for the proposed Project which will allow the potential effects of the Project on people in these main areas to be characterized: health, economy, employment, infrastructure and services. Demographic analysis will also help forecast future demand for infrastructure and services.

The Heritage Resources assessment concluded a low potential for heritage resources in the proposed Project Development Areas.

GIS/Information Management

Geographic Information Systems (GIS) and the products they produce are an integral part of the Project. The GIS team supports all other disciplines with the production of models, mapping, figures and data management.

Atmospheric Environment

Objective: To understand and characterize the atmospheric environment around the Project sites.

The Atmospheric Environment baseline work (air quality, noise and light) has characterized the existing environment as typical for the location (northern small community environment). Existing environment particulate matter concentrations are below ambient air quality guidelines except during forest fires. Potential Project effects to the Atmospheric Environment will be a focus of the Environmental Assessment.

How can you get involved ?

Please contact:
LLGPengages@stantec.com

Alamos Gold Inc.

Project Description

There are several Federal and provincial regulatory requirements that may apply to the Project, including environmental assessment and other environmental permitting obligations. A Project Description has been developed that will be submitted soon to both the Province (Environmental Approvals Branch, Department of Sustainable Development) and Federal (Canadian Environmental Assessment Agency) governments. This submission outlines the details of the proposed Project development (construction and operation) so that the two government agencies can identify the need and/or content required for the Environmental Assessment.

The objective of the Project is to produce gold (doré bullion) for sale. The current estimates are for a total Project mine excavation of 220 Megatonnes with a maximum 8,000 tonnes per day design processing rate and an estimated 12-year Project mine life. The total mineralized material to be mined from the open pits at both sites is estimated to be approximately 26 Megatonnes (17.5 Megatonnes from MacLellan and 8.5 Megatonnes from Gordon), with an average recoverable grade of 1.75 grams per tonne gold and 1.52 grams per tonne silver, resulting in the production of 1,465,000 ounces of gold and 1,267,000 ounces of silver.

Based upon the current site layouts, the proposed Project infrastructure at the MacLellan and Gordon sites will be entirely located within the boundaries of existing mining claims and leasehold lands. The proposed mine operation at both sites is a conventional open pit, with shovel and truck removal of the mine rock and ore produced during blasting. The anticipated depth of the Gordon open pit is approximately 190 m. The anticipated depth of the MacLellan open pit is approximately 356 m. The open pits at both sites will be developed in a series of benches with drilling and blasting completed on each bench.

Project mine operations are currently expected to commence at the Gordon site, which will provide mill feed for the first five years of Project operations. Mine operations at the Gordon site are planned to cease after year 5. Mining operations after year 5 will take place exclusively at the MacLellan site. Low-grade ore stockpiled at the Gordon site will be used as feedstock for the ore milling and processing plant at the MacLellan site when the MacLellan site ore production is less than the plant capacity.

For the Gordon site, a potable water treatment plant will be located at the MacLellan Site. The source of fresh water will be the Keewatin River, located to the west of the MacLellan site. Potable water will be trucked from the water treatment plant at MacLellan to a central storage facility that will be set up on the Gordon site. Power for the Gordon site will be supplied via on-site diesel generators. Power for the MacLellan site will be supplied by Manitoba Hydro. The upgraded power supply at MacLellan is expected to be owned, operated, and under the care and control of Manitoba Hydro and is therefore excluded from the scope of the Project assessment.

The main access to the Gordon site will be via the existing, all-weather Provincial Road 391. The existing MacLellan site access road will be retained for service and construction vehicle access. A new 2.6-km site access road is proposed to be constructed from Provincial Road 391 to the MacLellan ore milling and processing plant to the east of the existing access road.

All mine rock stockpiles and the tailings management facility are being engineered to reduce potential effects on the environment. Runoff collection ditches will be constructed around the perimeter of the stockpiles. Collected mine-rock contact water will be pumped to a site water management facility for management and/or treatment (if required) prior to discharge. Discharges will meet regulatory requirements.

Environmental Assessment

Stantec is just starting the Environmental Assessment and is reviewing the potential effect of the Project on the existing environment based on the information gathered during the last two years of environmental baseline studies. The environmental assessment will focus on the assessment of potential adverse environmental effects of the Project on certain “Valued Components”. Valued Components include ecological, social, and economic systems that comprise the environment and are environmental attributes associated with the Project that are of special value or interest to Indigenous peoples, regulatory agencies, the Proponent, resource managers, scientists, key stakeholders, and/or the general public.

At this time, the Valued Components proposed to be focused on in the Environmental Assessment include:

- Atmospheric Environment
- Surface Water
- Groundwater
- Wildlife and Wildlife Habitat
- Fish and Fish Habitat
- Vegetation and Wetlands
- Labour and Economy
- Community Services and Infrastructure
- Land and Resource Use
- Heritage Resources
- Traditional Land and Resource Use
- Human Health

It is expected that the Environmental Assessment will be completed in early 2018. Before its submission, Alamos Gold and Stantec will return to Lynn Lake and present the assessment findings to the community.

Lynn Lake Gold Project
Open House Questionnaire

May 1, 2017

How did you hear about this Open House?

What was your main reason for attending tonight?

Considering the information you have been provided with this evening, what do you feel are the most important environmental aspects being studied? (Please rank from Not Important to Very Important)

	1-Not Important	2	3-Somewhat Important	4	5-Very Important
Wildlife and Fish Habitat					
Surface and Groundwater					
Plants and Country Foods					
Land and Resource Use					
Traditional Land and Resource Use					
Community Health and Wellbeing					
Employment					
Contracts and Business Opportunities					
Training and Job Skills					
Air Quality (impacts on people, wildlife, etc.)					
Noise (impacts on people, wildlife, etc.)					
Increased Traffic					
Tailings and Waste Rock Management					
Other: ________________________					

Of the items listed above, what three environmental aspects are most important to you, in order of importance (1 - most important to 3 - third most important)?

1: ____

2: ____

3: ____

Please select all that apply:

I live in the Lynn Lake area

I own property near the Project

I conduct the following activities in the Project area:

	Check all that Apply	Where?
Hunting		
Gathering		
Fishing		
Trapping		
Snowmobiling		
Boating		
Other: ________________		
Other: ________________		

Do you identify as Indigenous or Métis (optional)?

Yes

No

If so, what Community or Nation do you identify with (optional)?

Did you attend prior Open Houses held in Lynn Lake for this Project?

☐ Yes - Please circle any/all that apply: 2015 Open House 2016 Open House

☐ No

Please rate how helpful this Open House was to you: (Please rank from not helpful to very helpful)

1-Not Helpful	2-Somewhat helpful	3-Neutral	4-Helpful	5 - Very Helpful

If you answered "somewhat helpful" or "not helpful", how can we do better next time?

Do you have any additional questions, comments, or concerns?

Would you like to have someone follow up with you regarding your questions, comments or concerns? If so, please include your contact information below.

Yes, please contact me.

No, I do not wish to be contacted.

Name:

Email:

Mailing Address:

Phone Number:

Thank you for taking the time to attend tonight's Open House and to fill out this survey!

Lynn Lake Gold Project

Gordon and MacLellan Sites

Lynn Lake, Manitoba

Our (Alamos) History

February 2003:
Alamos Gold formed through amalgamation of Alamos Minerals and National Gold

April 2006:
Commercial production commenced at Mulatos Mine

January 2010:
Alamos completed acquisition of Ağı Dağı and Kirazlı gold projects in Turkey

August 2013:
Acquired Esperanza Resources and its flagship Esperanza gold project located in Mexico

September 2013:
Acquired Orsa Ventures and its interest in the Quartz Mountain Property in Oregon

July 2015:
Aurico Gold and Alamos Gold merged. Alamos Gold acquired the Young-Davidson mine and 25% ownership of Lynn Lake Project through merger

January 2016:
Announced Closing of Carlisle Goldfields Acquisition, consolidating Lynn Lake ownership

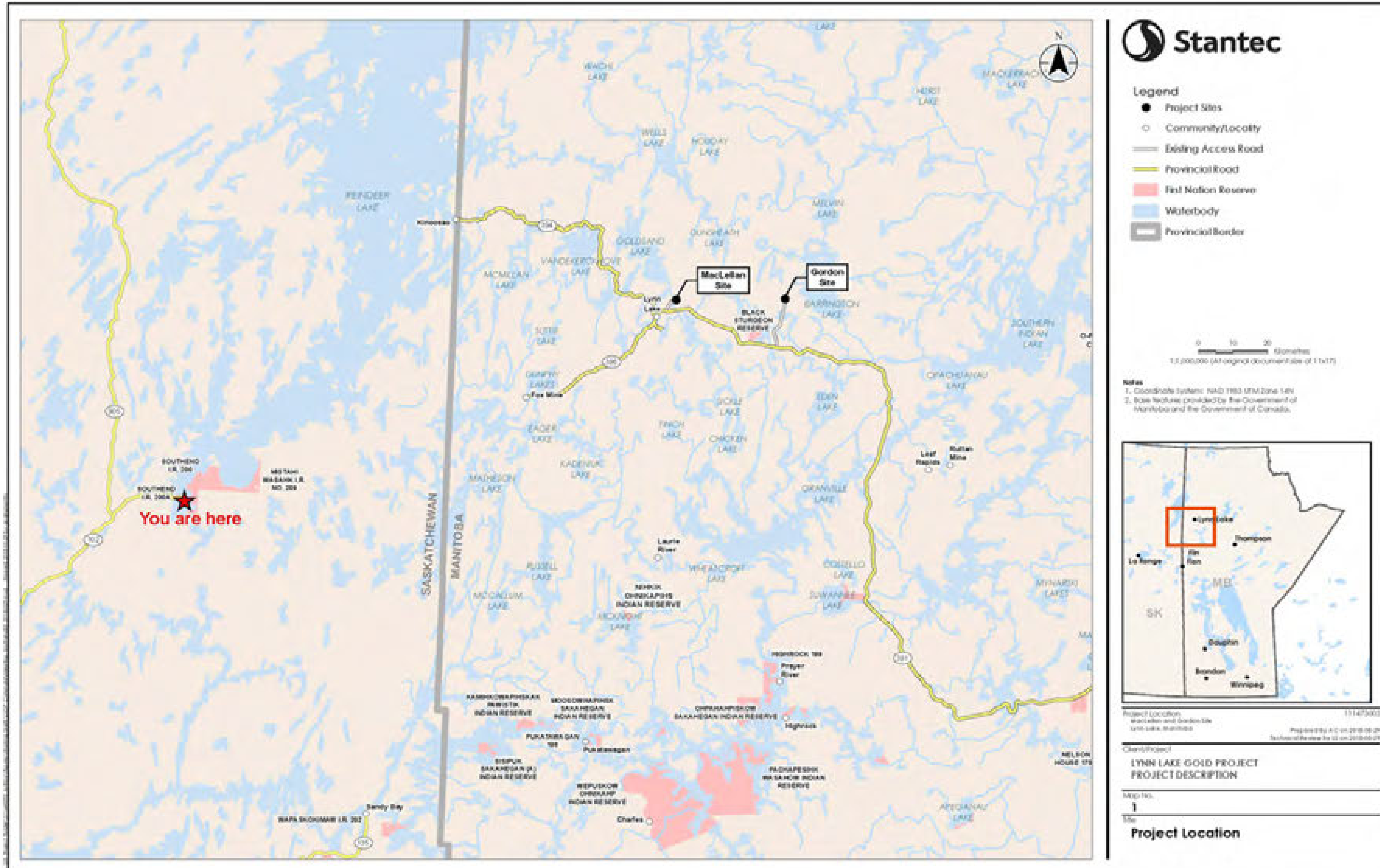
The Project

- Redeveloping historical MacLellan and Gordon (formerly 'Farley Lake') site gold mines as open pit developments
- **MacLellan Site:**
  - Open pit
  - Central ore milling and processing plant
  - Mine rock and low-grade ore storage and tailings management facility
  - Associated infrastructure
- **Gordon Site:**
  - Open pit
  - Mine rock and low-grade ore storage
  - Minor ancillary buildings

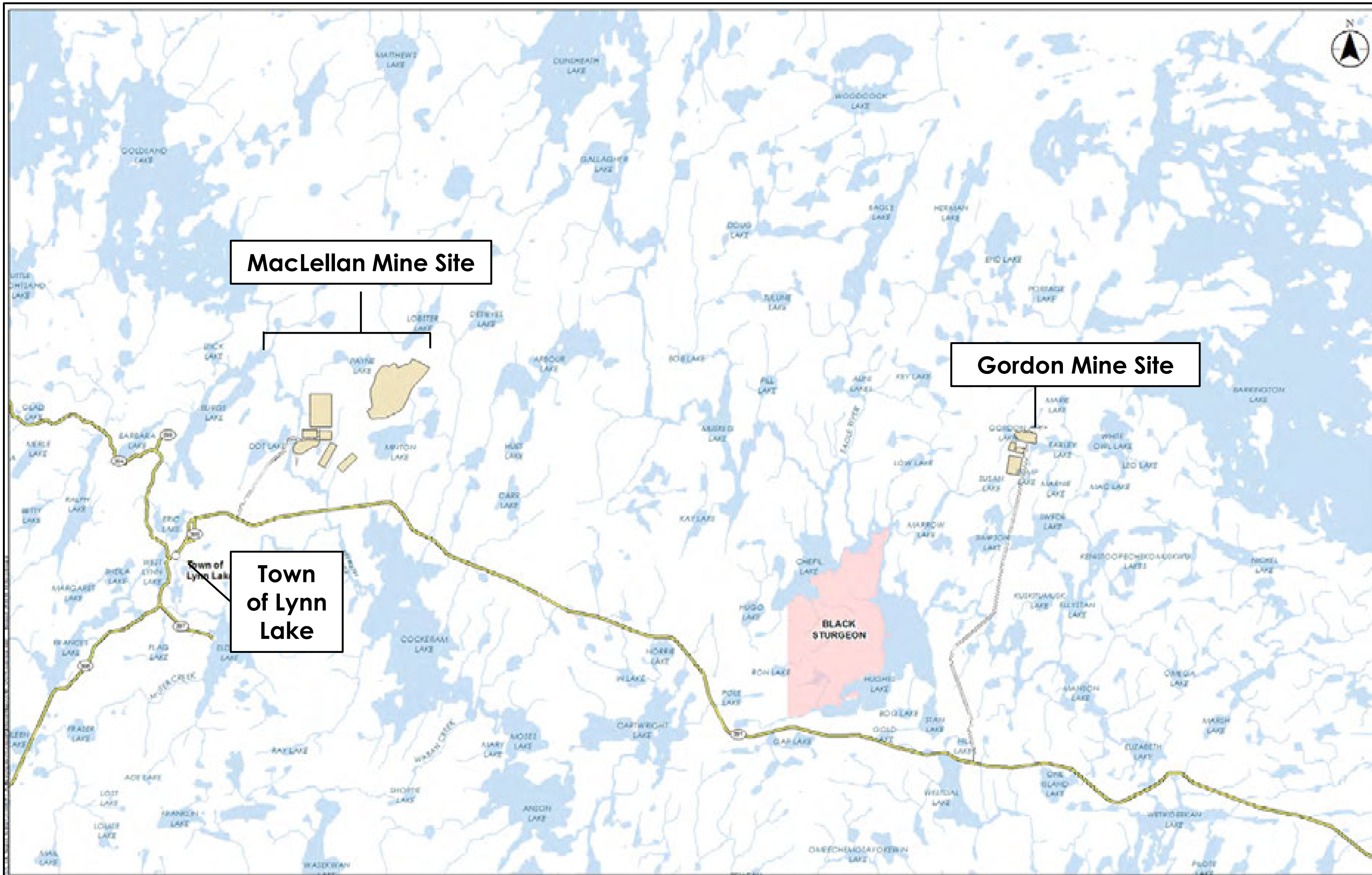
ALAMOS GOLD INC.

Stantec

Project Location



Project Location

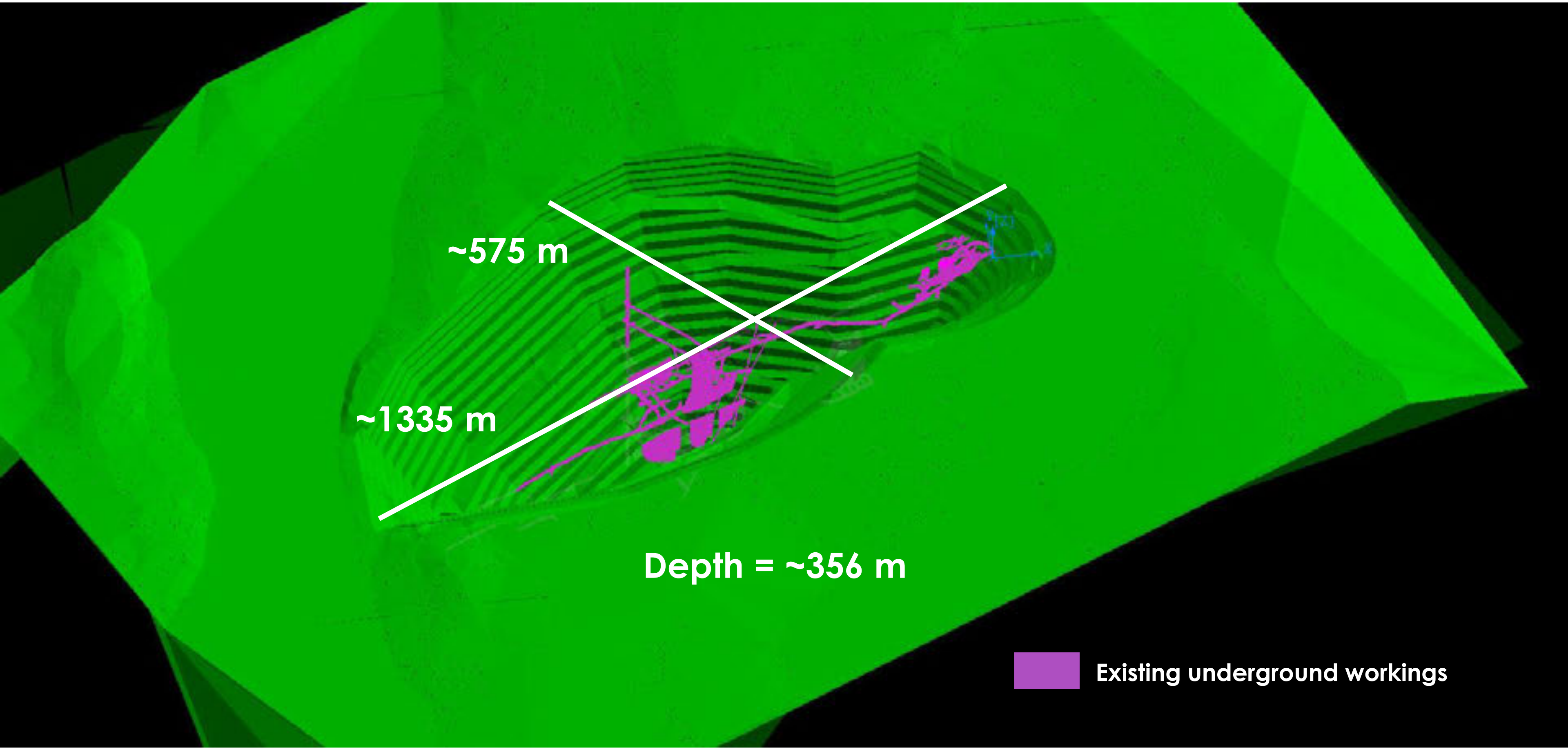



Southeast
MacLellan Existing Site Conditions


North
05/27/2015 08:58
Gordon Existing Site Conditions

MacLellan Open Pit Design

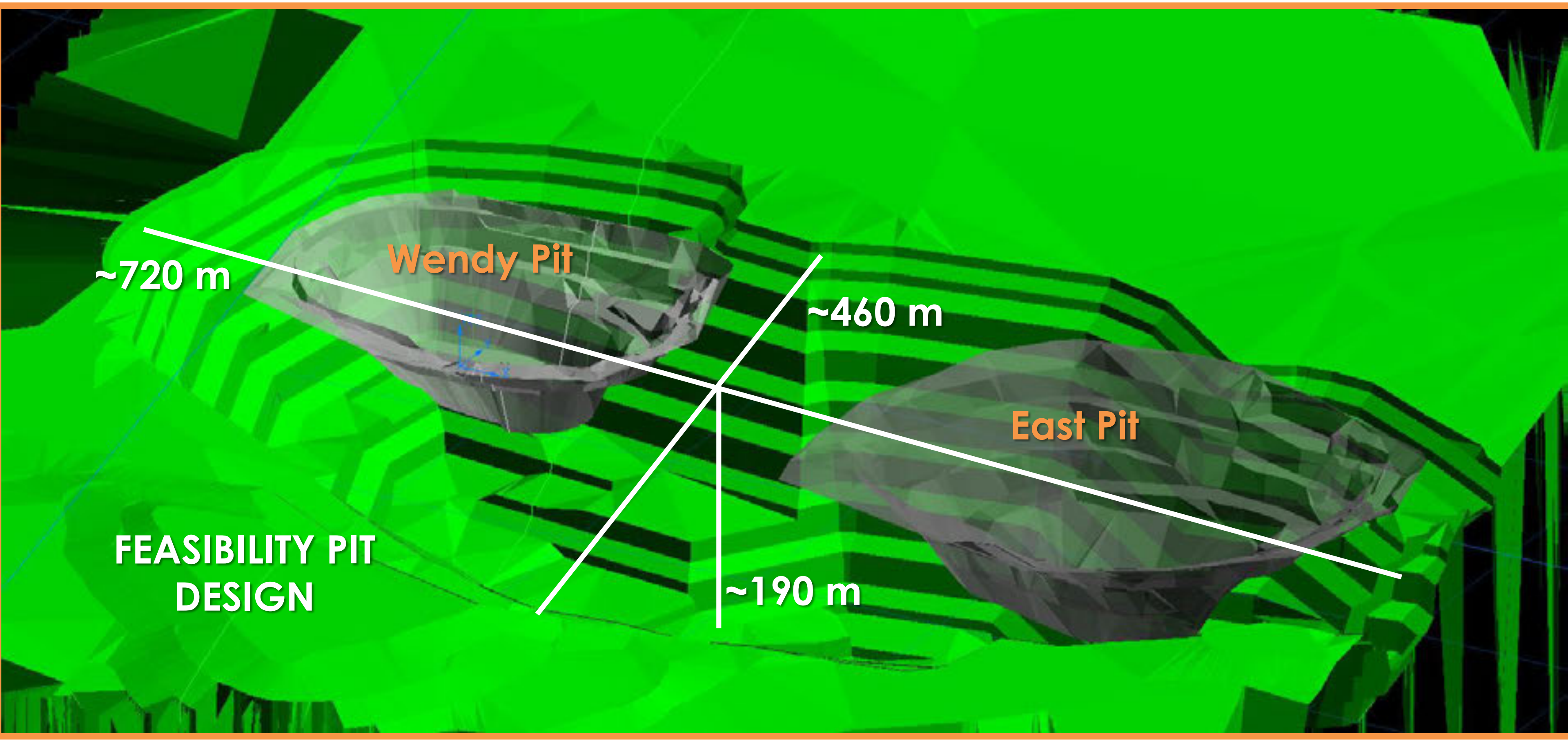
2016 Feasibility Study Pit vs. Existing Underground Workings



ALAMOS GOLD INC.

Stantec

Gordon Open Pit Design



New Open Pit: ~**460** x ~**720 m** wide, ~**190 m** deep

vs.

Wendy Open Pit **190** x **230 m** wide, **60 m** deep

East Open Pit **260 x 270 m** wide, **73 m** deep

ALAMOS GOLD INC.

Stantec

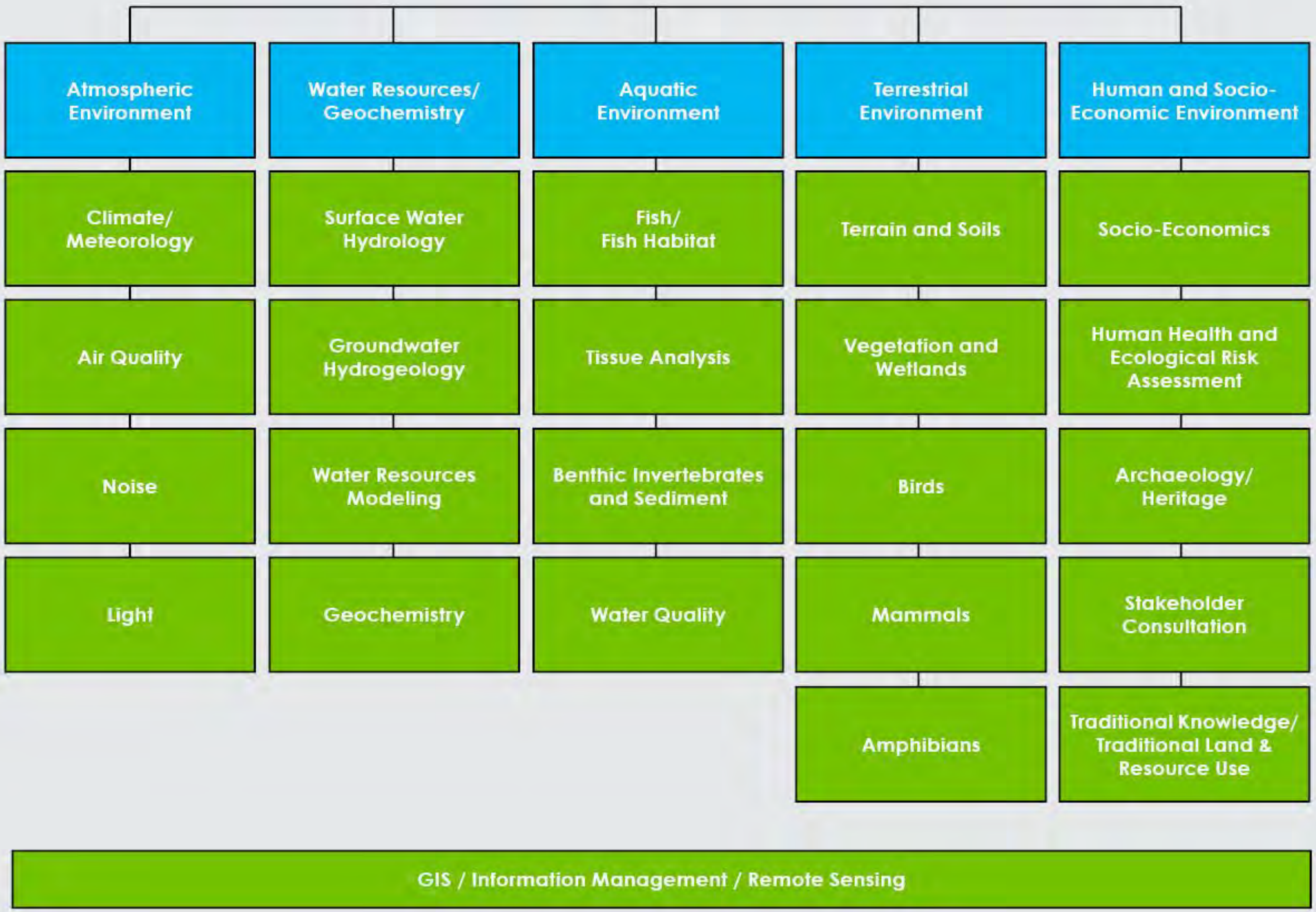
Project Planning and Permitting Process

Process	Approximate Timeline
Environmental Baseline & Geotechnical Studies Site Investigation/Characterization – Existing Environment	2015 to 2017
Feasibility Study Due Diligence, Process Development, and Costing – NI43-101 Report	2016 to 2017
Project Description (PD) Project Information, Environmental Interactions, and Scoping Considerations	2017
Environmental Assessment (EA) Assessment of Project effects on the Existing Environment	**2018** to 2019
Permitting Applications for Federal and Provincial Regulatory Approvals	2019 to 2020
Project Execution Construction; Operation; Decommissioning, Reclamation and Closure	~2020 onwards

ALAMOS GOLD INC.

Stantec

Lynn Lake Gold Project
Environmental Baseline Study Topics



Thank you for attending!

For further information about the Project, please contact:

Michael Raess
MRaess@alamosgold.com
204-356-2646

Lauren Stead
LLGPengages@stantec.com
306-667-2493

ALAMOS GOLD INC.

Stantec

OPEN HOUSE

Date & Time: May 31, 2018; 4:30 PM
Location: PBCN Band Office, Southend
Soup & Bannock provided

Please join us at an open house to learn about, ask questions, and provide feedback on two proposed projects in northern Saskatchewan and Manitoba.

Highway 914 Extension Project

Saskatchewan Ministry of Highways and Infrastructure (MHI) is proposing to extend Highway 914 starting near the McArthur River mine site to an existing road near the Cigar Lake mine site. When completed, the all-weather roadway will become part of the public road network in the area.

Saskatchewan

Lynn Lake Gold Project

Alamos Gold Inc (Alamos) is a Canadian-based intermediate gold producer proposing to redevelop the MacLellan and Gordon (formerly called 'Farley Lake') properties near Lynn Lake, Manitoba as open pit mines. Both properties were previously mined with varying degrees of rehabilitation and closure. Alamos plans to develop the properties into operating gold mines with an expected mine life of 12 years.

ALAMOS GOLD INC.

FOR ADDITIONAL INFORMATION PLEASE CONTACT:
Lauren Stead
Stantec Consulting Ltd.
Phone: 306-667-2493
Email: lauren.stead@stantec.com

Stantec

Highway 914 Extension Project and Lynn Lake Gold Project
Community Open House – May 31, 2018

CONTACT LIST SIGN-IN
Please print clearly – thank you!

Name	Address			Telephone / Email
	Street	Town	Postal Code	

Saskatchewan Stantec Alamos Gold Inc.

OPEN HOUSE

WHO:
Alamos Gold Inc. and Stantec Consulting Ltd.

WHEN:
Tuesday, February 4, 2020 3-8:00 pm
Presentations at 4:00 pm and 7:00 pm

WHAT:
Lynn Lake Gold Project Update

WHERE:
Corner Pocket Hall
467 Sherritt Ave, Lynn Lake MB

WHY:
To share information and solicit feedback/input

If you are unable to attend the Open House but have questions or would like some further information, please contact LLGPengages@stantec.com

Coffee, tea, and light snacks will be served

Alamos Gold Inc.

Stantec

OPEN HOUSE

WHO:
Alamos Gold Inc. and Stantec Consulting Ltd.

WHEN:
Monday, February 3, 2020 1-4:00 pm
Presentation starting at 2:00 pm

WHAT:
Lynn Lake Gold Project Update

WHERE:
Multiplex
Nelson House, MB

WHY:
To share information and solicit feedback/input

If you are unable to attend the Open House but have questions or would like some further information, please contact LLGPengages@stantec.com

Coffee, tea, and light snacks will be served

ALAMOS GOLD INC.

Stantec

Alamos Gold Inc.

Welcome! Thank you for taking the time to attend today's Open House regarding the Lynn Lake Gold Project. We are interested in discussing the Project, answering questions and making note of any comments you wish to provide.

PUBLIC ENGAGEMENT • FEBRUARY 2020

Who is Alamos Gold Inc?

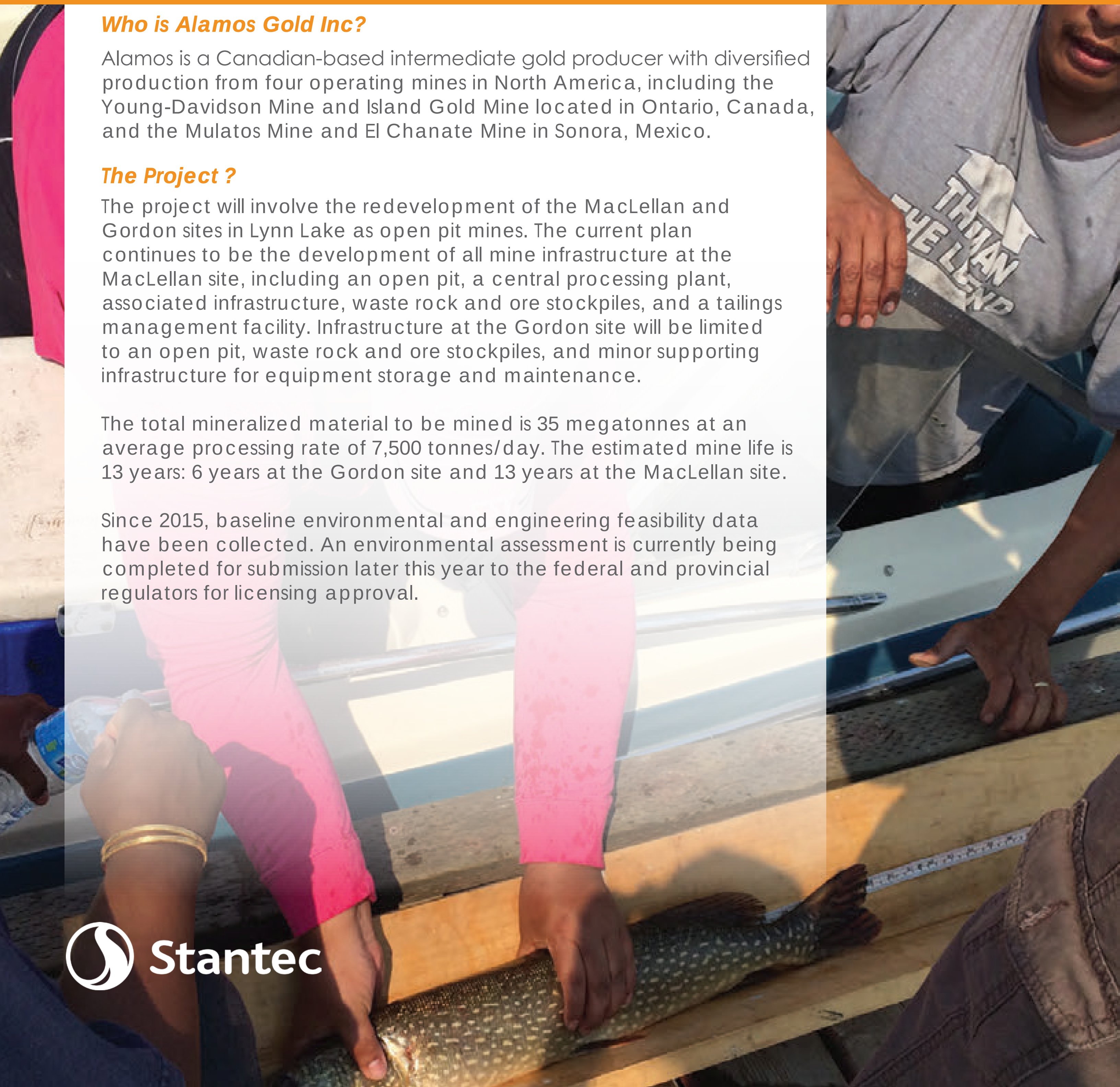
Alamos is a Canadian-based intermediate gold producer with diversified production from four operating mines in North America, including the Young-Davidson Mine and Island Gold Mine located in Ontario, Canada, and the Mulatos Mine and El Chanate Mine in Sonora, Mexico.

The Project ?

The project will involve the redevelopment of the MacLellan and Gordon sites in Lynn Lake as open pit mines. The current plan continues to be the development of all mine infrastructure at the MacLellan site, including an open pit, a central processing plant, associated infrastructure, waste rock and ore stockpiles, and a tailings management facility. Infrastructure at the Gordon site will be limited to an open pit, waste rock and ore stockpiles, and minor supporting infrastructure for equipment storage and maintenance.

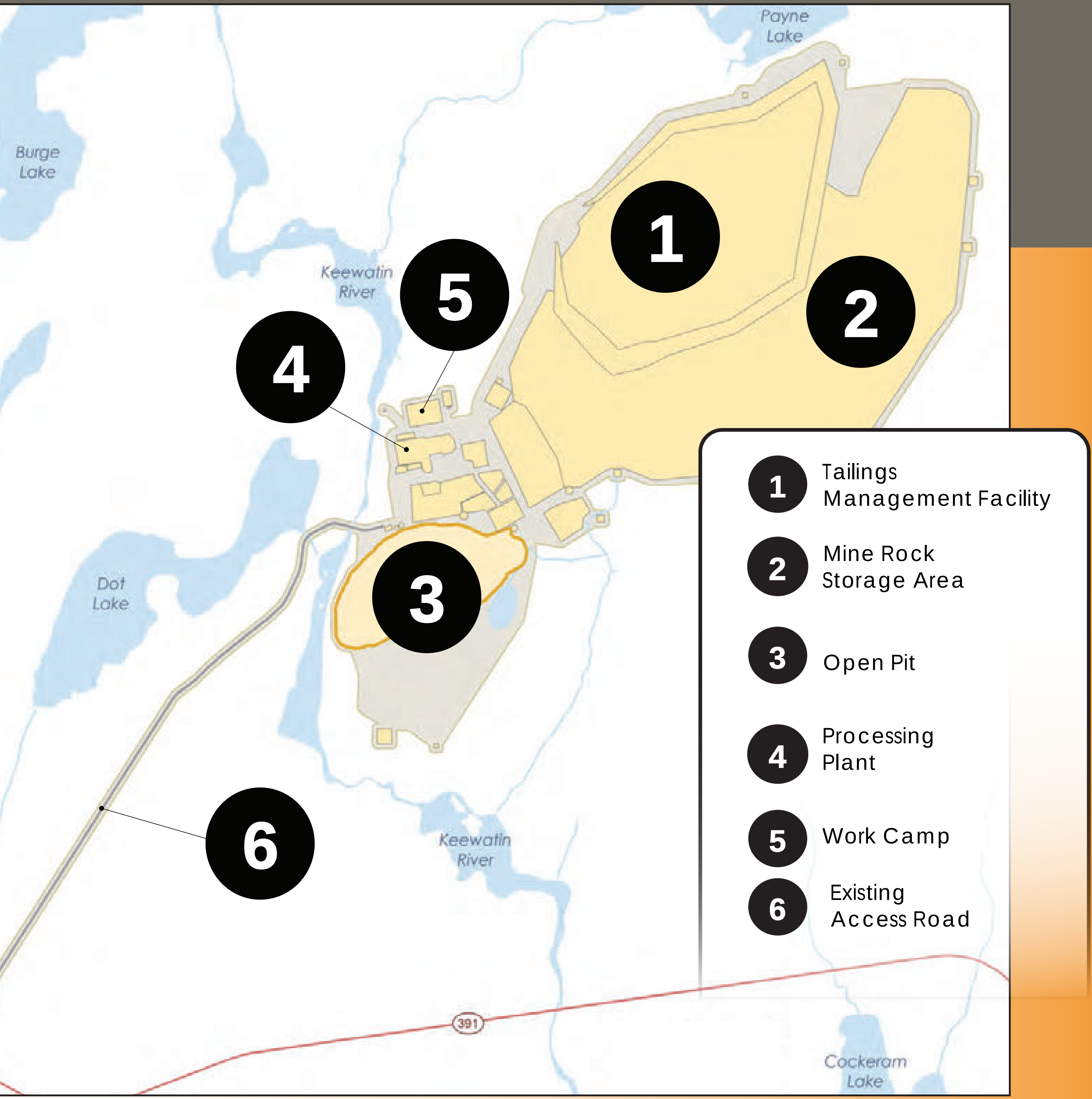
The total mineralized material to be mined is 35 megatonnes at an average processing rate of 7,500 tonnes/day. The estimated mine life is 13 years: 6 years at the Gordon site and 13 years at the MacLellan site.

Since 2015, baseline environmental and engineering feasibility data have been collected. An environmental assessment is currently being completed for submission later this year to the federal and provincial regulators for licensing approval.

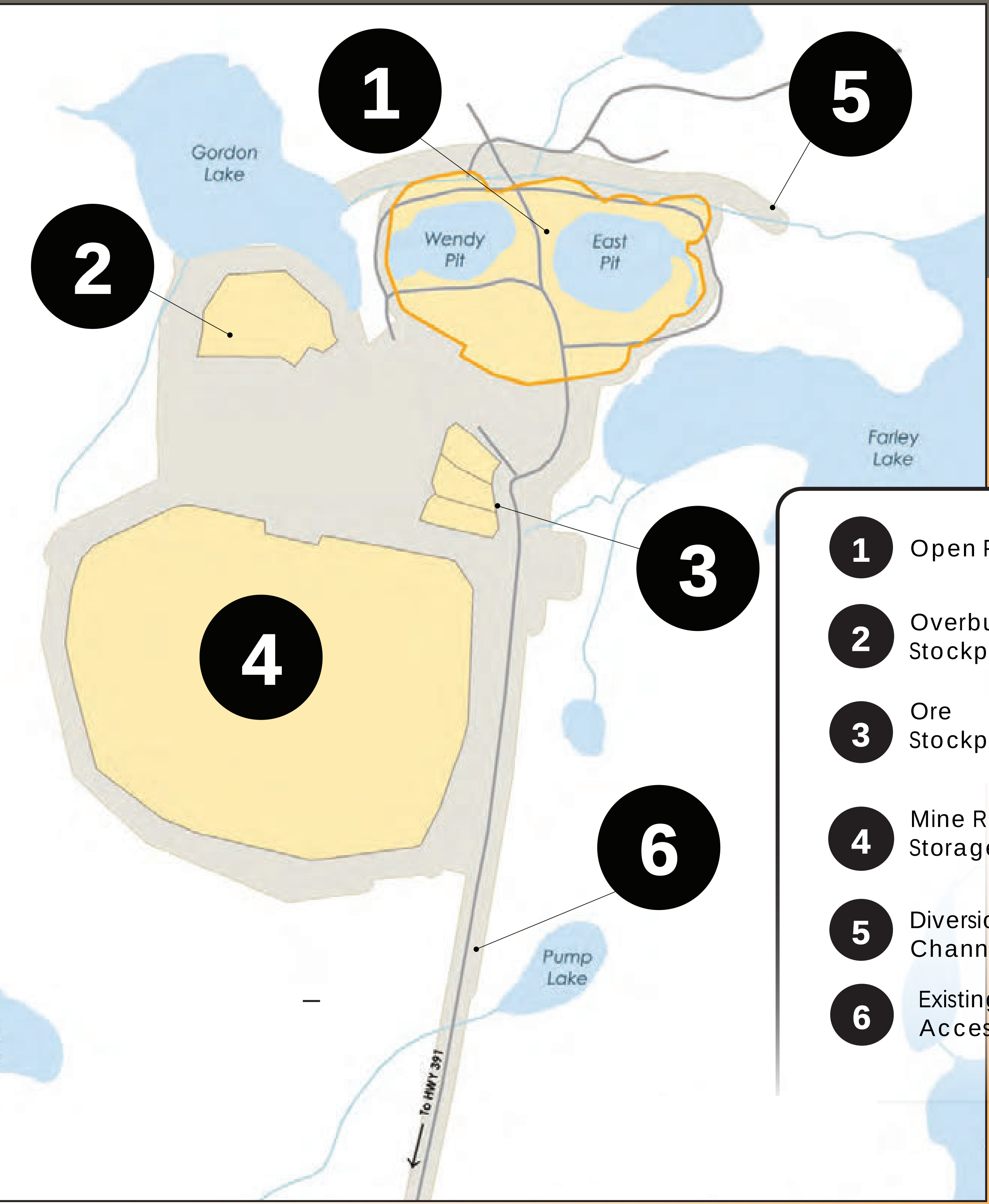


Stantec

PROPOSED GENERAL ARRANGEMENT PLAN- MACLELLAN SITE



PROPOSED GENERAL ARRANGEMENT PLAN- GORDON SITE



1 Open Pit

2 Overburden Stockpile

3 Ore Stockpiles

4 Mine Rock Storage Area

5 Diversion Channel

6 Existing Access Road

Lynn Lake Gold Project
Project Planning and Permitting Process

PROJECT PLANNING AND PERMITTING PROCESS	APPROXIMATE TIMELINE
Environmental Baseline & Geotechnical Studies Site Investigation/Characterization – Existing Environment	2015 to 2017
Feasibility Study Due Diligence, Process Development, and Costing – NI43-101 Report	2016 to 2017
Project Description (PD) & Value Engineering Project Information, Environmental Interactions, and Scoping Considerations	2017 to 2018
✓ **Environmental Assessment (EA)** Assessment of Project effects on the Existing Environment	2019 to 2020
Permitting Applications for Federal and Provincial Regulatory Approvals	2020 to 2021
Project Execution Construction; Operation; Decommissioning, Reclamation and Closure	~2021 onwards

Stantec

Alamos Gold Inc.

Both properties were previously mined with varying degrees of rehabilitation and closure. Some historical facilities still remain at the MacLellan site. The baseline studies completed have considered both the natural environmental setting and the historical activities. The historical activities in particular provide field-scale data on potential effects that could result from future mining activities, even though mining operations today are very different than they once were.

The Environmental Assessment Is Focused On:

AIR & NOISE

- Air Quality
- Noise and Vibration

WATER & FISH

- Groundwater
- Surface Water
- Fish and Fish Habitat

WILDLIFE & PLANTS

- Wildlife and Wildlife Habitat
- Vegetation and Wetlands

SOCIO-ECONOMICS

- Economy and Employment
- Community Services and Infrastructure
- Land & Resource Use

HEALTH

- Human and Ecological Health

HERITAGE & TRADITIONAL LAND USE

- Current Use of Land / Resources for Traditional Purposes
- Indigenous Peoples
- Heritage Resources

Air & Noise

Things we looked at:

- Air quality (dust)
- Greenhouse gas (GHG)
- Noise and vibration

Air dispersion and noise and vibration modelling considered receptors such as traplines and communities.

Planned Actions (part of project design):

- Shortened haul distances
- Use closed conveyors and dust collectors
- Apply water to dry areas (roads and TMF)
- Use modern blasting techniques
- Use a truck wheel wash before PR 391
- Monitor dust during the Project
- Limit cold starts for equipment
- Reduce idling
- Use speed limits for heavy equipment and trucks
- Put loud machines in buildings
- Use noise dampening work camp building materials
- Use large trucks to reduce traffic
- Follow blasting best management practices

EIS Findings:

- Model predicted elevated dust levels at both site boundaries during dry conditions
- With mitigation and environmental protection measures, the air quality will be good
- Predicted annual Project GHG emissions are:
    - Less than 0.5% of Manitoba's GHG emissions
    - Less than 0.02% of Canada's GHG emissions
- Predicted noise and vibration levels are below regulatory limits at the closest receptors

Water

Things we looked at:

- Water quantity (lake levels, stream flows, groundwater)
- Water quality (surface water and groundwater)

Planned Actions:

- Reduced footprint to reduce groundwater recharge and fewest watersheds possible
- Dewater pits slower
- Options for pit filling at closure being evaluated
- Use interception wells between pit and adjacent lakes at Gordon site
- Use collection ditches and ponds to reduce seepage migration
- Recycle water between mill and TMF
- Reduce pumping from Keewatin River
- Separate “contact water” from “non-contact water”
- Mix pit water prior to dewatering at Gordon site
- Use lower nitrogen blasting materials
- Ponds promoting sediment settling prior to discharge
- Design the mine rock storage area to increase runoff and reduce infiltration (groundwater)

EIS Findings:

- Decrease in Gordon Lake water levels in winter
- Increase in Farley Creek flow in late winter/spring
- Decrease in Minton Lake water levels year-round
- Changes are small and unlikely to effect fish populations
- Need and options for reducing effects currently being evaluated
- Groundwater table will be lowered due to dewatering the open pit during construction and operation and will recover during closure
- Potentially elevated metals in Farley and Minton lakes
- Need and options for treatment being evaluated
- Water discharged to the environment will meet Water Quality Guidelines for the Protection of Aquatic Life
- No known groundwater users within the area

Fish

Things we looked at:

- Fish habitat
- Fish mortality
- Fish health, growth and survival

Planned Actions:

- Reduce work in and around water
- Dewater and fill pits slower and longer
- Reduce pumping from Keewatin River
- Use interception wells between pit and lakes at Gordon site
- Fisheries Offset Plan
- Use screens on intakes
- Limit blast charge sizes near water
- Conduct fish salvages prior to dewatering
- No Fishing Policy for workers
- Use sediment and erosion control
- Use collection ditches and ponds
- Treat wastewater as necessary before discharge to meet Water Quality guidelines

EIS Findings:

- Reduction of Gordon Lake water levels in winter may affect brook stickleback
- Flow changes in Farley Creek unlikely to affect sucker or pike spawning
- Lake level changes in Minton Lake unlikely to affect pike and perch spawning/rearing
- Existing diversion channel at Gordon site will be replaced by new diversion channel
- Effects to East Pond at MacLellan site will be offset
- Other unavoidable fish habitat changes will be offset
- Water discharge will be non-toxic to fish
- Concentrations in Farley Lake, Minton Lake, and Keewatin River will meet Water Quality guidelines
- No short or long-term effects on health, growth or survival of fish expected

Wildlife & Plants

Things we looked at:

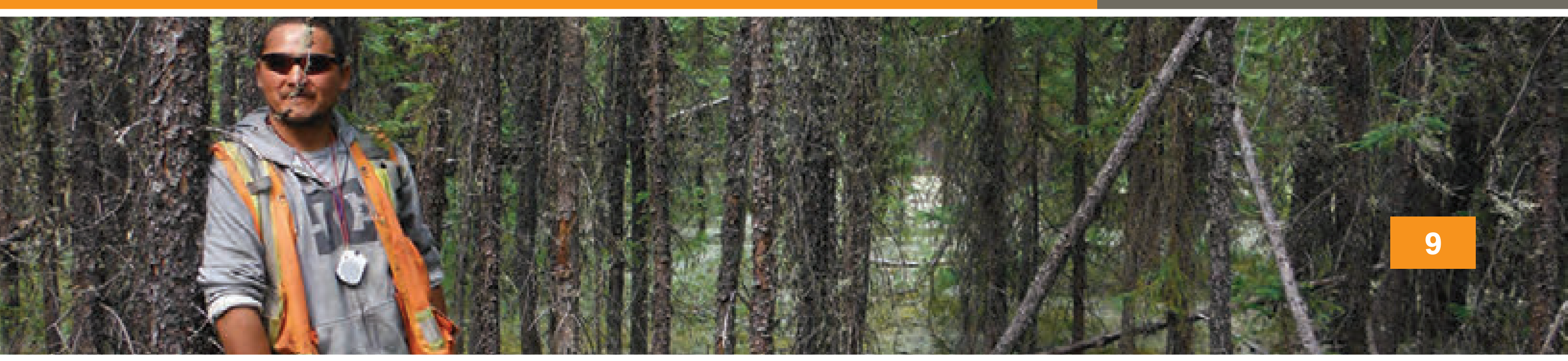
- Wildlife habitat
- Wildlife mortality
- Wildlife health
- Plants, including traditionally-used plants
- Wetland function

Planned Actions:

- Reduced Project footprint to keep more habitat
- Reduced noise and light emissions
- Avoid and protect sensitive habitats
- Construct outside of sensitive periods for wildlife
- Monitor wildlife during the Project
- Develop reclamation and closure plans
- Use speed limits and signs to reduce collision risk
- Construct outside of sensitive periods for wildlife
- Avoid creating trails for hunters or predators
- Monitor and control dust
- Use proper waste handling, fuel storage procedures
- Limit wildlife access to Project sites
- Reduced Project footprint to keep more habitat
- Control the introduction and spread of weeds
- Avoid the use of herbicides
- Use native seed mixes in replanting
- Monitor and control dust
- Maintain an undisturbed area around wetlands where practical
- Control erosion and sedimentation
- Conduct clearing under dry or frozen conditions

EIS Findings:

- Localized habitat loss will occur, including for species at risk, but historical mining limits the loss
- The region provides lots of habitat
- Clearing and traffic-related mortality is not expected to affect local wildlife populations
- The Project will not affect predator-prey dynamics
- The Project is unlikely to expose wildlife to contaminants that could affect their health
- Some vegetation will be lost, but changes will be small and localized



Human Health

Things we looked at:

- Air quality
- Country food quality (plants, animals, fish)
- Drinking water quality
- Human health

Planned Actions:

- Mitigation measures to limit exhaust emissions:
  - On-going engine and exhaust maintenance to limit exhaust emissions
  - Use of low sulphur diesel fuels
  - Reduce idling times wherever possible
  - Reduce cold starts wherever possible

- Mitigation measures to limit dust:
  - Dust suppressants on roads
  - Dust collectors and enclosures at crushers, mill storage areas and conveyors

- Water Management including:
  - Surface water runoff controls
  - Diversion of surface water away from Project
  - Manage contact water using collection pits, ponds
  - Progressive rehabilitation by placing soil to reduce water contact with Project features

EIS Findings:

- Changes in human health risk associated with changes in air quality anticipated to be not significant
- Changes in human health risk associated with changes in terrestrial country food (e.g. moose, berries, Labrador tea) quality anticipated to be not significant
- Changes in human health risk associated with changes in aquatic country food (fish) quality anticipated to be not significant
- Changes in human health risk associated with changes in drinking water quality anticipated to be not significant

Socio-economics

Things we looked at:

- Infrastructure, accommodations and community
- Hunting and fishing, traplines, and harvesting
- Local and regional employment and training opportunities
- Local and regional business opportunities
- Local workforce
- Housing and temporary accommodations
- Local services and infrastructure
- Transportation
- Community wellbeing
- Land use
- Recreation
- Resource use

Planned Actions:

- Build standalone utilities, work camp to reduce infrastructure and accommodation demand
- Use shift rotations
- Use buses and time daily shifts to reduce traffic disturbance and for safety
- Upgrade existing access roads
- Limit site clearing
- No Hunting/Fishing Policy for workers
- Continue to communicate with local resource users
- Keep local residents and Indigenous communities informed of employment and training opportunities
- Strong preference to hire local where possible
- Require workers 19 and under to complete grade 12 or equivalent to encourage youth to stay in school
- Develop work packages in consideration of local business capacity and capability
- When needed, bring workforce from other parts of region
- Make Project wages consistent with Manitoba

Socio-economics (cont'd)

EIS Findings:

- Negligible effects, camp will house workers during construction and operation
- Small increase in demand on infrastructure and services
- Managed by measures including building separate Project utilities, on-site first aid, waste management and emergency response planning
- Small increase in traffic predicted
- Managed by busing workers, timing shifts to avoid peak traffic periods
- Access roads to both mine sites will be upgraded to accommodate Project traffic
- Project will create some employment opportunities
- Population increase from Project workers may cause changes to sense of community belonging
- Labourforce of ~400 people required during construction and operation
- Need to work with communities to maximize local employment
- Remaining labour force to be Fly-in Fly-out from elsewhere in the region
- Small mixed effects to local and regional businesses
- Higher Project wages may mean upward pressure on local wages, more competition to fill positions
- Industries likely to benefit from Project opportunities:
    - Construction/transportation/warehouse
    - Accommodation and goods and services
- Moderate positive effects from tax revenues and gross domestic product (GDP)
- No direct effects to protected areas, First Nation Reserve land, TLE sites or other Crown land permit/lease sites
- Restricted access to recreation in the Project footprint
- Alternative recreational areas available throughout the local area
- Hunting, trapping, and fishing will be able to continue near existing levels
- Access to some lakes from the Gordon access road may be more difficult

Heritage & Traditional Land Use

Things we looked at:

- Heritage resources
- Concern for:
  - Plants
  - Animals
  - Fish
  - Water quality
  - Air quality
  - Acoustic environment
- Current use of Lands and resources for traditional purposes

Planned Actions:

- Conducted a Heritage Resource Impact Assessment
- Use a Protection Plan to manage any chance encounters with heritage resources
- Alamos supported three studies to learn about lands, waters, and resources important to traditional practices
- Continue engagement with potentially affected Indigenous communities
- Considered traditional knowledge in multiple VCs
- Mitigation for biophysical VCs address these concerns
- Follow up and monitoring programs will validate effectiveness of mitigation

EIS Findings:

- No significant heritage resources conflict with the Project
- Effects to hunting and trapping activities within and near the Gordon and MacLellan sites
- Example: the hunting/trapping trail near Mile 7
- Fishing sites may be affected on Simpson, Swede, Ellystan and Hughes lakes

Potential Effects on Indigenous Peoples

The Impact Assessment Agency of Canada requires assessment of effects to Indigenous Peoples, including:

- Health and socio-economic conditions
- Physical and cultural heritage
- Current use of lands and resources for traditional purposes
- Indigenous and Treaty Rights

Key issues indicated by Indigenous communities through engagement include:

- Effects to:
  - Environment and water quality
  - Fish and fish habitat, including whitefish, northern pike, and walleye
  - Wildlife, including moose, caribou, geese, chickens, ducks, and ptarmigans
  - Traditionally harvested plants
  - Indigenous and Treaty Rights
- Cumulative effects as a result of the Project
- Use of traditional knowledge in the environmental assessment and Project planning

Lynn Lake Gold Project
Open House Questionnaire

February 2020

ALAMOS GOLD INC.

Stantec

How did you hear about this Open House?

What was your main reason for attending today?

Did you attend prior Open Houses held in Lynn Lake for this Project?

Yes - Please circle any/all that apply: 2015 Open House 2016 Open House 2017 Open House

No

Please select all that apply:

I live in the Lynn Lake area

I own property near the Project

I conduct the following activities in the Project area:

	Check all that Apply	Where?
Hunting		
Gathering		
Fishing		
Trapping		
Snowmobiling		
Boating		
Other: ________________		
Other: ________________		

Do you identify as Indigenous or Métis (optional)?

Yes

No

If so, what Community or Nation do you identify with (optional)?

Please rate how helpful this Open House was to you: (Please rank from not helpful to very helpful)

1-Not Helpful	2-Somewhat helpful	3-Neutral	4-Helpful	5 - Very Helpful

If you answered "somewhat helpful" or "not helpful", how can we do better?

Do you have any additional questions, comments, or concerns?

Would you like to have someone follow up with you regarding your questions, comments or concerns? If so, please include your contact information below.

Yes, please contact me.

No, I do not wish to be contacted.

Name:

Email:

Mailing Address:

Phone Number:

Thank you for taking the time to attend today's Open House and to fill out this survey!

Lynn Lake Gold Project
Open House Questionnaire

February 2020

ALAMOS GOLD INC.

Stantec

What was your main reason for attending today?

I conduct the following activities in the Project area:

	Check all that Apply	Where?
Hunting		
Gathering		
Fishing		
Trapping		
Snowmobiling		
Boating		
Other: ________________		

Do you identify as Indigenous or Métis (optional)?

Yes

No

If so, what Community or Nation do you identify with (optional)?

Please turn over.

Please rate how helpful this Open House was to you: (Please rank from not helpful to very helpful)

1-Not Helpful	2-Somewhat helpful	3-Neutral	4-Helpful	5 - Very Helpful

If you answered "somewhat helpful" or "not helpful", how can we do better?

Do you have any additional questions, comments, or concerns?

Would you like to have someone follow up with you regarding your questions, comments or concerns? If so, please include your contact information below.

Yes, please contact me.

No, I do not wish to be contacted.

Name:

Email:

Mailing Address:

Phone Number:

Thank you for taking the time to attend today's Open House and to fill out this survey!

Appendix 3D EXAMPLE INFORMATION PACKAGE (2017)

October 18, 2017

O-Pipon-Na-Piwin Cree Nation
Box 1150
South Indian Lake, MB,
R0B 1N0

Attention: Chief and Council (O-Pipon-Na-Piwin Cree Nation)

Reference: Introduction to Alamos Gold Inc. and the Lynn Lake Gold Project

Dear Chief and Council:

I would like to take this opportunity to introduce Alamos Gold Inc. (Alamos), a mining company based in Toronto, Ontario, with one operating gold mine located in northern Ontario and two gold mines in Mexico. We also have development projects located in Mexico, Turkey and Canada.

The Lynn Lake Gold Project (LLGP) was acquired by Alamos in January of 2016 with a desire to develop the property into an operating gold mine with an expected mine life of 12 years. Since 2015, several environmental baseline studies have been completed within and near the proposed LLGP footprint and in 2016 our technical team initiated a feasibility study that is currently in its final stages.

For the LLGP, we are proposing to redevelop two historic mine sites near Lynn Lake: the MacLellan and Gordon sites. Alamos submitted a Project Description to the Canadian Environmental Assessment Agency (CEAA) in July of this year, formally commencing a federal environmental assessment for the LLGP under the requirements of the *Canadian Environmental Assessment Act*, 2012. Subject to a positive feasibility study and completion of the environmental assessment and other permitting efforts, we hope to begin construction in 2019.

You may have already received correspondence regarding the LLGP from CEAA. We hope this letter and the attached information package, which is the handout from the May 2017 Open House in Lynn Lake, will serve to introduce Alamos to your community, provide some initial information and open a communication channel. In this way, you can contact us directly with specific questions about Alamos or the LLGP and discuss whether you would like us to coordinate a visit with us in your community.

Our community relations team includes representatives from Alamos as well as Stantec Consulting Ltd. (Stantec). A list of our community relations team members is provided below and I encourage you to contact any of us should you have questions or concerns. One of our team members will be in contact with you in the next few weeks to discuss next steps and we look forward to hearing from you about how your community would like to be engaged regarding this project.

Lynn Lake, MB
Michael Raess (Sr. Environmental and Community Relations Coordinator)
MRaess@alamosgold.com; (204) 356-2646
Liz Martel (Community Liaison)
Elizabeth.Martel@alamosgold.com; (204) 356-2647

Stantec Consulting
Lauren Stead (Engagement Coordinator):
Lauren.Stead@stantec.com; (306) 667-2493

I appreciate your time and attention and I look forward to meeting you in the coming weeks and months.

Respectfully,

Colin Webster, P. Eng.
Vice President, Sustainability and External Affairs
Email: CWebster@alamosgold.com
Cell: (416) 770-3483

Appendix 3E SUMMARY OF REGULATORY ENGAGEMENT CONDUCTED FOR THE PROJECT

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
Federal Government			
DFO	May 24, 2019	Email to discuss baseline data and offsetting requirements	• Consultation • Fisheries/aquatic environment • Regulatory requirements
DFO	June 26, 2019	Email to discuss the timeline for a *Fisheries Act* Authorization application and offsetting plan	• Fisheries/aquatic environment • Regulatory requirements
DFO	July 22, 2019	Telephone call to discuss the *Fisheries Act* Authorization	• Fisheries/aquatic environment • Regulatory requirements
DFO	August 26, 2019	DFO received the Fisheries Act Application for Authorization from Stantec	• Fisheries/aquatic environment • Regulatory requirements
DFO	October 23, 2019	Email notification from DFO that Alamos' will have 180 days to complete deficiencies in the *Fisheries Act* Application for a *Fisheries Act* Authorization upon receipt of the letter from DFO stating as such in registered mail.	• Fisheries/aquatic environment • Regulatory requirements
DFO and ECCC	September 20, 2016	Teleconference	• Environmental baseline studies • Fisheries/aquatic environment • Project engineering • Regulatory requirements
DFO, IAAC	June 23, 2019	Meeting to discuss Fish and Fish Habitat Offsetting requirements for the Project and Stantec presented on baseline fish and fish habitat data	• Fisheries/aquatic environment • Regulatory requirements
DFO, IAAC	July 24, 2019	Email and Meeting to discuss the *Fisheries Act* Authorization in support of the Project and the new *Fisheries Act* coming into effect in the fall of 2019	• Fisheries/aquatic environment • Regulatory requirements
ECCC	September 13, 2017	Meeting to discuss regulatory requirements for the Project including historical mine sites and source of contamination of the environment	• Regulatory requirements

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
ECCC	October 23, 2019	Email guidance on climate change information used in the EIS	• Atmospheric environment • Regulatory requirements • Consultation
IAAC	December 14, 2016	Teleconference and presentation to introduce Alamos, describe the Project (including target schedule), discuss the EA and PD development, and confirm IAAC's expectations	• Introduction to Alamos • General Project information • Regulatory requirements
IAAC	January 10, 2017	Teleconference with Project Manager and Environmental Assessment Officer regarding the Project Description, greenhouse gas emissions	• General Project information • Regulatory requirements
IAAC	June 1, 2017	Meeting	• Indigenous engagement
IAAC	September 1, 2017	Email to notify Stantec of the beginning of the 20-day public comment period on the draft EIS Guidelines	• Regulatory requirements
IAAC	November 6, 2017	Email to discuss the comments from the draft EIS Guidelines. To date Stantec received comments from MCCN	• Regulatory requirements • Consultation
IAAC	January 30, 2018	Email from Alamos regarding additional funding options available within IAAC to help Indigenous Communities offset Traditional Land Use Studies	• Regulatory requirements • Traditional knowledge • Traditional land use studies
IAAC	February 5, 2018	Email to discuss IAAC's rationale for inclusion of the 13 Indigenous Communities in the EIS	• Consultation • Indigenous agreements and protocols • Regulatory requirements
IAAC	March 15, 2018	Teleconference with Alamos and Stantec regarding information gathered on the representation of PNCN. IAAC stated that Clarence Bighetty is part of MCCN and Gordon Bighetty Jr. is part of PNCN.	• Consultation • Aboriginal and Treaty Rights • Regulatory Requirements
IAAC	May 10, 2018	Email from IAAC stating that Chief Gordon Bighetty Jr. is part of MCCN and until a referendum is held between MCCN and PNCN it will remain as such. Engagement with Chief Gordon Bighetty Jr. can continue, but he will be	• Consultation • Aboriginal and Treaty Rights • Regulatory requirements

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
		considered under "public" engagement.	
IAAC	December 12, 2018	Email outlining proposed layout changes to the MacLellan site for the Project	• Consultation
IAAC	January 17, 2019	Email indicating that the proposed Project changes will be posted to the registry website for the Project and that IAAC would be notifying Indigenous groups and federal authorities of the update	• Consultation
IAAC	July 24, 2019	Meeting to discuss the *Fisheries Act* Authorization in support of the Project	• Fisheries/aquatic environment • Regulatory requirements
IAAC and ECCC	January 18, 2019	Teleconference to discuss the Preliminary Caribou Assessment and discuss the recovery strategy and new Manitoba caribou range map	• Terrestrial Environment
IAAC, DFO, MCC, MGET, Health Canada	October 10 and 11, 2017	Meeting led by Stantec discipline leads and Alamos for the purpose of a site tour to the MacLellan and Gordon sites	• Education • Employment opportunities • Regulatory requirements
IAAC, INR	February 23, 2018	Email with Stantec regarding letter from Deputy Chief Richard Dumas of MCCN clarifying that Clarence Bighetty is recognized as the Headman for Granville Lake/Pickerel Narrows Cree Nation (PNCN)	• Aboriginal and Treaty Rights • Indigenous agreements and protocols • Regulatory requirements
IAAC, Stantec, MGET, INR	April 24, 2018	Email to clarify if PNCN would be receiving a Consultation Work Plan independent of MCCN	• Consultation
NRCan, IAAC, and members of parliament (MPs) from political parties	November 28 and 29, 2016	Meeting to introduce Alamos and the Project and discuss concerns including potential job opportunities and engagement with Indigenous Communities	• General Project information • Regulatory requirements • Employment opportunities
Provincial Government			
Environmental Approvals Branch of MCC and MGET	May 3, 2017	Meeting with Environmental Engineer responsible for overall management of activities of the Municipal and Industrial Section of the	• Regulatory requirements

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
		Environmental Approvals Branch (MCC), Environmental Engineer responsible for licensing proposals for mining under *The Environment Act* (MCC), and Director (MGET)	
Historic Resources Branch	July 7, 2015	Email regarding an information data request from the Heritage Resources Registrar	• Regulatory requirements • Heritage resources
Historic Resources Branch	November 26, 2015	Email correspondence with the Heritage Resources Registrar and signed disclaimer statement	• Regulatory requirements • Heritage resources
Historic Resources Branch	June 14, 2017	Letter sent from Stantec to determine if buildings at the Gordon or MacLellan sites have heritage significance	• Regulatory requirements • Heritage resources
Historic Resources Branch	June 19, 2017	Email regarding the infrastructure of heritage value at the sites	• Regulatory requirements
Historic Resources Branch	June 21, 2017	Email form the Heritage Building Conservation Officer requesting the extant recording work of the infrastructure and no additional recording of the mine structures to be demolished will be required.	• Regulatory requirements • Heritage resources
MCC	January 7, 2015	Meeting to discuss the Project and regulatory system/permitting	• Regulatory requirements
MCC	June 10, 2015	Meeting with Natural Resources District Officer to discuss concerns including fire hazards and proposed camp sites.	• General Project information • Exploration investigations
MCC	June 20, 2017	Email to discuss comments on Stantec's proposed air dispersion modelling methods for the EIS and potential air quality monitoring stations	• Atmospheric environment • Consultation • Regulatory requirements
MCC	October 23, 2017	Email from Provincial Furbearer Biologist regarding registered trapline survey plan for Pukatawagan	• Socioeconomics/human environment
MCC	November 3, 2017	Email regarding beaver dam at Farley Lake Outlet	• Fisheries/aquatic environment
MCC	December 20, 2017	Email regarding registered traplines in Lynn Lake	• Socioeconomics/human environment

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
MCC	September 17, 2019	Teleconference regarding potential fish habitat offsetting options near Lynn Lake	• Fisheries/aquatic environment • Regulatory requirements
MCC, ECCC	June 20, 2017	Email sending Stantec's proposed air dispersion model methods for review by MCC and ECCC	• Atmospheric environment • Consultation
MCC, ECCC	July 14, 2017	Email with review comments from ECCC regarding Stantec's proposed air dispersion model methods	• Atmospheric environment • Consultation
MCC, ECCC	July 20, 2017	Email response from Stantec regarding MCCs comments on the proposed air dispersion model methods	• Atmospheric environment • Consultation
MCC, ECCC	June 7, 2019	Email regarding the proposed air dispersion model methods	• Atmospheric environment • Consultation
MCC, ECCC	June 28, 2019	Email regarding the proposed air dispersion model methods and review comments	• Atmospheric environment • Consultation
MCC, ECCC	July 25, 2019	Email from Stantec addressing ECCC and MCC's comments on air dispersion model methods	• Atmospheric environment • Consultation
MCC, ECCC	August 13, 2019	Email finalizing the air dispersion model methods	• Atmospheric environment • Consultation
MCC, Marcel Colomb First Nation, MCDC, MGET,	February 19, 2015	Meeting to discuss the Environmental Baseline Study and concerns regarding delays with permitting, long-term environmental concerns, training requirements and government support, involving Indigenous communities successfully, protecting natural springs, remediating historical dump sites in the forest, traditional knowledge, and cumulative effects on Cockeram Lake	• Consultation • Education • Indigenous agreements and protocols • Indigenous sacred and cultural sites • Employment opportunities • Regulatory requirements • Traditional knowledge • Water resources
MGET	November 19, 2014	Meeting with Director and Assistant Deputy Minister	• General Project information
MGET	December 4, 2014	Telephone call regarding B2Gold's request for "No Further Action" for Farley Lake remediation and the possibility of Alamos taking on this	• Regulatory requirements

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
		responsibility and remaining liability	
MGET	January 7, 2015	Meeting regarding the duty to consult, permit applications	• General Project information • Regulatory requirements
MGET	March 5, 2015	Email regarding process required to resolve permit challenges	• Regulatory requirements
MGET	May 4, 2015	Telephone call from MGET regarding wildlife in the area including wood frogs, boreal chorus frogs and potential bat hibernacula	• Terrestrial environment
MGET	November 19, 2015	Women in Mining Reception introduction to Alamos and the Project	• General Project information
MGET, Town of Lynn Lake	April 25, 2016	Meeting regarding the recycling program, boil water advisory, and a committee to handle donations and fundraising	• General Project information • Indigenous agreements and protocols
MGET	May 24, 2016	Meeting with Assistant Deputy Minister, Director, and Chief Mining Engineer, including helicopter fly-over of Gordon and MacLellan sites	• General Project information • Geology/geochemistry
MGET	June 17, 2016	Meeting with Assistant Deputy Minister and Director	• General Project information
MGET	June 17, 2016	Meeting with Assistant Deputy Minister, Director, and Aboriginal Issues Policy Analyst	• General Project information
MGET	October 26, 2016	Meeting with Assistant Deputy Minister, Director, Aboriginal Issues Policy Analyst, and Labour Force Development Officer	• General Project information • Business opportunities • Socio-economic environment
MGET	November 16, 2016	Meeting with regarding supplying power to the mine site, water treatment facility, and regulatory timelines	• Consultation • General Project information • Workforce housing study • Regulatory requirements
MGET	December 1, 2016	Telephone call to discuss potential borrow sources	• Geology/geochemistry • Project engineering
MGET	December 19, 2016	Teleconference and presentation to describe the Project (including target schedule), discuss the EA and	• General Project information • Regulatory requirements

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
		PD development, and confirm the expectations of the Environmental Approvals Branch	
MGET	November 16, 2019	Meeting regarding the status of the Project	• Consultation • Regulatory requirements • Workforce housing study
MGET and MCC	February 14, 2019	Email regarding the re-submission of work permit applications	• Regulatory requirements
MGET and MCC	March 22, 2019	Email regarding work permit application and Marcel Colomb First Nation Treaty Land Entitlement (TLE) land	• Aboriginal and Treaty Rights • Regulatory requirements
MGET and MCC	April 8, 2019	Email regarding consultation with Marcel Colomb First Nation and next steps regarding the work permit applications	• Aboriginal and Treaty Rights • Consultation • Regulatory requirements
MGET and MCC	April 29, 2019	Email regarding approved work permit after Alamos received the April 26, 2019 Band Council Resolution from Marcel Colomb First Nation	• Aboriginal and Treaty Rights • Consultation • Regulatory requirements
MGET and MI	August 31, 2016	Meeting with Ministers, Deputy Minister (MGET), Assistant Deputy Minister (MGET), Adjoint Special (MGET), Special Assistant (MGET), and Member of Legislative Assembly	• General Project information
MGET, Marcel Colomb First Nation, and other public stakeholders	November 9, 2015	Open House for MGET and discussed Alamos' feasibility study and the potential for the Project to be developed into a mine	• Consultation • Exploration investigations • Fisheries/aquatic environment • Employment opportunities • Project engineering • Water resources
MGET, MCC, Marcel Colomb First Nation	February 9, 2015	Meeting with government and Marcel Colomb First Nation representatives	• Community involvement • Education • Indigenous sacred and cultural sites • Regulatory requirements • Traditional knowledge • Water resources

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
MGET, MCDC	March 1, 2015	Meeting to introduce Alamos and discuss drill permit challenges	• Regulatory requirements
MGET, Town of Lynn Lake, and other public stakeholders	November 18, 2015	Alamos had several meetings at the Manitoba Mining and Minerals Convention in Winnipeg, MB	• Business opportunities • Education • Employment opportunities • Exploration investigations • Geology/geochemistry • Indigenous agreements and protocols • Project engineering • Socioeconomics/human environment
Municipal Government			
Town of Lynn Lake	November 25, 2014	Attendance at Town Council meeting	• General Project information
Town of Lynn Lake	January 13, 2015	Meeting with Mayor and Town Councilors to discuss schedule and timeline, work experience opportunities, and accommodation for Alamos employees	• Employment opportunities • General Project information • Socioeconomic/human environment
Town of Lynn Lake	February 20, 2015	Email to discuss the community open house and youth summer work experience	• Employment opportunities • Open house
Town of Lynn Lake	March 25, 2015	Open House see Section 3.2.4.7	• Consultation • Education • Employment opportunities • Human health • Open house • Socioeconomic/human environment • Terrestrial environment • Water resources
Town of Lynn Lake	April 22, 2015	Meeting with Council members to discuss the Project including business opportunities, and existing tailings storage facility	• Business opportunities • Exploration investigations • General Project information
Town of Lynn Lake	June 22, 2015	Meeting with Mayor and Town Councilors regarding plans after drilling and core processing was completed and the youth summer employment opportunities	• Community involvement • Employment opportunities • General Project information

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
Town of Lynn Lake	August 20, 2015	Telephone interview with Chief Administrative Officer regarding infrastructure and services within the Town of Lynn Lake	• Employment opportunities • Socio-economic/human environment
Town of Lynn Lake	November 18, 2015	Meeting regarding Alamos' plans to develop a quarterly newsletter	• General Project information
Town of Lynn Lake	November 1, 2016	Workforce Housing Study commencement	• Employment opportunities • Socioeconomic/human environment • Workforce housing study
Town of Lynn Lake	January 29, 2016	Meeting with Economic Development Officer to discuss open houses, drilling, and housing options	• General Project Information • Project engineering • Project open house
Town of Lynn Lake	February 16, 2016	Meeting with Economic Development Officer	• Community involvement
Town of Lynn Lake	April 26, 2016	Meeting with Economic Development Officer to discuss recycling program, town water quality, donations and fundraising	• Business opportunities • Community involvement • General Project information
Town of Lynn Lake	April 26.2016	Open House see Section 3.2.4.7	• Education • Employment opportunities • Fisheries/aquatic environment • Human health • Open House • Socioeconomic/human environment
Town of Lynn Lake	April 27, 2016	Meeting with Mayor and Town Councilors	• Community involvement • General Project information
Town of Lynn Lake	May 25, 2016	Mayor and Town Councilors	• Business opportunities • Community involvement • General Project information
Town of Lynn Lake	August 29, 2016	Meeting with Mayor, Town Councilors, Chief Administrative Officer, and Economic Development Officer	• General Project information
Town of Lynn Lake	October 25, 2016	Meeting with Mayor and Town Councilors regarding the Workforce Housing Study, town involvement throughout mine construction and operation, and concern that	• Community involvement • Employment opportunities • Socioeconomics/human environment • Workforce housing study

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
		past mining projects did not use in town housing	
Town of Lynn Lake	May 1, 2017	Open house see Section 3.2.4.7	• Business opportunities • Consultation • Employment opportunities • Open house • Project engineering • Socioeconomics/human environment • Traditional knowledge • Traditional land use studies
Town of Lynn Lake	May 12, 2017	Email communication with Mayor, CAO and Town Clerk regarding the accommodation study	• Workforce housing study
Town of Lynn Lake	September 16, 2017	Meeting to discuss general Project information including timeline, regulatory requirements and job opportunities	• Employment opportunities • General Project information • Regulatory requirements
Town of Lynn Lake	March 13, 2018	Town Council meeting to discuss opportunities to support the Project	• Business opportunities
Town of Lynn Lake	April 17, 2018	Meeting to set up Dreamcatchers Committee	• Education • Human health • Socioeconomics/human environment
Town of Lynn Lake	August 22, 2018	Meeting to discuss exploration activities	• Exploration investigations
Town of Lynn Lake	February 5, 2019	Meeting to discuss use and maintenance of highway; alternative power to MH; housing; and mineral deposits	• Project engineering • Socioeconomics/human environment
Town of Lynn Lake	March 19, 2019	Meeting to discuss 2018 Dreamcatchers Committee summary report and opening the new gym	• Education • Socioeconomics/human environment
Town of Lynn Lake	April 8, 2019	Meeting with Mayor and Town Councilor regarding power outages at Lynn Lake, open house, and services (lands and utilities)	• Business opportunities • Exploration investigation • Open house
Town of Lynn Lake	May 13, 2019	Meeting regarding air and noise emissions in the Town of Lynn Lake	• Atmospheric environment • Regulatory requirements
Town of Lynn Lake	October 10, 2019	Meeting to discuss housing	• Business opportunities

Appendix 3E Summary of Regulatory Engagement Conducted for the Project

Organization	Date	Purpose and Means of Engagement	Key Topics
			• Project engineering • Socioeconomics/human environment • Workforce housing study
Town of Lynn Lake, MH	June 20, 2017	Meeting to discuss a power line to the MacLellan site	

Lynn Lake Gold Project
Environmental Impact Statement
Chapter 4 - Environmental Effects Assessment Scope and Methods

Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Acronyms and Abbreviations

Alamos	Alamos Gold Inc.
CEA Agency	Canadian Environmental Assessment Agency
CEAA 2012	*Canadian Environmental Assessment Act*, 2012
EA	environmental assessment
EAP	Environmental Act Proposal
EIS	environmental impact statement
EMP	environmental management plan
Final EIS Guidelines	Final Guidelines for the Preparation of an Environmental Impact Statement, pursuant to CEAA, 2012, dated November 2017
IAA	*Impact Assessment Act*
LAA	Local Assessment Area
MCC	Manitoba Conservation and Climate
MSD	Manitoba Sustainable Development, now Manitoba Conservation and Climate
PDA	Project Development Area
Project, the	Lynn Lake Gold Project
Proponent, the	Alamos Gold Inc.
RAA	Regional Assessment Area
TK	Traditional Knowledge
TLRU	Traditional Land and Resource Use
VC	valued component

4.0 ENVIRONMENTAL EFFECTS ASSESSMENT SCOPE AND METHODS

4.1 INTRODUCTION

This chapter describes the methods used for assessing the Project's potential environmental effects. The environmental effects assessment approach was structured to meet the requirements of both the *Canadian Environmental Assessment Act*, S.C. 2012, c. 19 s. 52 (CEAA 2012) and *The Environment Act* c. E125 (Manitoba). These methods were informed by federal and provincial regulatory requirements with specific consideration of the Final Guidelines for the Preparation of an Environmental Impact Statement (EIS), pursuant to CEAA 2012, dated November 2017 (CEAA 2017; Appendix 4A) as well as the requirements set out in the Manitoba Sustainable Development (MSD, now Manitoba Conservation and Climate [MCC]) (provincial) Information Bulletin – Environment Act Proposal (EAP) Report Guidelines, March 2018 (MSD 2018; Appendix 4B).

On August 28, 2019, the *Impact Assessment Act* (IAA) came into force, repealing CEAA 2012. Section 181 of the IAA contains transitional provisions that apply to projects undergoing an EA under CEAA 2012 before the day the IAA came into force. The Notice of Commencement for the Project was posted by the CEA Agency on September 1, 2017; therefore, the Project EA will continue under CEAA 2012.

4.2 SCOPE OF THE ASSESSMENT

4.2.1 Approach Overview

The environmental assessment approach incorporates the following key considerations:

- Identifying the activities and components of the Project.
- Predicting and evaluating potential changes to the environment and the likely effects on identified valued components (VCs).
- Proposing measures to mitigate adverse environmental effects.
- Determining remaining residual effects and whether residual adverse effects are significant after the implementation of mitigation measures.
- Development of follow-up and monitoring programs to verify both the accuracy of the effects assessment and the effectiveness of mitigation measures.

Integral to the environmental assessment process was the consideration and incorporation of knowledge from the local community (community knowledge) and from Indigenous communities (traditional knowledge [TK]). Community knowledge and TK that was acquired through public participation and engagement with Indigenous communities and that Alamos Gold Inc. (Alamos) had access to from project-specific traditional land and resource use studies has been incorporated into this EIS.

The environmental assessment starts with the description of the Project and the existing environment, which informs the identification of VCs (i.e., the elements of the environment that could be affected by the Project and are of importance or interest to regulators, Indigenous communities and other potentially affected members of the public or interested parties). Potential Project interactions with the VCs are then identified, along with mitigation measures and management programs to avoid or reduce adverse effects, and the residual effects (those remaining after mitigation has been applied) are characterized. The residual Project-related environmental effects are characterized using specific criteria (e.g., direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological/socio-economic context). The significance of the Project-related environmental effects is then determined based on established criteria or thresholds.

The environmental effects assessment methods address both Project-related and cumulative environmental effects based on the Project description presented in Chapter 2. Project-related environmental effects may result from changes to the physical, biological, or human environment that are caused by an activity arising as a result of the Project. Cumulative environmental effects are changes to the physical, biological, or human environment that are caused by the effects of an activity associated with the Project, in combination with the effects of other past, present, or reasonably foreseeable future projects or activities that have been or will be carried out.

As part of the engagement process for this assessment (Chapter 3), opportunities were provided for public participation to the local community in the form of sharing information on the Project and obtaining feedback to understand local interests and concerns; and gathering of traditional knowledge from participating Indigenous communities. Section 5(1)(c) of CEAA 2012 requires specific consideration of environmental effects on Indigenous peoples. Alamos engaged with potentially affected Indigenous communities early in the project planning process. A more detailed discussion of the methods used to conduct the effect assessment, including the consideration of traditional knowledge, is discussed below.

Throughout project planning, Alamos has put management strategies in place to reduce the magnitude of potential adverse effects. This environmental assessment employs a precautionary, conservative approach. Conservative assumptions were generally applied to overstate rather than understate potential adverse effects. Aspects of the project have been examined and planned in a careful and precautionary manner in order to avoid significant adverse environmental effects.

4.2.2 Approach to Community and Traditional Knowledge

Community knowledge and TK are types of knowledge acquired and accumulated by a local community or an Indigenous group, respectively. Alamos worked to integrate TK and community knowledge throughout the EA process. Additional details are provided in the Engagement Chapter (Chapter 3).

Indigenous communities (those determined to be most affected by the Project and those that may be affected, but to a lesser degree) had the opportunity through engagement to provide their local community knowledge and TK into the EIS. Traditional Land and Resource Use (TLRU) studies were also prepared by interested Indigenous communities. These studies were reviewed to obtain and incorporate views that were shared and to inform the environmental assessment. Information from the TLRU studies was compiled into two chapters (Current Use of Land and Resources for Traditional Purposes, Chapter 17; and Indigenous

Peoples, Chapter 19) to address the effects of changes to the environment on Indigenous peoples (i.e., health and socio-economic conditions, physical and cultural heritage, and current use of land and resources for traditional purposes) pursuant to section 5 (1)(c) of CEAA 2012.

4.2.3 Assessment Steps

The environmental effects assessment method used in the EIS is shown graphically in Figure 4C-1 (Appendix 4C). This method involved the following generalized steps:

- **Scope of Assessment –** Scoping of the assessment includes the selection of VCs and the rationale for their selection; identification of the potential environmental effects; description of measurable parameters; description of temporal and spatial boundaries; and selection of thresholds of significance for residual effects. Engagement input, including receipt of information from TLRU studies, informed the scope of assessment, as discussed in Chapter 3 (Engagement).
- **Existing Conditions –** Existing (baseline) environmental conditions are established for each VC. In many cases, existing conditions include those environmental effects that may have been or may be caused by other past or present projects or activities that have been or are being carried out. Project-specific TK information has been considered in the existing conditions section of the VC Chapters (Chapters 6 through 19). Engagement input that informed the baseline field surveys is discussed in Chapter 3.
- **Assessment of Project-Related Environmental Effects –** The assessment of Project-related effects includes descriptions of how an environmental effect will occur or how the Project will interact with the environment, the mitigation and environmental protection measures proposed to reduce or eliminate the environmental effect, and the characterization of the residual environmental effects of the Project. The influence of engagement on the identification of issues and the assessment process, and the consideration of Indigenous information and TK is provided in each VC Chapter (Chapters 6 through 19).
- **Assessment of Cumulative Environmental Effects –** Cumulative environmental effects of the Project are identified in consideration of other past, present, or reasonably foreseeable future projects or activities that have been or will be carried out. The residual cumulative environmental effects of the Project in combination with other projects or activities that have been or will be carried out are then evaluated, including the contribution of the Project to those cumulative environmental effects (as applicable).
- **Determination of Significance –** The significance of residual Project-related and residual cumulative environmental effects, is then determined, in consideration of significance criteria.
- **Assessment of Potential Accidents or Malfunctions and Effects of the Environment on the Project –** The assessment of accidents and malfunctions includes descriptions of the events that may occur outside the normal planned function or activity of the Project, and mitigation and contingency plans to reduce or eliminate the risks of such events. Effects of the environment (e.g., extreme weather

and effects of climate change) on the Project is not a VC, but are considered, as required under CEAA 2012.

- **Environmental Management and Monitoring Programs –** Environmental assessment follow-up and monitoring programs that are required to verify key environmental effects predictions or to verify the effectiveness of the key mitigation, as well as required monitoring, are proposed where appropriate and applicable. This item is discussed in Chapter 23 (Environmental Management and Monitoring).

Further details on the methods that were used in the EIS are provided in the following sections.

4.2.4 Scope of the Project

The scope of the Project is defined by the components and activities required to construct and operate the Project's permanent facilities, including the decommissioning of existing infrastructure prior to construction, and ultimately the decommissioning/closure of Project facilities at the end of the Project life. The Project's components and activities are described in Chapter 2 and includes any ancillary facilities and infrastructure outside the scope of the Project. Mitigation measures incorporated as part of planning and design to mitigate potential adverse effects are presented in Chapter 2, as is an evaluation of alternatives to achieve the Project's purpose.

The factors considered for the environmental assessment for the Project include the following:

- Purpose of the Project
- Alternative means of carrying out the Project that are technically and economically feasible and environmental effects of such alternative means
- Environmental effects of the Project, including effects due to malfunctions or accidents which may occur in connection with the Project
- Consideration of cumulative effects of the Project in combination with other past, present, and reasonably foreseeable future projects and physical activities
- Significance of the environmental effects identified
- Public comments and Indigenous community input
- Technically and economically feasible mitigation measures to avoid or reduce adverse effects or enhance positive effects
- Requirements for follow-up program
- Changes to the Project caused by the environment.

4.3 METHODS

This section describes how the environmental effects assessment has been developed to meet the Final EIS Guidelines (federal) and Manitoba provincial guideline requirements. The assessment progressed through a series of steps as described in the subsections that follow.

4.3.1 Scoping the Assessment

4.3.1.1 Selection of Valued Components

VCs were selected for assessment based on the scope of the Project as prescribed by the Final EIS Guidelines (Appendix 4A), comments and topics raised during engagement, and the potential for interaction between the Project and the physical, biological, and socio-economic environments.

The assessment of environmental effects focuses on VCs, which are the elements of the environment that could be affected by the Project and are of importance or interest to regulators, Indigenous communities, and other potentially affected members of the public or interested parties.

The following VCs have been assessed as part of the EIS:

- Atmospheric Environment
- Noise and Vibration
- Groundwater
- Surface Water
- Fish and Fish Habitat
- Vegetation and Wetlands
- Wildlife and Wildlife Habitat
- Labour and Economy
- Community Services, Infrastructure and Wellbeing
- Land and Resource Use
- Heritage Resources
- Current Use of Lands and Resources for Traditional Purposes
- Human Health
- Indigenous Peoples.

These VCs were selected in consideration of the following:

- Regulatory guidance and requirements.
- Issues raised by regulatory agencies, key stakeholders, and the public.
- VC Selection was further validated/confirmed through engagement with Indigenous communities and Traditional Knowledge.
- Technical aspects of the Project (i.e., nature and extent of Project components and activities).
- Existing environmental conditions in the Project area and interconnections between the physical, biological, and human components of the environment.
- Experience and lessons learned from similar mining projects.
- Expert input or professional judgement.

The EIS provides separate individual chapters to describe each VC (and the rationale for its selection), summarize the comments that have been raised, and describe the linkages to other VCs. The assessment of VCs is provided in Chapters 6 to 19 of the EIS, and each chapter includes specific detail on the VC-specific measurable parameters that were identified for each assessment, and the rationale for the selection of those parameters. A complete discussion of interactions is also provided in each VC chapter. For complete concordance with the Final EIS Guidelines (federal) and provincial guidelines, see Concordance Tables i-1 to i-2. As described in CEAA 2012, environmental effects that result from changes to the environment as a result of the project being carried out or as a result of the federal government exercising any power duty or function that would allow the project to be carried out have been considered in the EIS.

The potential interactions between Project activities and the environment were considered for each VC, for the construction, operation, and decommissioning/closure phases of the Project. The identification of Project activities and their potential interactions with VCs was based on engagement with interested parties, the professional judgment of technical specialists involved in the assessment based on experience with other similar projects, and a review of existing conditions and TK.

4.3.1.2 Potential Environmental Effects, Effects Pathways, and Measurable Parameters

The assessment of potential effects begins with a description of the mechanisms whereby specific Project activities could result in a measurable change in the environment that may affect VCs. For the purposes of this EIS, one or more measurable parameter(s) are selected for the quantitative (where possible) or qualitative measurement of potential Project and cumulative effects. Examples of measurable parameters include the area of wildlife habitat that may be affected or the expected number of workers that will move into the area for Project construction. The amount of change in these measurable parameters is used to help characterize the environmental effects and to assist in evaluating their significance (Section 4.3.4.1).

4.3.2 Assessment Boundaries

Spatial and temporal boundaries are identified for the assessment and assist in quantifying effects. Spatial boundaries set the geographic areas over which the assessment will be conducted. Temporal boundaries set the timeframe to be considered. Spatial and temporal boundaries were established as part of early scoping exercises for the assessment. As Indigenous and public engagement information and traditional knowledge became available, the information was used to confirm the selection of these boundaries for each VC. As described in Chapter 3, spatial and temporal boundaries for each VC were presented at open houses held in February 2020.

4.3.2.1 Spatial Boundaries

Spatial boundaries for the assessment were selected based on the geographic extent over which Project activities and their effects on VCs are likely to occur, as well as other ecological, technical, and social considerations. Three geographic areas were defined for VC assessment purposes – the Project Development Area (PDA), Local Assessment Area (LAA) and Regional Assessment Area (RAA).

- The PDA encompasses the immediate area in which Project activities and components occur plus a 30 m buffer and is the anticipated area of direct physical disturbance associated with the construction and operation of the Project (i.e., the Project footprint; Maps 4-1 and 4-2).
- The LAA encompasses the area in which Project-related environmental effects (direct or indirect) can be predicted or measured for assessment. The LAA, which is specific to each VC, encompasses the PDA and is selected in consideration of the geographic extent of effects.
- The RAA is the area established for context for the determination of significance of project-specific effects. It is also the area in which potential cumulative effects are assessed. The RAA encompasses both the PDA and LAA and is VC-specific.

The term 'Project Region' is used in the assessment referring to Lynn Lake and surrounding areas northwest Manitoba in general.

VC-specific LAAs and RAAs are described and illustrated in each VC chapter (Chapters 6 to 19).

A list of Federal lands which fall within the LAA or RAA of each VC is provided in Appendix 4D.

4.3.2.2 Temporal Boundaries

Temporal boundaries for the assessment address the potential effects during the Project's construction, operation, and decommissioning/closure phases over relevant timescales. These temporal boundaries are used in the assessment of residual effects and are also considered applicable for the assessment of cumulative effects. The overall Project Schedule is presented in Chapter 2.

The temporal boundaries for the Project consist of the following phases:

- Construction (i.e., site preparation, physical construction/equipment installation, pre-production, and commissioning) will be scheduled following Project regulatory approval and is expected to take approximately 2 years to complete (Year -2, Year -1). Some limited pre-production may occur during this period. Project construction activities will be carried out concurrently at both mine sites.
- Operation (i.e., ore and mine rock extraction, processing, and waste management) will follow construction and is expected to take approximately 13 years to complete (Years 1 to 13).
  - Mining operations are expected to commence at both sites in Year 1. Mining at the Gordon site will be undertaken for six years (i.e., during Years 1 to 6) while mining at the MacLellan site will be undertaken for the entire life of the Project (i.e., during Years 1 to 13).
  - The ore stockpiled during mine operations (both sites) will provide feedstock to the ore milling and processing plant located at the MacLellan site during the Project.
- Decommissioning/closure will begin at the cessation of operation at each site. Active closure is scheduled to begin in Year 6 at the Gordon site and in Year 14 at the MacLellan site. Active closure is expected to take approximately 5 to 6 years to complete at each site. Active closure will be followed by post-closure, which is the time period during which active reclamation measures are complete, but monitoring is still required. The expected duration for post-closure is approximately 10 years. Pit filling is expected to take 11 years at the Gordon site and 21 years at the MacLellan site under average conditions (Chapter 9, Section 9.4.1). Permanent closure will occur when the site is stable, and monitoring is no longer required. The duration and conditions for post-closure monitoring and permanent closure will be detailed in subsequent submissions of the Closure Plan to regulatory agencies as Project design and execution progresses.

4.3.3 Description of Existing Conditions

Existing conditions for each VC are established based on data collected during baseline studies involving desktop analyses, field programs, engagement, and from TLRU studies. An overview of the existing environment is presented using current information about the existing condition and includes the identification of important data gaps for the effects assessment. Influences of past and present projects and physical activities on the VC condition leading to the present time is presented along with a discussion of the current condition of the VC. The existing environmental conditions are described in each of the VC chapters (Chapters 6 to 19). Additional supporting baseline material for the VCs is provided in the baseline technical data reports attached as appendices to the EIS.

4.3.4 Assessment of Potential Environmental Effects

The Project's potential effects are assessed in the context of each of the VCs existing condition. As described below, effects pathways and standard and Project-specific mitigation are presented, and the residual effects described for each Project phase (i.e., construction, operation, and decommissioning/ closure). The determination of significance of the residual effects is presented in Section 4.3.4.5 .

4.3.4.1 Assessment of Effect Pathways

For each potential effect, specific Project activities that may interact with the VC and result in an environmental effect (i.e., a measurable change that may affect the VC) are identified and described. The assessment of effect pathways is presented in the individual VC assessment chapters. Components and activities that do not interact with the VC are also identified and the reason for the lack of interaction is explained.

4.3.4.2 Mitigation of Potential Project Effects

Mitigation measures that will eliminate, reduce, or control potential environmental effects are identified and described for each VC. Technically and economically feasible mitigation measures constituting standard practice were considered in the evaluation of Project effects. Mitigation can also include VC-specific measures to deal with VC-specific issues, such as habitat offsetting/compensation, replacement, or planned environmental management and response measures.

Proposed mitigation measures are identified in the VC-specific effects assessment chapters and in the Project Environmental Management Plans as part of a process of adaptive management (Chapter 23).

4.3.4.3 Summary of Project Residual Environmental Effects

Following the analysis of environmental effects pathways and mitigation measures, the residual environmental effects (i.e., the environmental effects that remain after mitigation has been applied) are described. Characterizations of residual environmental effects include:

- **Direction** – the relative change compared to existing conditions (i.e., positive, or adverse).
- **Magnitude** – the amount of change in a measurable parameter or variable relative to existing conditions, defined for each VC as low, moderate, high, or other qualifier as deemed appropriate.
- **Geographic Extent** – the geographic area where the residual environmental effect of a defined magnitude occurs, defined for each VC based on definitions of PDA, LAA, and RAA, as appropriate.
- **Timing** - considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.
- **Frequency** – how often the residual environmental effect might occur (e.g., one time or multiple times) in a specified time period.
- **Duration** – the length of time required until the residual environmental effect can no longer be measured or perceived (e.g., short-term, mid-term, long-term).
- **Reversibility** – whether a measurable parameter or the VC can return to its existing condition or other target (such as a remediation target) after the Project activity ceases, including through active management techniques (e.g., habitat restoration).

- **Ecological/Socio-economic Context** – considers unique characteristics or value of the area, a community and/or ecosystem that may be affected by the Project and or whether the VC is important to the functioning of an ecosystem or community of people (i.e., resiliency). Ecological context takes into consideration existing conditions as well as the results of engagement and traditional knowledge.

Quantitative measures, where possible, and qualitative considerations where quantitative measurement was not possible, were developed to characterize residual effects. Residual environmental effects are effects that remain following the consideration of mitigation measures. A summary of the characterization of residual environmental effects is provided in tabular form for each VC. An example summary table is provided in Table 4-1.

Residual effects that are characterized as adverse are carried forward to the cumulative effects assessment (Section 4.3.4.4) and considered further regarding their significance (Section 4.3.4.5). Positive effects from the Project are considered further regarding their environmental, economic, and social benefits (Chapter 24).

The definitions of each term are typically standard across all VCs. The definitions of magnitude of the residual effects is VC-specific as provided in each of the VC assessment chapters. Characterizations are each provided for the Gordon and MacLellan sites, as applicable.

Table 4.1 Example of Summary of Residual Environmental Effects Table

Residual Effect	Residual Environmental Effects Characterization						
	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Gordon Site							
Residual Effect 1							
Residual Effect 2							
Residual Effect 3							
MacLellan Site							
Residual Effect 1							
Residual Effect 2							
Residual Effect 3							

4.3.4.4 Assessment of Cumulative Environmental Effects

Under cumulative effects assessment, Project residual effects that are likely to interact cumulatively with residual environmental effects from other physical activities (past, present, and reasonably foreseeable) are identified (future scenario with the Project) and assessed. The future scenario without the Project is also described. The Project's contribution to the cumulative effect is then analyzed. The approach used for conducting the cumulative effects assessment for the Project is as described in the Canadian Environmental Assessment Agency's Operational Policy Statement for Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act, 2012*, Technical Guidance for Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act, 2012*, and the Final Guidelines for the Preparation of the Environmental Impact Statement for the Lynn Lake Gold Project (Appendix 4A).

The effects of past and current projects relative to conditions prior to historic mining contribute to baseline conditions upon which Project effects are assessed. Conditions prior to historical mining activities are generally considered to be similar to currently undisturbed areas of the RAA for each VC. Changes in the interim (i.e., after the initiation of historic mining to the present day), where relevant, are reflected in the description of existing conditions for each VC. These existing conditions are the basis for determination of Project-related residual effects and cumulative effects with other past, present, and reasonably foreseeable future projects and activities.

Future projects that are reasonably foreseeable are those that (a) have obtained the necessary authorizations to proceed or are in the process of obtaining the required authorization, or (b) have been publicly announced with the intention to seek the necessary authorizations to proceed.

Two conditions must be met to initiate an assessment of cumulative effects on a VC:

- The Project is assessed as having adverse residual environmental effects on a VC.
- The adverse residual effects from the Project overlap spatially and temporally with residual effects of other physical activities on a VC.

If either condition is not met, an assessment of cumulative environmental effects would not be completed. The temporal overlap between the residual effects of the Project and the residual effects of other physical activities on a VC considers the Project phases and temporal boundaries described in Section 4.3.3.2.

Other projects and physical activities that might act cumulatively with the Project are identified and presented in the project and physical activities inclusion list (see below). The cumulative effects assessment considers how current environmental conditions were created by past and present physical activities and resource uses for each VC. How the Project and other existing and reasonably foreseeable future projects and activities affect the environment cumulatively is then discussed. For each potential cumulative effect, the interactions by which the cumulative effect may occur and the change in the state of the VCs relative to existing conditions are characterized.

The cumulative effects assessment follows the same iterative process and format used for Project effects; namely, description and analysis of cumulative effects, mitigation of cumulative effects, and characterization of residual cumulative effects as discussed below. A determination of the significance of residual cumulative environmental effects is then made using the same standards or thresholds for significance developed for the VC. The Project contribution to those cumulative effects is also analyzed and discussed. Information from engagement activities and regulators was also used to inform the cumulative effects assessment. The results of the cumulative effects assessment are described in each VC Chapter and summarized in Chapter 20.

Project and Activity Inclusion List

The project and activity inclusion list identifies known past, present and reasonably foreseeable future projects and physical activities that could overlap spatially and temporally with the Project's residual environmental effects. Table 4D-1 (Appendix 4D) presents the names, proponents, targeted commodity, use or activity, descriptions, and status of these projects and activities. Map 4-3 and Map 4-4 present the locations of these existing and known future physical activities. The specific projects and physical activities considered for each environmental effect and their interaction for each VC considered are described further in the VC Chapters (Chapter 6 to 19).

Pathways for Cumulative Effects

The assessment of each cumulative environmental effect begins with a description of the residual adverse Project environmental effects and an analysis of the pathways whereby they might interact with the residual effects from other projects and activities.

Mitigation of Cumulative Effects

Mitigation measures that can reduce the project cumulative environmental effects are described, with an emphasis on those measures that are under the control of the Proponent and that would help to reduce the interaction of the Project effect with the effects from other projects and activities. These additional mitigation measures that would assist in reducing potential cumulative environmental effects are described for the various VCs presented in Chapter 20.

Alamos is committed to mitigation of potential cumulative effects through monitoring of the Project's potential effects and implementing adaptive management for unanticipated effects. In addition, Alamos will share information and knowledge with other proponents through its environmental assessment and monitoring reports to regulatory agencies, such as Manitoba Conservation and Climate.

In developing mitigation measures for adverse cumulative effects, it is typically not feasible (or appropriate) for one proponent to manage effects in an area developed by several other proponents. It is the primary responsibility of a given proponent to manage their own projects.

Three types of mitigation can be implemented as follows:

- Those implemented solely by the Project proponent.
- Those implemented by the Project proponent in cooperation with other project proponents, government, Indigenous communities, or public stakeholders.
- Those implemented independently by other project proponents, government, Indigenous communities, or public stakeholders.

The degree to which the Proponent can influence the implementation of other proponent's measures is noted where known.

Characterization of Residual Cumulative Effects

As with residual Project effects, residual cumulative effects are described using the same characterizations: direction, magnitude, geographic extent, timing, frequency, duration, reversibility, and ecological or socio-economic context. The same qualitative or quantitative measures as for Project residual effects are used.

Residual cumulative environmental effects (i.e., the environmental effect of all past, present, and reasonably foreseeable projects and physical activities in combination with the environmental effect of the Project) are described, and the contribution of the Project to cumulative effects is discussed.

4.3.4.5 Determination of Significance of Effects (Project and Cumulative)

For each environmental effect, threshold criteria or standards beyond which a residual environmental effect is considered significant are identified. The thresholds are defined in consideration of federal and provincial regulatory requirements, standards, objectives, or guidelines as applicable to the VC. Where thresholds are not set by guidelines or regulations, a threshold is developed using the measurable parameters established for the VC, along with professional judgement of the assessors. The thresholds define the limits of a change in a measurable parameter or state of the VC beyond which it would be considered significant, based on resource management objectives, community standards, scientific literature, or ecological processes (e.g., desired states for fish or wildlife habitats or populations). Quantitative thresholds are preferred; however qualitative thresholds for significance may be used where quantitative thresholds are lacking.

A determination of significance of Project residual adverse environmental effects is made using thresholds of significance as defined for the VC. Generally, the determination of significance depends in part on the magnitude, duration, frequency, geographic extent, timing, or irreversibility of the residual effects.

If an environmental effect is determined to be significant, there is further consideration of the likelihood of occurrence of that significant environmental effect.

For cumulative environmental effects, the determination of significance is made using the same VC thresholds as for Project environmental effects. The assessment of significance of cumulative environmental effects is based on comparison to current conditions and includes an analysis of the Project's contribution to these cumulative effects.

4.3.4.6 Prediction Confidence

The determination of significance of residual Project environmental effects and residual cumulative environmental effects includes a discussion of the level of confidence in the prediction. Confidence in the prediction is based on scientific certainty relative to:

- The quality and quantity of data and the understanding of the effect pathways.

- The known or estimated effectiveness of the proposed mitigation measures.

4.3.5 Effects of the Environment on the Project

The Final EIS Guidelines for the Project and Section 19.1(h) of CEAA 2012, requires consideration of changes to the Project that may be caused by the environment. Effects that may occur as a result of the environment acting on the Project will be assessed. Potential environmental forces and hazards may include climate (i.e., extreme precipitation and storms, tornados, droughts, and floods), climate change, seismic events and landslides, and forest fire. The influence that these environmental forces and hazards may have on the Project will be predicted and described as well as the measures taken to limit or avoid potential adverse effects. The effects of the environment on the Project are presented in Chapter 21.

Potential effects of the environment on the Project are assessed in a similar fashion to Project environmental effects. Effects of the environment on the Project are identified, significance thresholds are determined, existing conditions are described, potential effects analyzed, mitigation measures described, and residual effects characterized. A summary statement of the effects of the environment on the Project is then provided.

4.3.6 Assessment of Potential Accidents or Malfunctions

Section 19 (1) (a) of CEAA 2012 and the Final EIS Guidelines require that the environmental assessment consider the effects of accidents or malfunctions that might occur in connection with a project. The potential for and consequence of accidents or malfunctions to occur over the life of the Project were assessed in this EA. The assessment provides a range of potential accident or malfunction event scenarios across all phases of the Project – construction, operation, and decommissioning/closure and evaluates their environmental effects. The assessment provides an initial basis for development of emergency response planning and what will eventually be incorporated into the Project's emergency response plan. Details on the types of accident or malfunction events considered are discussed in Chapter 22 of this EA.

Potential environmental effects on VCs due to accidents or malfunctions are assessed in a similar fashion to Project environmental effects (Section 4.3.4). Environmental effects are first identified, mitigation and safety measures are described (i.e., incident avoidance measures, design safeguards), and effects are characterized using the same terms used for Project-related environmental effects. The significance of the environmental effects is then determined using the same thresholds used for Project-related environmental effects based on the likelihood of the event occurring and the severity of the event.

4.3.7 Environmental Management Plans and Monitoring

A preliminary framework and scope for environmental management plans (EMPs), including environmental assessment follow-up and monitoring was developed in consideration of the Final EIS Guidelines for the Project. The EMP framework, including the context and objectives, is described in Chapter 23 and consists of the following conceptual plans:

- Air Quality and Greenhouse Gas Management plans

- Noise Monitoring Plan
- Groundwater Monitoring Plan
- Surface Water Monitoring and Management Plan
- Fish Habitat Offsetting and Fish Salvage plans
- Vegetation and Weed Management Plan
- Wildlife Monitoring and Management Plan
- Heritage and Cultural Resources Protection Plan
- Conceptual Closure Plan
- Emergency Response and Spill Prevention and Contingency Plan
- Erosion and Sediment Control Plan
- Soil Management and Rehabilitation Plan
- Mine Rock Management Plan
- Waste Management and Explosives Management Plans

A follow-up and monitoring program is used where applicable to verify the accuracy of key predictions and effectiveness of key mitigation measures proposed to mitigate adverse project and cumulative environmental effects. Compliance monitoring verifies compliance with the requirements of permit conditions, approvals or authorizations issued under laws or regulations. Preliminary VC-specific follow-up and monitoring plans are also identified under the conceptual EMP framework.

Adaptive management is the core element in the approach to implementation of the EMP and the EA follow-up and monitoring program. Adaptive management is a planned process for responding to uncertainty or to an unanticipated or underestimated Project effects. Information learned from monitoring actual Project effects is applied and compared to predicted effects. Where a variance between the actual and predicted effects occurs, a determination is made as to whether modifications or other actions are necessary to revise the existing mitigation measures. In cases where there may be no other mitigating options available, appropriate information sharing occurs on a timely basis.

Plans for information sharing with Indigenous communities and local and regional stakeholders regarding follow-up and monitoring activities and EMPs, including development and implementation of the program and public reporting, are included in the EMP framework.

4.3.8 Summary of Assessment, Commitments, and Outstanding Issues

The Final EIS Guidelines for the Project require the proponent to summarize key information from the EA. Summaries are presented in Chapter 20 in consideration of the following:

- Environmental effects under Section 5 of CEAA 2012 related to changes to the environment and effects of changes to the environment.
- Potential environmental effects, mitigation, residual environmental effects and cumulative effects and their significance.
- Proposed environmental management and monitoring.
- Proponent commitments and outstanding issues.
- Outstanding issues identified through engagement.

4.4 REFERENCES

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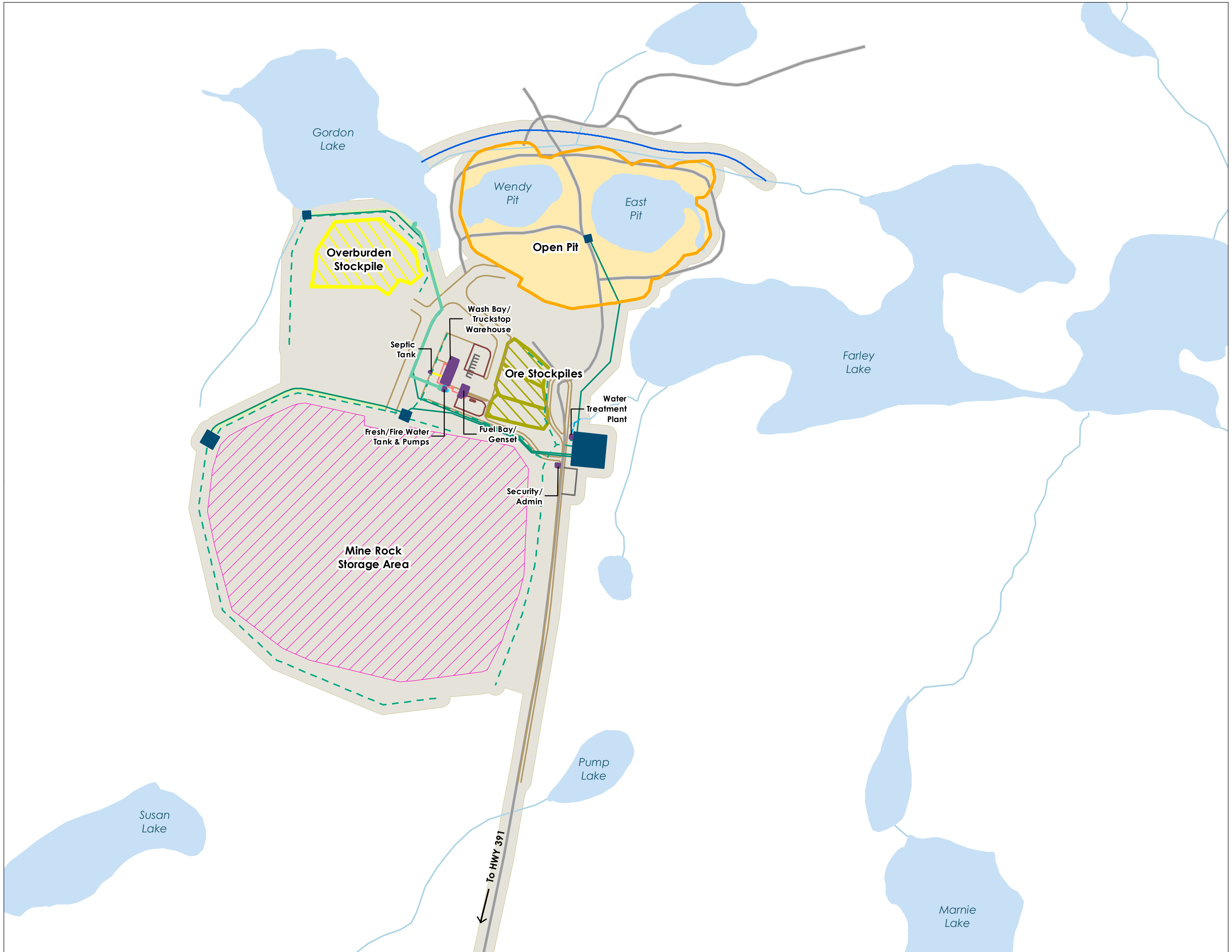

Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area
- Buildings
- Pond

Site Access

- Proposed Site Access Road
- Drainage Road

Other Infrastructure

- Construction Temporary Facility
- Parking
- Diversion Channel
- Fresh Water Pipe
- Sewer
- Potable Water
- Drainage Ditch - Clean water
- Drainage Ditch - Potentially Contaminated
- Drainage Pipe
- Fire Water

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:12,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Project Infrastructure features provided by QPit and Ausenco.

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2019-12-03
Technical Review by CAnseeuw on 2019-12-03
Senior GIS Review by GKroupa on 2019-12-11

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
4-1

Title
Project Development Area - Gordon site

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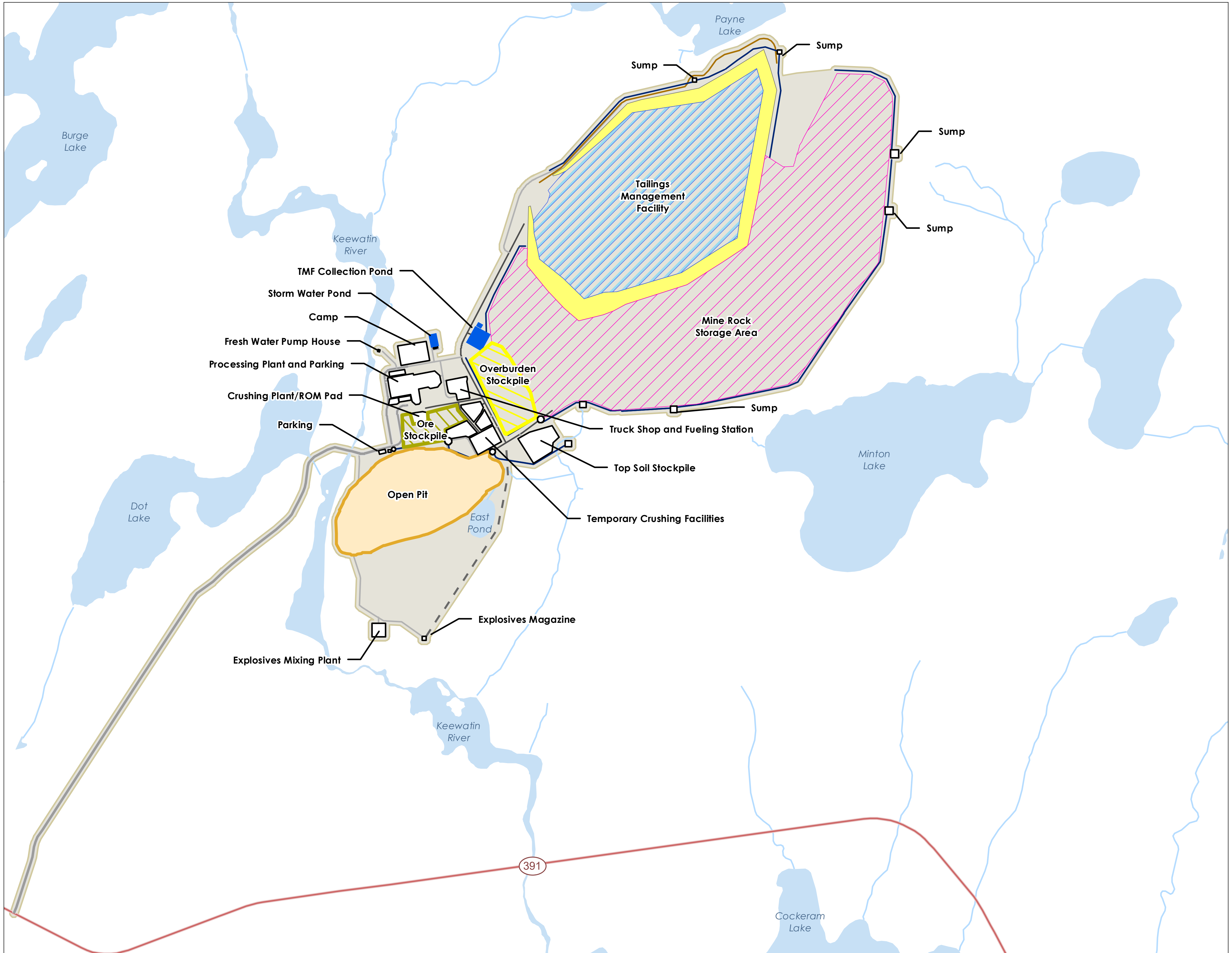

Stantec

Alamos Gold Inc.

Project Infrastructure

- Project Development Area
- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Ore Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Drainage Ditch
- Access Road
- Haul Road
- Inplant Road
- Toe Road
- Future Access Road

Landbase

- Highway
- Existing Access Road
- Watercourse
- Waterbody

N

0 0.5 1 Kilometres

(At original document size of 11x17)
1:30,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Project Infrastructure features provided by QPit and Ausenco.

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-05-08
Technical Review by ASomers on 2020-05-08
Senior GIS Review by GKroupa on 2020-05-08

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
4-2

Title
Project Development Area - MacLellan site

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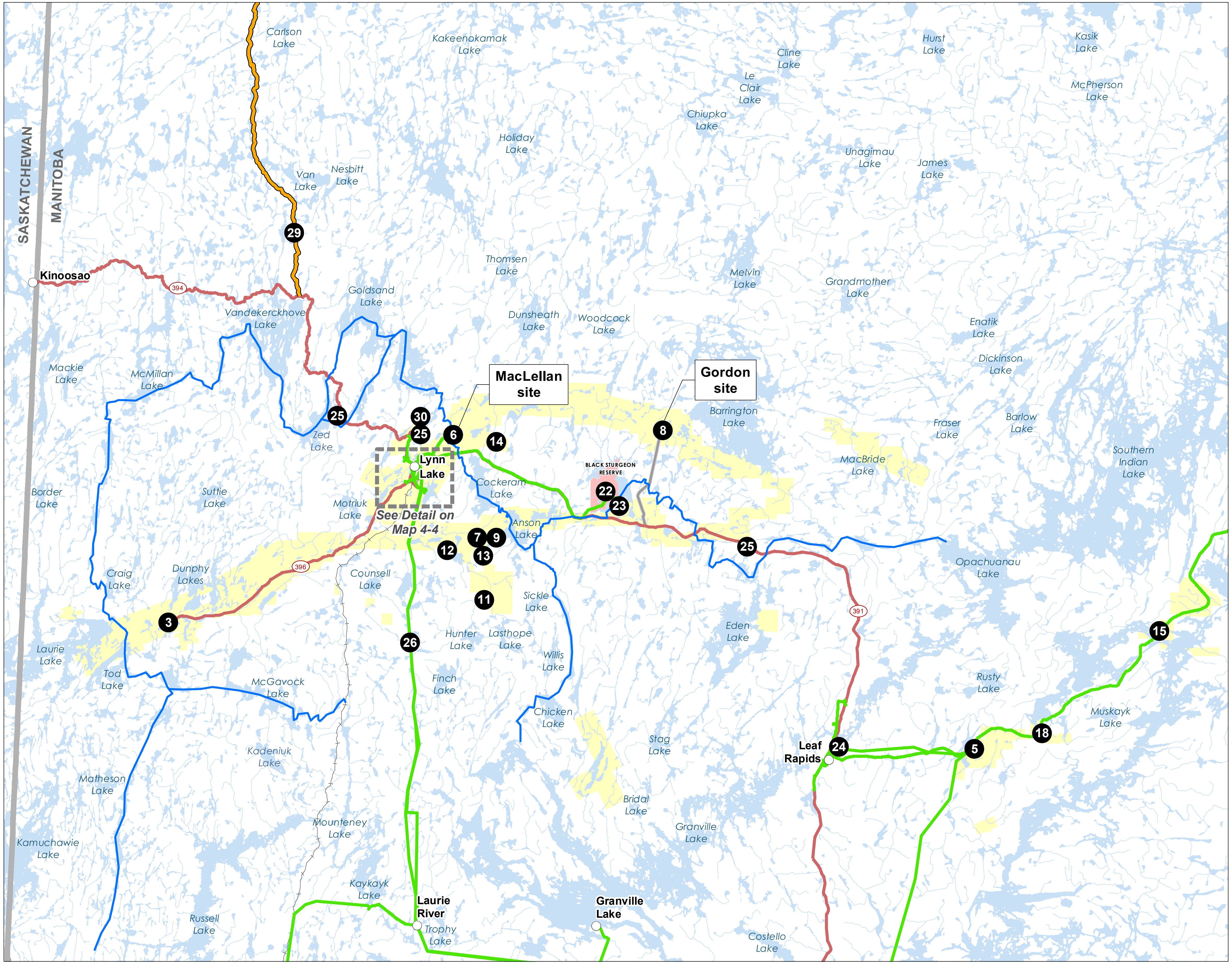


Stantec

ALAMOS GOLD INC.

Points of Interest

● Activity / Development Location

MINERAL DEVELOPMENT
1. A Mine*
2. EL Mine*
3. **Fox Mine**
4. Farley Mine*
5. **Ruttan Mine**
6. **MacLellan Mine (Historical)**
7. **Burnt Timber Mine**
8. **Farley Lake Mine**
9. **Keystone Gold Mine**
10. East/West Tailings Management Areas*

MINERAL EXPLORATION
11. **Last Hope Project**
12. **Linkwood Property Deposit**
13. **Burnt Timber Project**
14. **Lynn Lake Gabbros Nickel Project**
15. **South Bay Project**
16. Lynn Lake Nickel Sulphide Project*
17. Lynn Lake Nickel Project*
18. **Nisku Project**

** Not on current view; see Map 4-4*

WATER AND WASTE
19. Lynn Lake Waste Disposal Grounds*
20. Lynn Lake Aerated Sewage Lagoon*
21. Lynn Lake Water Treatment Plan*
22. **Black Sturgeon Sewage Treatment Lagoon**
23. **Black Sturgeon Water Treatment Facility**
24. **Leaf Rapids Sewage Treatment Plant**

RESIDENTIAL AND COMMUNITY DEVELOPMENT
25. **Cottage Subdivisions**

INFRASTRUCTURE DEVELOPMENT
26. **138 kV Transmission Line**
27. **Lynn Lake Airport**
28. Water Aerodrome (Eldon Lake)*
29. **Winter Road**

OTHER RESOURCE ACTIVITIES
30. **Annual Pike Fishing Derby**

Canoe Route
Winter Road
Hydro Transmission Line
Mineral Exploration Activity - Claims

Landbase

Community
Highway
Access Road
Railway
Watercourse
Waterbody
First Nation Reserve
Provincial Border

N

0 10 20 Kilometres

(At original document size of 11x17)
1:600,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada

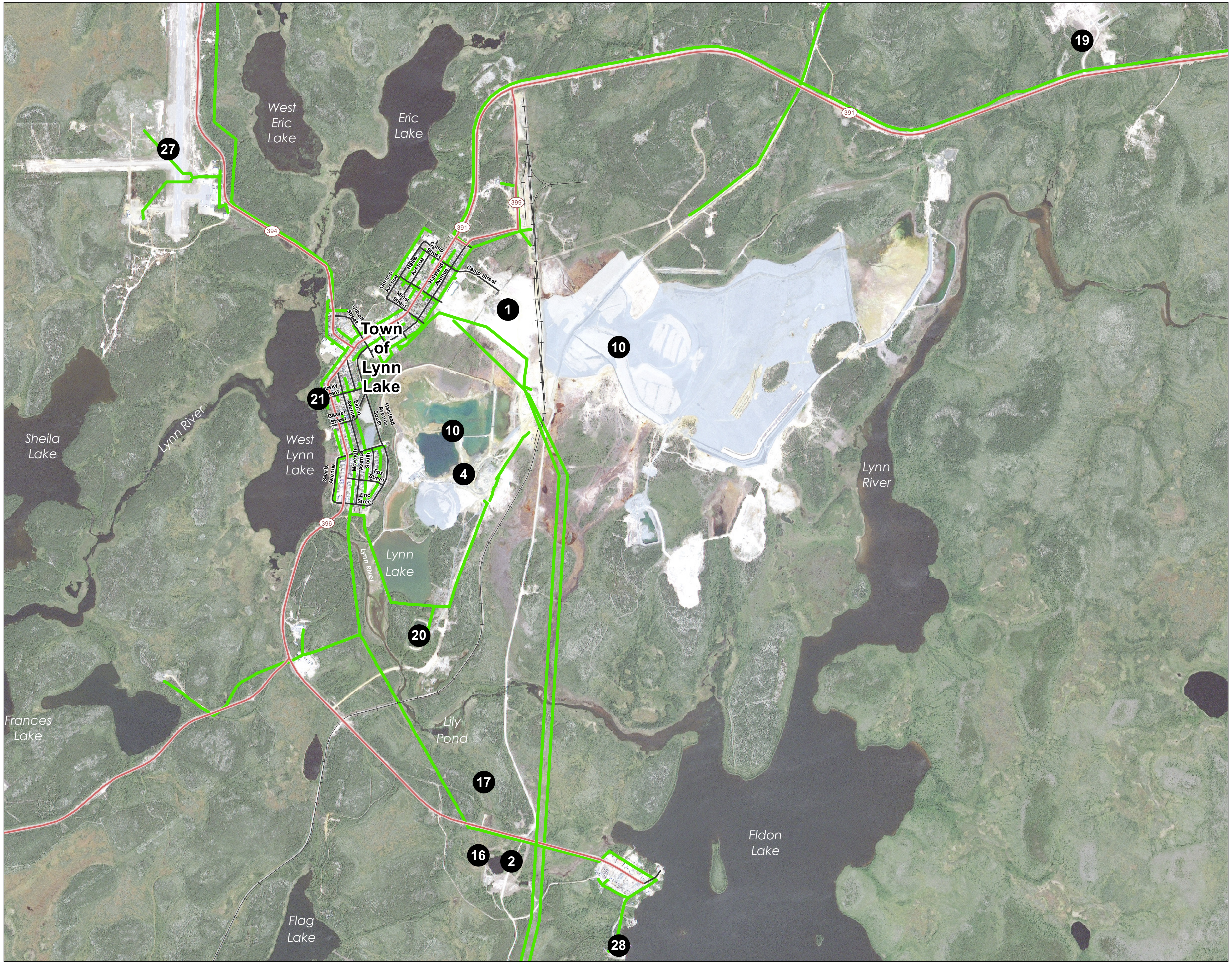
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2019-12-03
Technical Review by CAnseeuw on 2019-12-03
Senior GIS Review by GKroupa on 2019-12-11

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
4-3

Title
Projects and Activities Regional View



Stantec

ALAMOS GOLD INC.

Points of Interest

● Activity / Development Location

MINERAL DEVELOPMENT
1. **A Mine**
2. **EL Mine**
3. Fox Mine*
4. **Farley Mine**
5. Ruttan Mine*
6. MacLellan Mine (Historical)*
7. Burnt Timber Mine*
8. Farley Lake Mine*
9. Keystone Gold Mine*
10. **East/West Tailings Management Areas**

MINERAL EXPLORATION
11. Last Hope Project*
12. Linkwood Property Deposit*
13. Burnt Timber Project*
14. Lynn Lake Gabbros Nickel Project*
15. South Bay Project*
16. **Lynn Lake Nickel Sulphide Project**
17. **Lynn Lake Nickel Project**
18. Nisku Project*

** Not on current view; see Map 4-3*

WATER AND WASTE
19. **Lynn Lake Waste Disposal Grounds**
20. **Lynn Lake Aerated Sewage Lagoon**
21. **Lynn Lake Water Treatment Plan**
22. Black Sturgeon Sewage Treatment Lagoon*
23. Black Sturgeon Water Treatment Facility*
24. Leaf Rapids Sewage Treatment Plant*

RESIDENTIAL AND COMMUNITY DEVELOPMENT
25. Cottage Subdivisions*

INFRASTRUCTURE DEVELOPMENT
26. 138 kV Transmission Line*
27. Lynn Lake Airport*
28. Water Aerodrome (Eldon Lake)*
29. Winter Road*

OTHER RESOURCE ACTIVITIES
30. Annual Pike Fishing Derby*

Hydro Transmission Line

Landbase

Highway

Minor Road

Railway

N

0 250 500 Metres
(At original document size of 11x17)
1:26,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Imagery: SPOT-7 imagery, BlackBridge Gemoatics Corp. July 2015.

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2019-12-03
Technical Review by CAnseeuw on 2019-12-03
Senior GIS Review by GKroupa on 2019-12-11

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
4-4

Title
Projects and Activities
Town of Lynn Lake

Appendix 4A FINAL GUIDELINES FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT, PURSUANT TO CEAA 2012

GUIDELINES FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT

pursuant to the

Canadian Environmental Assessment Act, 2012

Lynn Lake Gold Project

ALAMOS GOLD INC.

Version 2: November, 2017

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DISCLAIMER

This document is not a legal authority, nor does it provide legal advice or direction; it provides information only, and must not be used as a substitute for the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) or its regulations. In the event of a discrepancy, CEAA 2012 and its regulations prevail. Portions of CEAA 2012 have been paraphrased in this document, but will not be relied upon for legal purposes.

Abbreviations and Short Forms

CEAA 2012	*Canadian Environmental Assessment Act*, *2012*
Agency	Canadian Environmental Assessment Agency
EA	environmental assessment
EIS	environmental impact statement
MMER	*Metal Mining Effluent Regulations*
SARA	*Species at Risk Act*
VC	valued component

Part 1 - Key Considerations

1. INTRODUCTION

The purpose of this document is to identify for the proponent the minimum information requirements for the preparation of an Environmental Impact Statement (EIS) for a designated project[1] to be assessed pursuant to the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). This document specifies the nature, scope and extent of the information required. Part 1 of this document defines the scope of the environmental assessment (EA) and provides guidance and general instruction that must be taken into account in preparing the EIS. Part 2 outlines the information that must be included in the EIS.

Section 5 of CEAA 2012 describes the environmental effects that must be considered in an EA, including changes to the environment and effects of changes to the environment. The factors that are to be considered in an EA are described under section 19 of CEAA 2012. The Canadian Environmental Assessment Agency (the Agency) or a review panel will use the proponent's EIS and other information received during the EA process to prepare a report that will inform the issuance of a decision statement by the Minister of Environment and Climate Change. Therefore the EIS must include a full description of the changes the project will cause to the environment that may result in adverse effects on areas of federal jurisdiction (i.e. section 5 of CEAA 2012) including changes that are directly linked or necessarily incidental to any federal decisions that would permit the project to be carried out. The EIS must also include a list of key mitigation measures that the proponent proposes to undertake in order to avoid or minimize any adverse environmental effects of the project. It is the responsibility of the proponent to provide sufficient data and analysis on potential changes to the environment to ensure a thorough evaluation of the environmental effects of the project by the Agency or review panel.

2. GUIDING PRINCIPLES

2.1. Environmental assessment as a planning and decision making tool

Environmental assessment (EA) is a process to predict environmental effects of proposed projects before they are carried out. An EA:

- identifies potential adverse environmental effects;
- proposes measures to mitigate adverse environmental effects;
- predicts whether there will be significant adverse environmental effects, after mitigation measures are implemented; and
- includes a follow-up program to verify the accuracy of the EA and the effectiveness of the mitigation measures.

2.2. Public participation

One of the purposes identified in CEAA 2012 is to ensure that opportunities are provided for meaningful public participation during an EA. CEAA 2012 requires that the Agency provide the public

1 In this document, "project" has the same meaning as "designated project" as defined in CEAA 2012.

with an opportunity to participate in the EA. For EAs led by the Agency the public has an opportunity to comment on the draft EA report. For EAs by a review panel, CEAA 2012 requires that the review panel hold a public hearing. Additional opportunities for participation may also be provided.

Meaningful public participation is best achieved when all parties have a clear understanding of the proposed project as early as possible in the review process. The proponent is required to provide current information about the project to the public and especially to the communities likely to be most affected by the project.

2.3. Engagement with Indigenous groups

A key objective of CEAA 2012 is to promote communication and cooperation with Indigenous peoples which includes First Nations, Inuit and Métis. The proponent is expected to engage with potentially affected groups, beginning as early as possible in the project planning process. The proponent shall provide potentially affected groups with opportunities to learn about the project and its potential effects and to make their concerns known about the project's potential effects and discuss measures to mitigate those effects. The proponent is strongly encouraged to work with each potentially affected group separately or together (should more than one group propose to engaged together), to establish an engagement approach. The proponent will make reasonable efforts to integrate Aboriginal traditional knowledge into the assessment of environmental effects and provide evidence of all efforts. For more information on incorporating Aboriginal traditional knowledge, refer to Part 1, Section 4.2.2 of these guidelines.

In order to fulfill the Crown's constitutional obligations to consult with potentially impacted groups, the Agency integrates its legal obligation for consultation and accommodation in the EA process. The information gathered by the proponent during its engagement with groups helps to contribute to the Crown's understanding of any potential adverse impacts on potential or established Aboriginal or treaty rights protected under section 35 of the *Constitution Act*, *1982* ("section 35 Aboriginal rights") including title and related interests, and the effectiveness of measures proposed to avoid or minimize those impacts.

2.4. Application of the precautionary approach

In documenting the analyses included in the EIS, the proponent will demonstrate that all aspects of the project have been examined and planned in a careful and precautionary manner in order to avoid significant adverse environmental effects.

3. SCOPE OF THE ENVIRONMENTAL ASSESSMENT

3.1. Designated project

On July 4, 2017, Alamos Gold Inc., the proponent of the Lynn Lake Gold Project, provided a project description to the Agency. Based on this project description, the Agency has determined that an EA is required under CEAA 2012 and will include the construction, operation, decommissioning and abandonment of the following project components:

– Open pits
– Ore, low grade ore, waste rock, overburden, top soil stockpile/storage areas
– Tailings management facility

- Water management facilities (potable and process)
- Central ore milling and processing plant
- Explosive storage and manufacturing
- Effluent treatment
- Site clearing, earthmoving, leveling, drilling and blasting activities
- Transportation corridor construction or improvement
- Ore and concentrate transportation
- Water supply (industrial and drinking)
- Wastewater treatment
- Power supply, including any new powerlines to the facility and related electrical supply infrastructure)
- Borrow areas
- Ancillary infrastructure (security, parking areas, mine truck and vehicle maintenance shops, administrative offices, warehouses, laboratories, and vehicle fueling and maintenance facilities)
- On-site and off-site accommodations
- Diversion channel adjustments

3.2. Factors to be considered

Scoping establishes the parameters of the EA and focuses the assessment on relevant issues and concerns. Part 2 of this document specifies the factors to be considered in the EA, including the factors listed in subsection 19(1) of CEAA 2012:

- environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other physical activities that have been or will be carried out;
- the significance of the effects referred to above;
- comments from the public;
- mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- the requirements of the follow-up program in respect of the project;
- the purpose of the project;
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
- any change to the project that may be caused by the environment; and
- the results of any relevant regional study pursuant to CEAA 2012.

3.2.1. Changes to the environment

Environmental effects occur as interactions between actions (the carrying out of the project or decisions made by the federal government in relation to the project) and receptors in the environment, and subsequently between components of the environment (e.g. change in water quality that may affect fish).

Under CEAA 2012, an examination of environmental effects that result from changes to the environment as a result of the project being carried out or as a result of the federal government exercising any power duty or function that would allow the project to be carried out must be considered in the EIS.

In scoping the potential changes to the environment that may occur, the proponent should consider any potential changes in the physical environment such as changes to air quality, water quality and quantity, and physical disturbance of land that could reasonably be expected to occur.

3.2.2. Valued components to be examined

Valued components (VCs) refer to environmental biophysical or human features that may be impacted by a project. The value of a component not only relates to its role in the ecosystem, but also to the value people place on it. For example, it may have been identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance.

The proponent must conduct and focus its analysis on VCs as they relate to **section 5 of CEAA 2012,** including the ones identified in Section 6.2 (Part 2) of these guidelines that may be affected by changes in the environment, as well as species at risk and their critical habitat as per the requirement outlined in section 79 of the *Species at Risk Act*. Section 5 of CEAA 2012 defines environmental effects as:

- a change that may be caused to fish and fish habitat, marine plant and migratory birds;
- a change that may be caused to the environment on federal lands, in another province or outside Canada;
- with respect to Aboriginal peoples, an effect of any change that may be caused to the environment on:
  - ✓ health and socio-economic conditions;
  - ✓ physical and cultural heritage;
  - ✓ the current use of lands and resources for traditional purposes; or
  - ✓ any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.
- for projects requiring a federal authority to exercise a power or perform a duty or function under another Act of Parliament:
  - ✓ a change, other than the ones mentioned above, that may be caused to the environment and that is directly linked or necessarily incidental to the exercise of the federal power or the performance of a duty or function; and
  - ✓ the effect of that change, other than the effects mentioned above, on:
    - o health and socio-economic conditions,
    - o physical and cultural heritage, or
    - o any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

The list of VCs presented in the EIS will be completed according to the evolution and design of the project and reflect the knowledge acquired through public consultation and engagement with

Indigenous groups. The EIS will describe what methods were used to predict and assess the adverse environmental effects of the project on these valued components.

The VCs will be described in sufficient detail to allow the reviewer to understand their importance and to assess the potential for environmental effects arising from the project activities. The EIS will provide a rationale for selecting specific VCs and for excluding any VCs or information specified in these guidelines. Challenges may arise regarding particular exclusions, so it is important to document the information and the criteria used to justify the exclusion of a particular VC or piece of information. Justification may be based on, for example, primary data collection, computer modelling, literature references, public participation or engagement with Indigenous groups, or expert input or professional judgement. The EIS will identify those VCs, processes, and interactions that either were identified to be of concern during any workshops or meetings held by the proponent or that the proponent considers likely to be affected by the project. In doing so, the EIS will indicate to whom these concerns are important (i.e. the public or Indigenous groups) and the reasons why, including environmental, cultural, historical, social, economic, recreational, and aesthetic considerations, and traditional knowledge. If comments are received on a component that has not been included as a VC, these comments will be summarized and the rationale for excluding the component will address the comments.

3.2.3. Spatial and temporal boundaries

The spatial and temporal boundaries used in the EA may vary depending on the VC and will be considered separately for each VC, including for VCs related to the current use of lands and resources for traditional purposes by Aboriginal peoples, or other environmental effects referred to under paragraph 5(1)(c) of CEAA 2012. The proponent is encouraged to consult with the Agency, federal and provincial government departments and agencies, local government and Indigenous groups, and take into account public comments when defining the spatial and temporal boundaries used in the EIS.

The EIS will describe the spatial boundaries, including local and regional study areas, of each VC to be used in assessing the potential adverse environmental effects of the project and provide a rationale for each boundary. Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Aboriginal traditional knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations.

The temporal boundaries of the EA will span all phases of the project determined to be within the scope of this EA as specified under section 3.1 above. Temporal boundaries will be defined taking into account effects predicated after project decommissioning and reclamation, and community knowledge and Aboriginal traditional knowledge. If impacts are predicted after project decommissioning, this should be taken into consideration in defining boundaries. Community knowledge and aboriginal traditional knowledge should factor into decisions around defining temporal boundaries.

If the temporal boundaries do not span all phases of the project, the EIS will identify the boundaries used and provide a rationale.

4. PREPARATION AND PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT

4.1. Guidance

The proponent is encouraged to consult relevant Agency policy and guidance[2] on topics to be addressed in the EIS, and to liaise with the Agency during the planning and development of the EIS. The proponent is also encouraged to consult relevant guidance from other federal departments.

In planning for a mine proposal and in developing the EIS and technical support documentation, the proponent is advised to consider the “Environmental Code of Practice for Metal Mines”[3], published by Environment and Climate Change Canada in 2009. The recommended practices in the Code include the development and implementation of environmental management tools, the management of wastewater and mining wastes, and the prevention and control of environmental releases to air, water and land. In addition, the parameters and approach of the Environmental Effects Monitoring program under the *Metal Mining Effluent Regulations* (MMER) should be considered when developing a baseline monitoring program for the aquatic environment.

For projects requiring the use of natural water bodies frequented by fish for the disposal of mine waste, including tailings and waste rock and for the management of process water, the MMER would need to be amended to add the affected water bodies to Schedule 2 to designate them as tailings impoundment areas. This regulatory process will not be initiated until a detailed assessment of alternatives for mine waste disposal has been undertaken by the proponent. Conducting this robust and thorough assessment of alternatives during the EA will streamline the overall regulatory review process and minimize the time required to proceed with the MMER amendment process. It also facilitates a thorough and transparent review of the assessment of alternatives as part of the EA process. For further guidance, the proponent should consult Environment and Climate Change Canada’s Guidelines for the Assessment of Alternatives for Mine Waste Disposal (2011).

In the event that the proponent chooses not to conduct an assessment of alternatives for mine waste disposal during the EA stage pursuant to the MMER requirements, the EA under CEAA 2012 will continue. In these circumstances, the proponent should discuss with Environment and Climate Change Canada how the information requirements and consultation associated with the MMER amendment process can be addressed through other means.

Submission of regulatory and technical information necessary for federal authorities to make their regulatory decisions during the conduct of the EA is at the discretion of the proponent. Although that information is not necessary for the EA decision, the proponent is encouraged to submit it concurrent with the EIS. While the EIS must outline applicable federal authorizations required for the project to proceed, the proponent must provide information relevant to the regulatory role of the federal government. It should be noted that the issuance of these other applicable federal legislative, regulatory and constitutional requirements are within the purview of the relevant federal authorities, and are subject to separate processes post EA decision.

4.2. Use of information

4.2.1. Government expert advice

Section 20 of CEAA 2012 requires that every federal authority with specialist or expert information or knowledge with respect to a project subject to an EA must make that information or knowledge

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[2] Visit the Canadian Environmental Assessment Agency website: www.canada.ca/ceaa
[3] Visit Environment and Climate Change Canada’s website at: www.canada.ca/en/environment-climate-change.html

available to the Agency or the review panel. The Agency will advise the proponent of the availability of pertinent information or knowledge or expert and specialist knowledge received from other federal authorities or other levels of government so that it can be incorporated into the EIS.

4.2.2. Community knowledge and Aboriginal traditional knowledge

Sub-section 19(3) of CEAA 2012 states that “the environmental assessment of a designated project may take into account community knowledge and Aboriginal traditional knowledge”. For the purposes of these guidelines, community knowledge and Aboriginal traditional knowledge are types of knowledge acquired and accumulated by a local community or an Indigenous group.

The proponent will incorporate into the EIS the community knowledge and Aboriginal traditional knowledge to which it has access or that is acquired through public participation and engagement with Indigenous groups, in keeping with appropriate ethical standards and obligations of confidentiality. Community knowledge and Aboriginal traditional knowledge should be reported as separate types of knowledge in the EIS. The proponent should verify Aboriginal traditional knowledge in the EIS with the affected Indigenous group. The proponent will integrate Aboriginal traditional knowledge into all aspects of its assessment including both methodology (e.g. establishing spatial and temporal boundaries, defining significance criteria) and analysis (e.g. baseline characterization, effects prediction, development of mitigation measures, conducting a Human Health Risk Assessment). Agreement should be obtained from Indigenous groups regarding the use, management and protection of their existing traditional knowledge information during and after the EA. Where existing, the proponent should apply available Indigenous’ group written policy or protocol for the collection and sharing of Aboriginal traditional knowledge. If policies or protocols for the collection and sharing of Aboriginal traditional knowledge are not available, the proponent should undertake appropriate practices. For more information on how Aboriginal traditional knowledge can be obtained and incorporated in the preparation of the EIS, please refer to the Agency’s reference guide entitled “Considering Aboriginal traditional knowledge in environmental assessments conducted under the *Canadian Environmental Assessment Act, 2012*”.

4.2.3. Existing information

In preparing the EIS, the proponent should consider existing information and previously completed studies relevant to the project, including pre-development, development, closure, reclamation, and post-closure monitoring studies related to the previous construction and operations of mines at the Gordon and MacLellan sites and all their associated developments. When relying on existing information to meet requirements of the EIS Guidelines, the proponent will either include the information directly in the EIS or clearly direct the reader to where it may obtain the information (i.e. through cross-referencing). When relying on existing information, the proponent will also comment on how the data were applied to the project, separate factual lines of evidence from inference, and state any limitations on the inferences or conclusions that can be drawn from the existing information.

4.2.4. Confidential information

In implementing CEAA 2012, the Agency is committed to promoting public participation in the EA of projects and providing access to the information on which EAs are based. All documents prepared or submitted by the proponent or any other stakeholder in relation to the EA are included in the Canadian

Environmental Assessment Registry and made available to the public on request. For this reason, the EIS will not contain information that:

- is sensitive or confidential (i.e. financial, commercial, scientific, technical, personal, cultural or other nature), that is treated consistently as confidential, and the person affected has not consented to the disclosure; or
- may cause substantial harm to a person or specific harm to the environment through its disclosure.

The proponent will consult with the Agency regarding whether specific information requested by these guidelines should be treated as confidential.

4.3. Study strategy and methodology

The proponent is expected to respect the intent of these guidelines and to consider the environmental effects that are likely to arise from the project (including situations not explicitly identified in these guidelines), the technically and economically feasible mitigation measures that will be applied, and the significance of any residual effects. Except where specified by the Agency, the proponent has the discretion to select the most appropriate methods to compile and present data, information and analysis in the EIS as long as they are justifiable and replicable.

It is possible these guidelines may include matters which, in the judgement of the proponent, are not relevant or significant to the project. If such matters are omitted from the EIS, the proponent will clearly indicate it, and provide a justification so the Agency, federal authorities, Indigenous groups, the public and any other interested party have an opportunity to comment on this decision. Where the Agency or the review panel disagrees with the proponent's decision, it will require the proponent to provide the specified information.

The assessment will include the following general steps:

- ✓ identifying the activities and components of the project;
- ✓ predicting potential changes to the environment;
- ✓ predicting and evaluating the likely effects on identified VCs;
- ✓ identifying technically and economically feasible mitigation measures for any significant adverse environmental effects;
- ✓ determining any residual environmental effects;
- ✓ considering cumulative effects of the project in combination with other physical activities that have been or will be carried out; and
- ✓ determining the potential significance of any residual environmental effect following the implementation of mitigation measures.

For each VC, the EIS will describe the methodology used to assess project-related effects. The EIS could include an analysis of the pathway of the effects of environmental changes on each VC. The EIS will document where and how scientific, engineering, community knowledge and Aboriginal traditional knowledge were used to reach conclusions. Assumptions will be clearly identified and justified. All data, models and studies will be documented such that the analyses are transparent and reproducible. All data collection methods will be specified. The uncertainty, reliability, sensitivity and conservativeness of models used to reach conclusions must be indicated.

The EIS will identify all significant gaps in knowledge and understanding related to key conclusions, and the steps to be taken by the proponent to address these gaps. Where the conclusions drawn from scientific, engineering and technical knowledge are inconsistent with the conclusions drawn from Aboriginal traditional knowledge, the EIS will present each perspective on the issue (including documentation of Indigenous groups' input) and a statement of the proponent's conclusions.

The EIS will include a description of the environment (both biophysical and human), including the components of the existing environment and environmental processes, their interrelations as well as the variability in these components, processes and interactions over time scales appropriate to the likely effects of the project. The description will include scientific and Aboriginal traditional knowledge and be sufficiently detailed to characterize the environment before any disturbances to the environment due to the project and to identify, assess and determine the significance of the potential adverse environmental effects of the project. These data should include results from studies done prior to any physical disruption of the environment due to initial site clearing activities. The information describing the existing environment may be provided in a stand-alone chapter of the EIS or may be integrated into clearly defined sections within the effects assessment of each VC. This analysis will include environmental conditions resulting from historical (e.g. previous mining) and present activities in the local and regional study areas.

If the baseline data have been extrapolated or otherwise manipulated to depict environmental conditions in the study areas, modelling methods and equations will be described and will include calculations of margins of error and other relevant statistical information, such as confidence intervals and possible sources of error. The proponent will provide the references used in creating their approach to baseline data gathering, including identifying where appropriate, the relevant federal or provincial standards. The proponent is encouraged to discuss the timeframe and considerations for its proposed baseline data with the Agency and affected Indigenous groups prior to submitting its EIS.

In describing and assessing effects to the physical and biological environment, the proponent will take an ecosystem approach that considers both scientific and community knowledge and Aboriginal traditional knowledge and perspectives regarding ecosystem health and integrity. The proponent will consider the resilience of relevant species populations, communities and their habitats.

The assessment of environmental effects on Aboriginal peoples, pursuant to paragraph 5(1)(c) of CEAA 2012, will undergo the same rigour and type of assessment as any other VC (including setting of spatial and temporal boundaries, identification and analysis of effects, identification of mitigation measures, determination of residual effects, identification and a clear explanation of the methodology used for assessing the significance of residual effects and assessment of cumulative effects). The proponent will consider the use of both primary and secondary sources of information regarding baseline information, changes to the environment and the corresponding effect on health, socio-economics, physical and cultural heritage and the current use of lands and resources for traditional purposes. Primary sources of information include traditional land use studies, socio-economic studies, heritage surveys or other relevant studies conducted specifically for the project and its EIS. Often these studies and other types of relevant information are obtained directly from Indigenous groups. Secondary sources of information include previously documented information on the area, not collected specifically for the purposes of the project, or desk-top or literature-based information.

The proponent will provide Indigenous groups reasonable opportunity to review and provide comments on the information used for describing and assessing effects on Aboriginal peoples, prior to submitting the EIS (further information on engaging with Indigenous groups is provided in Part 2, Section 5 of this document). Where there are discrepancies in the views of the proponent and Indigenous groups on the information to be used in the EIS, the EIS will document these discrepancies and the rationale for the proponent's selection of information.

The assessment of the effects of each of the project components and physical activities, in all phases, will be based on a comparison of the biophysical and human environments between the predicted future conditions with the project and the predicted future conditions without the project. In undertaking the environmental effects assessment, the proponent will use best available information and methods. All conclusions will be substantiated and predictions will be based on clearly stated assumptions. The proponent will describe how each assumption has been tested. With respect to quantitative models and predictions, the EIS will document the assumptions that underlie the model, the quality of the data and the degree of certainty of the predictions obtained. For all predictions related to effects on Indigenous groups, the proponent will document Indigenous group involvement.

4.4. Presentation and organization of the environmental impact statement

To facilitate the identification of the documents submitted and their placement in the Canadian Environmental Assessment Registry, the title page of the EIS and its related documents will contain the following information:

- project name and location;
- title of the document, including the term "environmental impact statement";
- subtitle of the document;
- name of the proponent; and
- date of submission of the EIS.

The EIS will be written in clear, precise language. A glossary defining technical words, acronyms and abbreviations will be included. The EIS will include charts, diagrams, tables, maps and photographs, where appropriate, to clarify the text. Perspective drawings that clearly convey the various components of the project will also be provided. Wherever possible, maps will be presented in common scales and datum to allow for comparison and overlay of mapped features.

For purposes of brevity and to avoid repetition, cross-referencing is preferred. The EIS may make reference to the information that has already been presented in other sections of the document, rather than repeating it. Detailed studies (including all relevant and supporting data and methodologies) will be provided in separate appendices and will be referenced by appendix, section and page in the text of the main document. The EIS will explain how information is organized in the document. This will include a table of content with a list of all tables, figures, and photographs referenced in the text. A complete list of supporting literature and references will also be provided. A table of concordance, which cross references the information presented in the EIS with the information requirements identified in the EIS Guidelines, will be provided. The proponent will provide copies of the EIS and its summary for distribution, including paper and electronic version in an unlocked, searchable PDF format, as directed by the Agency.

4.5. Summary of the environmental impact statement

The proponent will prepare a summary of the EIS in both of Canada's official languages (French and English) to be provided to the Agency at the same time as the EIS that will include the followings:

- a concise description of all key components of the project and related activities;
- a summary of the engagement with Indigenous groups, as verified by each group, and the participation of the public and government agencies, including a summary of the issues raised and the proponent's responses;
- an overview of expected changes to the environment;
- an overview of the key environmental effects of the project, as described under section 5 of CEAA 2012, and proposed technically and economically feasible mitigation measures;
- an overview of how factors under paragraph 19(1) of CEAA 2012 were considered;
- the proponent's conclusions on the residual environmental effects of the project, and the significance of those effects, after taking into account the mitigation measures.

The summary is to be provided as a separate document and should be structured as follows:

1. Introduction and EA context
2. Project overview
3. Alternative means of carrying out the project
4. Public participation
5. Engagement with Indigenous Groups
6. Summary of environmental effects assessment for each valued component, including:
    a. description of the baseline
    b. anticipated changes to the environment
    c. anticipated effects
    d. mitigation measures
    e. significance of residual effects
7. Follow-up and monitoring programs proposed

The summary will have sufficient details for the reader to understand the project, any potential environmental effects, proposed mitigation measures, and the significance of the residual effects. The summary will include key maps illustrating the project location and key project components.

Part 2 – Content of the Environmental Impact Statement

1. INTRODUCTION AND OVERVIEW

1.1. The proponent

In the EIS, the proponent will:

- provide contact information (e.g. name, address, phone, fax, email);
- identify itself and the name of the legal entity(ies) that would develop, manage and operate the project;
- describe corporate and management structures;
- specify the mechanism used to ensure that corporate policies will be implemented and respected for the project; and
- identify key personnel, contractors, and/or sub-contractors responsible for preparing each section of the EIS.

1.2. Project Overview

The EIS will describe the project, key project components and associated activities, scheduling details, the timing of each phase of the project and other key features. If the project is part of a larger sequence of projects, the EIS will outline the larger context.

The overview is to identify the key components of the project, rather than providing a detailed description, which will follow in Part 2, Section 3 of this document.

1.3. Project Location

The EIS will contain a description of the geographical setting in which the project will take place. This description will focus on those aspects of the project and its setting that are important in order to understand the potential environmental effects of the project. The following information will be included:

- the Universal Transverse Mercator (UTM) projection coordinates of the main project site;
- current land use in the area;
- distance of the project facilities and components to any federal lands;
- the environmental significance and value of the geographical setting in which the project will take place and the surrounding area;
- environmentally sensitive areas, such as national, provincial and regional parks, ecological reserves, wetlands, estuaries, and habitats of federally or provincially listed species at risk and other sensitive areas;
- description of local communities; and

- traditional territories and/or consultation areas, treaty lands, Indian Reserve lands and Métis harvesting regions, locals, and/or settlements (seasonal or permanent);
- traditional and commercial land uses by Indigenous peoples and the significance of the geographical setting to their culture and rights-based practices and role in their cultural landscape.

1.4. Regulatory framework and the role of government

The EIS will identify:

- any federal power, duty or function that may be exercised that would permit the carrying out (in whole or in part) of the project or associated activities;
- legislation and other regulatory approvals that are applicable to the project at the federal, provincial, regional and municipal levels;
- government policies, resource management plans, planning or study initiatives pertinent to the project and/or EA and their implications;
- any treaty, self-government or other agreements between federal or provincial governments and Indigenous groups that are pertinent to the project and/or EA;
- any relevant land use plans, land zoning, or community plans (including Indigenous plans); and
- regional, provincial and/or national objectives, standards or guidelines that have been used by the proponent to assist in the evaluation of any predicted environmental effects.

2. PROJECT JUSTIFICATION AND ALTERNATIVES CONSIDERED

2.1. Purpose of the project

The EIS will describe the purpose of the project by providing the rationale for the project, explaining the background, the problems or opportunities that the project is intended to satisfy and the stated objectives from the perspective of the proponent. If the objectives of the project are related to broader private or public sector policies, plans or programs, this information will also be included.

The EIS will also describe the predicted environmental, economic and social benefits of the project. This information will be considered in assessing the justifiability[4] of any significant adverse residual environmental effects as defined in section 5 of CEAA 2012, if such effects are identified.

[4] See subsection 52(2) of CEAA 2012.

2.2. Alternative means of carrying out the project

The EIS will identify and consider the environmental effects of alternative means of carrying out the project that are technically and economically feasible. The proponent will complete the assessment of alternative means in accordance with the Agency's Operational Policy Statement entitled *"Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012".*

In its alternative means analysis, the proponent will address, at a minimum, the following project components:

- ore and concentrate transportation (means and routing considered);
- access to the project site;
- location of key project components (open pits, pipelines; explosives storage; tailings management facility; central ore milling and processing plant (including consideration of a processing facility at each mining site) ore, low grade ore, waste rock, overburden, top soil stockpiles/storage areas; etc.);
- ore processing methods/technologies;
- fuel storage and distribution;
- power supply;
- management of water supply and waste water;
- water management and location of the final effluent discharge points;
- workforce accommodations and transportation;
- diversion channel adjustments; and
- mine waste disposal and final effluent discharge (methods and sites considered)[5].

The Agency recognizes that projects may be in the early planning stages when the EIS is being prepared. Where the proponent has not made final decisions concerning the placement of project infrastructure, the technologies to be used, or that several options may exist for various project components, the proponent shall conduct an environmental effects analysis at the same level of detail for each of the various options available (alternative means) within the EIS.

3. PROJECT DESCRIPTION

3.1. Project components

The EIS will describe the project, by presenting the project components, associated and ancillary works, and other characteristics that will assist in understanding the environmental effects. This will include:

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[5] Should an MMER Schedule 2 amendment be required for the project, the proponent is strongly encouraged to include MMER requirements for an assessment of alternatives for mine waste disposal in the EIS. The methodology recommended for the conduct of mine waste disposal alternatives is described in Environment and Climate Change Canada's *Guidelines for the Assessment of Alternatives for Mine Waste Disposal (2011)*. A copy of this guide can be found on Environment and Climate Change Canada's website at www.ec.gc.ca. Proponent should also refer to Part 1, Section 4.1 of the present guidelines.

- maps, at an appropriate scale, of the project location, the project components, boundaries of the proposed site with UTM coordinates, the major existing infrastructure, adjacent land uses and any important environmental features;
- tailings management facility (footprint, location and preliminary designs);
- waste rock, overburden, topsoil, low grade ore storage and stock piles (footprint, locations, volumes, development plans and design criteria);
- open pits (footprint, location, development plans including pit phases);
- crusher, milling, and processing facilities (footprint, technology, location);
- water management facilities proposed to control, collect and discharge surface drainage and groundwater seepage to the receiving environment from all key components of the mine infrastructure (e.g. pit water and/or underground mine water, mine effluent);
- permanent and temporary linear infrastructures (road, railroad, pipelines, power supply), identifying the route of each of these linear infrastructures, the location and types of structure used for stream crossings;
- storage areas for fuels, explosives, and hazardous wastes;
- drinking and industrial water requirements (source, quantity required, need for water treatment);
- energy supply (source, quantity); and
- waste disposal (types of waste, methods of disposal, quantity).

3.2. Project activities

The EIS will include descriptions of the construction, operation, decommissioning and abandonment associated with the proposed project.

This will include descriptions of the activities to be carried out during each phase, the location of each activity, expected material inputs and outputs and an indication of the activity's magnitude and scale.

Although a complete list of project activities should be provided, the emphasis will be on activities with the greatest potential to have environmental effects. Sufficient information will be included to predict environmental effects and address concerns identified by the public and Indigenous groups. Highlight activities that involve periods of increased environmental disturbance or the release of materials into the environment.

The EIS will include a summary of the changes that have been made to the project since originally proposed, including the benefits of these changes to the environment, Indigenous groups, and the public.

The EIS will include a schedule including time of year, frequency, and duration for all project activities.

The information will include a description of:

3.2.1. Site preparation and construction

- removal and use of existing industrial buildings and materials from historic mining;
- site clearing/grading and excavation;
- explosives manufacture and storage (location and management);

- blasting (frequency and methods);
- construction of access roads;
- any adjustments required to the Provincial Road 391;
- borrow materials requirement (source and quantity);
- water management, including water diversions, stream alterations, watercourse realignments, dewatering or deposition activities required (location, methods, timing);
- equipment requirements (type, quantity) and installation;
- administrative buildings, garages, other ancillary facilities;
- construction camp (location, capacity, wastewater treatment);
- characterization of the workforce, including the number and transportation of employees, work schedules, and workforce accommodations;
- storage and management of hazardous materials, fuels and residues;
- construction of the tailings management facility; and
- power supply.

3.2.2. Operation

- mining plan, ore production, ore stockpiling, concentrate production;
- storage, handling, and transport of materials;
- effluent management and treatment (quantity, quality, treatment requirement, and release point);
- explosives manufacture, storage and use (storage location and management);
- drilling and blasting (frequency and methods);
- contribution to atmospheric emissions, including emissions profile (type, rate, and source)
- water management on the project site including mine water, storm water, process water, wastewater, water recycling and effluent treatment (quantity, quality, treatment requirements, withdrawal and release point(s));
- ore extraction, ore crushing and treatment;
- storage, handling, and transportation of reagents, petroleum products, chemical products, hazardous materials and residual materials;
- characterization and management of ore, waste rock, low grade ore, overburden and tailings (storage, handling and transport of the volumes generated, mineralogical characterization, potential for metal leaching and acid rock drainage);
- waste management and recycling (other than mine waste such as tailings and waste rock);
- characterization of the workforce, including the number and transportation of employees, work schedules, and workforce accommodations;

3.2.3. Decommissioning and abandonment

- any progressive reclamation and monitoring planned;

- the preliminary outline of a decommissioning and reclamation/closure plan for any components associated with the project, including treatment of pre-existing infrastructure, timing, and unplanned premature closure;
- the ownership, transfer and control of the different project components;
- the responsibility for monitoring and maintaining the integrity of the remaining structures; and
- for permanent structures, a conceptual discussion on how decommissioning and abandonment could occur.

4. PUBLIC PARTICIPATION AND CONCERNS

The EIS will describe the ongoing and proposed public participation activities that the proponent will undertake or that it has already conducted on the project. It will provide a description of efforts made to distribute project information and provide a description of information and materials that were distributed during the consultation process. The EIS will indicate the methods used, where the consultation was held, the persons and organizations consulted, the concerns voiced and the extent to which this information was incorporated in the design of the project as well as in the EIS. The EIS will provide a summary of key issues raised related to the project and its potential effects to the environment as well as describe any outstanding issues and ways to address them.

5. ENGAGEMENT WITH INDIGENOUS GROUPS AND CONCERNS RAISED

For the purposes of developing the EIS, the proponent will engage with Indigenous groups that may be affected by the project, to obtain and incorporate their views on:

- effects of changes to the environment on Aboriginal peoples (health and socio-economic conditions; physical and cultural heritage, including any structure, site or thing that is of historical, archaeological, paleontological or architectural significance; and current use of lands and resources for traditional purposes) pursuant to paragraph 5(1)(c) of CEAA 2012, and
- potential adverse impacts of the project on potential or established section 35 rights, including title and related interests, in respect of the Crown's duty to consult, and where appropriate, accommodate Aboriginal peoples.

With respect to the effects of changes to the environment on Aboriginal peoples, the assessment requirements are outlined in Part 2, sections 6.1.9 and 6.3.4 of these guidelines. With respect to potential adverse impacts of the project on potential or established section 35 rights, including title and related interests, the EIS will document for each group identified in Part 2, Section 5.1 of these guidelines (or in subsequent correspondence from the Agency):

- potential or established section 35 rights[6], including title and related interests, when this information is directly provided by a group to the proponent, the Agency or is available through public records, including:

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[6] The 2011 *Updated Guidelines for Federal Officials to Fulfill the Duty to Consult (the Guidelines)* defines Aboriginal rights as: practices, traditions and customs integral to the distinctive culture of the Aboriginal group claiming the right that existed prior to contact with the Europeans (Van de Peet). In the context of Métis groups, Aboriginal rights means practices, traditions, and customs integral to the distinctive culture of the Métis group that existed prior to effective European control, that is, prior to the time when Europeans effectively established political and legal control in the claimed area (*Powley*). Generally, these rights are fact and site specific. For greater certainty, the Guidelines also define Aboriginal title as an Aboriginal right. Visit the Indigenous and Northern Affairs Canada website at: http://www.aadnc-aandc.gc.ca/eng/1100100014664/1100100014675

    - ✓ geographical extent, nature, frequency and timing of the practice or exercise of the right; and
    - ✓ maps and data sets (e.g., fish catch numbers);
- – characterization of changes to date on potential or established section 35 rights;
- – potential adverse impacts of each of the project components and physical activities, in all phases, on potential or established section 35 rights, including title and related interests. This assessment is to be based on a comparison of the exercise of the identified rights, title and related interests between the predicted future conditions with the project and the predicted future conditions without the project. Include the perspectives of potentially impacted groups and document Indigenous groups' involvement;
- – measures identified to accommodate potential adverse impacts of the project on the potential or established section 35 rights, including title and related interests. These measures will be written as specific commitments that clearly describe how the proponent intends to implement them, and may go beyond mitigation measures that are developed to address potential adverse environmental effects;
- – potential adverse impacts on potential or established section 35 rights, including title and related interests that have not been fully mitigated or accommodated as part of the EA and associated engagement with Indigenous groups. The proponent will also take into account the potential adverse impacts that may result from the residual and cumulative environmental effects. Include the perspectives of potentially affected groups where these were provided to the proponent by the groups;
- – VCs suggested by Indigenous groups for inclusion in the EIS, whether they were included, and the rationale for any exclusions; and
- – specific suggestions raised by Indigenous groups for mitigating the effects of changes to the environment on Indigenous peoples or accommodating potential adverse impacts of the project on existing Aboriginal and Treaty rights.

The information sources, methodology and findings of the assessment of paragraph 5(1)(c) effects under CEAA 2012 may be used to inform the assessment of potential adverse impacts of the project on potential or established section 35 rights, including title and related interests. However, there may be distinctions between the adverse impacts on potential or established section 35 rights, including title and related interests and paragraph 5(1)(c) effects under CEAA 2012. The proponent will carefully consider the potential distinction between these two aspects and, where there are differences, will include the relevant information in its assessment.

In terms of gathering views from potentially affected groups with respect to both environmental effects of the project and the potential adverse impacts of the project on potential or established section 35 rights, including title and related interests, the EIS will document:

- – VCs and related spatial and temporal boundaries suggested by groups for inclusion in the EIS, whether they were included, and the rationale for any exclusions;

- specific suggestions raised by each group for mitigating the effects of changes to the environment on Aboriginal peoples or accommodating potential adverse impacts of the project on potential or established section 35 rights, including title and related interests;
- views expressed by each group on the effectiveness of the mitigation or accommodation measures;
- from the proponent's perspective, any potential cultural, social and/or economic impacts or benefits to each group identified that may arise as a result of the project. Include the perspectives of potentially affected groups where these were provided to the proponent by the groups;
- any other comments, specific issues and concerns raised by potentially affected groups and how they were responded to or addressed;
- changes made to the project design and implementation directly as a result of discussions with potentially affected groups;
- where and how Aboriginal traditional knowledge was incorporated into the environmental effects assessment (including methodology, baseline conditions and effects analysis for all VCs) and the consideration of potential adverse impacts on potential or established section 35 rights, including title and related interests, and related mitigation measures; and
- any additional issues and concerns raised by potentially affected groups in relation to the environmental effects assessment and the potential adverse impacts of the project on potential or established section 35 rights, including title and related interests.

The EIS will include a tracking table of key issues raised by each group, including the concerns raised related to the project, proposed mitigation measures, and where appropriate, a reference to the proponent's analysis in the EIS. Information provided related to potential adverse impacts on potential or established section 35 rights will be considered by the Crown in meeting its common law duty to consult obligations as set out in the *Updated Guidelines for Federal Officials to Fulfill the Duty to Consult* (2011).

5.1. Indigenous groups and engagement activities

With respect to engagement activities, the EIS will document:

- the engagement activities undertaken with each group prior to the submission of the EIS, including the date and means of engagement (e.g. meeting, mail, telephone);
- any future planned engagement activities; and
- how engagement activities by the proponent allowed groups to understand the project and evaluate its effects on their communities, activities, potential or established section 35 rights, including title and related interests.

In preparing the EIS, the proponent will ensure that groups have access to timely and relevant information on the project and how the project may adversely impact them. The proponent will structure its engagement activities to provide adequate time for groups to review and comment on the relevant information. Engagement activities are to be appropriate to the groups' needs, arranged through discussions with the groups and in keeping with established consultation protocols, where available. The EIS will describe all efforts, successful or not, taken to solicit the information required from groups to support the preparation of the EIS.

The proponent will ensure that views of groups are recorded and that groups are provided with opportunities to validate the interpretation of their views. The proponent will keep detailed tracking records of its engagement activities, recording all interactions with groups, the issues raised by each group and how the proponent addressed the concerns raised. The proponent will share these records with the Agency.

For the groups expected to be most affected by the project, the proponent is expected to strive towards developing a productive and constructive relationship based on on-going dialogue with the groups in order to support information gathering and the effects assessment. These groups include:

- Marcel Colomb First Nation
- Mathias Colomb Cree Nation
- Nisichawayasihk Cree Nation
- O-Pipon-Na-Piwin Cree Nation
- Manitoba Metis Federation
- Peter Ballantyne Cree Nation
- Barren Lands First Nation

For the above groups, the proponent will strive to use primary data sources and hold face-to-face meetings to discuss concerns. The proponent will facilitate these meetings by making key EA summary documents (baseline studies, EIS, key findings, plain language summaries) accessible in advance. The proponent will ensure there are sufficient opportunities for individuals and groups to provide oral input in the language of their choice. Upon receipt, the proponent should consider translating information for these groups into the appropriate Indigenous languages(s) in order to facilitate engagement activities during the EA.

For groups that may also be affected by the project, but to a lesser degree, the proponent will ensure these groups are notified about key steps in the EIS development process and of opportunities to provide comments on key EA documents and/or information to be provided regarding their community. The proponent will still ensure these groups are reflected in the baseline information and assessment of potential effects or impacts in the EIS. These groups include:

- Métis Nation – Saskatchewan Northern Region 1
- Métis Nation – Saskatchewan Eastern Region 1
- Hatchet Lake First Nation
- Northlands Denesuline First Nation
- Sayisi Dene First Nation
- Pickerel Narrows Cree Nation

The groups referenced above may change as more is understood about the environmental effects of the project and/or if the project or its components change during the EA. The Agency reserves the right to alter the list of groups that the proponent will engage as additional information is gathered during the EA.

Upon receipt of knowledge or information of potential effects or adverse impacts to a group not listed above, the proponent shall provide that information to the Agency at the earliest opportunity.

6. EFFECTS ASSESSMENT

6.1. Project setting and baseline conditions

Based on the scope of the project described in Section 3 (Part 1), the EIS will present baseline information in sufficient detail to enable the identification of how the project could affect the VCs and an analysis of those effects. Include the consideration of historical mining activities at the Project sites (e.g. historical mine tailings and contamination, its management, and contribution as a source of environmental impacts). Should other VCs be identified during the conduct of the EA, the baseline condition for these components will also be described in the EIS. To determine the appropriate spatial and temporal boundaries to describe the baseline information, refer to Section 3.2.3 (Part 1) of these guidelines. As a minimum, the EIS will include a description of the following environmental components.

6.1.1. Atmospheric Environment

- a baseline survey of ambient air quality in the project areas and in the airshed likely to be affected by the project, for the mine sites, by identifying and quantifying emission sources for, but not limited to, the following contaminants in concentration units comparable to guidelines (i.e. $\mu g/m^3$): total suspended particulates, fine particulates smaller than 2.5 microns ($PM_{2.5}$), respirable particulates of less than 10 microns (PM_{10}), diesel particulate matter, carbon monoxide (CO), sulphur oxides (SOx), nitrogen oxides (NOx), and volatile organic compounds (VOCs);
- identify and quantify existing greenhouse gas emissions[7] by individual pollutant measured as kilotonnes of CO_2 equivalent per year in the project study areas;
- direct and indirect sources of air emissions;
- current provincial/territorial/federal limits for greenhouse gas emission targets;
- current ambient day-time and night-time noise and vibration levels at key receptor points (e.g. Indigenous groups or communities) or priority areas as described by Indigenous groups, including the results of a baseline ambient noise survey. Information on typical sound sources, geographic extent and temporal variations will be included;
- existing ambient night-time light levels at the project site and at any other areas where project activities could have an effect on light levels. The EIS will describe night-time illumination levels during different weather conditions and seasons; and
- historical records of relevant meteorological information (e.g. total precipitation (rain and snow); mean, maximum and minimum temperatures; and typical wind speed and direction).

6.1.2. Geology and geochemistry

- the bedrock and host rock geology of the deposit, including a table of geologic descriptions, geological maps and cross-sections of appropriate scale;
- the geomorphology, topography and geotechnical characteristics of areas proposed for construction of major project components;
- the geochemical characterization of expected mine material such as waste rock, ore, low grade ore, tailings, overburden and potential construction material in order to predict metal leaching and

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[7] Greenhouse gas emissions include: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3).

acid rock drainage[8] including oxidation of primary sulphides and secondary soluble sulphate minerals;

- geological hazards that exist in the areas planned for the project facilities and infrastructure, including:
  - ✓ history of seismic activity in the area;
  - ✓ isostatic rise or subsidence; and
  - ✓ landslides, slope erosion and the potential for ground and rock instability, and subsidence during and following project activities.
- baseline concentrations of contaminants of concern[9] within the local, regional and downstream receiving environments; and
- geochemical characterization of leaching potential, including, but not limited to, contaminants of concern from waste rock, pit walls, ore stockpiles, and tailings.

6.1.3. Topography and soil

- baseline mapping and description of landforms and soils (including soil chemistry), within the local and regional project areas;
- maps depicting soil depth by horizon and soil order within the mine site areas to support soil salvage and reclamation efforts, and to outline potential for soil erosion;
- suitability of topsoil and overburden for use in the rehabilitation of disturbed areas;
- permafrost conditions including distribution of frozen and unfrozen ground, thermal conditions (ground temperatures), ground ice, thaw sensitivity and active layer thickness; and
- maps depicting permafrost conditions within the local and regional study areas, including transport routes to be used by the project; and
- the potential for thaw settlement and terrain instability associated with ground thawing.

6.1.4. Riparian, Wetland and Terrestrial Environments

- characterization of soils in the excavation area, in terrestrial and riparian environments, with a description of their past use;
- topography, drainage, geology and hydrogeology, and the physicochemical characteristics of potential on-land sediment or soil disposal sites;
- characterization of the shoreline, banks, current and future flood risk areas, and wetlands (fens, marshes, peatlands, mudflats and eelgrass beds, etc.), including the location and extent of wetlands likely to be affected by project activities according to their size, type (class and form), the

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[8] The manual produced by the Mine Environment Neutral Drainage (MEND) Program, entitled, MEND Report 1.20.1, *"Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials"*, Version 0 - December 2009 is a recommended reference for use in acid rock drainage and metal leaching prediction.

[9] Contaminants of concern include, but are not limited to, selenium, sulphate, cadmium, nitrate and calcite.

description of their ecological function (ecological, hydrological, wildlife, socioeconomic, etc.) and species composition[10]; and

- plant and animal species (abundance, distribution and diversity) and their habitats, with a focus on species at risk or with special status that are of social, economic, cultural or scientific significance, as well as invasive alien species and species used for traditional purposes by Indigenous groups.

6.1.5. Groundwater and Surface Water

- hydrogeology, including:
  - ✓ hydrogeological context (e.g., hydrostratigraphy with aquifers and aquitards, major faults, etc.), including the delineation of key stratigraphic and hydrogeologic boundaries;
  - ✓ physical properties of the hydrogeological units (e.g. hydraulic conductivity, transmissivity, saturated thickness, storativity, porosity, specific yield);
  - ✓ groundwater flow patterns and rates;
  - ✓ a discussion of the hydrogeologic, hydrologic, geomorphic, climatic and anthropogenic controls on groundwater flow;
  - ✓ temporal changes in groundwater flow (e.g. seasonal and long term changes in water levels);
  - ✓ a delineation and characterization of groundwater - surface water interactions including temperature and the locations of groundwater discharge to surface water and surface water recharge to groundwater;
  - ✓ temperature changes in surface water as a result of groundwater-surface water interactions;
  - ✓ changes to surface water quality, including seasonal changes in runoff entering watercourses; and
  - ✓ in permafrost regions, describe configuration of frozen ground and taliks and the influence on groundwater flow.
- hydrogeological maps and cross-sections for the mine area to outline the extent of aquifers and aquitards, including bedrock fracture and fault zones, locations and depths of wells and strainers, groundwater types springs, surface waters, and project facilities. Groundwater levels, potentiometric contours, flow directions, groundwater divides and areas of recharge and discharge should be included;
- all groundwater monitoring wells, including their location, in respect to the project area, including geologic, hydrostratigraphic, piezometric and construction data (e.g. depths of surficial rock and bedrock, bedrock quality, fracture zones, piezometric levels, hydraulic conductivity, diameter and screen depth and intercepted aquifer unit);
- monitoring protocol for collection of existing groundwater and surface water data;
- an appropriate hydrogeologic model for the project area, which discusses the hydrostratigraphy and groundwater flow systems; a sensitivity analysis will be performed to test model sensitivity to climatic variations (e.g. recharge) and hydrogeologic parameters (e.g. hydraulic conductivity);

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[10] The Canadian Wetland Classification System, National Wetlands Working Group, 1997, See the website http://www.env.gov.yk.ca/animals-habitat/documents/canadian_wetland_classification_system.pdf

- groundwater quality, including lab analytical results for metals, major ions and physical parameters, including temperature, with the interpretation of results for any anomalous values and for contaminants of concern;
- graphs or tables indicating the seasonal variations in groundwater levels, flow regime, and quality;
- local and regional potable groundwater supplies, including their current use and potential for future use;
- bedrock fracture sizes and orientations in relation to groundwater flow;
- the delineation of drainage basins, at appropriate scales (water bodies and watercourses), including intermittent streams, flood risk areas and wetlands, boundaries of the watershed and subwatersheds, overlaid by key project components;
- hydrological regimes, including monthly, seasonal and annual water flow (discharge) data;
- for each affected water body, the total surface area, bathymetry, maximum and mean depths, water level fluctuations, type of substrate (sediments);
- seasonal surface water quality, including analytical results (e.g. water temperature, turbidity, pH, dissolved oxygen profiles, metals, major ions, and nutrients) and interpretation for representative tributaries and water bodies including all sites to receive mine effluents or runoff;
- any local and regional potable surface water resource; and
- sediment quality analysis (e.g. total metals, particle size, and total organic carbon content) for key sites likely to receive mine effluents.

6.1.6. Fish and fish habitat

For potentially affected surface waters:

- a characterization of fish populations on the basis of species and life stage, abundance, distribution, and movements, including information on the surveys carried out and the source of data available (e.g. location of sampling stations, catch methods, date of catches, species, catch-per-unit effort);
- a description of primary and secondary productivity of aquatic resources (e.g. benthic communities, feeder species, aquatic plants) in terms of abundance and distribution in affected water bodies with a characterisation of season variability;
- a list of any fish or invertebrate species at risk that are known to be present;
- a description of the habitat by homogeneous section, including the length of the section, width of the channel from the high water mark (bankful width), water depths, type of substrate (sediments), aquatic and riparian vegetation, habitat types and functions, cover components, and photos;
- a description of natural obstacles (e.g. falls, beaver dams) or existing structures (e.g. water crossings) that hinder the free passage of fish;
- a description of any existing effects associated with previous or current activities (e.g. culvert installation, historic mine activities, angling pressures);
- maps, at a suitable scale, indicating the surface area of potential or confirmed fish habitat for spawning, rearing, nursery, feeding, overwintering, migration routes, etc. Where appropriate, this information should be linked to water depths (bathymetry) to identify the extent of a water body's littoral zone; and

- the description and location of suitable habitats for fish species at risk that appear on federal and provincial lists and that are found or are likely to be found in the study area.

Note that certain intermittent streams or wetlands may constitute fish habitat or contribute indirectly to fish habitat. The absence of fish at the time of the survey does not irrefutably indicate an absence of fish habitat.

6.1.7. Migratory birds and their habitat[11]

- birds and their habitats that are found or are likely to be found in the study area. This description may be based on existing sources, but supporting evidence is required to demonstrate that the data used are representative of the avifauna and habitats found in the study area. The existing data must be supplemented by surveys, as appropriate, to ensure current data for the project area;
- abundance, distribution, and life stages of migratory and non-migratory birds (including waterfowl, raptors, shorebirds, marsh birds and other land birds) likely to be affected in the project area based on existing information, or surveys, as appropriate, to provide current field data for the project area;
- characterization of various ecosystems found in the project area, likely to be affected, based on existing information (land cover types, vegetation); and
- year-round migratory bird use of the area (e.g. winter, spring migration, breeding season, fall migration), based on preliminary data from existing sources and surveys, as appropriate, to provide current field data.

6.1.8. Species at Risk

- a list of all potential or known *Species at Risk Act* listed species at risk (fauna and flora) that may be affected by the project, using existing data and literature as well as surveys to provide current field data;
- a list of all species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as extirpated, endangered, threatened or of special concern[12], using existing data and literature as well as surveys to provide current field data
- any published studies that describe the regional importance, abundance and distribution of species at risk including recovery strategies or plans. The existing data must be supplemented by surveys, as appropriate, to provide current field data; and
- information on residences, seasonal movements, movement corridors, habitat requirements, key habitat areas, identified critical habitat and/or recovery habitat (where applicable) and general life history of species at risk that may occur in the project area, or be affected by the project.

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[11] Surveys should be designed in light of the available references and recommendations in Environment and Climate Change Canada's document entitled "*Guidance for the Preparation of an Environmental Impact Statement and Useful References*" (2016) (available from Environment and Climate Change Canada), and in the Canadian Wildlife Service's Technical Report No. 508, *A Framework for the Scientific Assessment of Potential Project Impacts on Birds* (Hanson et al. 2009). Appendix 3 of the Framework provides examples of project types and recommended techniques for assessing impacts on migratory birds.

[12] Proponents are encouraged to consult COSEWIC's annual report for a listing of the designated wildlife species: http://www.sararegistry.gc.ca/default.asp?lang=En&n=AA7D4CE8-1

6.1.9. Indigenous peoples

With respect to potential effects of changes to the environment caused by the project on Indigenous peoples and the related VCs, baseline information will be provided for ***each group*** identified in Section 5 (Part 2) of these guidelines (and any groups identified after these guidelines are finalized). Baseline information will describe and characterize the elements in paragraph 5(1)(c) of CEAA 2012 based on the spatial and temporal scope selected for the EA according to the factors outlined in Part 1, Section 3.3.3 of this document. Baseline information will also characterize the regional context of each of the elements of paragraph 5(1)(c) of CEAA 2012 to support the assessment of project related effects and cumulative effects. Baseline information will be sufficient to provide a comprehensive understanding of the current state of each VC.

Baseline information for current use of lands and resources for traditional purposes will focus on the traditional activity (including hunting, fishing, trapping, plant gathering, and cultural practices) and include a characterization of the attributes of the activity that may be affected by project-related changes to the environmental and socio-economic change. This includes not only identifying species of importance, but also assessing the quality and quantity of preferred traditional resources and locations, timing (e.g. seasonality, access restrictions, distance from community), ambient/sensory environment (e.g. noise, air quality, visual landscape, presence of others) and cultural environment (e.g. historical/generational connections, preferred areas). Specific aspects that will be considered include, but are not limited to:

- location of traditional territory (including maps where available);
- traditional uses currently practiced or practiced in living memory or as identified by Aboriginal traditional knowledge passed down through generations;
- location of reserves and communities;
- location of hunting camps, cabins and traditional gathering or teaching grounds;
- fish, wildlife, birds, plants or other natural resources of importance for traditional use;
- places where fish, wildlife, birds, plants or other natural resources are harvested, including places that are preferred;
- access and travel routes for conducting traditional practices;
- frequency, duration or timing of traditional practices; and
- cultural values associated with the area affected by the project and the traditional uses identified.

Baseline information for health[13] and socio-economic conditions will include the functioning and health of the socio-economic environment, encompassing a broad range of matters that affect communities in the study area in a way that recognizes interrelationships, system functions and vulnerabilities. Specific aspects that will be considered include:

- sites or areas that are used by Indigenous people either for permanent residences or on a seasonal/temporary basis and the number of people that use each site or area identified;
- drinking and recreational use water sources (permanent, seasonal, periodic, or temporary);

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[13] The proponent should refer to Health Canada's *Useful Information for Environmental Assessments* document in order to include the appropriate baseline information relevant to human health. This document can be obtained at http://www.publications.gc.ca/site/eng/481782/publication.html

- consumption of country foods (also known as traditional foods) including food that is trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes, outside of the commercial food chain;
- which country foods are consumed by which groups, how frequently, and where these country foods are harvested;
- commercial activities (e.g. fishing, trapping, hunting, forestry, outfitting); and
- recreational uses.

Baseline information for physical and cultural heritage[14] (including any site, structure or thing of archaeological, paleontological, historical or architectural significance) will consider all elements of cultural and historical importance to groups in the area and is not restricted to artifacts considered under provincial heritage legislative requirements. Specific aspects that will be considered include:

- burial sites;
- cultural landscapes;
- sacred, ceremonial or culturally important places, objects or things; and
- archaeological potential and/or artifact places.

Any other baseline information that supports the analysis of predicted effects of project-related changes to the environment on Indigenous peoples will be included as necessary. The EIS will also indicate how input from Indigenous groups, including Aboriginal traditional knowledge, was used in establishing the baseline conditions related to health and socio-economics, physical and cultural heritage and current use of lands and resources for traditional purposes.

Baseline information for the following species or habitats of particular importance to health and socio-economic conditions, physical and cultural heritage, or current use of lands and resources for traditional purposes should be provided, including:

- areas of concentration of migratory animals, such as breeding, denning and/or wintering areas;
- ungulates, furbearers, amphibians, small mammals, and their habitat;
- existing or proposed protected areas, special management areas, Indigenous groups' management or priority areas, and conservation areas in the regional study area; and
- key plant communities and animals, both terrestrial and aquatic, that are potentially affected by the project.

6.1.10. Other changes to the environment arising as a result of a federal decision or due to changes on federal lands, in another province or outside Canada

Should there be the potential for a change to the environment arising as a result of a federal decision(s), or on federal lands, lands in another province or lands outside Canada, the EIS will include baseline information on the environmental component likely to be affected (if this information is not already covered in other subsections of these guidelines). For example, if an authorization

[14] Heritage resources to be considered will include but not be limited to, physical objects (e.g. middens, culturally-modified trees, historic buildings), sites or places (e.g. burial sites, sacred sites, cultural landscapes) and attributes (e.g. language, beliefs).

provided under the *Fisheries Act* was to result in the flooding of key wildlife habitat, baseline information should be provided on the wildlife species likely to be affected.

6.1.11. Human environment

- the rural and urban settings likely to be affected by the project;
- any federal lands, lands located outside the province or Canada that may be affected by the project;
- the current use of land in the study area, including a description of hunting, recreational and commercial fishing, trapping, gathering, outdoor recreation, use of seasonal cabins, outfitters;
- current use of all waterways and water bodies that will be directly affected by the project, including recreational uses, where available;
- location of and proximity of any permanent, seasonal or temporary residences or camps;
- health[15] and socio-economic conditions, including the socio-economic determinants of health, the functioning and health of the socio-economic environment, encompassing a broad range of matters that affect communities in the study area in a way that recognizes interrelationships, system functions and vulnerabilities (for example effects on sub-populations such as workers/job seekers and their families, youth, elders, women, service providers, economically marginalized members of the community, etc.); and
- physical and cultural heritage, including structures, sites or things of historical, archaeological, paleontological or architectural significance.

6.2. Predicted changes to the physical environment

The EA will include a consideration of the predicted changes to the environment as a result of the project being carried out or as a result of any powers, duties or functions that are to be exercised by the federal government in relation to the project. These predicted changes to the environment are to be considered in relation to each phase of the project (construction, operation, decommissioning, and abandonment) and are to be described in terms of the magnitude, geographic extent, duration and frequency, and whether the environmental changes are reversible or irreversible. For each predicted change, the proponent will identify all sensory and observable change indicators (e.g. smells, noise, smoke) adopted as a result of traditional knowledge in relation to each VC. As changes to various parts of the physical environment, listed below, may be inter-related as part of an ecosystem, the EIS will explain and describe the connections between the changes described.

6.2.1. Changes to the atmospheric environment

- changes in air quality (*including sulfur oxides (SOx), nitrous oxides (NOx),* total suspended particulates, fine particulates smaller than 2.5 microns ($PM_{2.5}$), respirable particulates of less than 10 microns (PM_{10}) and diesel particulates presented in concentration values comparable to guidelines (i.e. $\mu g/m^3$))*;*

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[15] The proponent should refer to Health Canada's *Useful Information for Environmental Assessments* document in order to include the appropriate baseline information relevant to human health. This document can be obtained at http://www.publications.gc.ca/site/eng/9.700511/publication.html

    - ✓ justify dispersion modeling methods and include relevant input and output files.
- – an estimate of the direct greenhouse gas emissions associated with all phases of the project as well as any mitigation measures proposed to minimize greenhouse gas emissions. This information is to be presented by individual pollutant and should also be summarized in CO_2 equivalent per year;
    - ✓ justify all estimates and emission factors used in the analysis;
    - ✓ provide the methods and calculations used for the analysis;
    - ✓ compare and assess the level of estimated emissions of greenhouse gases to the regional, provincial and federal emission targets;
- – changes in ambient day-time and night-time noise and vibration levels at key receptor locations; and
- – changes in night-time light levels.

6.2.2. Changes to groundwater and surface water

- – changes to groundwater flow patterns, fluxes, and divides based on the results of groundwater flow modelling that incorporates changes related to mining;
- – changes to turbidity, oxygen level, water temperature, ice regime, water quality;
- – changes in surface water quality associated with any mine effluent releases or surface runoff;
- – changes to the hydrological and hydrometric conditions;
- – changes to groundwater recharge/discharge areas and any changes to groundwater infiltration areas;
- – changes to groundwater quality associated with storage or release of any mine effluents or drainage including surface runoff; and
- – changes to water quality attributed to acid rock drainage and metal leaching associated with the storage of waste rock, ore, low grade ore, tailings, overburden and potential construction material, including:
    - ✓ short term metal leaching properties;
    - ✓ longer term rates of acid generation (if any) and metal leaching;
    - ✓ estimates of the potential for mined materials (including waste rock, tailings and low grade ore) to be sources of acid rock drainage or metal leaching;
    - ✓ estimates of potential time to the onset of acid rock drainage or metal leaching;
    - ✓ quantity and quality of leachate/effluent from samples of tailings, waste rock, and ore;
    - ✓ quantity and quality of effluent to be released from the site into the receiving waters;
    - ✓ quality of humidity cell or column test liquid from acid rock testing;
    - ✓ sensitivity analysis to assess the effects of imperfect segregation of waste rock;
    - ✓ pit water chemistry during operation and decommissioning and abandonment (post-closure), and pit closure management measures (e.g. flooding). This will include geochemical modelling of pit water quality in the post-closure period; and
    - ✓ surface and seepage water quality from the waste rock dumps, tailings/waste rock impoundment facility, stockpiles and other infrastructure during operation and post-closure.

6.2.3. Changes to riparian, wetland and terrestrial environments

– overall description of changes related to landscape disturbance;
– changes to the habitat of migratory and non-migratory birds, with a distinction made between the two birds category, including losses, structural changes and fragmentation of riparian habitat of terrestrial environments and wetlands frequented by birds (types of cover, ecological unit of the area in terms of quality, quantity, diversity, distribution and functions);
– changes to critical habitat for federally listed species at risk (*Species at Risk Act*) and/or important habitat for species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (for listing on Schedule 1 of the *Species at Risk Act*); and
– changes to key habitat for species important to current use of lands and resources for traditional purposes.

6.3. Predicted effects on valued components

Based on the predicted changes to the environment identified in section 6.2, the proponent is to assess the environmental effects of the project on the following VCs. All interconnections between VCs and between changes to multiple VCs will be described:

6.3.1. Fish and fish habitat

– the identification of any potential adverse effects to fish and fish habitat as defined in subsection 2(1) of the *Fisheries Act*, including the calculations of any potential habitat loss or alterations (temporary or permanent) in terms of surface areas (e.g. spawning grounds, fry-rearing areas, feeding), and in relation to watershed availability and significance. The assessment will include a consideration of:
  - ✓ the geomorphological changes and their effects on hydrodynamic conditions and fish habitats (e.g. modification of substrates, dynamic imbalance, silting of spawning beds);
  - ✓ the modifications of hydrological and hydrometric conditions on fish habitat and on the fish species' life cycle activities (e.g. reproduction, fry-rearing, movements);
  - ✓ potential effects on riparian areas that could affect aquatic biological resources and productivity taking into account any anticipated modifications to fish habitat;
  - ✓ changes to water and sediment quality identified in changes to groundwater and surface water, and their potential effects on fish and fish habitat;
  - ✓ any potential imbalances in the food web in relation to baseline conditions; and
  - ✓ effects on the primary and secondary productivity of water bodies and how mine-related effects may affect fish food sources.

– the effects of changes to the aquatic environment, including those identified under changes to groundwater and surface water, on fish and their habitat, including:
  - ✓ the anticipated changes in the composition and characteristics of the populations of various fish species, including shellfish and forage fish;
  - ✓ any modifications in migration or local movements (upstream and downstream migration, and lateral movements) following the construction and operation of works (physical and hydraulic barriers);

  - ✓ any reduction in fish populations as a result of potential overfishing due to increased number of people in the project area;
  - ✓ any modifications and use of habitats by federally or provincially listed fish species;

- – a discussion of how project construction timing correlates to key fisheries windows for freshwater and anadromous species, and any potential effects resulting from overlapping periods;
- – a discussion of how vibration caused by blasting may affect fish behaviour, such as spawning or migrations; and
- – calculate any potential habitat offset/compensation works related to fish and fish habitat in terms of the amount of habitat being offset/compensated, as well as the spatial location of the offsetting/compensation habitat.

6.3.2. Migratory birds

- – direct and indirect adverse effects on migratory birds, including population level effects that could be caused by all project activities, including, but not limited to:
  - ✓ site preparation;
  - ✓ deposit of harmful substances in waters that are frequented by migratory birds (e.g. tailing impoundment area);
- – collision risk of migratory birds with any project infrastructure and vehicles; and
- – indirect effects caused by increased disturbance (e.g. noise, light, presence of workers), relative abundance movements, and losses or changes in migratory bird habitat, considering the critical breeding and migration periods for the birds.

6.3.3. Species at risk

- – the potential adverse effects of the project on *Species at Risk Act* listed species and, where appropriate, its critical habitat; i.e. direct and indirect effects on the survival or recovery of *Species at Risk Act* listed species (e.g. common nighthawk, olive-sided flycatcher, rusty blackbird, yellow rail, short-eared owl, horned grebe, little brown myotis, northern myotis, northern leopard frog, and boreal woodland caribou).
- – the potential adverse effects of the project on species assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as extirpated, endangered, threatened, or of special concern (e.g. barren ground caribou, wolverine, bank swallow, and barn swallow).

6.3.4. Indigenous peoples

With respect to Indigenous peoples, a description and analysis for each group of how changes to the environment caused by the project will affect the following activities exercised by each Indigenous group:

- – current use of lands and resources for traditional purposes. This assessment will characterize the effects (including cumulative effects) on the use or activity (e.g. hunting, fishing, trapping, plant gathering, and cultural practices) as a result of the underlying changes to the environment (i.e. how will the activity change if the project proceeds). The underlying changes to the environment will also be described, including, but not limited to:

- ✓ any changes to the availability or quality of resources (fish, wildlife, birds, plants or other natural resources) used for traditional purposes (e.g. hunting, fishing, trapping, collection of medicinal plants, use of sacred sites);
- ✓ any changes to access and perceived access into areas used for traditional purposes, including development of new roads, deactivation or reclamation of access roads and changes to waterways that affect navigation, and how this may affect continued knowledge of the area, financial capacity to access and desirability to access;
- ✓ any changes to the environment that affect cultural value or importance associated with traditional uses or areas affected by the project (e.g. values or attributes of the area that make it important as a place for inter-generational teaching of language or traditional practices, communal gatherings, integrity of preferred traditional practice areas);
- ✓ how timing of project activities (e.g. construction, blasting, discharges) have the potential to interact with the timing of traditional practices, and any potential effects resulting from overlapping periods;
- ✓ consideration of the regional context for traditional use, and the value of the project area in that regional context, including alienation of lands from traditional use;
- ✓ any changes to environmental quality (e.g. air, water, soil), the sensory environment (e.g. noise, light, visual landscape);
- ✓ consideration of sacred, ceremonial or culturally important places, objects or things;
- ✓ any changes that could detract from use of the area or lead to avoidance of the area as a result of real and perceived disturbance of the environment (e.g. observation of and fear of contamination of water or country foods);
- ✓ any changes to the environment resulting from the presence of worker or increased access to the area by non-Indigenous peoples (e.g. noise, competition for or pressure on resources);
- ✓ an assessment of the potential to return affected areas to pre-project conditions to support traditional practices (including the identification of end land use goals);

– human health, focusing on effects on health outcomes or risks in consideration of, but not limited to, potential changes in air quality, noise exposure and effects of vibration from blasting, current and future availability of country foods, and water quality (drinking, recreational and cultural uses). When risks to human health due to changes in one or more of these components are predicted, a complete Human Health Risk Assessment (HHRA) examining all exposure pathways for pollutants of concern may be necessary to adequately characterize potential risks to human health. Where adverse health effects are predicted, any incidental effects such as effects on current use of lands and resources for traditional purposes will also be assessed. The proponent must provide a justification if it determines that an assessment of the potential for contamination of country foods is not required or if some contaminants are excluded from the assessment;

– socio-economic conditions, including, but not limited to:

- ✓ the use of navigable waters (including any water used for Indigenous transport)
- ✓ forestry and logging operations
- ✓ commercial fishing, hunting, trapping, and gathering activities
- ✓ commercial outfitters
- ✓ recreational use
- ✓ food security

- ✓ changes at the community level that affect socio-economic conditions for Indigenous peoples as result of increased population, economic activity, cost of living, among other factors
- ✓ non commercial / trade economy

– physical and cultural heritage, and structures, sites or things of historical, archaeological, paleontological or architectural significance to groups, including, but not limited to:

- ✓ the loss or destruction of physical and cultural heritage
- ✓ changes to access to physical and cultural heritage
- ✓ changes to the cultural value or importance associated with physical and cultural heritage
- ✓ changes to sacred, ceremonial or culturally important places, objects, or things
- ✓ changes to visual aesthetics over the life of the Project

– Other effects of changes to the environment on groups should be reflected as necessary.

6.3.5. Other valued components that may be affected as a result of a federal decision or due to effects on federal lands, another province or outside Canada.

If there is potential for the project to result in environmental changes on federal lands, lands in a province other than Manitoba, or outside of Canada as a result of the project, descriptions of effects will include, but are not limited to, a consideration of:

– changes to ambient air quality on federal lands that may be affected by the project, including any changes in the concentration of the following contaminants, as relevant: total suspended particulates, fine particulates ($PM_{2.5}$), particulate matters up to 10 micrometers in size (PM_{10}), sulfur oxides (SOx), volatile organic compounds (VOCs), nitrogen oxides (NOx), and diesel particulates presented in concentration values comparable to guidelines (i.e. $\mu g/m^3$);

– changes to interprovincial wildlife, including any changes to the Manitoba North Range (MB9) boreal woodland caribou and the Beverly and Qamanirjuaq barren-ground caribou populations, habitat, movement or migratory corridors;

– an estimate of the direct greenhouse gas emissions associated with all phases of the project in a regional, provincial, national and international context, as well as any mitigation measures proposed to minimize greenhouse gas emissions. This information is to be presented by individual pollutant and should also be summarized in CO2 equivalent per year.

If there is the potential for a change to the environment arising as a result of a federal decision(s), for example an authorization under section 35 of the *Fisheries Act*, the EIS should include a description of the specific project components for which a federal authorization/decision is required, and an assessment of any other valued components (not already covered in other subsections of these guidelines) that may be affected by the changes to the environment caused by these specific project components.

Such an assessment may include a consideration of the following:

– changes to the use of waterways and water bodies;

– effects to water quality, wetlands and aquatic invertebrate species at risk;

– changes to recreational navigation;

– effects to commercial trapping.

6.4. Mitigation measures

Every EA conducted under CEAA 2012 will consider measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project. Under CEAA 2012, mitigation measures includes measures to eliminate, reduce or control the adverse environmental effects of a designated project, as well as restitution for damage to the environment through replacement, restoration, compensation or other means. Measures will be specific, achievable, measurable and verifiable, and described in a manner that avoids ambiguity in intent or commitment, interpretation and implementation. Mitigation measures may be considered for inclusion as conditions in the EA decision statement and/or in other compliance and enforcement mechanisms provided by other authorities' permitting or licensing processes.

As a first step, the proponent is encouraged to use an approach based on the avoidance and reduction of the effects at the source. Such an approach may include the modification of the design of the project or relocation of project components.

The EIS will describe the standard mitigation practices, policies and commitments that constitute technically and economically feasible mitigation measures and that will be applied as part of standard practice regardless of location. The proponent will describe criteria used to estimate the technical and economic feasibility of potential mitigation measures and provide rational as to why certain mitigation measures were rejected. The EIS will then describe the project's environmental protection plan and its environmental management system, through which the proponent will deliver this plan. The plan will provide an overall perspective on how potentially adverse effects would be minimized and managed over time. The EIS will further discuss the mechanisms the proponent would use to require its contractors and sub-contractors to comply with these commitments and policies and with auditing and enforcement programs.

The EIS will then describe mitigation measures that are specific to each environmental effect identified. Mitigation measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation measure is designed to address.

The EIS will identify and describe mitigation measures to avoid, or lessen potential adverse effects on species and/or critical habitat listed under the *Species at Risk Act*. These measures will be consistent with any applicable recovery strategy and action plans. The EIS will also identify and describe mitigation measures to avoid or lessen adverse effects on listed COSEWIC species, and species harvested by Indigenous groups.

The EIS will specify the actions, works, minimal disturbance footprint techniques, best available technology, best management practices, corrective measures or additions planned during the project's various phases to eliminate or reduce the significance of adverse effects. The EIS will also present an assessment of the effectiveness of the proposed technically and economically feasible mitigation measures. The reasons for determining if the mitigation measure reduces the significance of an adverse effect will be made explicit. The proponent is also encouraged to identify mitigation measures for effects that are adverse although not significant.

The EIS will indicate what other technically and economically feasible mitigation measures were considered, and explain why they were rejected. Trade-offs between cost savings and effectiveness of the various forms of mitigation measures will be justified. The EIS will identify who is responsible for the implementation of these measures and the system of accountability.

Where mitigation measures are proposed to be implemented for which there is little experience or for which there is some question as to their effectiveness, the potential risks and effects to the environment should those measures not be effective will be clearly and concisely described. In addition, the EIS will identify the extent to which technological innovations will help mitigate environmental effects. Where possible, it will provide detailed information on the nature of these measures, their implementation, management and the requirements of the follow-up program.

Adaptive management is not considered as a mitigation measure, but if the follow-up program (refer to Section 8 below) indicates that corrective action is required, the proposed approach for managing the action (including resources) should be identified.

6.5. Significance of residual effects

After having established the technically and economically feasible mitigation measures, the EIS will present any residual environmental effects of the project on the VCs identified in Section 6.3 above. All residual effects, even if very small or deemed insignificant will be described.

The EIS will then provide a detailed analysis of the significance of the residual environmental effects that are considered adverse following the implementation of mitigation measures, using guidance described in Section 4 of the Agency's Operational Policy Statement, *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects under the Canadian Environmental Assessment Act, 2012*[16].

The EIS will identify the criteria used to assign significance ratings to any predicted adverse effects. It will contain clear and sufficient information to enable the Agency or review panel, technical and regulatory agencies, Indigenous groups, and the public to review the proponent's analysis of the significance of effects. The EIS will document the terms used to describe the level of significance.

The following criteria should be used in determining the significance of residual effects:

- magnitude
- geographic extent
- timing
- duration
- frequency
- reversibility
- ecological and social context[17]
- existence of environmental standards, guidelines or objectives for assessing the effect

[16] Visit the Canadian Environmental Assessment Agency's website at: www.canada.ca/en/environmental-assessment-agency/news/media-room/media-room-2015/determining-whether-designated-project-is-likely-cause-significant-adverse-environmental-effects-under-ceaa-2012.html

[17] The ecological and social context within which potential environmental effects may occur should be taken into account when considering the key criteria above in relation to a particular VC, as the context may help better characterize whether adverse effects are significant.

In assessing significance against these criteria the proponent will, where possible, use relevant existing regulatory documents, environmental standards, guidelines, or objectives such as prescribed maximum levels of emissions or discharges of specific hazardous agents into the environment. The EIS will contain a section which explains the assumptions, definitions and limits to the criteria mentioned above in order to maintain consistency between the effects on each VC.

Where significant adverse effects are identified, the EIS will set out the probability (likelihood) that they will occur, and describe the degree of scientific uncertainty related to the data and methods used within the framework of this environmental analysis.

6.6. Other effects to consider

6.6.1. Effects of potential accidents or malfunctions

The failure of certain works caused by human error or exceptional natural events (e.g. flooding, earthquake, forest fire) could cause major effects. The proponent will therefore conduct an analysis of the risks of accidents and malfunctions across all phases of the Project, determine their effects, and present a preliminary emergency response measures and capacities.

Taking into account the lifespan of all different project components and temporal phases, the proponent will identify the probability of potential accidents and malfunctions related to the project, including an explanation of how those events were identified, potential consequences (including the environmental effects as defined in section 5 of CEAA 2012), the plausible worst case scenarios and the effects of these scenarios. Fate and behaviour modelling of potential spills of hydrocarbons, sodium cyanide, and ammonium nitrate to fish-bearing waterways may be considered across all seasons.

This assessment will include an identification of the magnitude of an accident and/or malfunction, including the quantity, mechanism, rate, form and characteristics of the contaminants and other materials likely to be released into the environment during the accident and malfunction events and would potentially result in an adverse environmental effect as defined in section 5 of CEAA 2012.

The EIS will describe the preventative measures and design safeguards that have been established to protect against such occurrences and the contingency and emergency response procedures that would be put in place if such events do occur. Environmental sensitivity mapping, including likely pathways, will identify areas sensitive to accident and malfunction scenarios that are located adjacent to project activities, such as streams and wetland areas frequented by fish and/or migratory birds.

6.6.2. Effects of the environment on the project

The EIS will take into account how local conditions and natural hazards, such as severe and/or extreme weather conditions and external events (e.g. flooding, drought, ice jams, landslides, avalanches, erosion, subsidence, fire, outflow conditions and seismic events), could adversely affect the project and how this in turn could result in effects to the environment (e.g. extreme environmental conditions that can contribute to and/or complicate malfunctions and accidental events). These events will be considered in different probability patterns (e.g. 5-year flood vs. 100-year flood).

The EIS will provide details of planning, design and construction strategies intended to minimize the potential environmental effects of the environment on the project.

6.6.3. Cumulative effects assessment

The proponent will identify and assess the project's cumulative effects using the approach described in the Agency's Operational Policy Statement entitled *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* and the guide entitled *Technical Guidance for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012*[18].

Cumulative effects are defined as changes to the environment due to the project combined with the existence of other past, present and reasonably foreseeable physical activities. Cumulative effects may result if:

- the implementation of the project may cause direct residual adverse effects on the VC, taking into account the application of technically and economically feasible mitigation measures; and,
- the same VC may be affected by other past, present and future physical activities[19].

VCs that would not be affected by the project or would be affected positively by the project can, therefore, be omitted from the cumulative effects assessment. A cumulative effect on an environmental component may, however, be important even if the assessment of the project's effects on this component reveals that the effects of the project are minor.

In its EIS, the proponent will:

- identify and provide a rationale for the VCs that will constitute the focus of the cumulative effects assessment, focussing the cumulative effects assessment on the VCs most likely to be affected by the project and other project and activities. To this end, the proponent must consider, without limiting itself thereto, the following components likely to be affected by the project:
    - ✓ fish and fish habitat, including salmon and other valued fish species;
    - ✓ species at risk;
    - ✓ migratory birds;
    - ✓ Indigenous peoples; and
    - ✓ any VCs associated with subsection 5(2) of CEAA 2012;
- given the prior mining history at both sites, consider each VC not only in relation to current conditions, but conditions prior to historic mining, and identify changes/alterations in the interim, relevant to the consideration of cumulative effects;
- identify and justify the spatial and temporal boundaries for the cumulative effect assessment for each VC selected. The boundaries for the cumulative effects assessments will generally be different for each VC considered. These cumulative effects boundaries will also generally be larger than the boundaries for the corresponding project effects;
- identify the sources of potential cumulative effects. Specify other projects or activities that have been or that are likely to be carried out that could cause effects on each selected VC within the

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[18] Visit the Canadian Environmental Assessment Agency's website at: https://www.canada.ca/en/environmental-assessment-agency/services/policy-guidance.html

[19] These terms are defined in the Canadian Environmental Assessment Agency's *Technical Guidance for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012*, Draft, December 2014 – https://www.canada.ca/en/environmental-assessment-agency/services/policy-guidance/technical-guidance-assessing-cumulative-environmental-effects-under-canadian-environmental-assessment-act-2012.html

boundaries defined, and whose effects would act in combination with the residual effects of the project. This assessment may consider the results of any relevant study conducted by a committee established under section 73 or 74 of CEAA 2012;

- assess the cumulative effects on each VC selected by comparing the future scenario with the project and without the project. Effects of past activities (activities that have been carried out) will be used to contextualize the current state of the VC. In assessing the cumulative effects on current use of lands and resources for traditional purposes, the assessment will focus on the cumulative effects on the relevant activity (e.g. hunting, fishing, trapping, plant harvesting) and also consider overall effects on Indigenous rights-based activities on their traditional lands and resources and health and socio-economic conditions. Cumulative effects must consider residual effects across multiple VCs;
- describe the mitigation measures that are technically and economically feasible. The proponent shall assess the effectiveness of the measures applied to mitigate the cumulative effects. In cases where measures exist that are beyond the scope of the proponent's responsibility that could be effectively applied to mitigate these effects, the proponent will identify these effects and the parties that have the authority to act. In such cases, the EIS will summarize the discussions that took place with the other parties in order to implement the necessary measures over the long term;
- determine the significance of the cumulative effects; and
- develop a follow-up program to verify the accuracy of the assessment or to dispel the uncertainty concerning the effectiveness of mitigation measures for certain cumulative effects.

The proponent is required to engage with key stakeholders and Indigenous groups prior to finalizing the choice of VCs and the appropriate boundaries to assess cumulative effects.

7. SUMMARY OF ENVIRONMENTAL EFFECTS ASSESSMENT

The EIS will contain a table summarizing the following key information:

- potential environmental effects on valued components;
- proposed mitigation measures to address the effects identified above;
- potential residual effects and the significance of the residual environmental effects

The summary table will be used in the EA Report prepared by the Agency or will be considered by the review panel. An example of a format for the key summary table is provided in Appendix 1 of this document.

In a second table, the EIS will summarize all key mitigation measures and commitments made by the proponent which will more specifically mitigate any significant adverse effects of the project on VCs (i.e. those measures that are essential to ensure that the project will not result in significant adverse environmental effects).

8. FOLLOW-UP AND MONITORING PROGRAMS

A follow-up program is designed to verify the accuracy of the effects assessment and to determine the effectiveness of the measures implemented to mitigate the adverse effects of the project. Where there is uncertainty about effects outcomes, the proponent will show evidence of detailed follow-up and monitoring programs to identify change, and identify adaptive management measures that will be applied.

Considerations for developing a follow-up program include:

- whether the project will impact the physical environment, environmentally sensitive areas/VCs, or protected areas or areas under consideration for protection;
- the nature of Indigenous and public concerns raised about the project;
- the accuracy of predictions;
- whether there is a question about the effectiveness of mitigation measures or the proponent proposes to use new or unproven techniques and technology;
- the nature of cumulative environmental effects;
- the nature, scale and complexity of the program;
- a description of proposed engagement with Indigenous groups in the planning and implementation of follow-up and monitoring; and
- identify, with supporting rationale, how long post closure water will need to be managed and monitored; and
- whether there was limited scientific knowledge about the effects in the EA.

The goal of a monitoring program is to ensure that proper measures and controls are in place in order to decrease the potential for environmental degradation during all phases of project development, and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety.

8.1. Follow-up program

The duration of the follow-up program shall be as long as required to evaluate the effectiveness of the mitigation measures.

The EIS shall present a preliminary follow-up program and shall include:

- objectives of the follow-up program and the VCs targeted by the program;
- list of elements requiring follow-up;
- number of follow-up studies planned as well as their main characteristics (list of the parameters to be measured, planned implementation timetable, etc.);
- intervention mechanism used in the event that an unexpected deterioration of the environment is observed;
- mechanism to disseminate follow-up results among the concerned populations;
- accessibility and sharing of data for the general population;
- opportunity for the proponent to include the participation of Indigenous groups and stakeholders on the affected territory and include Aboriginal traditional knowledge, during the development and implementation of the program;

- involvement of local and regional organizations and Indigenous groups in the design, implementation and evaluation of the follow-up results as well as any updates, including a communication mechanism between these organizations and the proponent.

8.2. Monitoring

The proponent will prepare an environmental monitoring program for all phases of the project.

Specifically, the environmental impact statement shall present an outline of the preliminary environmental monitoring program, including the:

- identification of the interventions that pose risks to one or more of the environmental and/or valued components and the measures and means planned to protect the environment;
- identification of regulatory instruments that include a monitoring program requirement for the valued components;
- description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required);
- description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the environmental provisions of their contracts;
- guidelines for preparing monitoring reports (number, content, frequency, format) that will be sent to the authorities and Indigenous groups concerned; and
- plans to engage Indigenous groups in monitoring, where appropriate.

Appendix 1 Example - Summary Table of Environmental Assessment

						Key Criteria for Determining Significance[20]						
Valued Component affected	Area of federal jurisdiction[21] (√)	Project Activity	Potential effects	Proposed mitigation	Residual effect	*Magnitude*	*Geographical Extent*	*Timing*	*Duration*	*Frequency*	*Reversibility*	Significance of residual adverse effect
Fish and fish habitat												
Migratory birds												
Species at risk												
Current use of land and resource for traditional purpose	**√** 5(1)(c)(iii)											
Any other VCs identified												

[20] Other key criteria can be used to determine significance, as appropriate. The ecological and social context within which potential environmental effects may occur should be taken into account when considering the key criteria in relation to a particular VC, as the context may help better characterize whether adverse effects are significant.

[21] Indicate by a check mark which valued components can be considered "environmental effects" as defined in section 5 of CEAA 2012, and specify which subsection of section 5 is relevant. For example, for the VC "current use of lands and resources for traditional purposes", the appropriate cell would indicate, section 5(1)(*c*)(iii) of CEAA 2012.

Appendix 4B MSD (PROVINCIAL) INFORMATION BULLETIN – ENVIRONMENT ACT PROPOSAL (EAP) REPORT GUIDELINES

Information Bulletin – Environment Act
Proposal Report Guidelines

Manitoba
Sustainable Development

These guidelines apply to all Environment Act Proposals (EAPs) under The Environment Act. They prescribe what is required in report(s) supporting the EAP, and the quantity and types of copies required.

Separate, supplementary guidelines exist for certain types of developments, indicating additional information required. These guidelines are available on the Environmental Approvals Branch (EAB) webpage (http://www.gov.mb.ca/sd/eal) or by contacting the EAB.

DEVELOPMENT ENVIRONMENTAL ASSESSMENT (EA) REPORT

This information is based on the Licensing Procedures Regulation (Manitoba Regulation 163/88).
Note that where Imperial measurements are used, metric equivalents must be listed as well.

The EA Report typically contains the following:

- Executive summary
- Introduction and background
- Description of proposed development, including construction, operation, maintenance, and decommissioning if applicable
- Description of existing environment in the project area
- Description of environmental effects of the proposed development
- Description of the human health effects of the proposed development
- Mitigation measures to protect the environment and human health, and residual environmental effects
- Follow-up plans, including monitoring and reporting
- Conclusions

Definitions

"environment" means

(a) air, land and water, or
(b) plant and animal life, including humans

"environmental health" means those aspects of human health that are or can be affected by pollutants or changes in the environment

"pollutant" means any solid, liquid, gas, smoke, waste, odour, heat, sound, vibration, radiation, or a combination of any of them that is foreign to or in excess of the natural constituents of the environment, and

(a) affects the natural, physical, chemical, or biological quality of the environment, or
(b) is or is likely to be injurious to the health or safety of persons, or injurious or damaging to property or plant or animal life, or
(c) interferes with or is likely to interfere with the comfort, well being, livelihood or enjoyment of life by a person.

Introduction and Background

- Need or rationale for the development, purpose, and alternatives; may include one or more of the following depending on the development:

- products or services to be provided and process technologies to be used;
- quantitative information on the volumes or amounts of products or services as applicable;
- current population trends, if a specified population is to be served by the development; and
- reference to previous studies and activities relating to feasibility, exploration, or project siting and prior authorization received from other government agencies.

Description of Proposed Development

- Certificate of Title showing the owner(s) and legal description of the land upon which the development will be constructed; or, in the case of highways, rail lines, electrical transmission lines, or pipelines, a map or maps at a scale no less than 1:50,000 showing the location of the proposed development.

- Owner of land upon which the development is intended to be constructed, and of mineral rights beneath the land, if different from surface owner.

- Existing land use on the site and on land adjoining it, as well as changes that will be made in such land use for the purposes of the development.

- Land use designation for the site and adjoining land as identified in a development plan adopted under The Planning Act or The City of Winnipeg Act, and the zoning designation as identified in a zoning by-law, if applicable.

- Description of proposed development and schedule for stages of the development, including proposed dates for planning, design, construction, commissioning, operation, and decommissioning and/or termination of operation (if known), identifying major components and activities of the development as applicable (e.g. access road, airstrip, processing facility, waste disposal area, etc.).

- Funding, including the name and address of any government agency or program (federal, provincial or otherwise) from which a grant or loan of capital funds have been requested (where applicable).

- Other federal, provincial or municipal approvals, licences, permits, authorizations, etc. known to be required for the proposed development, and the status of the project's application or approval. (Information on federal approval requirements may be obtained from the Canadian Environmental Assessment Agency at http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=D75FB358-1.)

- Results of any public consultations undertaken or to be undertaken in conjunction with project planning.

Description of Existing Environment in the Project Area

- The biophysical environment as related to the development, including topographic and base maps and aerial photographs as necessary, as follows:
  - description of the local area and regional setting including important terrain features such as hills, valleys, lakes, rivers, shorelines, etc;
  - description of the prevailing climate and meteorological conditions, and identification of any nearby climate monitoring stations;
  - identification and description of local and regional surface waterbodies (lakes, rivers, wetlands, etc.) and description of the regional groundwater conditions including aquifers, recharge areas, quality, wells, etc.;
  - description of the aquatic environment including fish resources, fish habitat, benthic invertebrates, aquatic macrophytes, etc. for each waterbody that could be affected by the proposed development;
  - description of the terrestrial environment including vegetation, wildlife (mammals, birds, amphibians, reptiles, etc.), wildlife habitat, etc. that could be affected by the proposed development;
  - identification and description of any rare, threatened or endangered species or any important or sensitive species and/or habitats, particularly if federally and/or provincially protected; and

- o identification and description of the existing land and resource uses in the region including agriculture, forestry, mining, hydroelectric, oil and gas, recreation, tourism, etc.

- The socioeconomic environment as related to the development, including topographic and base maps and aerial photographs as necessary, as follows:
    - o identification of any existing public safety and human health risks in the development area;
    - o identification and description of protected areas (e.g. national and provincial parks);
    - o heritage resources (e.g. archaeological and historic sites), etc; and
    - o identification of Indigenous communities in the vicinity of the proposed development.

Existing environmental information may come from sources such as site visits, previous studies, environmental databases, baseline data, ecological land classification, and traditional ecological knowledge.

<u>Description of Environmental and Human Health Effects of the Proposed Development</u>

- Potential impacts of the development on the environment, including, but not necessarily limited to:
    - o impact on biophysical environment, including wildlife, fisheries, surface water, groundwater, and forestry resources;
    - o type, quantity and concentration of pollutants (emissions, effluents and solid wastes) to be released, and the technologies proposed to contain or treat the waste streams;
    - o information on the storage, transportation and disposal of any hazardous wastes that may be produced;
    - o identification of any storage of gasoline or associated products (e.g. diesel fuel, used oil, heating oil, aviation gas, solvents, isopropanol, methanol, acetone, etc.);
    - o impact on heritage resources;
    - o socio-economic implications resulting from environmental impact; and
    - o climate change implications including a greenhouse gas inventory calculated according to guidelines developed by Environment Canada (http://www.ghgreporting.gc.ca/GHGInfo/Pages/page15.aspx) and the United Nations (http://www.ipcc-nggip.iges.or.jp/public/index.html.)
- Potential impacts of the development on human health and safety, including, but not necessarily limited to:
    - o potential impact on human health and safety resulting from any release of pollutants, including a human health risk assessment.
- Potential impacts of the development on Indigenous communities, including, but not necessarily limited to:
    - o direct impacts on communities in the project area;
    - o resource use, including hunting, fishing, trapping, gathering, etc.;
    - o cultural or traditional activities in the project area.

<u>Mitigation Measures and Residual Environmental Effects</u>

- Proposed environmental management and risk mitigation practices to be employed to prevent or mitigate adverse implications from the impacts identified above, having regard to, where applicable:

    - o mitigation incorporated at the planning and design stages;
    - o containment, handling, monitoring, storage, treatment, and final disposal of pollutants;
    - o conservation and protection of natural or heritage resources;
    - o environmental restoration and rehabilitation of the site upon decommissioning; and
    - o protection of environment and human health.

- Residual environmental effects remaining after the application of mitigation measures, to the extent possible expressed in quantitative terms relative to baseline conditions.

- Description of control technology as compared to best available control technology.

Follow-up Plans, including Monitoring and Reporting

- Proposed follow-up activities that will be required at any stage of development (e.g. monitoring, inspection, surveillance, audit, etc.)

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Appendix 4C FIGURES

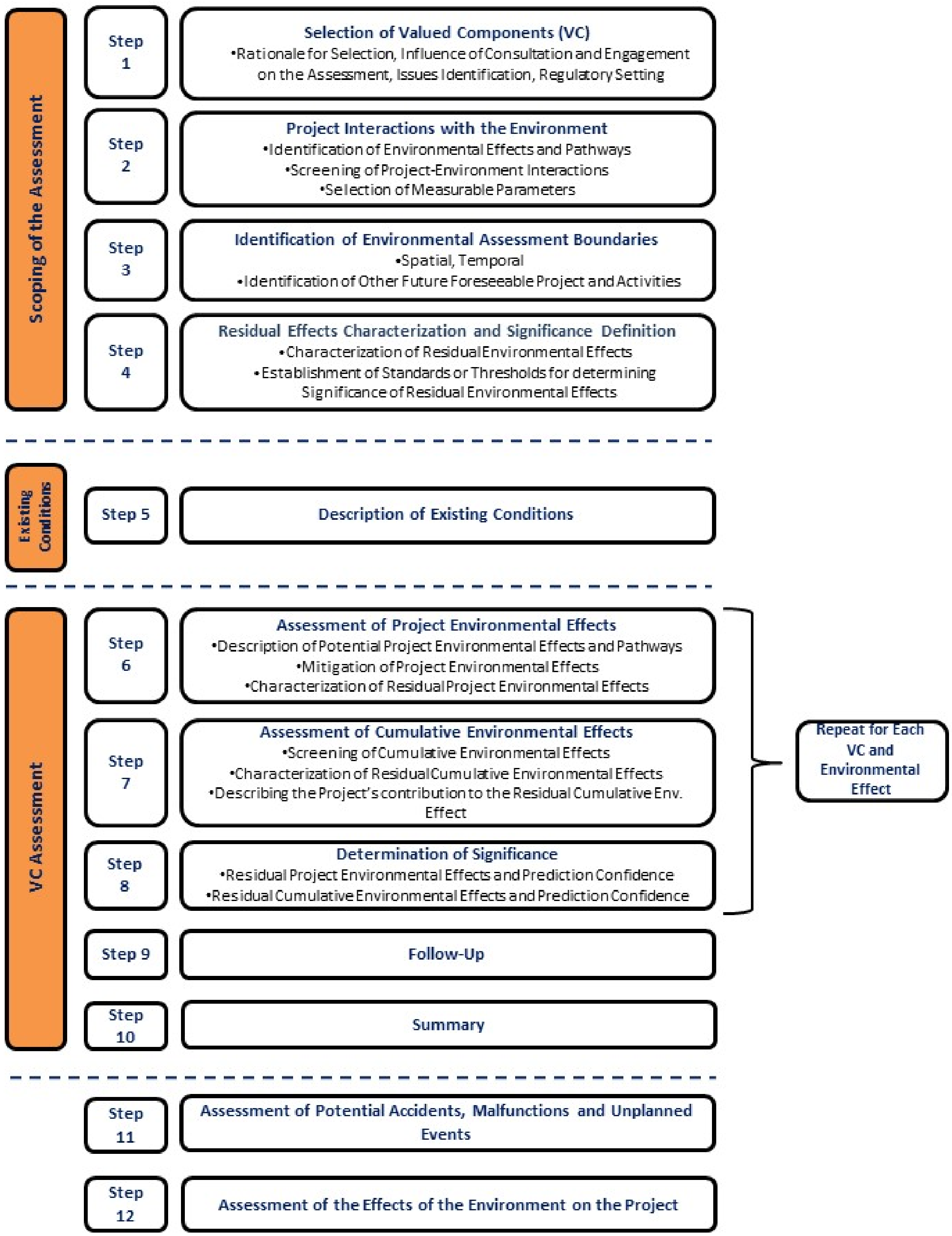

Figure 4-1 Environmental Effects Assessment Method Used in the Environmental Impact Statement

Appendix 4D TABLES

Table 4D-1 Federal Lands Present Within Local and Regional Assessment Areas by Valued Component

Valued Component	Federal Lands within LAA	Federal Lands within RAA
Air Quality	• Black Sturgeon Reserve	• None
Noise	• None	• Black Sturgeon Reserve
Groundwater	• None	• None
Surface Water	• None	• Black Sturgeon Reserve
Fish and Fish Habitat	• None	• Black Sturgeon Reserve
Vegetation and Wetlands	• Black Sturgeon Reserve	• Black Sturgeon Reserve
Wildlife	• Black Sturgeon Reserve	• Black Sturgeon Reserve
Labour and Economy*	• Black Sturgeon Reserve	• Black Sturgeon Reserve • Granville Lake Indian Settlement (IS) • South Indian Lake IS • Kinoosao-Thomas Clarke 204 IR
Community Services, Infrastructure, and Wellbeing*	• Black Sturgeon Reserve	• Black Sturgeon Reserve • Granville Lake IS • South Indian Lake IS • Kinoosao-Thomas Clarke 204 IR
Land and Resource Use	• Black Sturgeon Reserve	• Black Sturgeon Reserve
Heritage Resources*	• None	• Black Sturgeon Falls Reserve • Highrock 199 • Hills Island Indian Reserve • Kamihkowapihskak Pawistik Indian Reserve • Kapawasihk • Kimosominahk Indian Reserve • Mile 20 Second Revision Indian Reserve • Mistiategameek Sipi Indian Reserve • Monahawuhkan • Moosowhapihsk Sakahegan Indian Reserve • Napahkapihskow Sakhahigan Indian Reserve • Nelson House 170/170a/170b/170C • Nihkik Ohnikapihs Indian Reserve • Numaykoos Sakaheykun

Table 4D-1 Federal Lands Present Within Local and Regional Assessment Areas by Valued Component

Valued Component	Federal Lands within LAA	Federal Lands within RAA
		• Odei River Indian Reserve
Heritage Resources continued*	• None	• Ohpahahpiskow Sakahegan Indian Reserve • Opekanowi Sakaheykun • Opekunosakakanihk • O-Pipon-Na-Piwin Cree Nation 1 • Pachapesihk Wasahow Indian Reserve • Pukatawagan 198 • Sisipuk Sakahegan (A)/(B)/(C) Indian Reserve • Suwannee Lake Indian Reserve • Wapasihk • Wapikunoo Bay Indian Reserve • Wapisu Lake Indian Reserve • Wepuskow Ohnikahp Indian Reserve • Wuskwi Sakaheykun • Wuskwi Sipi
Current Use of Lands and Resources	Black Sturgeon Reserve	Black Sturgeon Reserve
Human Health	Black Sturgeon Reserve	Black Sturgeon Reserve
Indigenous Peoples*	Black Sturgeon Reserve	• Black Sturgeon Reserve • Highrock 199 • Hills Island Indian Reserve • Kamihkowapihskak Pawistik Indian Reserve • Kapawasihk • Kimosominahk Indian Reserve • Mile 20 Second Revision Indian Reserve • Mistiategameek Sipi Indian Reserve • Monahawuhkan • Moosowhapihsk Sakahegan Indian Reserve • Napahkapihskow Sakhahigan Indian Reserve • Nelson House 170 / 170a / 170b / 170 C • Nihkik Ohnikapihs Indian Reserve • Numaykoos Sakaheykun • Odei River Indian Reserve • Ohpahahpiskow Sakahegan Indian Reserve • Opekanowi Sakaheykun

Table 4D-1 Federal Lands Present Within Local and Regional Assessment Areas by Valued Component

Valued Component	Federal Lands within LAA	Federal Lands within RAA
Indigenous Peoples continued*	Black Sturgeon Reserve	• Opekunosakakanihk O-Pipon-Na-Piwin Cree Nation 1 • Pachapesihk Wasahow Indian Reserve • Pukatawagan 198 • Sisipuk Sakahegan (A)/(B)/(C) Indian Reserve • Suwannee Lake Indian Reserve • Wapasihk • Wapikunoo Bay Indian Reserve • Wapisu Lake Indian Reserve • Wepuskow Ohnikahp Indian Reserve • Wuskwi Sakaheykun • Wuskwi Sipi
*Note: These Statistics Canada administrative boundaries consist of the following standard geographical classifications: Census subdivision including towns, cities, Indian Reserves, and Indian Settlements. This nomenclature (e.g., Black Sturgeon IR) is unique to Chapters 13 (Labour and Economy) and 14 (Community Services, Infrastructure, and Wellbeing)		

Table 4D-2 Project and Activities Inclusion List

No.	Project Name or Physical Activity	Proponent	Commodity, Use, Activity	Description	Status
PAST AND PRESENT PHYSICAL ACTIVITIES					
Mineral Development					
1	"A" Mine	Sherritt Gordon Mines Limited	Primary: nickel, copper, zinc Secondary: gold	Underground mine	Closed Operation: 1953-2002
2	"EL" Mine	Sherritt Gordon Mines Limited	Primary: copper-nickel	Combined open-pit and underground mine	Closed Operation: 1954-1963
3	Fox Mine	Sherritt Gordon Mines Limited	Primary: Copper Secondary: zinc	Underground mine	Closed Operation: 1970-1985
4	Farley Mine	Sherritt Gordon Mines Limited	Primary: nickel, copper, zinc Secondary: gold	Open pit mine	Closed Operation: 1972-2002
5	Ruttan Mine	Sherritt Gordon Mines Limited	Primary: copper, zinc, silver, gold mine	Open pit mine	Closed Operation: 1973-2002
6	MacLellan Mine (Historical)	SherrGold Inc.	Primary: silver, zinc, lead	Underground mine	Closed Operation: 1986-1989
7	Burnt Timber Mine	Black Hawk Mining	Primary: gold	Open pit mine	Closed Operation: 1993-1996
8	Farley Lake Mine	Black Hawk Mining	Primary: gold	Open pit mine	Closed Operation: 1996-2000
9	Keystone Gold Mine	Black Hawk Mining	Primary: gold	Open pit mine	Closed Operation: 1996-2000
10	East/West Tailings Management Areas	Sherritt Gordon Mines Limited	Primary: nickel, copper, zinc Secondary: gold	Tailings management areas located just east of Lynn Lake	Closed Operation: 1953-2002

Table 4D-2 Project and Activities Inclusion List

No.	Project Name or Physical Activity	Proponent	Commodity, Use, Activity	Description	Status
Mineral Exploration					
-	-	Various	Mineral exploration activity	Blocks of mining claims and mineral leases at Lynn Lake and surrounding area	1941-Present
11	Last Hope Project	Carlisle Goldfields Limited*	Mineral exploration activity	Consisted of mining claims at the Last Hope property 20 km southeast of Lynn Lake; mineral exploration activity occurred in 2012	1982-1984; 2012
12	Linkwood Property Deposit	Carlisle Goldfields Limited*	Mineral exploration activity	Consisted of mining claims at the Linkwood deposit area southeast of Lynn Lake; mineral exploration activity occurred in 2012	1980s; 2012
13	Burnt Timber Project	Carlisle Goldfields Limited*	Mineral exploration activity	Consisted of mining claims at the Burnt Timber deposit southeast of Lynn Lake; mineral exploration activity occurred in 2012	Late 1980s-1990; 2012
14	Lynn Lake Gabbros Nickel Project	VMS Ventures Inc. (now Royal Nickel Corporation)	Mineral exploration activity	Consisted of four mining claim groups over 38 km^2 in the Lynn Lake nickel belt; mineral exploration activity occurred in 2007	2007
15	South Bay Project	VMS Ventures Inc. (now Royal Nickel Corporation)	Mineral exploration activity	Consisted of mining claims at South Bay property 100 km east of Lynn Lake; mineral exploration activity continued to 2004	2003-2004
16	Lynn Lake Nickel Sulphide Project	Corazon Mining Limited	Mineral exploration activity	Consists of mining claims at Lynn Lake; mineral exploration activities continued to 2018	2015-2018
17	Lynn Lake Nickel Project	Pacific Coast Nickel Corporation	Mineral exploration activity	Consisted of mining claims at Lynn Lake; mineral exploration activities continued to 2010	2008-2010
18	Nisku Project	CanAlaska Uranium Ltd.	Mineral exploration activity	Consisted of mining claims in the Leaf Rapids area at the North Ruttan copper-zinc property; mineral exploration activity occurred in 2017	2017

Table 4D-2 Project and Activities Inclusion List

No.	Project Name or Physical Activity	Proponent	Commodity, Use, Activity	Description	Status
Water and Waste					
19	Lynn Lake Waste Disposal Grounds	Town of Lynn Lake	Solid Waste	Solid waste disposal ground for the Town of Lynn Lake, northeast of Lynn Lake off PR 391	Operating 2010-Present
20	Lynn Lake Aerated Sewage Lagoon	Local Government District of Lynn Lake	Wastewater Treatment	Aerated sewage lagoon system for Town of Lynn Lake.	Operating 1974-Present
21	Lynn Lake Water Treatment Plant	Town of Lynn Lake	Water Treatment	Raw water intake from West Lynn Lake. Plant has capacity of 30 litres per second and uses multimedia filtration, cartridge filtration and nanofiltration. Design population is 4,050.	Operating 2002-Present
22	Black Sturgeon Sewage Treatment Lagoon	Indigenous Services Canada	Wastewater Treatment	Sewage treatment lagoon.	Operating 2004-Present
23	Black Sturgeon Water Treatment Facility	Indigenous Services Canada	Water Treatment	Raw water piped from lift station by Hughes Lake. Facility uses a chemically assisted filtration system serving Black Sturgeon.	Operating 2011-Present
24	Leaf Rapids Sewage Treatment Plant	Town of Leaf Rapids	Wastewater Treatment	Sewage treatment plant. The effluent is released to the Churchill River.	Operating 1988-Present
Residential and Community Development					
-	Lynn Lake, MB	Town of Lynn Lake	Town	Includes the built area of Lynn Lake with the municipal boundary	Created in 1950
-	Leaf Rapids, MB	Town of Leaf Rapids	Town	Includes the built area of Leaf Rapids within the municipal boundary	Created in 1974
-	Kinoosao, SK	Community of Kinoosao	Community	Includes the built area within the community of Kinoosao	Created in 1952

Table 4D-2 Project and Activities Inclusion List

No.	Project Name or Physical Activity	Proponent	Commodity, Use, Activity	Description	Status
-	Black Sturgeon Reserve	Marcel Colomb First Nation	Residential Development	Consists of 14 homes added in 2018 and 8 homes in 2019 at Hughes Lake	2018
25	Cottage Subdivisions	Province of Manitoba	Recreational cottages	Zed, Burge, and Eden Lake cottage subdivisions	1997 to present
Infrastructure Development					
26	138 kV Transmission Line	Manitoba Hydro	Electrical power line	Laurie River to Lynn Lake 138 kV Transmission Line (Laurie River to Lynn Lake)	Operating 1994 to present
27	Lynn Lake Airport	Town of Lynn Lake/YYL Airport	Air transportation	Weather station at Lynn Lake Airport circa 1959. Lynn Lake was home base for Calm Air from 1969 to 1985. Lynn Lake Airport town operated since 1999 and as a Public/ Private partnership with YYL Airport Inc. since 2013.	1959 to present
28	Water Aerodrome (Eldon Lake)	Province of Manitoba	Air transportation	Various float plane landing & dock areas. MCC Wildfire Base with helipads, docking station	Operating 1954 to present
29	Winter Road	Sayisi Dene First Nation	Road transportation	Construction, operation, and maintenance of a winter road linking Tadoule Lake, Brochet and Lac Brochet with PR 394 near Lynn Lake	Operating 1997 to present
-	Provincial Roads	Province of Manitoba	Road transportation	PRs 391, 394, 396, 397, 398	Operating 1966 to present
-	Railway	Keewatin Railway Company	Rail transportation	Railway link Pukatawagan to Sherritt Junction and Lynn Lake, with service up to McVeigh	Operating 1954 to present
Other Resource Activities					
-	Traditional Land and Resources	Various	Use of lands and waterbodies for traditional resource purposes	Lynn Lake and surrounding area	Ongoing

Table 4D-2 Project and Activities Inclusion List

No.	Project Name or Physical Activity	Proponent	Commodity, Use, Activity	Description	Status
-	Hunting, Outfitting, Trapping, Fishing (Lodges and Outfitters)	Various	Use of lands and waterways for commercial trapping and fishing, hunting, and outfitting and sport fishing	Lynn Lake and surrounding area	Ongoing
-	Recreation Activities	Various	Use of lands and waterways for recreation (e.g., canoeing)	Lynn Lake and surrounding area	Ongoing
30	Annual Pike Fishing Derby	Town of Lynn Lake	Recreational activity	Held on Burge Lake annually	2017
FUTURE PHYSICAL ACTIVITIES (CERTAIN AND REASONABLY FORESEEABLE)					
-	Mineral Development	Alamos Gold Inc.	Mining	Lynn Lake and surrounding area	2021
-	Mineral Exploration	Various	Mineral Exploration Activity (Nickel, Copper, Cobalt)	Lynn Lake and surrounding area	2019
-	Traditional Land Use	Various	Use of lands and waterbodies for traditional resource purposes	Lynn Lake and surrounding area	2019
-	Resource Use Activities	Various	Use of lands and waterways for trapping, hunting, and outfitting and sport fishing	Lynn Lake and surrounding area	2019
-	Recreation	Various	Use of lands and waterways for recreational purposes	Lynn Lake and surrounding area	2019
See Maps 4-3 and 4-4 for approximate project/activity location *Acquired by Alamos Gold Inc. in 2015					

Lynn Lake Gold Project
Environmental Impact Statement
Chapter 5 - Environmental Setting

Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Acronyms and Abbreviations

Alamos	Alamos Gold Inc.
bgs	below the ground surface
°C	degree Celsius
µg/m^3	micrograms per cubic metre
ASI	area of special interest
ARD	acid rock drainage
BP	before present
ca.	circa
CCME	Canadian Council of Ministers of the Environment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWQG – FAL	Canadian Water Quality Guidelines – Freshwater Aquatic Life
dBA	decibel A-weighted
EIS	Environmental Impact Statement
GCDWQ	Guidelines for Canadian Drinking Water Quality
GHG	greenhouse gas
Golder	Golder Associates
ha	hectares
HBC	Hudson's Bay Company
kg	kilograms
km, km^2	kilometers, square kilometres
kph	kilometres per hour
kt	kilotonne
m	metres

m^3	cubic metres
masl	metres above sea level
MB CDC	Manitoba Conservation Data Centre
MB ESEA	*The Endangered Species and Ecosystems Act* (Manitoba)
MDMER	Metal and Diamond Mine Effluent Regulations
mm	millimetres
ML	metal leaching
MWQSOG - DW	Manitoba Water Quality Standards, Objectives and Guidelines – Drinking Water
MWQSOG - FAL	Manitoba Water Quality Standards, Objectives and Guidelines – Freshwater Aquatic Life
non-PAG	non potentially acid generating
oz	ounce
PAG	potentially acid generating
PM	particulate matter
PR	provincial road
Project, the	Lynn Lake Gold Project
Proponent, the	Alamos Gold Inc.
RCMP	Royal Canadian Mounted Police
SARA	*Species at Risk Act*
SOCC	species of conservation concern
TLRU	traditional land and resource use
TMF	tailings management facility
VC	valued component

5.0 ENVIRONMENTAL SETTING

5.1 INTRODUCTION

This chapter provides an overview of the environmental setting for the Project and the broader surrounding environment to provide context for the Environmental Impact Statement (EIS) and a general description of the environmental significance, value, and character of the area where the Project will be developed. The information in this chapter provides the basis of the environmental assessment. Additional details regarding the existing condition of valued components (VCs) is provided in Chapters 6 through 19 and in the technical data reports (Volume 4).

The Project is located near Lynn Lake, Manitoba in north central Manitoba. Lynn Lake, Manitoba is located approximately 280 kilometres (km; by vehicle) northwest of Thompson, 1,083 km (by vehicle) northwest of Winnipeg, and 100 km (by vehicle) east of Kinoosao, Saskatchewan. The Project is in a remote, sparsely populated and rugged region of the Boreal Shield Ecozone. Primary resource uses occurring in the region include mining activities and forestry. Hunting, trapping, water-oriented recreation, including sport fishing, and other forms of tourism are important activities. There are two communities near the Project: the Town of Lynn Lake and the Black Sturgeon Reserve (Marcel Colomb First Nation). These communities are connected by provincial road (PR) 391, which runs southeast from Lynn Lake to the Town of Leaf Rapids and the City of Thompson.

The area supports peat-covered hummocky glacial deposits underlain by an expanse of Precambrian bedrock. The terrain consists of mostly hilly, till-veneered bedrock, with intervening low areas of organic terrain. Steep rocky ridges protrude 30 m to 60 m above lakes and peat-filled depressions. Surface water features and peat generally occupy the topographic lows. Soils in the region are comprised of mineral soils, which are dominant on sandy, acidic till, with organic soils typical in bogs and peat plateaus, and widespread discontinuous permafrost (Smith et. al. 1998).

Contiguous tracts of boreal forest span the area with jack pine (*Pinus banksiana*) common in well-drained areas, and black spruce (*Picea mariana*) and tamarack (*Larix laricina*) species abundant in wetter areas. The area is home to diverse wildlife species such as beaver (*Castor canadensis*), moose (*Alces alces*), black bear (*Ursus americanus*), American marten (*Martes americana*), and a variety of migratory birds such as ring-necked duck (*Aythya collaris*), bald eagle (*Haliaeetus leucocephalus*), and Tennessee warbler (*Leiothlypis peregrina*). Numerous wetlands, lakes, rivers, and streams are found throughout the area due to impermeable bedrock and poorly drained soils in peat filled depressions. These waterbodies are a part of the Churchill River Watershed that drains into the Hudson Bay to the east (Smith et. al. 1998). Fish inhabiting the area include northern pike (*Esox lucius*), walleye (*Sander vitreus*), yellow perch (*Perca flavescens*), and brook stickleback (*Culaea inconstans*).

An overview of existing conditions related to the natural, social, cultural, economic, and built environment is provided in the subsequent sections of this chapter. The environmental setting described in this chapter represents a contextual description of the geographic area. Additional information on existing conditions of valued components is provided in Chapters 6 through 19 and in the technical data reports (Volume 4).

5.2 PHYSICAL ENVIRONMENT

5.2.1 Climate and Meteorology

The Project is located within a strong continental climatic region characterized by short, cool summers and long, cold winters (Volume 4, Appendix C). Long-term climate data (1981-2010) from the Lynn Lake Airport monitoring station indicates that the mean annual air temperature is -3.2°C, ranging from an extreme maximum of 35°C (August 11, 1991) to an extreme minimum of -47°C (December 19, 1989). The coldest monthly average temperature is -24°C (January) and the highest monthly average temperature is 16°C (July). There is an annual average of 98 frost-free days. On average, there are 141 days with precipitation per year with an average annual precipitation of 478 mm (318 mm as rain and 160 mm as snow-water-equivalent; ECCC 2019b).

Hourly wind speed and direction data from Lynn Lake airport for 2015 to 2018 show that the annual average wind speed is 3.7 m/s (13 kph) with little variation in monthly average winds over the year. The maximum hourly wind speed (13.9 m/s or 50 kph) was observed in June. Monthly average wind speeds are lowest in December and hourly maximum wind speeds are lowest in August. Winds are generally from the northwest in colder months, and easterly in the warmer months (ECCC 2019b).

5.2.2 Air Quality and Greenhouse Gases

Existing air quality is reflective of the remote location of the Project and the current lack of industrial activities in the area. Overall, the existing air quality in the area can be characterized as very good (Volume 4, Appendix A and Chapter 6).

Baseline dustfall measurements at the Gordon and MacLellan sites are well below dustfall objectives from Ontario and British Columbia (Manitoba does not have a dustfall objective). Average particulate matter baseline concentrations ($PM_{2.5}$ and PM_{10}) are also well below the *Canadian Ambient Air Quality Standard* for $PM_{2.5}$ (27 µg/m^3) and the *Manitoba Ambient Air Quality Criteria* for PM_{10} (50 µg/m^3; CCME 2017; Manitoba Sustainable Development 2005) at the sites and Black Sturgeon Reserve, although the presence of air emissions from forest fires biases this baseline (e.g., during June and early July 2015; Volume 4, Appendix A and Chapter 6). Existing dust levels are attributed to traffic on unpaved roads and other human activities such as the use of wood stoves and open fires.

Local monitoring was supplemented with ambient air quality data from other more distant monitoring locations in Manitoba and the Northwest Territories for nitrogen dioxide (NO_2), Sulphur dioxide (SO_2) and carbon monoxide (CO). The Fort Smith ambient air quality monitoring station, operated by the Government of Northwest Territories, is considered the most representative for the Project as the station is in a similarly remote area with low population density and with similar meteorological and topographical conditions. The baseline concentration levels for NO_2, SO_2 and CO based on measurements from the Fort Smith station range from 1.3% to 6.8% of the respective *Manitoba Ambient Air Quality Criteria* (Manitoba Sustainable Development 2005; Volume 4, Appendix A and Chapter 6).

Existing greenhouse gas (GHG) emissions are characterized by summarizing provincial and national inventory totals. The most recently available data (2017) for Manitoba and Canada from Canada's National

Inventory Report (ECCC 2019a) were used. Manitoba's GHG emissions total for 2017 is 21,668 kt of carbon dioxide (CO_2) equivalent (CO_{2e}) and Canada's GHG emissions total is 715,760 kt CO_{2e}. Manitoba GHG emissions accounted for 3% of the national GHG emissions.

5.2.3 Ambient Sound

The existing acoustic environment in remote areas, such as the area surrounding the Project, is characterized by wind noise, occasional aircraft flyovers, flowing water, vegetation rustling, wildlife (birds) and insect noise (Volume 4, Appendix D and Chapter 7). Elevated noise levels observed at night are attributed to wildlife activity. The Lynn Lake Airport does not receive regularly scheduled commercial flights; however, occasional aircraft flyovers contribute to baseline ambient sound in remote regions near the Project. The average daytime equivalent sound level (L_d) and nighttime equivalent sound level (L_n) in a representative remote, unpopulated region near the Project (i.e., south of the Gordon site) were found to be 34.3 decibel A-weighted (dBA) and 33.4 dBA, respectively.

Noise monitoring in a representative rural area (i.e., the cottage area within Burge Lake Provincial Park located west of the MacLellan site) identified L_d and L_n values of 39.4 dBA and 37.9 dBA, respectively (Volume 4, Appendix D and Chapter 7). The acoustic environment in rural areas is characterized by residents' activities, local traffic, watersport and recreational activities, occasional aircraft flyovers, vegetation rustling, wildlife, insects, and water ripple noise. Additional human sources of baseline noise are also related to traffic along PR 391. Ambient sound levels at receptors located in the community of Lynn Lake were based on levels advised in Health Canada 2017 noise guidance for quiet rural communities (45 dBA L_d and 35 dBA L_n).

5.2.4 Ambient Light

The ambient light environment near the Project is typical of light levels in remote towns and villages at higher latitudes (Volume 4, Appendix B). Baseline measurements are consistent with other small towns and villages where light pollution is typically not a priority for control. Sky glow is routinely influenced by the presence of Aurora Borealis (i.e., northern lights).

The baseline light measurements were taken in the fall (October) and occurred during clear skies when the moon was not in the sky. Measuring incident light and sky glow should occur during periods of new moon (or at least during times when the moon is not in the sky) and clear skies, since these are conditions where the sky is at its darkest. Other meteorological conditions, such as those that occur during periods of rain, snow, or fog, will tend to diffuse light emissions, and could therefore lead to brighter night-time conditions that potentially reduce the estimated effect of the Project on the light environment.

Ambient light measurements taken during each season is typically not required. Incident light levels are not sensitive to seasonal variation, and sky glow typically varies by 0.2 mag/arcsec^2 depending on the season (Patat 2007). Sky glow is usually dominated by other factors, including anthropogenic light, celestial objects (e.g., the moon) and meteorological conditions (e.g., cloud cover).

Dark sky, including features such as the "Milky Way" and other constellations, is available within a few kilometers of Lynn Lake and Black Sturgeon Reserve. The light that affects these communities is the light that is generated within them, not by the overlap of other sources, such as industry, outside of the urban areas.

Further information on baseline light conditions and the results of the Project Light Impact Assessment are provided in Volume 5, Appendix B, Sections 4.0 and 6.0, respectively.

5.2.5 Physiography, Geology and Soils

5.2.5.1 Glacial and Post Glacial History

The regional landscape was influenced by the most recent glaciation as well as by post-glacial processes. The area was repeatedly overridden by the Laurentide Ice Sheet during the Quaternary period (Klassen 1986; Dredge and Cowan 1989). During the last glacial maximum (approximately 10,000 to 30,000 years ago), northwest Manitoba was influenced by both the Keewatin ice (i.e., in present day Nunavut and Northwest Territories) and the Labrador ice (Klassen 1986). Several ice-flow directions have been documented; however, the late Wisconsinan ice-flow pattern suggests a dominant south-southwest ice flow (Kaszycki et al. 2008). Major glacial landforms in northern Manitoba consist of morainal ridges. The closest one from the area being the Leaf Rapids Interlobate Moraine located approximately 70 km to the east. Other well-documented glacial landforms in northern Manitoba consist of a series of drumlin-like ridges composed of ice contact stratified sand and gravel (Klassen 1986; Kaszycki et al. 2008; Dredge and McMartin 2011). Ideas concerning the glacio-dynamic processes involved in their formation are varied and generally imply the deformation of subglacial sediment by overriding ice.

Ice retreat at the end of the last glaciation is responsible for the inundation of a vast portion of land. During deglaciation (approximately 9,500 to 7,500 years ago), ice blocked the natural northward drainage of the area and meltwater ponded along the ice front, creating glacial Lake Agassiz (Kaszycki et al. 2008). The northwestern portion of glacial Lake Agassiz is believed to have reached the area location.

5.2.5.2 Physiography and Bedrock Geology

The Project overlaps with the Paleoproterozoic Lynn Lake Greenstone Belt within the Churchill Structural Province of the Canadian Shield. The Lynn Lake Greenstone Belt is comprised of volcanic rocks of the Wasekwan Group, sedimentary rocks of the Sickle Group, and plutonic intrusions (i.e., formed when magma penetrates existing rock). The Lynn Lake Greenstone Belt strikes east-west for approximately 130 km, with a maximum width of about 60 km. Reconnaissance structural studies have been conducted at both the Gordon and MacLellan sites (Gilbert et al. 1980; Peck et al. 1998). The host rock of the Gordon deposit comprises oxide facies banded iron formation, argillite, siltstone and rhyolite/dacite belonging to the Wasekwan Group in the northern part of the Lynn Lake Greenstone Belt, while the host rock of the MacLellan deposit comprises auriferous quartz-carbonate-sulphide veins also located in the northern part of the Lynn Lake Greenstone Belt. Overburden geology is characterized as glaciolacustrine sediments overlying either bedrock or a discontinuous regional sand diamicton (i.e., till). Organic deposits were observed as a thin veneer with thicker accumulations observed in low lying areas. Isolated pockets of glaciofluvial sediments are also present.

The Project is located within the Churchill River Upland Ecoregion of the Boreal Shield Ecozone (Smith et al. 1998). It falls under the South Indian bedrock plateau subdivision of the Kazan Upland (Bostock 1970) which covers about 35,000 km^2 of mostly hilly, till-veneered bedrock terrain, and intervening low areas of organic terrain (Klassen 1986). The terrain ranges from level to moderately sloping, with most slopes ranging from 0 to 15%. The surface topography in the region is partly related to the underlying bedrock structure and partly related to the glacial and postglacial history. Topography slopes from a high of 450 metres above sea level (masl) in the west and northwest to a low of 260 m masl in the southeast. Surface topography surrounding the Project is flat to gently undulating. Elevation ranges from 312 masl to 351 masl at the Gordon site, and 323 masl to 379 masl at the MacLellan site.

5.2.5.3 Terrain, Surficial Geology, and Permafrost

Surficial geology of the Lynn Lake area has been described by Kaszycki et al. (2008). The dominant surficial material consists of till (Volume 4, Appendix E). The till deposits are generally thin, range from 1 to 3 m in thickness, and are generally found overlying bedrock. Thicker till deposits are also present and commonly occur as fluted landforms. The texture of the till found in the Lynn Lake area is generally sandy and contains a large proportion of debris derived from crystalline shield lithologies. Matrix grain size composition averages 70% sand, 23% silt, and 7% clay (Kaszycki et al. 2008).

Glaciolacustrine deposits comprise nearshore sand and gravel as well as massive to laminated sand, silt and clay that accumulated in the deeper areas of glacial Lake Agassiz. Regional surficial deposits maps produced by Kaszycki et al. (2008) identify some glaciolacustrine silt and clay deposits in the area east and south of Lynn Lake. The study also indicates that glaciolacustrine sediments are commonly found overlying till in the area. Ice-contact glaciofluvial deposits composed of interstratified sand, gravel and cobbles may be present locally; however, they were not mapped in the Lynn Lake area by Kaszycki et al. (2008).

No landslide deposits were identified within the two sites; however, material affected by slow downward movement (creep) of fine-grained material was noted along the lower edge of a till-covered ridge in the northeastern portion of the MacLellan site and along the edge of collapsing peat plateaus.

The Permafrost Distribution Map of Canada (Heginbottom et al. 1995) indicates that the Project is located within the sporadic to discontinuous permafrost zone, where permafrost is typically found in 10% to 50% of the land area. When present, the permafrost generally has low to moderate ice content (i.e., low in silt, sand and gravel deposits; moderate in clay and organic deposits). Climate is generally the main factor controlling the general distribution of permafrost; however, surface morphology, vegetation, and other site factors (e.g., soil type, snow accumulation) may control the distribution locally (French 1996).

Baseline information available from the Land Resource Unit of Agriculture and Agri-Food Canada (Smith et al. 1998) suggests that permafrost is widespread in organic deposits in the northern portion of the Churchill River Upland Ecoregion but, diminishes to sporadic along the southern boundary of the ecoregion. Similarly, permafrost in mineral soils is less widespread, and is confined mainly to fine-textured sediments in the northern half of the ecoregion.

Based on the mapping of organic materials (second most widespread surficial deposits mapped in the area), it is believed that permafrost is present in approximately half of the area surrounding the Project.

Note however that permafrost is absent of large fens characterized by high water table and/or surface water are not likely to contain permafrost. Permafrost was encountered in 13 of the 44 soil and terrain field sites, most of these permafrost sites corresponding to organic deposits. Whenever encountered, the upper limit of the permafrost was observed at depth ranging from 46 to approximately 75 cm.

The most common evidence of permafrost occurrence in the area consists of peat plateaus ranging in size from 1 ha to well over 10 ha. French and Egerov (1998) reporting on several permafrost field investigations describe the degradation of certain marginal bodies of ice (sometimes up to 4 m thick) in response to ground disturbance and suburban development in Thompson, approximately 230 km southeast of the area. Ice-rich permafrost found in organic and glaciolacustrine materials is known to be highly susceptible to thaw degradation both from natural process (e.g., thermokarst occurring around the perimeter or within peat plateaus) and in response to ground disturbance (e.g., the removal or disturbance of the vegetation along access roads crossing organic terrain).

Peat plateaus are one of the most striking permafrost-related features present in northern Manitoba. They consist of generally flat-topped expanses of peat, elevated above the general surface of a peatland, and contain segregated ice that may or may not extend downward into the underlying mineral soil (Zoltai and Tarnocai 1975). The presence of peat plateaus within the area was confirmed as part of terrain mapping and field investigation programs conducted for the Project (Volume 4, Appendix E). Observed peat plateaus had dimensions ranging from 1 ha to well over 10 ha.

The thickness of the permafrost bodies could not be confirmed, but a review of preliminary borehole data produced by Golder Associates (Golder 2017) indicates the presence of ice lenses at depths of 2 to 4 m below the ground surface (bgs) in the glaciolacustrine sediments underlying a peat plateau. Based on available literature and on previous experiences conducting field investigations in northern Manitoba, the average thickness of permafrost within the Lynn Lake area is estimated to be within that range. Deeper pockets of permafrost are to be expected (potentially 10 to 12 m bgs); however, these deposits would consist of exceptions. Mapping of potential areas of permafrost, peat plateaus, and thermokarst is provided in Maps 5-1 and 5-2. Further information is provided in Volume 4, Appendix E.

Terrain mapping of the existing MacLellan access road has not been conducted, as an alternate access route was being considered at the time of baseline studies. However, the review of available satellite imagery allows for the formulation of assumptions regarding the nature of the underlying materials and the presence/absence of permafrost along this roadway alignment. The dominant surficial materials found along the access road consist of till, a material which field investigations suggested that is permafrost-free. Fine-grained glaciolacustrine deposit and organic soils, however, are present, which suggest that section of the current access road could have been constructed over frozen grounds.

The occurrence of permafrost is a potential constraint that has been taken into consideration during development of the Project as the ground disturbance related to a wide range of Project activities (e.g., construction and/or operation of access roads) could adversely affect the thermal equilibrium of the local permafrost. Evidence for degradation of permafrost is manifest in the numerous thermokarst depressions observed within peatland areas (Kaszycki et al. 2008). French and Egerov (1998) for example, have describe the degradation of certain marginal bodies of ice (sometimes up to 4 m thick) in response to ground disturbance and suburban development in Thompson, approximately 230 km southeast of the area. Ice-rich permafrost found in organic and glaciolacustrine materials is known to be highly susceptible to thaw degradation both from natural process (e.g., thermokarst occurring around the perimeter or within peat plateaus) and in response to ground disturbance (e.g., the removal or disturbance of the vegetation along access roads crossing organic terrain).

Another response of permafrost degradation is the occurrence of differential thaw settlement and subsidence along existing roadways and access trails present in the area. Visual indicators of permafrost degradation were observed along sections of PR 391, for example along the segment of road between Lynn Lake and the Gordon site, where undulating gravel or pavement sections have developed from the thermal degradation of ice-rich permafrost present below the roadway. Although it is possible that permafrost degradation affects the existing access road leading to the MacLellan site, no visual indicators that such process is actively occurring was observed. Based on the known occurrence of permafrost within the area the design of road upgrades will have to account for the presence of permafrost to avoid the development of future terrain instabilities.

It is important to note, that permafrost degradation also occurs as a natural process within the region (mainly caused by climatic warming). This is particularly true since permafrost in the areas is assumed to be warm (i.e., with mean annual temperatures close to 0°C). The degradation process may be expressed as a thickening of the active layer (i.e., the layer that thaws every year), a raising of the permafrost base, a reduction in the areal extent of a deposit. The presence of features indicative of permafrost degradation was observed in the field and mainly consisted of evidences of ground subsidence in areas of peat plateaus. In some areas, this subsidence was observed to have had a significant impact on local drainage conditions by releasing important quantities of water into the ecosystem.

5.2.5.4 Soils

Within the Churchill River Upland Ecoregion, Dystric Brunisols are the dominant soils on sandy acidic till, while Gray Luvisols are dominant on well to imperfectly drained clay deposits (Smith et al.1998). Granitic rock outcrops are co-dominant in the area. Appreciable areas of shallow and deep organic Mesisols, Fibrisols, and Cryosols are associated with basin bogs, peat plateau, and veneer bogs (Smith et al. 1998). Gray Luvisols, and to a lesser extent Static and Turbic Cryosols, are common on clayey lacustrine deposits along the Churchill River and around Southern Indian Lake, while Eutric Brunisols occur on silty fluvioglacial ridges and on calcareous loamy till.

Across the area, soils include Brunisolic, Cryosolic and Organic soil orders (Map 5-3 and 5-4). Brunisols occupy the largest proportion of the Project area, followed by Cryosols then Organic soils. The mineral soils of the Brunisolic order predominantly occur on coarse (e.g., loamy sand, sand) to moderately coarse (e.g., sandy loam) morainal materials, with internal drainage ranging from rapid to imperfect drainage. The soils of the Cryosolic order are affected by permafrost near the soil surface. The Cryosols in the Project area occur in organic deposits, sometimes underlain by morainal deposits or finer-textured, glaciolacustrine sediments, and are characterized as having very poor drainage. Soils of the Organic order are generally characterized as being composed of fibric materials (organic materials which are not well-decomposed), sometimes overlying morainal deposits with the surface 1-2 metres, and are considered very poorly drained. Non-soil areas include exposed bedrock, previously developed lands and open water.

At the Gordon site, the most extensive soils within terrestrial areas belong to the Fay Lake soil units which represents 42% of the site (Volume 4, Appendix E). Soils within the Fay Lake soil units commonly have a loamy sand surface texture, occur on very gently sloping to moderately sloping areas of the landscape (i.e., slope gradients of >2-9%), are well drained and classified as Eluviated Dystric Brunisols.

At the MacLellan site, the most extensive soils within terrestrial areas belong to the Hat Lake and Wuskwatim soil units, which represent 34% and 32% of this area, respectively (Volume 4, Appendix E). Soils of the Hat Lake soil units have a loamy sand surface texture, occur on nearly level to very gently sloping areas of the landscape (i.e., slope gradients of >0.5-9%), and are imperfectly drained and classified as Gleyed Eluviated Dystric Brunisols. Soils of the Wuskwatim soil units have a fibric surface texture, occur on level to depressional portions of the landscape, and are very poorly drained and classified as Terric Fibric Organic Cryosols and Fibric Organic Cryosols. Soils in the riparian areas at both sites are primarily undeveloped and composed of the Wuskwatim soil units.

Soil mapping was not completed for the existing access road from PR 391 to the MacLellan site, as an alternate access route was being considered at the time of baseline studies. As described in Chapter 2, Section 2.3.2.3, disturbances related to the existing access road are anticipated to include removal and replacement of roadbed granular material and placement of new material and compacted granular. The existing side ditches will be cleared or reconstructed based on a suitable design. As a result, only marginal soil disturbance is anticipated.

Review of existing satellite imagery and mapped soil units for the MacLellan site in proximity of the access road allows for some assumptions to be made on likely soil conditions. Soils along the access road are anticipated to be predominantly belonging to the imperfectly drained Hat Lake soil unit, developed on sandy morainal deposits, with the very poorly drained Wuskwatim soil unit, developed on organic deposits, occupying a portion of the route. Soils developed on the morainal deposits are anticipated to be permafrost-free. However, areas of Wuskwatim soils are classified as Cryosols indicating these soil units have been affected by frozen ground conditions through their development.

Soil thickness is variable and ranges from 0 m, in areas of exposed bedrock at the Gordon site, to more than 2 m; however, depth to bedrock is commonly 0.3 to 2 m bgs. Topsoil depths range from 0 cm in areas of exposed bedrock, to more than 200 cm in some organic soils. Generally, topsoil depths in mineral soils range from approximately 15 to 60 cm with an average of approximately 45 to 50 cm (on average). Topsoil depths are more highly-variable in the organic materials with Cryosols ranging from approximately 45 to 160 cm and soils of the Organic order, ranging from 60 to >200 cm. Further information is provided in Volume 4, Appendix E. Maps 5-4 and 5-5 provide generalized estimates of the depths/thicknesses of topsoil across the Project.

Mineral soils across the Project have pH values of less than 6 and generally less than 5 in the surface soil layers (or horizons). Organic soil deposits have pH values of close to 3.

The excavation area at both sites consists of soils belonging to the Hat Lake and Nekik Lake soil units, and previously developed land. The excavation areas were partially used in the past as an underground mine and surface mine at the MacLellan and Gordon sites, respectively. Soils of the Hat Lake soil units are described above. The Nekik Lake soil units have a fibric surface texture, occur on nearly level areas of the landscape (i.e., slope gradients of 0.5-1%) and are very poorly drained and are classified as Terric Mesic Organic Cryosols. Results from terrain and soil mapping can be found in the Soil and Terrain Baseline Technical Data Report and associated Validation Report in Volume 4, Appendix E.

Regarding suitability of topsoil and overburden for use in construction and rehabilitation of disturbed areas (decommissioning/closure phase of the Project), soils within the Gordon site are mainly rated fair to poor (47%) for reclamation suitability, with a minor portion of this area rated as poor (5%). Soils within the MacLellan site are rated fair to poor for reclamation suitability. Soils within the access roads and PR 391 are mainly rated fair to poor (60%) for reclamation suitability. These ratings do not nullify the use of overburden in construction or rehabilitation. The primary limitation to reclamation suitability relates to the coarse surface soil texture and not soil quality. Overburden has a low risk for acid rock drainage and metal leaching potential (Section 5.2.6).

Overburden will be required during the construction phase for site preparation of roads and the plant site. Material will be sourced from existing stockpiles, local stripping and from the open pit. Excess material will be stored in the overburden stockpile. Stripping for the TMF embankments will occur later, and it is anticipated that most of the material will be stored. The overburden stockpile will be the primary source of the material for rehabilitation; the stockpiles at both Sites will be a mix from all stripping operations. Preliminary investigation at the MacLellan site west of Lynn Lake identified six potential borrow source areas and four potential quarries. Most sites investigated revealed materials consisting of silty sand to gravelly silty sand till. The till was noted as containing various quantities of cobbles and boulders. One source of sand and gravel was encountered at the site (Golder 2016). Alamos Gold Inc. (Alamos) conducted further extensive borrow source investigations at the MacLellan site. Both in-pit and ex-pit borrow sources were identified for development at the MacLellan site, including a contingency site located north of the open pit adjacent to the Tailings Management Facility (TMF). Additional external sources for sand, specifically the need for an external sand quarry, was also previously identified as a supply option for borrow (Q'Pit Inc. 2019).

5.2.6 Geochemistry

Geochemical testing of ore, mine rock and overburden included: static testing, short-term metal leaching properties, laboratory and field kinetic tests, which allowed for estimates of the onset of acid rock drainage (ARD) and metal leaching (ML) potential. Further details are provided in the Geochemistry Baseline Technical Data Report and associated Validation Report in Volume 4, Appendix F. The results of this testing can be summarized as follows:

- Overburden has low risk of ARD/ML and may not require special management or mitigation measures.
- Approximately 72% and 78% of the mine rock from the MacLellan and Gordon site open pits, respectively, will be non-potentially acid generating (non-PAG) based on ARD Project geological/geochemical block models. The rest of the mine rock could be potentially acid generating (PAG) rock having a risk to generate ARD after decommissioning/closure. Leachates from kinetic testing indicate a high leaching potential for arsenic and a moderate leaching potential for aluminum, cadmium, copper, molybdenum, and selenium from the MacLellan mine rock. Mine rock from the

Gordon site showed a high leaching potential for nitrite and copper and a moderate leaching potential for fluoride, arsenic, selenium, cadmium, chromium, aluminum, and copper based on kinetic testing. In ponds located downstream of historical mine rock storage areas at the Gordon site, arsenic, iron, selenium, ammonia, and nitrite occasionally exceed Canadian Water Quality Guidelines – Freshwater Aquatic Life (CWQG-FAL). There is no sign of ARD observed downstream of the historical rock storage sites at the Gordon site, where PAG and non-PAG were blended and covered with overburden and soil approximately 20 years ago.

- Ore from the MacLellan and Gordon site open pits will contain 52% and 66% non-PAG materials, respectively. The rest of the ore could be PAG. ARD is not likely to occur with blended ore stockpiles during operation, considering the minimum ARD onset time is predicted to be 14 years compared to the much shorter residence time of the ore in the stockpiles. High leaching potentials were identified for arsenic and cadmium for the MacLellan site ore based on kinetic testing. Moderate leaching potentials were determined for aluminum, fluoride, silver and copper for ore from the Gordon site and for silver, lead, copper and aluminum for ore at the MacLellan site. Contact water from ore stockpiles will be collected and managed during operation. At decommissioning/closure, any remaining ore will require additional management to prevent future ARD/ML (Appendix 23B).

- Approximately 57% of the tailings will be non-PAG material produced from ores from both sites. ARD is not expected during operation because the tailings beaches will be constantly covered with new layers preventing depletion of the neutralization potential, which requires at least eight years for PAG material. In the tailings pond, *Metal and Diamond Mine Effluent Regulation*s (MDMER) limits could be exceeded for cyanide, un-ionized ammonia, copper and nickel during operation. Seepage from tailings might also have concentrations above the MDMER limits for total cyanide and un-ionized ammonia and could exceed 10 times the CWQG-FAL for aluminum, chromium, iron, free cyanide, copper, arsenic, cadmium, fluoride and mercury. Seepage from the TMF will be collected and pumped back into the TMF pond during operation preventing releases to the surrounding environment. Partial liners under the TMF dykes will reduce the risk of groundwater contamination. Water from the TMF pond will be directed to the open pit during active closure. After decommissioning closure, acidic conditions may develop in PAG tailings after eight or more years of exposure based on laboratory neutralization potential depletion rates. Under acidic conditions, MDMER limits for nickel and copper could be exceeded. The risk of ARD/ML development in the TMF will be managed by placing covers over the TMF during decommissioning/closure to limit the infiltration of precipitation and ingress of oxygen (Appendix 23B). The potential release of PAG-influenced discharges will be monitored and managed throughout the Project lifecycle through application of an approved Environmental Effects Monitoring Program to prevent non-compliant releases into the receiving environment.

5.2.7 Surface Water and Groundwater Resources

5.2.7.1 Hydrology

The Project lies within four subwatersheds of the broader Granville Lake Watershed: Hughes River, Lower Keewatin River, Lower Lynn River, and Cockeram Lake (Volume 4, Appendix G and Chapter 9). The

Hughes River subwatershed contains large lakes such as Ellystan Lake, White Owl Lake, Swede Lake, Simpson Lake, Farley Lake, and Gordon Lake.

Surface water around the Gordon site drains southward into the Hughes River, via Farley, Swede and Ellystan lakes, which in turn discharge into Barrington River and Southern Indian Lake on the Churchill River. Around the MacLellan site, water flows south into the Keewatin River and southeast through Cockeram Lake and Sickle Lake before discharging into Granville Lake on the Churchill River, upstream of Southern Indian Lake.

Gordon Lake is located at the upstream end of the watershed and west of the historical mine area that formerly drained eastward to Farley Lake via Gordon Creek. As part of historical mining activities at the Gordon site, a diversion channel was constructed between Gordon Lake and Farley Lake, north of the historical East and Wendy pits. The East and Wendy pits are flooded and are not connected to the diversion channel or Gordon or Farley lakes. The water level in Gordon and Farley lakes is maintained at pre-development levels due to the construction of control structures at the outlets as part of closure activities that occurred between 2007 and 2012.

The Keewatin River, Lynn River, Goldsand Lake, and Cockeram Lake are some of the largest waterbodies in the Lower Keewatin River, Lower Lynn River, and Cockeram Lake subwatersheds. The subwatershed on the west side of the MacLellan site flows towards the Keewatin River which ultimately converges with the Lynn River before entering Cockeram Lake.

Five lakes surround the MacLellan site, including Payne Lake (which drains into the Keewatin River) and Lobster, Minton, and two unnamed lakes (which drain into an unnamed river that ultimately discharges to Cockeram Lake in the south).

A shallow waterbody (East Pond) is located about 200 m east of the historical mine operational area at the MacLellan site and drains via diffuse surface water discharge through a wetland area prior to becoming a defined channel which drains to the Keewatin River in the south. The Keewatin River flows southeast from Cockeram Lake, through Sickle Lake before discharging into Granville Lake on the Churchill River, upstream of Southern Indian Lake.

Evidence of beaver activity has been noted throughout the area, particularly in streams and at lake outlets. In these areas, beaver dam construction has reduced flow and increased upstream water levels.

5.2.7.2 Hydrogeology and Groundwater Quality

Bedrock in the region is typically covered by 2 to 4 m of overburden. Overburden consists of discontinuous glaciolacustrine sediments overlying either bedrock or a discontinuous regional glacial sand diamicton that overlies bedrock. Organic deposits are present as a thin veneer with thicker accumulations in low lying areas. Where glaciolacustrine sediments are absent, glacial sand diamicton (i.e., till) is present at ground surface or underlying organic deposits. A series of bedrock valleys near the MacLellan site are present where overburden is greater than 28 m thick.

Groundwater flow in the region is strongly influenced by topography, which results in flow originating from topographically high areas to low areas (Volume 4, Appendix H and Chapter 8). Recharge is associated with the topographic high areas and discharges to surface water features within the topographic low areas.

Overall, groundwater quality in the region meets the Manitoba Water Quality Standards, Objectives and Guidelines for drinking water (MWQSOG-DW) and the Guidelines for Canadian Drinking Water Quality (GCDWQ) except for dissolved iron and manganese. These parameters are typically elevated in groundwater within northern areas where reducing groundwater conditions exist. In addition, select monitoring wells exceeded the MWQSOG-DW and CDWQG for sulphate and dissolved lead. Monitoring wells located within the historical mine operational areas for both sites also exceeded the MWQSOG-DW and/or GCDWQ for dissolved arsenic.

Background groundwater quality also meets the more stringent MWQSOG for Freshwater Aquatic Life (MWQSOG-FAL) and the CWQG-FAL for parameters except fluoride, total phosphorus, and dissolved aluminum, iron, phosphorus, and zinc (Volume 4, Appendix H and Chapter 8). Select monitoring wells exceeded the MWQSOG-FAL for dissolved chromium. Irregular exceedances of the MWQSOG-FAL and/or CWQG-FAL have been observed for dissolved arsenic, chromium, silver, and uranium.

5.2.7.3 Surface Water Quality

Most of the lakes near the Gordon and MacLellan sites are shallow (less than 4 m deep) and do not stratify during the summer. Background surface water quality generally reflects geochemistry of the Precambrian Shield. Lakes and streams are typically low in dissolved ions (<80 mg/L total dissolved solids), soft (hardness <75 mg/L as $CaCO_3$), and neutral to slightly acidic in pH (Volume 4, Appendix I). Some parameters (e.g., dissolved oxygen, pH, total phosphorus, aluminum, chromium, and iron) are naturally elevated and occasionally do not meet water quality guidelines.

At the outlet of Gordon Lake, the 2015 to 2018 dataset showed no notable changes in water quality from background conditions (Volume 4, Appendix I). This suggests that drainage from the historical inactive Gordon site (i.e., any surface runoff from existing mine rock and overburden storage areas and seepage from the adjacent former open pits) does not affect water quality in Gordon Lake. Analysis of water quality data indicate elevated levels of some metals and other ions (e.g., alkalinity, hardness, specific conductance, calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, arsenic, copper, iron, nickel, and uranium) in the existing open pits and in Farley Lake compared to background concentrations in the Gordon site area; however, concentrations of these parameters were similar to background by Swede Lake, the next lake downstream from Farley Lake. In general, the Hughes River subwatershed, within which the Gordon site is located, has the following parameters in concentrations that exceed MWQSOG-FAL and/or CWQG-FAL: total and dissolved organic carbon, total phosphorus, iron, and aluminum. These exceedances are likely the result of lithology in the case of aluminum and sulphate; the presence of mineralized rock in the case of copper and nickel; and the proliferation of beaver dams, muskeg bogs, and low relief in the case of organic carbon (Chapter 9).

The inactive MacLellan site does not appear to affect water quality in the Keewatin River, as there were no identifiable increased concentrations of water quality parameters between the sites upstream and downstream of the site (upstream of the Lynn River confluence). Sulphate and chloride concentrations and aluminum, copper, nickel, cadmium, cobalt, and zinc concentrations were higher in Eldon Lake, the Lynn River, in the Keewatin River downstream of the Lynn River, and in Cockeram Lake (the first lake downstream of the inactive MacLellan site and the unrelated former East Tailings Management Area) than in other lakes and streams not downstream from these facilities, including the Keewatin River upstream from the Lynn River confluence. Mean copper, nickel, iron, and zinc concentrations were higher than CWQG-FAL in Eldon Lake, the Lynn River, and in Cockeram Lake. These exceedances are generally attributable to past mining activity near Lynn Lake. Other guideline exceedances in the MacLellan site area, including total phosphorus, iron, and aluminum, reflect background conditions (Volume 4, Appendix I and Chapter 9).

5.3 BIOLOGICAL ENVIRONMENT

5.3.1 Fish and Fish Habitat

Based on the results of field surveys, a total of 17 fish species are known to occur in the lakes and streams near the Project (Volume 4, Appendix J and Chapter 10). Small-bodied fish species are most diverse in streams and large lakes. Brook stickleback were the most widespread small-bodied species and the only one present in small, shallow lakes. Other small-bodied species were ninespine stickleback (*Pungitius pungitius*), log perch (*Percina caprodes*), trout perch (*Percopsis omiscomaycus*), emerald shiner (*Notropis atherinoides*), spottail shiner (*Notropis hudsonius*), longnose dace (*Rhinichthys cataractae*), lake chub (*Couesius plumbeus*), and slimy sculpin (*Cottus cognatus*). Large-bodied fish species were northern pike, walleye, yellow perch, lake whitefish (*Coregonus clupeaformis*), burbot (*Lota lota*), cisco (*Coregonus artedi*), white sucker (*Catostomus commersoni*), and longnose sucker (*Catostomus catostomus*). Larger lakes, such as Cockeram Lake, typically support a greater diversity of fish and fish habitat than smaller lakes near the Project. Northern pike are the most widespread large-bodied species. Fish species of conservation concern (SOCC) are discussed in Section 5.3.4.

The Gordon site is in the headwaters of a tributary to the Hughes River watershed, and no large rivers flow through the area. Farley Creek, the outlet of Farley Lake, is the largest stream near the Project. Most lakes at the Gordon site are shallow (<3 m) with soft substrates, such as sand or muck. Hard substrates, such as boulders or cobbles are less common but present in some locations. Aquatic vegetation and cover in the littoral zone are abundant in most of the lakes near the Project.

Except for the Keewatin and Cockeram rivers, streams at the MacLellan site are generally small (<5 m wide and <1 m deep) with fine silt and organic substrates. Lakes at the MacLellan site are also generally shallow (<3 m) with relatively large littoral. Most of the lakes surrounding the MacLellan site provide spawning, rearing, and overwintering habitat for large-bodied and small-bodied fish species.

5.3.2 Vegetation and Wetlands

The Project is in the Boreal Shield Ecozone, Churchill River Upland Ecoregion, and Reindeer Lake Ecodistrict, which is characterized by black spruce dominated forests and permafrost and non-permafrost wooded bogs and patterned fens (Smith et al. 1998). Tamarack is typically found in richer peatland wetlands, while richer upland sites are forested with white birch (*Betula papyrifera*), jack pine, and occasionally white spruce (*Picea glauca*). Jack pine stands occur mainly on upland sites, while white birch can be found in both uplands and wetlands throughout the Ecodistrict (Smith et al. 1998). Common dandelion (*Taraxacum officinale*) and quack-grass (*Elymus repens*) are weed species observed in the area (Tier 3 noxious weeds; Government of Manitoba 2015). Plant SOCC are discussed in Section 5.3.4.

The Project is in the High Boreal wetland region, which is characterized by permafrost and non-permafrost wooded bogs and patterned fens (Halsey et al. 1997). An estimated 37% of the High Boreal wetland region is covered in wetlands (Volume 4, Appendix L and Chapter 11). Nine wetland types have been recorded in the area including wooded coniferous bog, shrubby fen, wooded coniferous swamp, shrubby bog, wooded coniferous fen, shrubby swamp, graminoid fen, patterned fen, and marshes. Upland plant communities include dense, open, and sparse conifer followed by shrubland, dense and open mixedwood deciduous and barren.

5.3.3 Wildlife and Wildlife Habitat

The region is home to American marten, American red squirrel (*Tamiasciurus hudsonicus*), beaver, black bear, Canadian lynx (*Lynx canadensis*), fisher (*Martes* pennant), grey wolf (*Canis lupus*), mink (*Neovison vison*), moose, red fox (*Vulpes vulpes*), river otter (*Lontra canadensis*), snowshoe hare (*Lepus americanus*), weasel (*Mustela* sp.), wolverine (*Gulo gulo*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), little brown myotis (*Myotis lucifugus*), and various small rodents (e.g., voles). Moose and black bear are some of the important game species harvested by local resource users (Volume 4, Appendix M and Chapter 12). SOCC are discussed in Section 5.3.4.

Based on the Manitoba Breeding Bird Atlas (MB BBA 2019), 198 bird species have the potential to breed in the region. Of these, 62 are waterbirds, four are upland game birds, 18 are raptors, and 114 are passerines (i.e., songbirds) or near-passerines (e.g., woodpeckers). Common waterbird species observed during baseline studies (Volume 4, Appendix N and Chapter 12) were mallard (*Anas platyrhynchos*), ring-necked duck, Canada goose (*Branta canadensis*), and common loon (*Gavia immer*). Common songbirds were swamp sparrow (*Melospiza Georgiana*), ruby-crowned kinglet (*Regulus calendula*), Tennessee warbler, dark-eyed junco (*Junco hyemalis*), and yellow-rumped warbler (*Setophaga coronate*). SOCC are discussed in Section 5.3.4.

Three species of amphibian have the potential to breed within the region: boreal chorus frog (*Pseudacris maculata*), wood frog (*Rana sylvatica*), and northern leopard frog (*Lithobates pipiens*). Baseline field surveys confirmed the presence of breeding habitat for boreal chorus and wood frogs; both are widely dispersed throughout the region (Volume 4, Appendix O and Chapter 12). Although the historical range of northern leopard frog includes the region, none were observed during baseline studies. SOCC are discussed in Section 5.3.4.

5.3.4 Species of Conservation Concern and Species at Risk

SOCC are those species listed as special concern, threatened, or endangered under the *Species at Risk Act* (SARA; Government of Canada 2019), recommended for listing under SARA by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2019), listed as threatened or endangered under *The*

Endangered Species and Ecosystems Act (Manitoba; MB ESEA; Government of Manitoba 2019), or ranked as S1-S3 by the Manitoba Conservation Data Centre (MB CDC 2018).

No aquatic SOCC or species at risk have been documented or are expected in the Project area based on known fish species distributions.

Four of the 19 plant SOCC are known to occur within the Project area: lake quillwort (*Isoetes lacustris*), small water-lily (*Nymphaea tetragona*), northern woodsia (*Woodsia aplina*), and shrubby willow (*Salix arbusculoides*). None of these species are listed under SARA; however, the flooded jellyskin lichen (*Leptogium rivulare*), is ranked special concern (Environment Canada 2013). None of the other plant species listed under SARA, which have been recorded in Manitoba, grow in the habitat types found in the region.

One species not listed by the MB CDC to be in the Churchill River Upland Ecoregion, boreal locoweed (*Oxytropis borealis*), was observed near the Gordon site. Three of the four observations of shrubby willow were also observed near the Gordon site (one observation) and MacLellan site (two observations).

The region is located within the known range of 16 SOCC wildlife species (Table 12-8 in Chapter 12): five mammals, 10 birds, and one amphibian species.

Two of the five mammal SOCC (i.e., little brown myotis and wolverine) have been documented in the region. Northern myotis was not detected during bat baseline surveys, yet it has the potential to occur in the region due to the availability of suitable bat roosting and foraging habitat.

Of the 10 bird SOCC, three are confirmed breeders in the area: common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus cooperi*), and barn swallow (*Hirundo rustica*). Trumpeter swan (*Hirundo rustica*), horned grebe (*Podiceps auritus*), evening grosbeak (*Coccothraustes vespertinus*), and rusty blackbird (*Euphagus carolinus*) may occur based on the availability of suitable breeding habitat; however, yellow rail (*Coturnicops noveboracensis*), short-eared owl (*Asio flammeus*), and bank swallow (*Riparia riparia*) are less likely to occur based on lack of suitable habitat near the Project.

The historical range of northern leopard frog includes the region; however, there are no recent records of their presence and none were observed during baseline studies (Volume 4, Appendix O).

The Project is in the Province of Manitoba's woodland caribou Kamuchawie Management Unit – a geographic unit used to facilitate the management and recovery of woodland caribou (*Rangifer tarandus caribou*; MBWCMC 2015). The Project also overlaps the Manitoba North Range (MB9), an area delineated as containing potential woodland caribou critical habitat, used for the recovery of woodland caribou populations, by the Federal Recovery Strategy for the Woodland Caribou, Boreal Population (Government of Canada 2012, ECCC 2019b). Traditional Knowledge indicates that caribou were hunted near Muskeg Lake, Wetikoeekan (Sasquatch) Lake and near Goldsand Lake until about the 1950s. In the last five years, ongoing baseline surveys have provided only one modern observation of woodland caribou in an area west of Lynn Lake in April 2019 (via remote camera), which suggests the species may occasionally be present in the region (Volume 4, Appendix M).

Barren-ground caribou (*Rangifer tarandus groenlandicus*) is a subspecies of caribou that ranges across the taiga forests and tundra north of the boreal forest (Banfield 1974). Desktop review indicates that it is unlikely that barren-ground caribou would traverse through the area surrounding the Project except accidentally (MinGold Resources Inc. 1989, Tetra Tech 2013, pers. comm. 2015a, b, and c). Traditional Knowledge indicates that barren-ground caribou were hunted in an area north of the Project until the early 1950s and are now harvested in an area further away (MCFN 2018; Chapter 17). There is no indication that the species has been observed or hunted in the region in the last several decades.

5.4 HUMAN AND SOCIO-ECONOMIC ENVIRONMENT

5.4.1 Socio-Economic Context

5.4.1.1 Population

There are two population centres in the region: the Town of Lynn Lake and the Black Sturgeon Reserve (Volume 4, Appendix P and Chapter 13). The Town of Lynn Lake was built in the mid-20th century, to serve the mining industry. In 2011, the Town of Lynn Lake had approximately 650 residents. As of the most recent census (2016), the population decreased by nearly 30% to 494 (Statistics Canada 2016a). The population of the Marcel Colomb First Nation is 298, all of whom are among the 430 registered members living on Black Sturgeon Reserve. The remaining off-reserve population numbers 133 members (MCFN; INAC 2017).

5.4.1.2 Dwellings and Accommodations

In 2016, Lynn Lake had 263 private dwellings of which 176, or 67%, were occupied (Statistics Canada 2017). The Town of Lynn Lake has a mix of ownership and rental units. Most housing is at least 40 years old and in poor condition or unlivable. In 2016, the average value of a home in Lynn Lake was $56,390 and average monthly rent was $560 (Statistics Canada 2017). Encouraging long-term residency is a goal of the Town, but with the loss of population, the condition of the Town's housing has deteriorated resulting in a shortage of viable housing. The appearance of the Town (abandoned buildings, boarded up windows, litter) is an impediment to attracting and retaining residents, businesses, and employees (Town of Lynn Lake 2016a).

There is some cottage development at subdivisions at Burge Lake and Eden Lake. As of 2012, there were 20 cottages on Burge Lake (Tetra Tech 2013). The two subdivisions are part of the First Come First Served Cottage Lot Program managed by Manitoba Conservation and Climate. Some residents of the Town of Lynn Lake are building permanent homes at the Burge Lake subdivision. An expansion to Burge Lake Provincial Park on the west shore of Burge Lake, about 10 km from Lynn Lake, has been proposed and would include 15 cottage lots (Graham 2018).

Marcel Colomb First Nation has a total of 28 houses located on the Black Sturgeon Reserve. Fourteen units were built in 2013 with an additional 14 added in 2018 and 8 more in 2019 (pers. comm. 2019a).

The Lynn Lake area is part of Manitoba's Northern Tourism Region. Lynn Lake has two hotels with 34 rooms and Leaf Rapids also has two hotels (TravelinManitoba.com 2019).

5.4.2 Labour and Economy

In 2016, the unemployment rate of Division No. 23, which excludes the towns of Lynn Lake and Leaf Rapids, was 23.8% compared with that of Thompson (7.6%) and Manitoba (6.7%). The participation and employment rates (40.4% and 30.8%) were low compared to those of Thompson and the province. Employment in Division No. 23 was largely in service-based industries, such as educational services (25%), public administration (15%) and health care and social assistance (15%; Statistics Canada 2016b). Construction, retail trade, and transportation and warehousing employed 10% of the labour force. The unemployment rate in the Town of Lynn Lake was 8.6% compared to 28.6% in Leaf Rapids. The participation and employment rates in Lynn Lake were higher (61.4% and 56.1%) than those of Leaf Rapids and lower compared to those of Thompson and the province. Employment in the Town of Lynn Lake was largely related to educational services (50%), health care and social assistance (30%), and transportation and warehousing (25%), as compared to Leaf Rapids where employment was in educational services (35%), retail trade (30%), and health care and social assistance (25%; Statistics Canada 2016b).

Since the closure of the mines, the region has made an effort to develop its tourism industry, which is based largely around fishing and hunting (Volume 4, Appendix P and Chapter 13). The industry generates seasonal work for local guides as well as some economic spinoffs for the Town of Lynn Lake, which is used as a staging area for visiting anglers and hunters. In 2014, the Town of Lynn Lake identified several economic development goals, including encouraging new mineral resource development, promoting tourism, and partnering with the Centre for Livelihoods and Ecology to conduct a feasibility study for the development of an essential oils enterprise (Lynn Lake Mayor and Council 2014).

5.4.3 Education

Education services within the region are provided through Frontier School Division, Area 1, which provides both in-class teaching services as well as distance education for senior years and career programs (Frontier School Division n.d.). West Lynn Heights School serves the Town of Lynn Lake and Black Sturgeon Reserve.

West Lynn Heights School has nine classrooms, three of which are not in use. In 2017, 187 students were enrolled between kindergarten and Grade 12 and in September 2018, this number had dropped to 179. There were 13 teachers at West Lynn Heights School in 2018 (Manitoba Education and Training 2018, 2019). Other programs that use the school include a breakfast program, an adult education program, and a Head Start Program (pre-kindergarten). While teaching outcomes at the school are above regional standards, there is high absenteeism, particularly beyond the eighth grade, and student performance falls below provincial standards (Town of Lynn Lake 2019).

Education services in the Town of Leaf Rapids are also delivered through the Leaf Rapids Education Centre, which teaches kindergarten to Grade 12 and had a total enrolment of 175 in 2018, up from 169 in 2017. The number of teachers at the school was 11 in 2018 (Manitoba Education and Training 2018, 2019). The Adult Education Centre provides training related to academic upgrading, high school courses, and employment preparation (Manitoba Regional Tourism Network 2015).

5.4.4 Health Care, Emergency, and Social Services

The Project is in the service delivery area for the Northern Health Region. The Lynn Lake Hospital is the only hospital in the area. It is a 19-bed (including eight long-term care beds) facility with a 24-hour emergency room, a lab, and X-ray (Volume 4, Appendix P and Chapter 14). It is staffed by two nurses on each shift, health care aids during the day, and a physician who is available daily during regular business hours and on-call after-hours. The hospital shares a public health nurse, mental health care nurse, and foot care nurse with the Leaf Rapids Health Centre. Several other services are available on a rotating basis from Thompson. The Lynn Lake Hospital building was built over 40 years ago to serve a much larger population. It has been upgraded several times and is in good condition (Town of Lynn Lake 2019).

Leaf Rapids Health Centre runs a physician-staffed clinic that is open on weekdays and a nurse-run emergency room. The centre, which has no in-patient beds, is in the Town Centre building (Northern Health Region 2019). In 2016, the Leaf Rapids Health Centre Diagnostic Imaging Suite received upgrades with the installation of new equipment (Northern Health Region 2017).

Black Sturgeon Reserve nor Kinoosao have nursing stations. Residents of these reserves travel to Lynn Lake for medical attention. The community of O-Pipon-Na-Piwin Cree Nation has a federally run nursing station (Northern Health Region 2019). For medical emergencies and specialist appointments, residents are transported by medivac to Thompson or Winnipeg. Residents of the Town of Lynn Lake and Black Sturgeon Reserve may be transported by medical van to access appointments in Thompson.

Social services in the Town of Leaf Rapids include a healthy baby program, public health education and youth support, provided through the Leaf Rapids Education Center, Leaf Rapids Health Centre and Youth Centre (Safer Choices Northern Network n.d.).

Addictions services, including counselling, healthy lifestyle promotion, and prevention can be accessed through the Lynn Lake Hospital The closest addictions treatment facility is in Nelson House (Northern Health Region 2019).

The Lynn Lake Royal Canadian Mounted Police (RCMP) detachment provides police services to the Town of Lynn Lake and Black Sturgeon Reserve. The Lynn Lake RCMP detachment service delivery area covers a large rural area characterized by few roads, dense forest, and a number of remote fishing camps that are accessible only by airplane or helicopter.

The Lynn Lake RCMP is responsible for initial search and rescue at the outset of an emergency, with a specialized search and rescue team deployed to follow up. To respond to emergencies in more remote areas, the detachment keeps boats, snowmobiles, and all-terrain vehicles at its disposal, and, when necessary, charters equipment, such as planes. Volunteer search and rescue teams are also located in Lynn Lake, Leaf Rapids and Thompson (Manitoba Office of the Fire Commissioner n.d.).

Lynn Lake also has a volunteer-run fire department that serves both the Town of Lynn Lake and Black Sturgeon Reserve. Much of the fire department's equipment is dated beyond its recommended service life (Town of Lynn Lake 2016a). In 2018, the Lynn Lake Fire Department received a more modern firetruck to replace two older trucks, which will enhance the department's capacity (Graham 2018).

5.4.5 Transportation and Utilities

The Town of Lynn Lake is accessible by PR 391, which connects the Town of Lynn Lake and Black Sturgeon Reserve with the Town of Leaf Rapids and City of Thompson. PR 391 also provides access to all-weather gravel access roads to the Gordon and MacLellan sites. The only air service at Lynn Lake Airport is through chartered flights. The main users are fishing charters in summer, RCMP, and health services (Environmental Resource Management 2017). There is also an airport with a 3,500-m runway in the community of O-Pipon-Na-Piwin Cree Nation. There is currently no rail service to the Town of Lynn Lake.

The Town of Lynn Lake provides solid waste services for residents and businesses. Waste from the town and Marcel Colomb First Nation is disposed at the Lynn Lake Waste Disposal Site. Water in the Town of Lynn Lake comes from West Lynn Lake. The water treatment plant and distribution network are operated by the Town. Water and wastewater services are generally exclusive to the community. The water distribution and wastewater collection infrastructure were built more than 50 years ago and both systems require substantial investment (pers. comm. 2019b). Both systems were put in place to serve a much larger population, approximately four to six times the current population. While a reduced demand allows operations to continue, the reduced number of rate payers is impairing the ability to renew the system (PUB 2018). Marcel Colomb First Nation operates its own water treatment plant and sewage lagoon on the Black Sturgeon Reserve. Both were built recently and are in good working condition. The community uses a water truck and septic tank truck to service homes, although new infrastructure is being built with lines for water and sewer (pers. comm. 2019a). Hughes Lake is the source of drinking water supplies for Marcel Colomb First Nation's water treatment plant.

5.4.6 Land and Resource Use

5.4.7 Historical Land and Resource Use

Land use in the main population centres in the region (i.e., the towns of Lynn Lake and Leaf Rapids and the City of Thompson) has historically been based on mining as the primary industry. All three towns were built to serve mines in the mid-20th century as part of government led efforts in the development of Manitoba's resource towns, known as "The Government Era, 1945-1970" (Robson 1988).

The Gordon site, historically referred to as the Farley Lake site, was formerly operated as a two-pit open pit gold mine between 1996 and 1999 under Black Hawk Mining Inc. and was closed in 1999. The mine produced 214,800 ounces (oz) of gold from 1.7 million tonnes of ore during its lifespan. After closure, the site underwent a reclamation process and currently consists of a 15-km gravel access road, a bridge across the Hughes River, two mine rock storage areas and two overburden storage areas that have been capped, and two water-filled open pits. All buildings and infrastructure have been removed.

The MacLellan site was formerly operated as an underground gold and silver mine, with a five-level shaft to a depth of 448 m and ramp access from surface to 420 m below. The mine was operated by Maskwa Nickel Chrome Mines Limited, a subsidiary of Falconbridge Nickel Mines Limited, between 1986 and 1989 and produced approximately 144,000 oz of gold and 432,000 oz of silver. The mine operated under a licence that allowed for the discharge of mine water and sewage-plant effluent into polishing ponds and a marshy area adjacent to the Keewatin River. Ore was trucked to the Black Hawk Mining Inc. mill facility in Lynn Lake for processing. The mine was closed in 1989 and has been in a ‘care and maintenance’ phase since, with very little reclamation completed (Tetra Tech 2013). The site currently consists of a 4.6-km gravel access road, power transmission line (abandoned pole line), and infrastructure from the former underground mine, such as head frame, hoist house and shaft, access ramp, maintenance and other storage buildings, core shack and core racks, vent raise, and mine water settling ponds.

5.4.7.1 Current Land and Resource Use

Outdoor recreation activities are popular in the region and include sportfishing, hunting, boating, swimming, camping, cross-country skiing, and snowmobiling (Town of Lynn Lake 2019a). Primary resource uses occurring within the region include hunting and outfitting, trapping, fishing, minerals and aggregate, and forestry (Volume 4, Appendix P and Chapter 15).

Hunting is common within the region for several game species, including big game (e.g., moose, black bear), small game (e.g., rabbit), upland gamebirds (e.g., willow ptarmigan, ruffed grouse), and waterfowl (e.g., Canada goose, mallard). There are four lodges/outfitters operating or who have operated in the region that predominantly cater to non-resident black bear hunters.

The registered trapline system in Manitoba administers commercial furbearer harvest management where registered trapline holders are granted exclusive opportunity to harvest furbearing animals in individual traplines. The number of trapping licences issued in the province has fluctuated from 2014 to 2018 (Manitoba Sustainable Development 2018). The trapping season generally extends from October to May. Marten and muskrat have been the most-harvested species in Manitoba over recent years, while wolf and wolverine were the highest value species (Manitoba Sustainable Development 2018). There are approximately 20 registered traplines located in the region.

The Town of Lynn Lake is the self-proclaimed ‘Sportfishing Capital of Manitoba’. Fishing is an important activity for local resource users and lodges and outfitters that operate in the region (Town of Lynn Lake 2016b). Key sportfishing species include brook trout (*Salvelinus fontinalis*), burbot, goldeye (*Hiodon alosoides*), lake trout (*Salvelinus namaycush*), northern pike, rainbow trout (*Oncorhynchus mykiss*), walleye, whitefish, and yellow perch (Manitoba Sustainable Development 2002; 2018c).

The region provides limited commercial fishing opportunities. Goldsand Lake (with a quota ≥10,000 kg) was last commercially fished in 2002 (pers. comm. 2017a). Two commercial fish lakes in the vicinity of the MacLellan site have fish quotas of ≤1,000 kg: Cartwright and Cockeram lakes. These lakes were last commercially fished in 2012 and 1997, respectively (pers. comm. 2017d; pers. comm. 2019c).

The Project is in Mineral Exploration Licence Zone A which includes numerous mining claims and mineral leases, predominantly concentrated around the Lynn Lake area. The Project is included in an area that is subject to claim staking only. A wide array of minerals and other commodities (including aggregate) have been mined in the region (e.g., copper, lead, zinc, gold, silver, nickel, and cobalt). Other mineral dispositions include an expansive quarry withdrawal area encompassing PR 391 (Manitoba Growth, Enterprise and Trade 2019).

The Project is in Forestry Management Units 71 and 72 and has a total annual allowable cut of 234,430 m^3 for both softwoods and hardwoods (Manitoba Sustainable Development 2017). There are no timber sales or timber permits within Forestry Management Units 71 and 72, suggesting commercial forestry does not occur in the region (pers. comm. 2019c). Fuelwood (firewood) harvesting and gathering is common for personal use to either heat homes or use while camping.

There are six Research and Monitoring Forest Resource Inventory – Permanent Sample Plots (pers. comm. 2019d) in the region. There are areas of private productive forestland consisting of Local Government District productive forestland, First Nation Reserve/Federal Land, and private productive forestland. There are no private land Woodlot Program Sites (pers. comm. 2017b), enhanced silviculture sites, or Trees for Tomorrow plantations (pers. comm. 2019d) within the area.

Land Use and Development

The region consists of lands that are predominantly unoccupied Crown land. These lands are located within the Town of Lynn Lake and unorganized territory in the Thompson Community and Regional Planning Area of northwest Manitoba. The land base consists of unsurveyed land under the section-township-range system. Crown land types are numerous and consist of general permits and leases for remote cabins, lodge and tourist outcamps, camps/campgrounds, fish farm/fish camps, trapper cabins, communal cabin, recreation sites/lots, park cottage subdivision lots, commercial lots and sites, treaty land entitlement sites, infrastructure facilities (e.g., airstrip, communication tower, seaplane base, waste sites), and a forest research site (Crown Lands and Property Agency 2017).

Federal Crown land consists of the Black Sturgeon Reserve (Marcel Colomb First Nation) and treaty land entitlement sites. Unoccupied provincial Crown land includes registered trapline districts (i.e., Pukatawagan, and Southern Indian Lake) and community interest zones. Marcel Colomb First Nation maintains the only community interest zone within the area.

The current Town of Lynn Lake Development Plan No. 1329-2009 identifies the MacLellan site as being designated a “Limited Development” area. Mineral exploration and development are encouraged in the Limited Development land use area. There is no applicable development designation under a development plan for the Gordon site as it is on unoccupied Crown land located outside of the municipal boundary. There are also two Tailings Management Areas (West and East) near the townsite of Lynn Lake. They were established as a result of historical mining operations that occurred at Lynn Lake from the 1950s to the 1980s (Manitoba Growth, Enterprise and Trade 2019).

Parks, Protected Areas and Management Areas

There are two parks in the region, Burge Lake and Zed Lake provincial parks. Burge Lake includes a small, eight-site campground located 5 km from the MacLellan site and 10 km from the Town of Lynn Lake. Zed Lake includes a small 10-site campground located 40 km from the Town of Lynn Lake (Manitoba Sustainable Development 2019b). Recreation opportunities offered at both parks include swimming, boating, and fishing.

Two large areas of land in the region have been identified as candidate Areas of Special Interest (ASIs) protected areas. There are two ASIs within the region in the vicinity of the Gordon and MacLellan sites – Eden Lake ASI, located approximately 14 km southeast of the Gordon site and Goldsand Lake ASI, located approximately 13 km northwest of the MacLellan site (Chapter 15, Map 15-5).

There are no wildlife management areas in the region.

Recreation Activities

Lakes and rivers in the Lynn Lake area are popularly used for northern pike (jackfish), walleye (pickerel), and trout (lake trout, rainbow trout, brown trout, and speckled trout) fishing. The Town of Lynn Lake promotes outdoor recreation and tourism opportunities as well as local attractions including parks, mining museum, and other recreation facilities. The town is the location of the annual Great Northern Pike Derby (Town of Lynn Lake 2019a).

In addition to recreational fishing, lakes within the Northwest Region around the Town of Lynn Lake offer opportunities for wildlife viewing, and for canoeists and kayakers. Winter activities in the Lynn Lake area include ice fishing, snowmobiling, ice-skating, cross-country skiing, snowshoeing, tobogganing, and dogsledding. The wilderness areas around Lynn Lake offer various wildlife, including moose, black bear, wolf, caribou, geese, ducks, partridge, and other small game. Recreational hunting is also a popular activity in this area (Town of Lynn Lake 2019a).

As described in the previous section there are two campgrounds in the region, located at Burge Lake and Zed Lake provincial parks. Recreational cottage subdivision lots on Crown land are located at Zed Lake, Burge Lake, and Eden Lake under Crown general permits and leases. The region also contains lands that may be used for private recreation purposes, in the form of remote cottages located outside of recreational cottage subdivisions in provincial parks and at remote lakes.

Recreational trails in the region are limited to an informal network. While there are no designated snowmobile trails or cross-country ski trails, informal snowmobiling and cross-country skiing are known to occur within the region, particularly within the vicinity of Lynn Lake and Leaf Rapids. Informal gathering activities (e.g., berry picking) likely occur across the region for berries of interest that grow wild in the north, including blueberry, saskatoon berry, raspberry, and strawberry (Manitoba Agriculture 2011).

Canoeing and boating occur in the region. A portion of the approximately 3,500-km “Land of Little Sticks” historical canoe route is in the Lynn Lake area. The route includes the following waterbodies in the area (from west to east): Vandekerchove, Zed, Little Brightsand, Goldsand, and Burge lakes, Keewatin River, Cockeram, Anson, Cartwright, and Hughes lakes, Hughes River, Eden Lake, and Barrington River (Berard 1978). Public boat launches are located at Vandekerchove, Zed, Little Brightsand, Burge, Cockeram, and Eden lakes (Town of Lynn Lake 2019b).

5.4.8 Current Use of Lands and Resources for Traditional Purposes by Indigenous Peoples

The Project is located within Treaty 5 that was initially signed in 1875, with adhesions in 1908 and 1909, and covers northern Manitoba and small portions of Saskatchewan and Ontario. Two First Nations in the Project area, Mathias Colomb Cree Nation and Marcel Colomb First Nation, are signatories to Treaty 6 Adhesion of 1898. Marcel Colomb First Nation's reserve, the Black Sturgeon Reserve, is the First Nation community nearest to the Gordon site (approximately 2.8 km to the nearest point on the access road) and the MacLellan (approximately 19.5-km) site. There is current use of lands and resources for traditional purposes by Indigenous peoples in the Project sites and throughout the region.

Archival, desktop and Project-specific traditional land and resource use (TLRU) research was conducted (November 19, 2014 to May 22, 2020) to collect information on past and current use of lands and resources for traditional purposes (Chapter 17). Two categories of Indigenous communities were considered as part of the assessment: those that were identified by the Canadian Environmental Assessment Agency (now Impact Assessment Agency of Canada [IAAC]) to have the potential to be most affected by the Project (i.e., Marcel Colomb First Nation, Mathias Colomb Cree Nation, Nisichawayasihk Cree Nation, O-Pipon-Na-Piwin Cree Nation, Barren Lands First Nation, Peter Ballantyne Cree Nation and Manitoba Metis Federation); and those that were identified by IAAC as affected by the Project to a lesser degree (i.e., Northlands Denesuline First Nation, Sayisi Dene First Nation, Hatchet Lake First Nation, and Métis Nation – Saskatchewan). Pickerel Narrows Cree Nation was also initially identified as potentially affected by the Project, but to a lesser degree; however, upon discussions with the IAAC, it was determined that Indigenous Services Canada recognizes the Granville Lake Indian Settlement (referred to as the Granville Lake community) as a reserve under the governance of Mathias Colomb Cree Nation, and therefore Pickerel Narrows Cree Nation is not discussed for the purposes of this EIS as a separately governed Indigenous community (Impact Assessment Agency of Canada (IAAC) pers. comm. 2018). The research suggests Indigenous communities use the area and surrounding region for traditional activities (e.g., hunting, fishing, trapping, plant gathering [food and medicine], and cultural practices), commercial fishing, or may be affected by or have an interest in the Project due to their use of PR 391 or their location downstream of the Project.

5.4.8.1 Traditional Land and Resource Use

Precontact Period

The assessment recognizes that Indigenous groups in the region had overlapping TLRU territories. Environmental and social events, such as the depletion of the beaver in the early 1800s and extinguished land rights as a result of signed treaty and treaty adhesions, altered TLRU territories. Archaeological, archival, and oral tradition agree that there is a long history of occupation of northern Manitoba, extending back thousands of years. People moved into northwestern Manitoba after Glacial Lake Agassiz began to drain at the end of the Ice Age. For this assessment, the time continuum for northern Manitoba has been divided into the Early Precontact Period (from approximately 9,500 to 6,500 years before present [BP]); the Middle Precontact Period (approximately 6,500 to 2,500 BP); and the Late Precontact Period (2,500 BP to time of contact with Europeans about 325 BP).

It is speculated that people moved into northern Manitoba as part of a continued northerly human expansion that followed the retreating shoreline of Lake Agassiz beginning about 9,500 years ago (Pettipas 1984). The earliest inhabitants of northern Manitoba were small bands of hunter gatherers.

The first people thought to adapt to and live permanently in the northern Boreal Forest are referred to as the Shield Archaic Tradition (Kroker 1990; Pettipas 1984). The earliest evidence of the Shield Archaic in the regional area is from site GjLp-7, at the north end of Wuskwatim Lake (approximately 200 km south east of Lynn Lake) on the traditional lands of Nisichawayasihk Cree Nation. Radiocarbon assays of a moose antler and human bone indicate the site is about 6,390 years old (Smith 2002).

There is evidence of a northerly influence from the Taltheilei Tradition during the Late Precontact period. The Taltheilei people primarily hunted barren-ground caribou and are considered by archaeologists to be the ancestors of the present Dene (Kroker 1990; Pettipas 1984).

Ceramic materials suggest southern influences. Distinctive pottery styles indicate the presence of three cultural groups in the Boreal Forest: Laurel, Blackduck, and the Selkirk Composite. Archaeologists generally agree that the ancestors of the modern Cree produced Selkirk pottery and its associated variant styles (Kroker 1990).

Historic Period

At the time of first European exploration along the west coast of Hudson Bay it is probable that the three main Indigenous groups were Cree, Dene, and Inuit. In the 1680s the Hudson’s Bay Company (HBC) and French fur traders from new France built and occupied posts on the Nelson and Hayes rivers (Maurice 1970). After 1713, the HBC gained control of the coast of Hudson Bay and began building coastal trade posts along the west shore of Hudson Bay (Payne 1979). York Factory was established by the HBC in 1713 and a post at the mouth of the Churchill River, Fort Prince of Wales, in 1717 (Payne 1979). These two posts dominated the northern Manitoba fur trade for the next 250 years. The transfer of goods and furs between northern Manitoba and Great Britain was through either Churchill or York Factory and, by extension, the Churchill and Hayes rivers were major transportation corridors for Indigenous groups and the European fur traders. This was particularly the case after inland expansion by the HBC in the 1770s (Payne 1979).

HBC inland expansion was a result of competition from fur traders in Montreal. The inland expansion intensified during the last quarter of the 18th and first quarter of the 19th century. The construction of trade posts in the northern interiors of Manitoba and Saskatchewan brought the fur trade directly to most of the Indigenous ancestors of the communities involved in this assessment. It also provided the catalyst for the formation of the Manitoba and Saskatchewan Métis communities (Chapter 17, Section 17.2.2.2).

Fish were among the main winter provisions for both First Nations and the HBC and was also the main food source for the sled dogs. HBC winterers called the main fish species caught “guineard” or whitefish. Sturgeon was originally abundant in the Churchill River and formed an important component of the community’s diet as well as a source of income. Sturgeon fishing was generally in the early spring, usually the latter part of May or early June, and in early fall, usually the latter part of September or the first weeks of October (Chapter 17, Section 17.2.6).

Geese, ducks, and swans were the main birds used as a food source. Indigenous hunters routinely brought migratory wildfowl to the HBC posts, when available. The migrating birds were usually along the Churchill River by the end of April and would depart in the latter part of September. Mammal furs and meat were the main trade commodities throughout the history of the fur trade. Beaver was the prime fur traded during the seventeenth and eighteenth centuries. A depletion of the beaver population throughout the western interior during the early 1800s diversified the types of mammals trapped. By the late 1930s, furs acquired by the HBC at Pukatawagan included squirrel, fox, mink, weasel, marten, muskrat, wolf, otter, and lynx (Various 1929-1943).

Northern Indigenous groups used several trees and plants. They collected birch bark for a variety of uses including canoe and dwelling covers as well as dishes and domestic utensils. Larch, a strong elastic wood, was used for sleds. Poplar was preferred as firewood and for smoking meat and fish. White spruce branches made bedding and pine saplings made tent poles (Thompson 1916). Edible berries used by both Indigenous people and the HBC consisted of dry and swamp cranberry; crow and blackberry; raspberry; strawberry; cherries; red, black and white currants; gooseberry, hipberry, juniper berry, eye berry, and bear berry (Thompson 1916).

During the open water season, the main mode of transport was canoe. Birch bark was gathered to make canoes; wood was harvested to construct the frame. Canoes were still the main method of water transport during the 1930s and 1940s. By this time, most of the canoes used by the HBC and the people at Pukatawagan had canvas covers that generally had to be replaced annually (Various 1929-1943). Winter transport was usually by foot and dog sled. Sleds were generally made of larch (Thompson 1916:117) with birch collected for making snowshoes (Charles 1805-1806). These modes of winter travel continued into the early 1940s as many members of Mathias Colomb Cree Nation as well as HBC employees used dog sleds.

The ancestors of Marcel Colomb First Nation were not averse to traveling great distances. Cree from the Granville Lake area routinely traveled the Churchill River to Fort Churchill and back; a 1,300 km round trip. During the 1920s and early 1930s, many families would travel between Pukatawagan and their outlying summer camps and would undertake one last fall season fishing trip. Following river freeze-up in late October or early November, trappers would begin accessing trap lines. Trappers would go out at least once or twice before Christmas and then at least three or four times after Christmas before the river opened (Various 1929-1943). By the early 1940s, band members often remained in satellite communities on the Churchill River year-round.

During the summer, the Cree congregated in areas close to active fisheries. At these locations, canoes were repaired, or new ones constructed. Fishing, primarily for whitefish and sturgeon, was combined with hunting and harvesting berries and plants. If access to more plentiful fisheries along the river system required travel, people would generally leave two or three times during the summer for a week to 10 days (Various 1929-1943).

The late fall was a time for gathering materials for sleds and snowshoes. The Cree would then divide into smaller family units and leave for their wintering sites before freeze-up and snowfall (Various 1929-1943).

5.4.8.2 Traditional Land and Resource Use Studies

Some Indigenous communities conducted TLRU studies for the Project. One TLRU study was completed with support and participation from Marcel Colomb First Nation. A second TLRU study was completed for Peter Ballantyne Cree Nation; however, it has not yet been released by the community for use in the environmental assessment. A third TLRU study (Métis Land Use and Occupancy Study) was completed by an independent consultant for the Manitoba Metis Federation. A Project-specific TLRU study is currently being conducted by an independent consultant for Mathias Colomb Cree Nation. Information from completed and released TLRU studies has been integrated with this EIS.

First Nations communities in the Project region (Chapter 3) are signatory to Adhesions to Treaty No. 5, Treaty No. 6, and Treaty No. 10. The Project is in the area subject to Adhesion to Treaty No. 5 (Treaty Relations Commission of Manitoba 2017).

Based on available information, First Nation and Métis TLRU considered the following:

- Plant harvesting (food, medicine, and cultural purposes)
- Hunting, trapping, and fishing (cultural and economic purposes)
- Cultural sites/areas (e.g., burial sites, sacred sites, spiritual sites, sacred geography)
- Traditional areas (e.g., settlement, habitation area, traditional location)
- Trails and travel routes (e.g., trail systems, waterways, landmarks).

Indigenous peoples harvest plants for food, medicine, and cultural purposes. Marcel Colomb First Nation indicated the use of the following areas for gathering food and medicinal plants and other plants – Goldsand Lake (southern end), Cockeram Lake, Keewatin River, Moses Lake, Anson Lake, Cartwright Lake, Muskeg Lake, Hughes Lake, Elisabeth Lake, near Pilote Lake, and near Eden Lake (MCFN TLRU Study 2017, Figure 2b).

Marcel Colomb First Nation shared TLRU information on hunting and trapping areas for large and small game, waterfowl, and other animals including areas for hunting and trapping around Goldsand Lake, Cockeram Lake, Keewatin River, Dunsheath Lake, Hughes Lake, Westdal Lake, Elisabeth Lake, and Eden Lake. Hunting for moose, ducks, and geese has occurred at Black Sturgeon Reserve. Typical species trapped include beaver, muskrat, lynx, mink, and martin.

Marcel Colomb First Nation identified fishing locales, including commercial fishing lakes, and important spawning areas at Goldsand Lake, Cockeram Lake, Keewatin River, Chepil Lake, Hughes Lake, Swede Lake, Barrington Lake, and Eden Lake. Commercial fishing has historically occurred on Barrington, Cockeram, Dunsheath, and Goldsand lakes. Fish spawning areas were identified at Hughes Lake, north of PR 391, and on the Keewatin River, Hughes Lake and Stan Lake.

Cultural sites and areas (e.g., burial sites, sacred sites, spiritual sites) important to Indigenous people were identified by Marcel Colomb First Nation (Chapter 17).

Marcel Colomb First Nation identified settlement and habitation areas, as well as traditional locations outside of their reserve on Goldsand Lake, between Minton and Cockeram lakes, Chepil Lake, Hughes Lake, Black Sturgeon Reserve, Marnie Lake, Swede Lake, Wetikoeekan Lake, and Eden Lake.

Indigenous peoples continue to use long-established trails and travel routes that connect communities, harvesting areas, and gathering places in a network of traditional use and cultural patterns. Marcel Colomb First Nation identified trails and travel routes in the area extending from Vandekerchove Lake to Goldsand Lake, Cockeram Lake to Anson Lake and Sickle Lake; Dunsheath Lake to Chepil Lake and Hughes Lake, to Westdal Lake, Wetikoeekan Lake, Pilote Lake to Eden Lake; and Anson Lake to Cartwright Lake, Hughes Lake, Swede Lake to Barrington Lake and north to Melvin Lake; and to Granville Lake to the south, and Southern Indian Lake to the east.

Traditional activities practiced by Metis citizens within a 100 km radius of the Project include:

- Gathering plants and natural materials for food, medicine and other purposes, including berries to consume or store (preserve).
- Fish harvesting on Simpson and Swede lakes, as well as Hughes Lake, Hughes River, Chepil Lake, West Lynn Lake, Cockeram Lake, and Burge Lake.
- Hunting at a location west of the Gordon access road, hunting for ptarmigan nearer to the MacLellan site, hunting for caribou, moose, and deer throughout the study area, and non-commercial trapping and snaring in the TLRU study area.
- Access routes or trails including snowmobile routes, boat launches and routes, canoe routes and portages, walking trails, trails used by other vehicles, and water routes on the Hughes River and Cockeram Lake.
- Cultural, ceremonial, and spiritual sites used for traditional purposes in the TLRU study area (Chapter 17).

5.4.9 Heritage Resources

The heritage resources, including previously recorded archaeological sites within the Project region, characterize the cultural environment. The cultural chronology and cultural environment of Manitoba is generally divided into two periods, Precontact and Historic. Each is further divided into Early, Middle and Late. The Precontact Period dates from ca. 12,000 to 325 years ago and relates to the time when Indigenous hunter/gatherer groups first moved into the area as Lake Agassiz receded.

Cultural traditions, history and spirituality were passed to subsequent generations through the spoken word or possibly by rock paintings (pictographs), alignments (petroforms) and figures cut into rock faces (petroglyphs). The archaeological sites that relate to these Indigenous groups consist of stone tools and waste flakes discarded when making or sharpening the tools, pottery fragments and bone fragments from mammals, birds, and fish.

The ore and overburden stockpile locations at the Gordon site were not considered to have high heritage resource potential based on predictive modelling and the extent of previous disturbance. No archaeological sites have been previously recorded in the Gordon site development area. Field assessments at this location did not record heritage resources (Volume 4, Appendix Q and Chapter 16).

Ten archaeological sites have been recorded in the MacLellan site (Volume 4, Appendix Q and Chapter 16, Map 16-4). Three of the recorded sites were concluded to be Historic Period camp sites. One of the sites was recorded on a terrace on the east side of the Keewatin River. Artifacts observed at the site consisted of a folding stove, a steel washtub and several tin cans and bottles (Evans 2012). Reassessment of the site in 2015 recorded a rectangle depression that may be the remnants of a *ca*. 1940s cabin foundation. A trail remnant, consisting of a narrow, linear cleared area parallel to the river, was recorded west of the foundation. Two sites were located on the west side of the Keewatin River and contained refuse piles of tin cans. One of the recorded sites consists of a 4-m by 4-m wood-framed building that stands beside a mine access road and adjacent to an old quarry. The building may have been a storage structure during the early mining days of the MacLellan site.

Uninterpreted sites pertain to locations where only a few artifacts are recovered and the activities that produced the cultural deposit are not clear. The artifacts that were recovered at the MacLellan site indicated that all Uninterpreted sites dated to the Precontact Period.

Six of the seven Uninterpreted sites were identified by lithic flakes, deposited during the manufacturing of a stone tool, while the seventh site pertains to a section of the Minton Lake portage. One of these sites is in an upland area north of the TMF. The artifacts were shallowly buried beneath the organic layer. It is possible that additional sites are present at this and other upland locations. However, based on the site extent defined by shovel tests, these sites do not encompass a large area.

Development within the MacLellan site is primarily located in areas that would have experienced limited human activity given the nature of the terrain and lack of navigable and potable water. Locations along the Keewatin River would have been more conducive for human occupation and resource harvesting. The one exception is the upland area where exposed quartz veins may have been quarried for stone tool manufacture.

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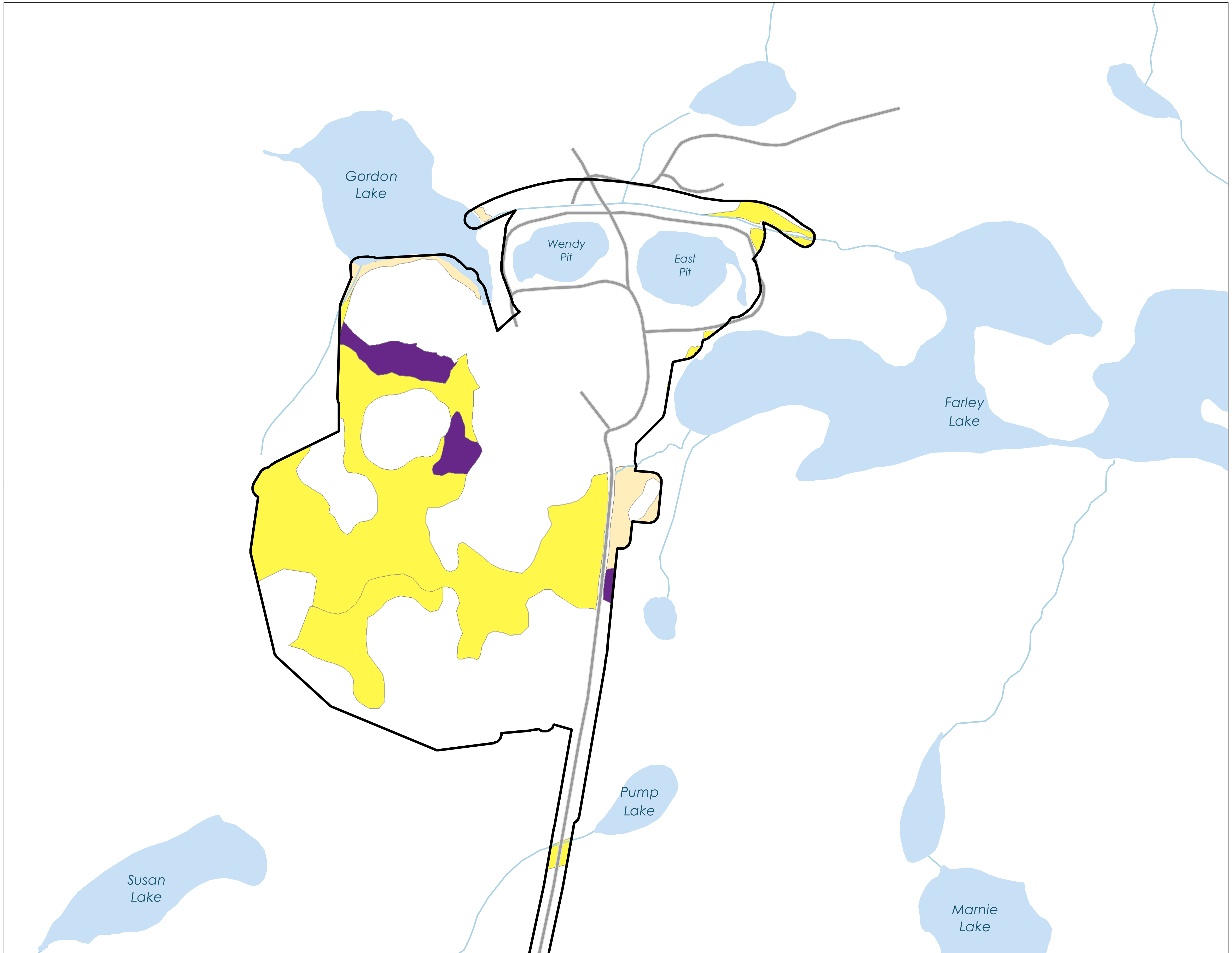


Stantec

ALAMOS GOLD INC.

Project Infrastructure

Project Development Area

Terrain Constraints

Ov, Ob: Organic deposits with no apparent permafrost

X: Organic deposits with permafrost

Xpt: Peat Plateau affected by thermokarst

Landbase

Existing Access Road

Watercourse

Waterbody

N

0 200 400 Metres

(At original document size of 11x17)
1:12,500

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

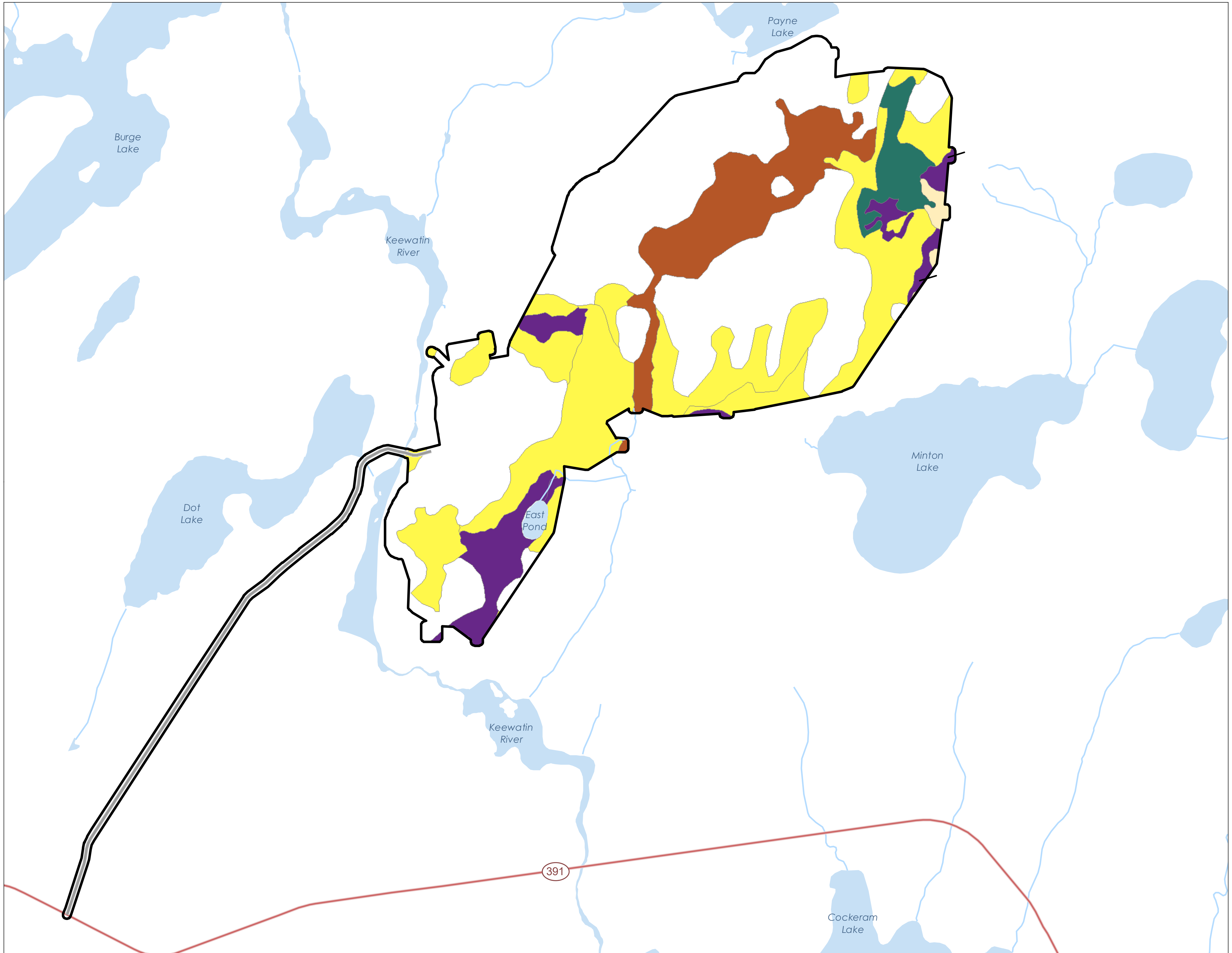
Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-04-13
Technical Review by ASomers on 2020-04-13
Senior GIS Review by GKroupa on 2020-04-13

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
5-1

Title
Terrain Constraints - Gordon



Stantec

Alamos Gold Inc.

Project

Project Development Area

Terrain Constraints

- Ov, Ob: Organic deposits with no apparent permafrost
- X: Organic deposits with permafrost
- Xt: Organic deposit affected by thermokarst
- Xpt: Peat Plateau affected by thermokarst
- L: Seepage

Landbase

- Highway
- Existing Access Road
- Watercourse
- Waterbody

N

0 0.5 1 Kilometres

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Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location

Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-04-13
Technical Review by ASomers on 2020-04-13
Senior GIS Review by GKroupa on 2020-04-13

Client/Project

111473008

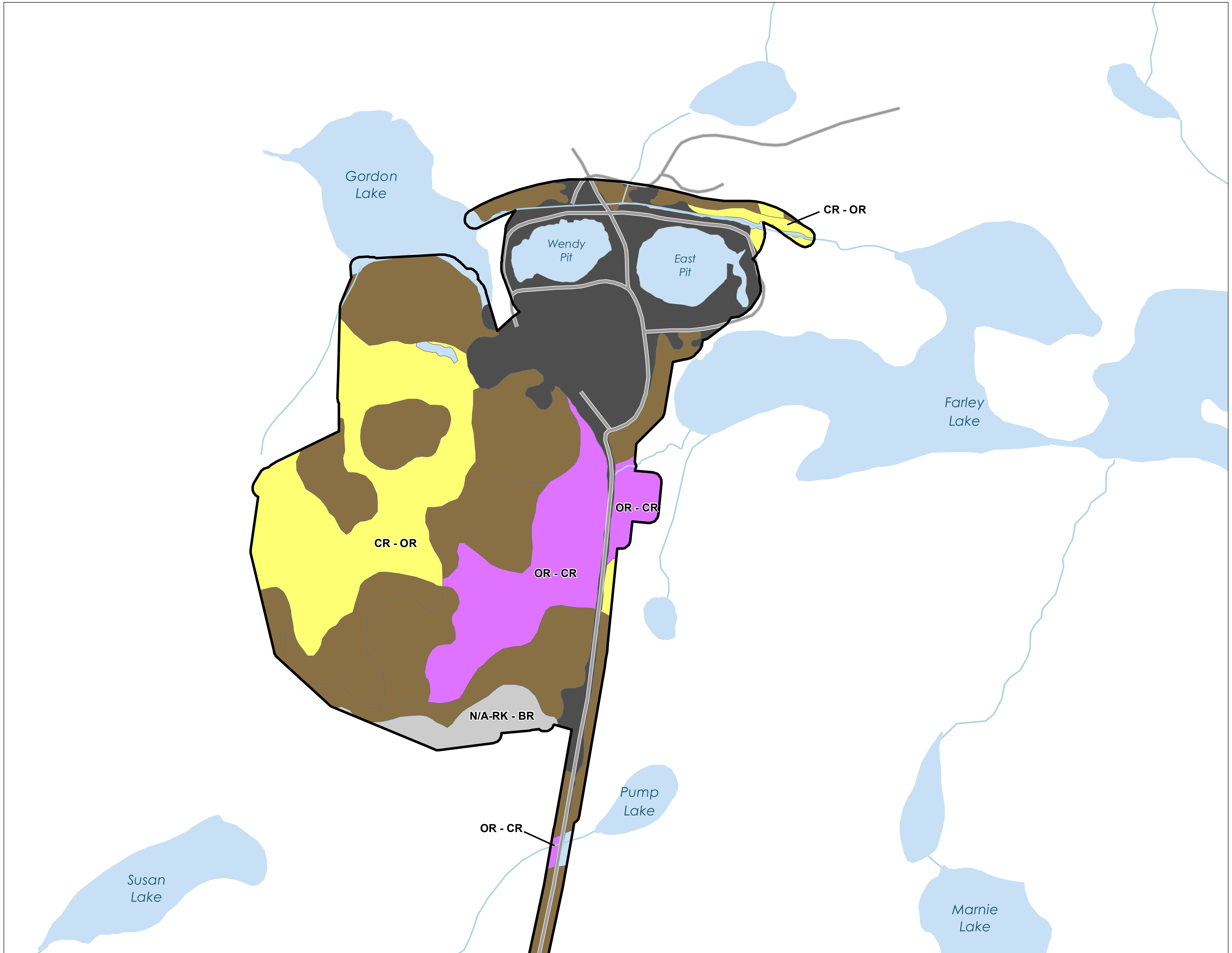
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.

5-2

Title

Terrain Constraints - MacLellan



Stantec

ALAMOS GOLD INC.

Project Infrastructure

Project Development Area

Soil Information

Soil Order

Brunisol (BR)

Cryosol (CR)

Organic (OR)

Non-Soil

N/A - Bedrock (N/A - BK)

N/A - Developed Land (N/A -

Soil Order Map Unit Label

BR - OR

Dominant soil order

Significant soil order

Note: only applied to those soil map units where there are dominant and significant soil orders

Landbase

Existing Access

Watercourse

Waterbody

N

0 200 400 Metres

(At original document size of 11x17)
1:12,500

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N

2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-04-15
Technical Review by DWhetter on 2020-04-15
Senior GIS Review by GKroupa on 2020-04-15

Client/Project 111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
5-3

Title
Soil Order - Gordon

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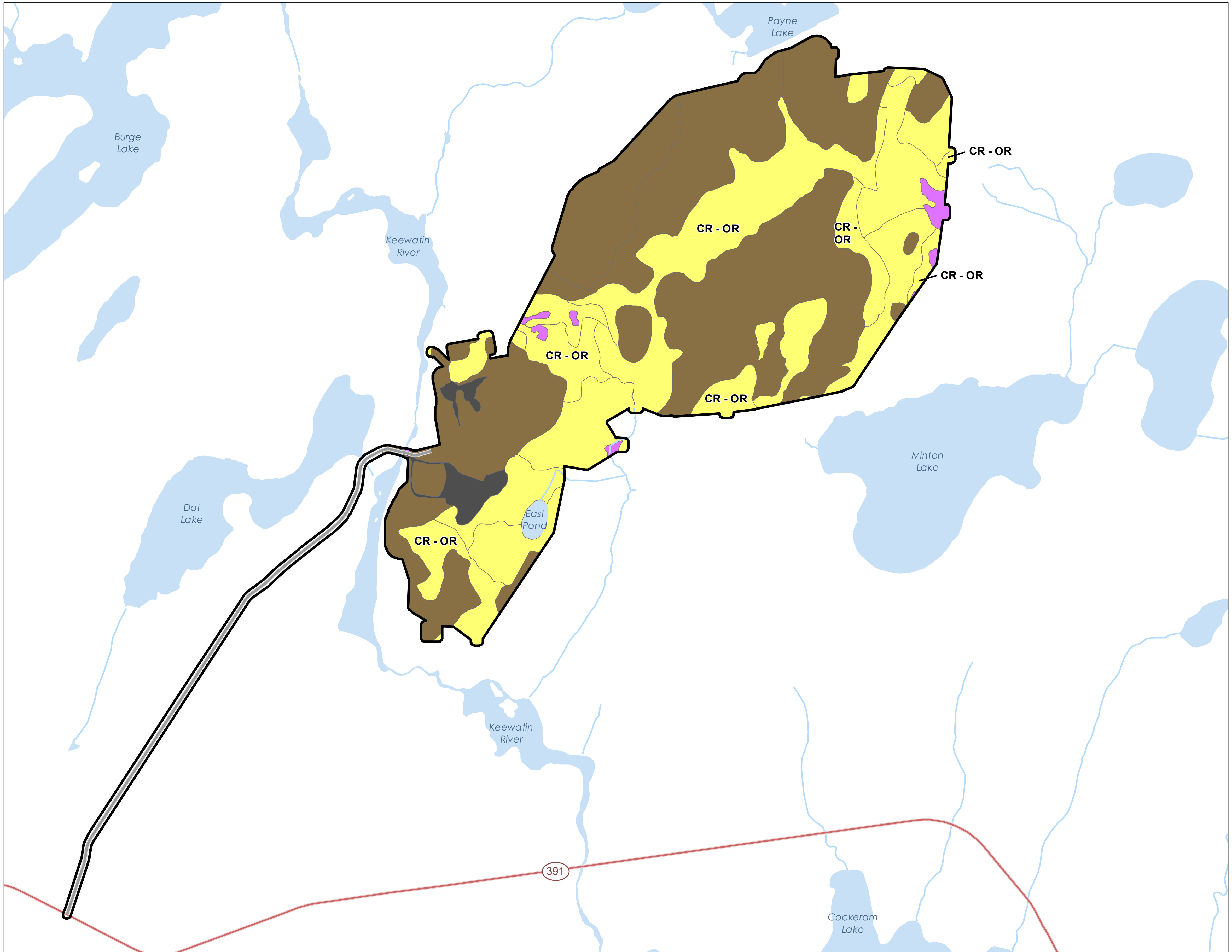


Stantec

Alamos Gold Inc.

Project

Project Development Area

Soil Information

Soil Order

Brunisol (BR)

Cryosol (CR)

Organic (OR)

Non-Soil

N/A - Bedrock (N/A - BK)

N/A - Developed Land (N/A - DL)

Soil Order Map Unit Label

BR - OR

Dominant soil order

Significant soil order

Note: only applied to those soil map units where there are dominant and significant soil orders

Landbase

Highway

Existing Access Road

Watercourse

Waterbody

N

0 0.5 1 Kilometres

(At original document size of 11x17)
1:30,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-04-15
Technical Review by DWhetter on 2020-04-15
Senior GIS Review by GKroupa on 2020-04-15

Client/Project
111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

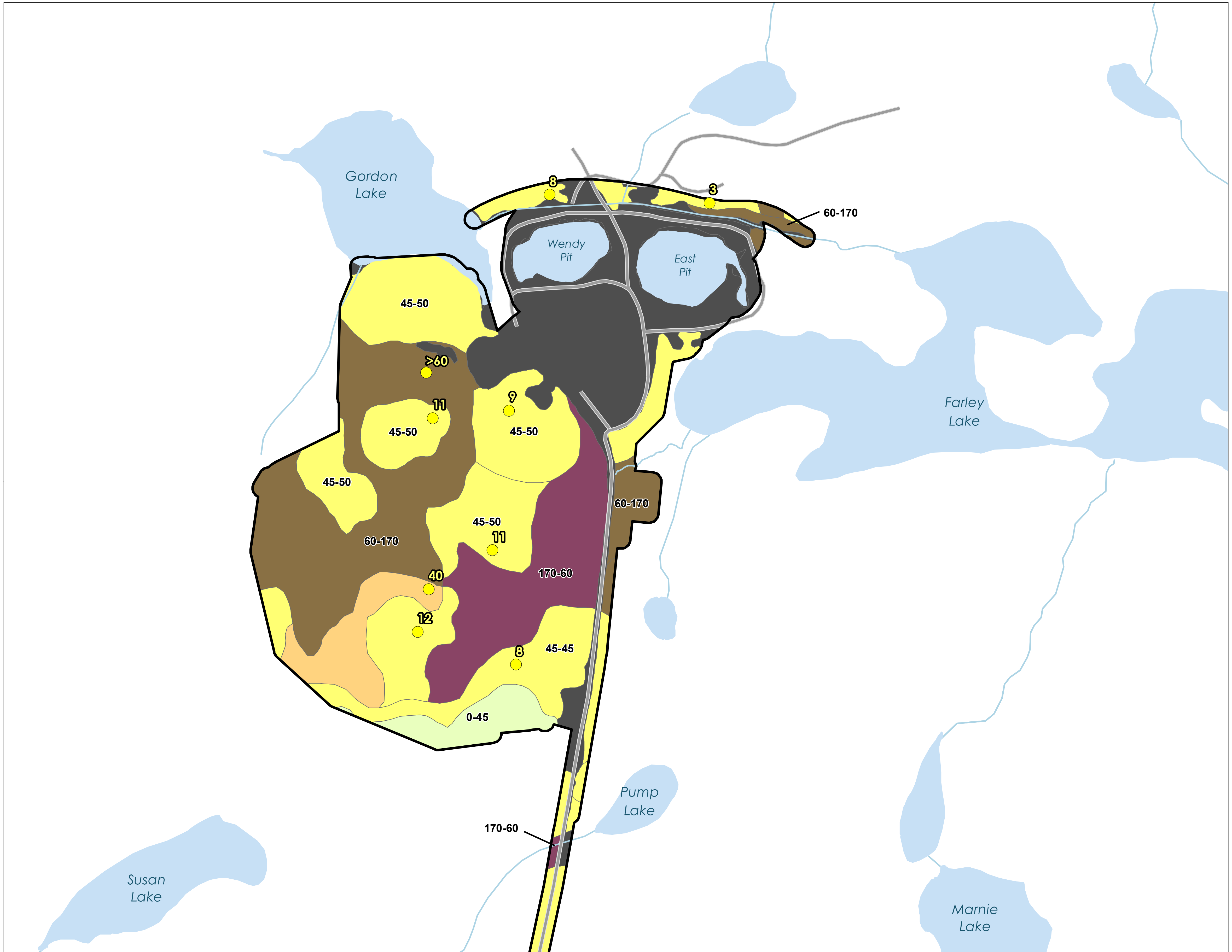
Map No.

5-4

Title

Soil Order - MacLellan

G:\ GIS Project Folder\111473008 LLGP EA\figures\Ch5 Environmental Setting\for Review\Map5-4 SOILS SoilOrder MacLellan 20200414.mxd   Revised: 2020-05-12 By: ACampigotto



Stantec

Alamos Gold Inc.

Project Infrastructure

Project Development Area

Soil Information

Soil and Terrain Inspection Location (topsoil depth in cm)

Typical Topsoil Depth for Dominant Soil (cm)

- 0
- 45
- 50
- 60
- 170
- N/A - Developed Land

Landbase

- Existing Access Road
- Watercourse
- Waterbody

Note: This map displays typical topsoil depth values for the dominant soil series within each soil map unit. The typical topsoil depth for each dominant soil series was assigned based on the average topsoil depth found for each of those soil series encountered across the Project Development Area during field investigations. In some cases, two soil series are mapped within a soil map unit and, in these cases, two typical topsoil depth values are presented in a text label in the map unit. In addition, actual topsoil depths recorded at soil and terrain inspection locations are displayed.
Topsoil depths presented for soil map units should be considered approximations only. Actual topsoil depths within soil map unit areas and at specific locations will vary and may vary considerably. The topsoil depths presented may be used to guide planning of topsoil salvage for reclamation purposes; however, actual topsoil depths should be confirmed prior to or during soil salvage activities, as appropriate.

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake,
Manitoba

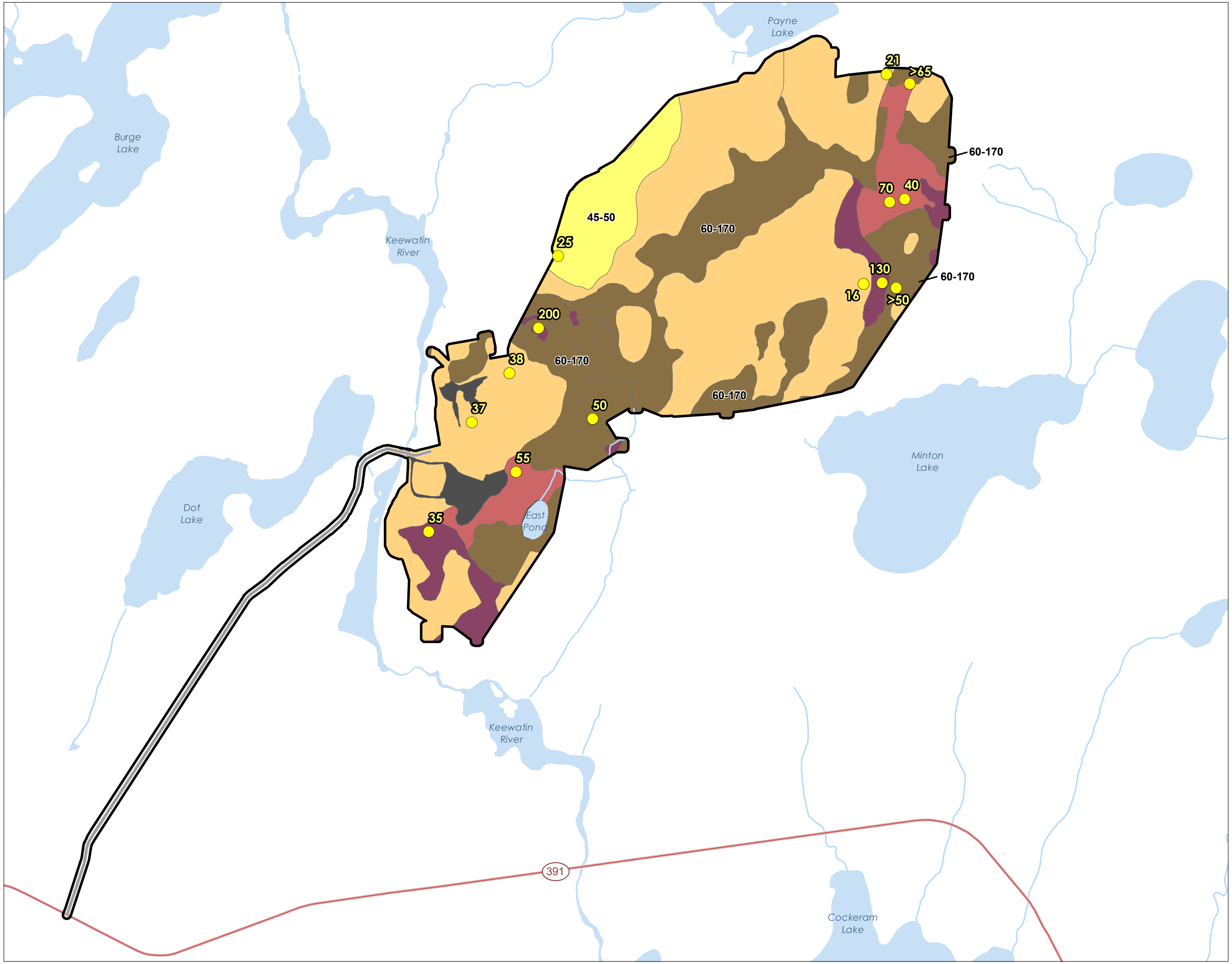
Prepared by ACampigotto on 2020-04-13
Technical Review by ASomers on 2020-04-13
Senior GIS Review by GKroupa on 2020-04-13

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
5-5

Title
Soil Thickness - Topsoil Depth Gordon

G:_GIS_Project_Folder\111473008_LLGP_EA\figures\Ch5_Environmental_Setting\for_Review\Map5-5_SOILS_TopsoilDepth_Gordon_20200414.mxd Revised: 2020-05-12 By: ACampigotto



Stantec

Alamos Gold Inc.

Project Infrastructure

Project Development Area

Soil Information

Soil and Terrain Inspection Location (topsoil depth in cm)

Typical Topsoil Depth for Dominant Soil (cm)

- 45
- 50
- 60
- 65
- 170
- N/A - Developed Land

Landbase

- Highway
- Existing Access Road
- Watercourse
- Waterbody

Note: This map displays typical topsoil depth values for the dominant soil series within each soil map unit. The typical topsoil depth for each dominant soil series was assigned based on the average topsoil depth found for each of those soil series encountered across the Project Development Area during field investigations. In some cases, two soil series are mapped within a soil map unit and, in these cases, two typical topsoil depth values are presented in a text label in the map unit. In addition, actual topsoil depths recorded at soil and terrain inspection locations are displayed.
Topsoil depths presented for soil map units should be considered approximations only. Actual topsoil depths within soil map unit areas and at specific locations will vary and may vary considerably. The topsoil depths presented may be used to guide planning of topsoil salvage for reclamation purposes; however, actual topsoil depths should be confirmed prior to or during soil salvage activities, as appropriate.

N

0 0.5 1 Kilometres

(At original document size of 11x17)
1:30,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-04-13
Technical Review by ASomers on 2020-04-13
Senior GIS Review by GKroupa on 2020-04-13

Client/Project 111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
5-6

Title
Soil Thickness - Topsoil Depth MacLellan

ALAMOS GOLD INC.

Lynn Lake Gold Project Environmental Impact Statement Chapter 6 - Assessment of Potential Effects on the Atmospheric Environment

Stantec

Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Acronyms and Abbreviations

Alamos	Alamos Gold Inc.
Ausenco	Ausenco Engineering Canada Inc.
°C	degrees Celsius
AAQC	ambient air quality criteria
ADMG	air dispersion model guideline
AEP	Alberta Environment and Parks
BMP	best management practice
CAAQS	Canadian Ambient Air Quality Standards
CACs	criteria air contaminants
CCME	Canadian Council of Ministers of the Environment
CEA Agency	Canadian Environmental Assessment Agency
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
COP	Conference of the Parties
CH_4	methane
dm	decimeter
DPM	diesel particulate matter
DPM_{10}	diesel particulate matter with an aerodynamic diameter less than 10 µm
$DPM_{2.5}$	diesel particulate matter with an aerodynamic diameter less than 2.5 µm

DTSP	diesel total suspended particulate
ECCC	Environment and Climate Change Canada
EIS	environmental impact statement
ENR	Northwest Territories Environment and Natural Resources
$FPM_{2.5}$	fugitive particulate matter with an aerodynamic diameter less than 2.5 µm
FPM_{10}	fugitive particulate matter with an aerodynamic diameter less than 10 µm
FTSP	fugitive total suspended particulate
GHG	greenhouse gas
$g/m^2/30$-day	gram per square metre per 30 days
g/VMT	gram per vehicle-mile travelled
HCN	hydrogen cyanide
HFC	hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
kph	kilometres per hour
kt	kilotonne
kt/y	kilotonne per year
LAA	Local Assessment Area
$\mu g/m^3$	microgram per cubic metre
m/s	meters per second
$mg/dm^2/day$	milligram per square decimeter per day
mg/kg	milligram per kilogram
mg/L	milligram per litre
µm	micrometer
MCC	Manitoba Conservation and Climate

MOECC	Ontario Ministry of Environment and Climate Change (now Ministry of the Environment, Conservation and Parks)
m/s	metre per second
MSD	Manitoba Sustainable Development (now Manitoba Conservation and Climate)
NaCN	sodium cyanide
NIR	National Inventory Report
N_2O	nitrous oxide
NO_2	nitrogen dioxide
PAH	polycyclic aromatic hydrocarbons
PDA	Project Development Area
PFC	perfluorocarbons
PM	particulate matter
$PM_{2.5}$	fine particulate matter with an aerodynamic diameter less than 2.5 µm
PM_{10}	respirable particulate matter with an aerodynamic diameter less than 10 µm
PR	provincial road
RAA	Regional Assessment Area
RMA	Resource Management Area
ROM	run-of-mine
SF_6	sulphur hexafluoride
SOP	standard operating procedure
SO_2	sulphur dioxide
TDR	technical data report
TLRU	traditional land and resource use
TMF	tailings management facility

TMR	technical modelling report
TSP	total suspended particulate
US EPA	United States Environmental Protection Agency
VC	valued component
VOC	volatile organic compounds
wad-CN	weak acid dissociable cyanide
WRAP	Western Regional Air Partnership
WRF	Weather Research and Forecasting
WRI	World Resource Institute

6.0 ASSESSMENT OF POTENTIAL EFFECTS ON THE ATMOSPHERIC ENVIRONMENT

The Atmospheric Environment as a valued component (VC) consists of two subcomponents: air quality and greenhouse gases (GHGs).

Air quality, as a subcomponent of the Atmospheric Environment VC, has been selected because of its intrinsic importance to the health and wellbeing of humans, wildlife, vegetation, and other biota. The atmosphere is an important pathway for the transport of contaminants to the freshwater, terrestrial, and human environments. Some project activities result in the release of substances to the atmosphere that, owing to their physical and chemical properties, are classed as air contaminants. These substances are activity-dependent (e.g., dust is raised during mining activities; combustion by-products emitted during construction and operation).

In addition, GHGs, as a subcomponent of the Atmospheric Environment VC, have been selected because the change in GHGs are of scientific and regulatory concern. GHGs absorb and re-emit infrared radiation from the planetary surface, thereby introducing the potential effect of warming the lower levels of the atmosphere and acting as a thermal blanket for the planet. Globally, GHGs are emitted from numerous natural and human sources and the increased atmospheric concentrations have been associated with climate change (Intergovernmental Panel on Climate Change [IPCC] 2007). Although the science of climate change has not been advanced to the point where a clear cause-and-effect relationship can be established between project-specific emissions and subtle changes to global climate, GHG assessments determine the effect on facility-level and jurisdictional inventories.

The primary pathway for air contaminants to reach human and ecological receptors is via airborne dispersion and deposition during Project activities. As a result, the key objective of the air quality assessment is to provide predicted ambient concentrations and depositions due to Project emissions for the following VCs of the EIS:

- Surface Water (Chapter 9) - Project emissions and the deposition of these emissions may affect water quality of surrounding lakes and streams.
- Fish and Fish Habitat (Chapter 10) - Project emissions and the deposition of these emissions may affect water quality of surrounding lakes and streams and changes in water quality may affect the availability and suitability of fish habitat and affect the growth, survival and health of fish.
- Vegetation and Wetlands (Chapter 11) - Project fugitive dust emissions and the deposition of these emissions on surrounding native plant communities may affect plant species diversity, community diversity and wetland functions.
- Wildlife and Wildlife Habitat (Chapter 12) - Project emissions and the associated ambient concentrations and deposition of these emissions may increase the exposure of wildlife to air

contaminants and affect wildlife health. The deposition of Project emissions to soil may affect soil quality which may, in turn, alter soil-related exposures for wildlife receptors.

- Human Health (Chapter 18) - Project emissions and the associated ambient concentrations may increase the exposure of humans to air contaminants that may affect human health. The deposition of Project emissions to soil may affect soil quality which may, in turn, alter soil-related exposures for human receptors.

6.1 SCOPE OF ASSESSMENT

An air quality assessment was conducted to determine potential residual and cumulative changes to ambient air quality. The Final EIS Guidelines (Appendix 4A) for the Lynn Lake Gold Project identify the Project components and residual effects to be included in the air quality assessment.

The air quality assessment estimates air emissions from the planned Project activities and uses an atmospheric dispersion model to predict the potential changes in ambient air quality associated with Project emissions (Section 6.2.1.1). The air quality assessment considers substances for which there are applicable air quality objectives and standards adopted by either or both Manitoba Conservation and Climate (MCC) and Environment and Climate Change Canada (ECCC). The predicted effects are assessed relative to these criteria, presented in Section 6.1.1.

The air quality assessment considers the following substances:

- Nitrogen dioxide (NO_2)
- Carbon monoxide (CO)
- Sulphur dioxide (SO_2)
- Hydrogen Cyanide (HCN)
- Total suspended particulate (TSP) matter with an aerodynamic diameter less than 30 µm
- Respirable particulate matter (PM_{10}) with an aerodynamic diameter less than 10 µm
- Fine particulate matter ($PM_{2.5}$) with an aerodynamic diameter less than 2.5 µm
- Total particulate deposition (dustfall)
- Metals (arsenic, cadmium, copper, lead, nickel, zinc).

Also considered in the air quality assessment are diesel particulate matter (DPM), individual volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and a broader spectrum of metal species (seven metal species associated with diesel exhaust and eighteen metal species contained in ore, mine rock, overburden and tailings). Emissions of VOCs and PAHs from the Project are associated entirely with diesel exhaust. Predicted ambient concentrations of these substances due to the Project were used for the human health assessment (Chapter 18).

The GHG assessment considers emissions of GHGs expressed in the form of tonnes of carbon dioxide equivalent (CO_{2e}) and compares them to provincial and national emission totals. The GHG assessment includes the known GHG substances that are emitted by the Project. These are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O).

Greenhouse gases also include perfluorocarbons (PFC), hydrofluorocarbons (HFC), and sulphur hexafluoride (SF_6). These man-made GHGs are usually found in primary aluminum production, production of HCFC-22 (chlorodifluoromethane, produced as a substitute for chlorofluorohydrocarbons (CFCs) for air conditioning, refrigeration, foam and aerosol applications) and electrical equipment manufacturing, respectively, and are often referred to as the "F-gases." The Project is not generating these F-gases and therefore they are not expected to be released in substantial amounts or at all. As a result, the F-gases are not included in the GHG assessment.

6.1.1 Regulatory and Policy Setting

6.1.1.1 Air Quality

The air quality assessment was undertaken following the draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation [now MCC] 2006). The primary substances considered in the air quality assessment (NO_2, CO, SO_2, TSP, PM_{10}, $PM_{2.5}$ and lead) are defined as criteria air contaminants (CACs) because there are objectives, standards, or criteria governing their concentration in ambient air.

The applicable regulatory criteria for this assessment include the Manitoba Ambient Air Quality Criteria (AAQC; Manitoba Sustainable Development [MSD; now MCC] 2005), Ontario's Ambient Air Quality Criteria (MOECC 2012) in the absence of Manitoba AAQC for specific substances of interest, and the Canadian Ambient Air Quality Standards (CAAQS; CCME 2017). These are provided in Table 6-1. The Manitoba AAQC include two concentration levels: Maximum Acceptable Level Concentrations and Maximum Desirable Level Concentrations. The more stringent Maximum Desirable Levels are used in the air quality assessment. In the absence of specific Manitoba AAQC for dustfall, the Ontario 30-day and annual average AAQC were used. There are no Manitoba AAQC for VOCs, PAHs, and metals other than the six metal species included in the air quality assessment. Therefore, predicted ambient concentrations of VOCs, PAHs, and metals due to the Project were evaluated through the human health assessment (Chapter 18).

The CAAQS were developed as part of the Air Quality Management System (CCME 2012a) with the objective of driving continuous improvement of air quality in Canada. The Canadian Council of Ministers of the Environment (CCME) describes the process for selecting monitoring stations, measuring pollutant concentrations, and determining achievement of the CAAQS (CCME 2019; CCME 2012b). Determining achievement of the CAAQS is based upon the measured air quality concentrations at community monitoring stations with comparison to the CAAQS and assigning air quality status to one of four management levels (CCME 2019; CCME 2012b). The four air quality management levels require progressively more rigorous actions by jurisdictions as air quality approaches or exceeds the CAAQS, thereby allowing proactive management actions to be undertaken to reduce emissions and avoid exceedances of the CAAQS (CCME 2019).

The CCME guidance on determining achievement of the CAAQS (CCME 2019) states that:

> "*CAAQS were not developed as facility level regulatory standards. Rather, they are used by provinces and territories to guide air zone management actions intended to reduce ambient concentrations below the CAAQS and prevent CAAQS exceedances.*"

In this context, predicted ambient concentrations due to the Project are compared to the CAAQS for information purposes and do not imply compliance with the AAQC at the "Project Boundary" (Section 6.1.4).

Table 6-1 Applicable Regulatory Criteria for the Air Quality Assessment

Substance	Averaging Period	Manitoba Ambient Air Quality Criteria [a] (µg/m³)		Ontario Ambient Air Quality Criteria [b] (µg/m³)	Canadian Ambient Air Quality Standards [c] (µg/m³)
		Maximum Acceptable Level Concentration	Maximum Desirable Level Concentration		
Gaseous CACs					
NO_2	1-hour	**400**	—	400	**79 (42 ppb)** [d]
	24-hour	**200**	—	200	—
	Annual	100	**60**	—	**23 (12 ppb)** [e]
CO	1-hour	35,000	**15,000**	36,200	—
	8-hour	15,000	**6,000**	15,700	—
SO_2	1-hour	900	**450**	690	**170 (65 ppb)** [f]
	24-hour	300	**150**	275	—
	Annual	60	**30**	55	**10 (4.0 ppb)** [g]
Other Gaseous Species					
HCN	1-hour	**40**	—	—	—
	24-hour	—	—	**8**	—
	Annual	**3**	—	—	—
Particulate Matter (PM) CACs					
TSP	24-hour	**120**	—	120	—
	Annual	70 [h]	**60** [h]	60 [h]	—
PM_{10}	24-hour	**50**	—	50	—
$PM_{2.5}$	24-hour	30	—	30	**27** [i]
	Annual	—	—	—	**8.8** [j]
Dustfall	30-day	—	—	**7 g/m²**	—
	Annual	—	—	**4.6 g/m²** [h]	—

Table 6-1 Applicable Regulatory Criteria for the Air Quality Assessment

Substance	Averaging Period	Manitoba Ambient Air Quality Criteria [a] (µg/m³)		Ontario Ambient Air Quality Criteria [b] (µg/m³)	Canadian Ambient Air Quality Standards [c] (µg/m³)
		Maximum Acceptable Level Concentration	Maximum Desirable Level Concentration		
Metals					
Arsenic	24-hour	**0.3**	—	0.3	—
Cadmium	24-hour	**2**	—	0.025	—
	Annual	—	—	0.005	—
Copper	24-hour	**50**	—	50	—
Lead	24-hour	**2**	—	0.5	—
	30-day	**0.7**	—	0.2	—
Nickel	24-hour	**2**	—	0.2	—
	Annual	—	—	0.04	—
Zinc	24-hour	**120**	—	120	—

NOTES:
[a] Manitoba Ambient Air Quality Criteria (MSD 2005)
[b] Ontario Ambient Air Quality Criteria (MOECC 2012)
[c] Canadian Ambient Air Quality Standards (CCME 2017)
[d] The 1-hour CAAQS for NO_2 is referenced to the three-year average of the annual 98th percentile of the NO_2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).
[e] The annual CAAQS for NO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average NO_2 concentrations (effective 2025) (CCME 2017).
[f] The 1-hour CAAQS for SO_2 is referenced to the three-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).
[g] The annual CAAQS for SO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average SO_2 concentrations (effective 2025) (CCME 2017).
[h] Annual geometric mean
[i] The CAAQS for 24-hour $PM_{2.5}$ is referenced to the annual 98th percentile of daily 24-hour average concentrations, averaged over three years (effective 2020) (CCME 2017).
[j] The CAAQS for annual $PM_{2.5}$ is referenced to the three-year mean of annual average concentrations (effective 2020) (CCME 2017).
"—" Not available
Values in **BOLD** text represent the AAQC that are proposed for the environmental assessment

6.1.1.2 Greenhouse Gases

The management of GHG emissions takes place on provincial, national, and international scales, however, the existing Acts and Accords are primarily related to operational emissions above a threshold, or are related to emission reductions on a provincial and federal scale as outlined below:

- Manitoba has a Draft Regulatory Framework for a Made-in-Manitoba Output-based Pricing System that would not apply to Project construction and would only apply to industrial facilities with emissions equal to or greater than 50,000 tonnes of CO_{2e} (t CO_{2e})/year (MCGP 2017). This system would apply carbon pricing to that portion of a facility's emissions that exceed a designated emissions-intensity performance standard for that type of facility.

- The June 2019 Report from the Expert Advisory Council to the Minister of Sustainable Development, established under Section 7 of *The Climate and Green Plan Act* has recommended that Manitoba set a GHG reduction goal of no less than 1 million tonnes (Mt) of CO_{2e} cumulative emissions reductions for the province's first five-year carbon savings account period of 2018-2022 (MEAC 2019).
- Under the authority of the *Canadian Environmental Protection Act* (CEPA 1999), the GHG Emission Reporting Program requires operators of facilities to report their annual GHG emissions to ECCC if their emissions are above 10,000 t CO_{2e} per year (ECCC 2019a).
- Canada committed to a 17% reduction of national GHG emissions below the 2005 level by 2020. This commitment was made in the *Copenhagen Accord*, which was "taken note of" by participating countries during the Conference of the Parties (COP) 15 in Copenhagen in 2009 (UNFCCC 2009).
- Canada committed to a 30% reduction of national GHG emissions below the 2005 level by 2030. This commitment was made in the *Paris Agreement* during the COP21 in Paris in 2015 (UNFCCC 2015).
- Federal pollution pricing system is implemented in Manitoba under the *Greenhouse Gas Pollution Pricin*g Act by which a fuel charges are applied to fossil fuels (Government of Canada, 2020).

6.1.2 The Influence of Engagement on the Assessment

Engagement has been ongoing prior to and throughout the EIS process, and will continue with local Indigenous communities, stakeholders, the public, and government agencies through the life of the Project. More detail on the Engagement process can be found in Chapter 3.

Engagement feedback related to the atmospheric environment has been addressed through direct responses, updates to baseline information, and in the Final EIS, as appropriate. Key feedback that influenced the atmospheric environment effects assessment is provided below.

6.1.2.1 Indigenous Engagement

As part of the information sharing throughout the engagement process, Project-related information was provided by Indigenous communities in the form of traditional land and resource use (TLRU) studies and other forms of information sharing.

A Project-specific TLRU study was completed collaboratively with Marcel Colomb First Nation with a final report provided to the community on January 11, 2018 (Stantec 2018b). The TLRU study included interviews with participants selected by Marcel Colomb First Nation regarding traditional land use in the Project area, including availability of traditional resources, access to traditional resources or areas, occupancy, cultural sites and areas, and experience of TLRU.

A Project-specific TLRU study was completed in collaboration with Peter Ballantyne Cree Nation but has not yet been released by community leadership for use in the environmental assessment. The TLRU study included interviews with community members in Kinoosao, Saskatchewan.

A TLRU study (Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study for the Lynn Lake Gold Mine Project) was completed by an independent consultant for the Manitoba Metis Federation (SVS 2020), the results of which were received in February 2020. The study documents harvesting and land use by the Manitoba Métis Community within a 100 km radius of the Project.

The Marcel Colomb First Nation TLRU study (Stantec 2018b) indicates that several Marcel Colomb First Nation members (interviewees referred to as MC1, MC5, MC6 and MC7) have expressed concerns about potential contamination from the Project that can affect air and water quality and harm plants, animals and fish:

> *"MC1 stated that environmental damage had been done by mines in the past. MC5 is concerned about contamination from the mines and that it will spoil the medicines and harm plants, animals, water, and fish. MC5 mentioned that mine pollution contaminates the air and water and is worried about eating anything from the land or even melting snow to make water because it is contaminated from the mine. Both MC6 and MC7 have concerns about contamination from developments in the area. Construction and operation of developments such as the mines and railways are of concern because of the potential for contamination. They stated that water contamination is their biggest worry; however, air quality also concerns them."*

During a meeting with the Land, Environment & Resources Department of Nisichawayasihk Cree Nation in December 2019, Nisichawayasihk Cree Nation representatives expressed concerns related to climate change and Canada's commitment to reduce CO_{2e} amounts to the atmosphere, dust generated by the Project within the Nisichawayasihk Cree Nation's Resources Management Area (RMA), increased traffic on Provincial Road (PR) 391 resulting in further deterioration of main access roads, air and water quality, potential release of hazardous materials into the environment resulting from transportation of dangerous goods through Nisichawayasihk Cree Nation's RMA, human health and employment and training opportunities.

A community meeting was held in Nelson House on February 3, 2020 for members of the local community including Nisichawayasihk Cree Nation (Chapter 3). The meeting included the presentation of information with respect to the Project and the EIS, followed by open dialogue for questions and answers.

Some of the concerns raised by participants included potential adverse effects associated with vehicle traffic on PR 391 from Thompson to Lynn Lake through the traditional territory of Nisichawayasihk Cree Nation, potential effects to air and noise, water and fish, wildlife and plants, socio-economics, health, heritage and traditional land use.

The Project will result in a marginal increase of truck traffic (maximum of 142 trucks per month or less than 5 trucks per day) along PR 391 from Thompson to Lynn Lake for the delivery of mine consumables such as fuel, explosives, grinding media and reagents. Nelson House is located 80 km west of Thompson and approximately 10 km south of PR 391. Due to the small increase in truck traffic on PR 391 compared to baseline traffic and the distance of Nelson House from PR 391, the Project residual effects on air quality at Nelson House are expected to be negligible and are therefore, not addressed in this chapter.

Indigenous receptor locations were incorporated into the atmospheric environment, acoustic environment, human health and Indigenous peoples assessments (Chapters 6, 7, 18 and 19, respectively). The selection of these receptors was informed by Alamo's engagement with Indigenous communities and publicly available sources of traditional land use information. Due to the length of time required to conduct air quality modeling, Indigenous receptors were selected early in the assessment process and represent potential receptor locations rather than individual use sites. This information informed and aligned with the potential Project interactions considered in this chapter.

6.1.2.2 Public Engagement

Four open house public meetings have been held to date in Lynn Lake (in 2015, 2016, 2017 and 2020) for members of the local community including Marcel Colomb First Nation (Chapter 3). Open house attendees were invited to complete questionnaires to provide feedback on the Project, as well as identify issues, concerns or inquiries related to the Project. No questions, comments or concerns identified on the questionnaires completed at the 2015, 2016, 2017 and 2020 open houses pertained to the atmospheric environment.

At the open houses, the questionnaires asked respondents to use a scale from 1 (not important) to 5 (very important) to rate the importance of studying various topics as part of the environmental assessment. For the questionnaires completed in 2016, air quality was rated 'very important' in the opinions of 73% of respondents. Further, 65% of the respondents from the 2017 questionnaire rated air quality as 'very important'.

6.1.2.3 Regulatory Engagement

Prior to conducting the dispersion modelling assessment that is central to the air quality assessment, an air quality dispersion modelling plan was prepared for review by MCC (Stantec 2017a). Following submission, feedback was provided by MCC and incorporated in the EIS. The plan was also provided to ECCC for review. In 2019, after minor changes to the layout of Project infrastructure and the corresponding letter to the Canadian Environmental Assessment Agency (now the Impact Assessment Agency of Canada [IAAC]; Stantec 2018a), the dispersion modelling plan was resubmitted for review and confirmation by MCC and ECCC. Following resubmission, additional feedback was provided by MCC and ECCC and incorporated in the air quality assessment. The specific comments from MCC and ECCC from the 2017 and 2019 reviews are summarized as follows:

Manitoba Conservation and Climate (2017 and 2019)

- Rationale for considering the listed six metals as potential pollutants. The dispersion model should consider other metals such as manganese, magnesium, mercury, aluminum, chromium.
- The air quality assessment should consider any potential air pollutant such as hydrogen cyanide from the gold extraction process.

- The air quality assessment should consider VOC emissions from diesel combustion (stationary and mobile equipment) and diesel storage area.
- The GHG emissions of the Project should be included in the report.
- Describe the rationale for selecting CALPUFF®.
- Compare the modelled mesoscale meteorological data using Weather Research and Forecasting (WRF) model with any nearby observational data before input to CALMET® meteorological model.
- Upper air data might be available at The Pas, Manitoba, which is approximately 300 km south of Lynn Lake. Consider this data to validate the meteorological data.
- In the absence of representative air quality data in Manitoba, the MCC Air Quality Section suggested to use air quality data outside of the province that is comparable with Lynn Lake (example, remote location and has similar meteorological and topographical conditions).

Environment and Climate Change Canada (2019)

- Proposed Ambient Air Quality Criteria: ECCC requested that predicted ambient concentrations around the Project be compared to the most stringent standard available. The CAAQS for nitrogen dioxide were introduced in December 2017 and are more stringent than the Manitoba AAQC. ECCC requested Alamos Gold Inc. (Alamos) compare predicted NO_2 concentrations to the 2025 CAAQS at the 1-hour (42 ppb) and annual (12 ppb) timeframes. Since the Project is expected to be in operation beyond 2025, ECCC requested that the 2025 SO_2 standards be used, 65 pb (1-hour) and 4 ppb (annual).
- Additional Emission Sources: ECCC requested that additional emission sources, including light duty vehicles on haul roads and access roads, as well as incinerators (if any), be included in the model.
- Modelling Scenarios: ECCC requested that Alamos include a base case in modelling, and that its predicted concentrations be compared to the Project and Application cases.
- Construction Emissions: Construction emissions were not included as a model scenario as the associated emissions were stated to be substantially lower than operational emissions. ECCC requested that emissions from construction be quantified and compared to Project emissions to demonstrate that construction emissions do not need to be modeled.

The MCC and ECCC approved the air quality dispersion modelling plan on August 13, 2019 (MSD 2019a; ECCC 2019a). The comments and recommendations made by MCC and ECCC were incorporated in the air quality assessment.

6.1.3 Potential Effects, Pathways and Measurable Parameters

6.1.3.1 Air Quality

Project construction and operation will result in the release of CACs that will change ambient air quality. The air quality assessment focuses on Project operation because the operation phase has the greatest potential for adverse effects to air quality. The estimated air emissions, including dust, associated with Project construction are less than the emissions from the worst-case year of operation.

The potential effect addressed in the air quality assessment is the "change in ambient air quality" due to Project emissions. Measurable parameters facilitate qualitative or quantitative measurement of Project effects and provide a means to evaluate the change to a VC. The measurable parameters for the air quality assessment are provided in Table 6-2.

6.1.3.2 Greenhouse Gases

The Project will result in the release of GHGs to the atmosphere. The key potential effect addressed in the atmospheric environment assessment is the "change in atmospheric greenhouse gases" due to Project emissions during construction and operation. Measurable parameters facilitate qualitative or quantitative measurement of Project effects and provide a means to evaluate the change to a VC. The measurable parameters for the GHG assessment are provided in Table 6-2.

Table 6-2 Potential Effects, Effects Pathways and Measurable Parameters for Atmospheric Environment

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in air quality	Atmospheric dispersion of air emissions from Project equipment and activities during operation	Ambient concentrations of gaseous CACs (NO_2, CO and SO_2) and HCN in µg/m³ Ambient concentrations of particulate CAC (TSP, PM_{10} and $PM_{2.5}$) in µg/m³ and deposition of total particulate (i.e., dustfall) in g/m³/30-day Ambient concentrations of metals (arsenic, cadmium, copper, lead, nickel, and zinc) in µg/m³
Change in atmospheric greenhouse gases	GHG emissions from Project equipment and activities during construction and operation	GHG emissions (CO_2, CH_4, and N_2O) in tonnes of CO_2 equivalent per year (tCO_{2e})

6.1.4 Boundaries

6.1.4.1 Spatial Boundaries

Air Quality

PDA

The Project Development Area (PDA) encompasses the immediate area in which Project activities and components may occur plus a 30 m buffer and is the anticipated area of direct physical disturbance associated with construction and operation of the Project (i.e., the Project footprint). The PDA includes the access roads, the open pits, mine rock storage areas, overburden stockpiles, and ore stockpiles at the Gordon and MacLellan sites; and the Tailings Management Facility (TMF) and ore milling and processing plant at the MacLellan site. The PDA does not include PR 391 that connects the Gordon and MacLellan sites because PR 391 is an existing public road that is not part of the Project footprint; however, PR 391 is included in the LAA/RAA described below. Truck traffic associated with ore haulage from the Gordon site to the ore milling and processing plant at the MacLellan site will generate emissions. The extent of the PDA at the Gordon and MacLellan sites is shown on Map 6-1.

LAA and RAA

The Local Assessment Area (LAA) and Regional Assessment Area (RAA) for air quality were established to comply with provincial regulatory requirements and to capture air quality effects of the specific components being assessed. The LAA is the maximum area where Project-specific environmental effects on air quality can be predicted or measured with a reasonable degree of accuracy and confidence. The LAA is inclusive of the PDA. The RAA represents the area within which cumulative effects on air quality are likely to occur, depending on the location of other past, present, or reasonably foreseeable future projects or activities.

Both the LAA and RAA are defined as a 50 km by 28 km area that is centered on the Project and includes both the Gordon and MacLellan sites. This modelling domain is large enough to predict ground-level concentrations for comparison with the relevant regulatory criteria for ambient air quality. The LAA and RAA are consistent with regulatory recommendations in the draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation 2006). This modelling domain is used for both the LAA and RAA and is the area over which dispersion modelling was completed and the area over which graphical results of the air quality modelling are presented. Map 6-1 shows the LAA/RAA for air quality.

Project Boundary

The air quality assessment focuses on areas that are located outside industrial facility boundaries. A facility boundary is a “fence line” that indicates the region where public access is restricted. AAQC are only applied to areas where there is public access (i.e., on and beyond the facility boundary). Setting the facility boundary for a mine is less straightforward than for a fenced facility such as a pulp mill. In the instance of a fenced mill, the facility’s physical fence line defines where public access is restricted. Mines are not generally fenced; however, public access is often discouraged or prohibited due to safety concerns.

For the air quality assessment, a "Project Boundary" was used to better represent the potential for public exposure and compliance with air quality criteria. The Project Boundary is defined as an outline around the PDA at the Gordon and MacLellan sites with a buffer of 300 m. The Project Boundary also includes PR 391 with a 300 m buffer on each side of the road. The selected Project Boundary agrees with the Manitoba Hunting Guide (MSD 2019b), which prohibits hunting within 300 m of a quarry or mineral mine. Local residents will be notified of the prohibited zone; therefore, instances of members of the public being located within the hunting prohibited zone are expected to be infrequent and brief. The extent of the Project Boundary used in the air quality assessment is shown on Map 6-1.

Air quality within the Project Boundary, for the workplace, is managed through the Manitoba *Operation of Mines Regulation* under *The Workplace Health and Safety Act* and the Occupational Exposure Limits for Airborne Hazardous Substances (Manitoba Department of Finance 2020). The ambient air quality standards for the public (i.e., outside the Project Boundary) are different than the occupational air quality standards (i.e., inside the Project Boundary). This chapter focuses on ambient air quality. The human health assessment (Chapter 18) focuses on both ambient air quality and occupational air quality.

Greenhouse Gases

The three GHGs described above are long-lived in the atmosphere; these gases mix and disperse well as they move down wind; the environmental effects related to GHGs are global and thus the spatial boundary is the global area under the Earth's atmosphere. Section 6.5.1 evaluates the GHG emissions from the Project against the provincial and national GHG emissions targets.

6.1.4.2 Temporal Boundaries

Project Phases

The temporal boundaries for the Project consist of the following phases:

- Construction – two years (scheduled to be carried out concurrently from Year -2 to Year -1 at both sites).
- Operation – 13 years (scheduled to be carried out from Year 1 to Year 6 at the Gordon site and from Year 1 to Year 13 at the MacLellan site).
- Decommissioning/closure – five to six years of active closure (scheduled to begin in Year 6 at the Gordon site and in Year 14 at the MacLellan site). Active closure will be followed by post-closure, which is the time period during which active reclamation measures are complete, but monitoring is still required. The expected duration for post-closure is approximately 10 years. Pit filling is expected to take 11 years at the Gordon site and 21 years at the MacLellan site under average conditions (Chapter 9, Section 9.4.1). Permanent closure will occur when the site is stable, and monitoring is no longer required. For the atmospheric environment this would occur when site activities (e.g., use of heavy equipment and trucking) have ceased and the site has been largely revegetated or soils have otherwise been stabilized with little or no potential to generate a substantial amount of dust. The duration and

conditions for post-closure monitoring and permanent closure will be detailed in subsequent submissions of the Closure Plan to regulatory agencies as Project design and execution progresses.

Selected Worst-Case Years for Project Construction and Operation

The worst-case years for Project construction and operation were assessed for air quality with the understanding that the other years will have a lower level of potential residual effects on air quality. The worst-case years of construction and operation coincide with the peak construction and mining rate (i.e., ore, overburden, and mine rock), respectively, that will result in the highest emissions of air contaminants. The worst-case year of construction was selected based on the most overlapping construction activities, the largest number of construction equipment units and highest construction material movement. The worst-case year for operation was selected based on the highest mining rate (for ore and mine rock), largest number of mining equipment units and highest movement of overburden, mine rock and ore measured in tonnes. The 12-month period from Q2 Year -2 to Q1 Year -1 was determined as the worst-case year of construction for both the Gordon and MacLellan sites. Year 2 was determined to be the worst-case year of operation for the Gordon site and Year 7 the worst-case year of operation for the MacLellan site.

6.1.5 Residual Effects Characterization

The characterizations used to assess residual effects on air quality are provided in Table 6-3. The characterizations used to assess residual effects on GHGs are provided in Table 6-4.

Table 6-3 Definition of Terms Used to Characterize Residual Effects on Air Quality

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to air quality relative to baseline. **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to air quality relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible –** model predicted ambient air quality levels are less than 10% of baseline conditions and do not result in exceedances of the ambient air quality criteria. **Low –** model predicted ambient air quality levels are greater than 10% of baseline conditions, but less than 50% of the ambient air quality criteria. **Moderate –** model predicted ambient air quality levels are greater than 50% of the ambient air quality criteria, but the maximum air quality levels are less than the ambient air quality criteria **High –** model predicted ambient air quality levels are greater than the ambient air quality criteria
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA –** residual effects extend into the LAA

Table 6-3 Definition of Terms Used to Characterize Residual Effects on Air Quality

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Timing	Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.	**Not Applicable –** seasonal aspects or time of day are unlikely to affect air quality **Applicable –** seasonal aspects or time of day may affect air quality
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event –** a single occurrence of air emissions during Project construction, operation, or decommissioning **Multiple irregular event (no set schedule) –** short term upset emission events, or infrequent release of air emissions that occur sporadically or at irregular intervals **Multiple regular event –** release of air emissions during Project construction, operation or decommissioning that occurs multiple times and on a repetitive schedule **Continuous –** the release of air emissions occurs continuously during Project construction, operation, or decommissioning
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** residual effect restricted to no more than the duration of the construction phase **Medium-term –** residual effect extends through operation **Long-term –** residual effect extends beyond operation
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect for air quality is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect for air quality is unlikely to be reversed
Ecological and Socio-Economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activity **Disturbed –** area has been substantially previously disturbed by human development or human development is still present

Table 6-4 Definition of Terms Used to Characterize Residual Effects on Greenhouse Gases

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to the GHG emissions relative to baseline **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to the GHG emissions relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Low** - although a change is measurable, based on Agency guidance (CEA Agency 2003) and professional judgment, relatively small changes are expected in provincial and national GHG emissions **Moderate –** based on Agency guidance (CEA Agency 2003) and professional judgment, notable changes are expected in provincial and national GHG emissions; also referred to as "medium" **High –** based on Agency guidance (CEA Agency 2003) and professional judgment, material changes are expected in provincial and national GHG emissions
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA –** residual effects extend into the LAA
Timing	Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.	**Not Applicable –** seasonal aspects are unlikely to affect GHG emissions **Applicable –** seasonal aspects may affect GHG emissions
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event –** a single occurrence of GHG emissions during Project construction, operation, or decommissioning **Multiple irregular event (no set schedule) –** the release of GHG emissions occurs more than once but at an unpredictable interval of time **Multiple regular event –** a release of GHG emissions during Project construction, operation or decommissioning that occurs at regular intervals **Continuous –** the release of GHG emissions occurs continuously during Project construction, operation, or decommissioning
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** residual effect restricted to no more than the duration of the construction phase (2 years) **Medium-term –** residual effect extends through operation (5 years for the Gordon site and 13 years for the MacLellan site) **Long-term –** residual effect extends beyond operation (>5 years for the Gordon site and >13 years for the MacLellan site)

Table 6-4 Definition of Terms Used to Characterize Residual Effects on Greenhouse Gases

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed
Ecological and Socio-Economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activity **Disturbed –** area has been substantially previously disturbed by human development or human development is still present

6.1.6 Significance Definition

6.1.6.1 Air Quality

A significant residual adverse effect for air quality is one where the Project's air emissions degrade the quality of the ambient air such that the model predicted concentrations (combined with background) are likely to exceed applicable regulatory criteria for ambient air quality, and are of concern relative to the geographical extent of predicted exceedances, their frequency of occurrence and the presence of potentially susceptible receptors (e.g., humans, wildlife, vegetation, soils, or water bodies).

6.1.6.2 Greenhouse Gases

Provincial and federal policies and regulations do not identify specific thresholds or standards that could be used to determine significance when assessing the residual effects of the Project's GHG emissions. The contribution of Project GHG emissions will be compared to provincial and national GHG emission totals. The Canadian Environmental Assessment Agency guidance (CEA Agency 2003) recommends ranking Project emission contributions into low, moderate, or high as presented in the magnitude definition of Table 6-4.

The primary criterion used to assess Project-related changes in GHG emissions is magnitude. The significance of Project GHG emission totals will be determined at the provincial and national jurisdictional boundaries by comparing Project GHG emission totals to provincial and national GHG emission totals.

6.2 EXISTING CONDITIONS FOR ATMOSPHERIC ENVIRONMENT

Three distinct subcomponents characterize the atmospheric environment baseline conditions: i) climate and meteorology, ii) ambient air quality and iii) GHGs.

Physical attributes of the atmosphere that describe climate and meteorology (e.g., temperature, precipitation, humidity, winds, pressure, and solar radiation) are important because they govern the atmospheric dispersion of emissions and determine their ultimate disposition in the environment. Existing air quality is important because it is the context into which the Project's emissions are added (e.g., a near-pristine environment vs. an urbanized or industrialized airshed). Baseline conditions for GHGs are understood in the context of provincial and national emission totals and the Project's contribution to total GHG emissions.

6.2.1 Methods

6.2.1.1 Climate and Meteorology

Climate is defined as the weather conditions prevailing in an area in general or over a long time period and is described in terms of average and extreme weather conditions that occur over a 30-year period. These statistical summaries are referred to as Climate Normals. Climate Normals were obtained for the most recent 30-year period 1981 to 2010 from the Lynn Lake Airport climate station (ECCC 2019b) located approximately 7 km southwest of the Project. The climate data collected and analyzed at this station includes ambient air temperature and precipitation. Additional hourly wind data was obtained for 2015 to 2018 to provide a more refined understanding of local winds. Given the proximity of Lynn Lake Airport to the Project and the relatively uniform topographical and ground cover conditions, the meteorological conditions at the airport are expected to be representative of the LAA. The full assessment of climate and meteorology baseline conditions is presented in the Climate and Meteorology Baseline Technical Data Report (TDR) and associated Validation Report in Volume 4, Appendix C. Note that the Air Quality Technical Modelling Report (TMR) in Volume 5, Appendix A, Attachment D contains a detailed description of the CALMET® meteorological input files that drive the CALPUFF® dispersion model.

6.2.1.2 Air Quality

Existing ambient air quality was determined based on analysis of ambient air quality monitoring data from local monitoring of $PM_{2.5}$, PM_{10} and dustfall conducted during the air quality baseline field programs in 2015 and 2016 and from other more distant monitoring stations in Manitoba and the Northwest Territories for NO_2, SO_2 and CO, which were not measured during the field programs (Volume 4, Appendix A). The baseline ambient air concentrations used in other approved projects in Manitoba were also reviewed.

Local Baseline Monitoring Program

A local baseline ambient air quality monitoring program in 2015 and 2016 included data collection from two $PM_{2.5}$ and PM_{10} continuous monitoring stations and seven passive dustfall monitoring stations in the LAA. Details of the local monitoring program are provided in the Air Quality Baseline TDR and associated

Validation Report in Volume 4, Appendix A. The monitoring program was conducted during summer months to coincide with snow-free conditions when exposed surfaces will generate the highest concentrations of ambient particulate matter (PM). Ambient concentrations of $PM_{2.5}$ and PM_{10} were measured at the MacLellan site during summer 2015 and 2016, and at Black Sturgeon Reserve during fall 2015. The monitoring location at the MacLellan site was selected due to its proximity to the community of Lynn Lake. The Black Sturgeon Reserve was added to the monitoring program to provide baseline data for that community, which is closer to the Gordon site. The $PM_{2.5}$ and PM_{10} measurements at the MacLellan site were affected by forest fires in northern Manitoba and Saskatchewan in late June and early July 2015. Monitoring of $PM_{2.5}$ and PM_{10} at Black Sturgeon Reserve occurred in late September and early October 2015 and therefore, the measurements were not biased by the forest fires in summer. The monitoring at Black Sturgeon Reserve was not continued in 2016 as the data collected during 2015 was considered sufficient to establish a baseline.

Monthly dustfall amounts in milligrams per square decimeter per day ($mg/dm^2/day$) were measured at four sites in summer 2015 (the MacLellan site, Burge Lake, Lynn Lake and Farley Lake). To gain additional understanding of baseline conditions along PR 391, three dustfall monitoring stations were added in summer 2016 to the existing four: Cockeram Lake, Westdal Lake and Black Sturgeon Reserve Road. Map 6-2 shows the locations of the baseline ambient air quality monitoring stations.

During one sampling period in summer 2015 and one sampling period in summer 2016, dustfall samples were analyzed for metals (33 metal species) to determine baseline metal deposition values that were used in the human health assessment (Chapter 18).

In March 2016, three bulk snow samples were collected from the Gordon site and three bulk snow samples were collected from the MacLellan site. The locations of the snow collection sites are shown in Map 6-2. The snow samples were analyzed to determine baseline snow surface loading rates for total metals deposition.

Other Measurements

Local monitoring was complemented with ambient air quality data from other more distant monitoring locations in Manitoba and the Northwest Territories for NO_2, SO_2 and CO. The monitoring networks in Manitoba and the Northwest Territories are part of the National Air Pollution Surveillance program. Further details for the air quality monitoring at more distant locations are provided in the Air Quality Baseline TMR Volume 5, Appendix A.

MCC operates five continuous air quality monitoring stations in Manitoba: two stations in Winnipeg (Ellen Street and Scotia Street) and one station in each of Brandon, Thompson and Flin Flon (MSD 2019c). The stations are located more than 200 km away from the Project. Only the Thompson, Flin Flon and Ellen Street stations in Manitoba were selected for analysis. The Thompson and Flin Flon stations were selected because they are the closest monitoring stations to the Project, located approximately 230 km to the southeast and 240 km to the southwest of the Project, respectively. Both stations measure SO_2 but not NO_2 and CO. The Winnipeg Ellen Street station was selected because it measures SO_2, NO_2 and CO. The Thompson station is most affected by industrial emissions from the Vale's mining operations and nickel smelter (MSD 2016). Flin Flon is a mining city and copper and zinc mining by Hudson Bay Mining and

Smelting is the major source of industrial emissions (MSD 2016). However, the copper smelter shut down in June 2010, substantially reducing air emissions in the region (MSD 2016). The Winnipeg Ellen Street station in Winnipeg, is located approximately 800 km south of the Project. Winnipeg is the only Census Metropolitan Area in Manitoba with almost 60% of the provincial population (MSD 2016). The Winnipeg Ellen Street station is the most influenced by urban and traffic emissions.

The Northwest Territories Environment and Natural Resources (ENR) operates four continuous ambient air quality monitoring stations in Fort Smith, Inuvik, Norman Wells and Yellowknife (ENR 2019). Only the Fort Smith station was selected for analysis because it is the southmost station in the Northwest Territories, experiences similar meteorological conditions, and is in a similar remote location as the Project. Further details regarding the selected monitoring sites for baseline data are provided in the Air Quality TMR in Volume 5, Appendix A.

The Wanipigow Sand Extraction Project is in a remote area approximately 160 km northeast of Winnipeg and approximately 700 km southeast of the Project. The Wanipigow Sand Extraction project received its Environment Act Licence No. 3285 from MCC on May 16, 2019. The baseline concentrations from the Wanipigow Sand Extraction Project are largely based on monitoring data from the Winnipeg Ellen Street station except for SO_2 concentrations which are based on monitoring data from the Thompson station. The baseline ambient air concentrations used in that air quality assessment (AECOM 2018) were reviewed and compared with measured concentrations during the baseline monitoring program in 2015 and 2016 and with other historical measurements from Manitoba and the Northwest Territories.

6.2.1.3 Greenhouse Gases

Existing GHG emissions are characterized by summarizing provincial and national inventory totals (CEA Agency 2003). The 2017 data (most recently available) for the province and Canada were used (ECCC 2019c).

6.2.2 Overview

6.2.2.1 Climate and Meteorology

The Project lies in the Reindeer Lake Ecodistrict of the Boreal Shield Ecozone. The Boreal Shield Ecozone occupies central Manitoba north and east of Lake Winnipeg, and south of the Taiga Shield Ecozone. The Boreal Shield Ecozone is extensively forested while the Taiga Shield Ecozone forms the transition from the Boreal Shield Ecozone to the south to the treeless Southern Arctic Ecozone to the north (Smith et al. 1998).

The Reindeer Lake Ecodistrict lies within a warmer, more humid subdivision of the Boreal Shield Ecozone. It has a strong continental climate which is characterized by long, cold winters and short, cool summers. In the Reindeer Lake Ecodistrict summers are cool and short on average, however, warm days are quite common. Winters are long and cold. The mean annual temperature is about -3.1°C, the average growing season is 136 days, and the number of growing degree-days is 970 (Smith et al. 1998).

Mean annual precipitation in the Reindeer Lake Ecodistrict is about 480 mm, of which more than one-third falls as snow. Precipitation varies greatly from year to year and is highest during late spring through early summer. The average yearly moisture deficit (i.e., the difference between evaporation and precipitation) is nearly 60 mm (Smith et al. 1998).

The climate baseline assessment for the LAA is based on the 30-year Climate Normals data (1981 to 2010) from the Lynn Lake Airport climate station. The average and extreme monthly summaries of ambient temperature and precipitation are presented in Table 6-5.

The mean annual temperature for the 30-year interval is -3.2°C. The coldest monthly average temperature is -24°C (January) and the highest monthly average temperature is 16°C (July). The total annual precipitation is 478 mm, with 318 mm falling as rain, and the remainder as snow. July is the wettest month (85 mm, as rain), while February is the driest month (16 mm, nearly all as snow). The total average snowfall is 208 cm, with the highest snowfall occurring in November (36 cm).

Hourly wind speed and direction data from Lynn Lake airport for 2015 to 2018 were also analyzed. These data are summarized in Table 6-6 and Figure 6A-1 in Appendix 6A. Table 6-6 shows that the annual average wind speed is 3.7 m/s (13 kph) with little variation in monthly average winds over the year. The maximum hourly wind speed (13.9 m/s or 50 kph) was observed in June. Monthly average wind speeds are lowest in December and hourly maximum wind speeds are lowest in August. Winds are generally from the northwest in colder months, and easterly in the warmer months.

Figure 6A-1 in Appendix 6A illustrates annual wind speed and wind direction statistics for Lynn Lake Airport (2015-2018) in wind rose and wind frequency distribution diagram format. The wind rose illustrates that winds generally prevail from the northwest quadrant with the most frequent and strongest winds (>6 m/s or 22 kph) originating from that direction. Easterly and southerly winds are also predominant. Southwesterly and northeasterly winds are less predominant and generally less frequently strong. Winds are between 2 m/s and 4 m/s (7 kph and 14 kph) for 41% of the time. Calm winds (<1 m/s or 3.6 kph) are not recorded at Lynn Lake Airport station (i.e., only winds above 1 m/s are recorded at the Lynn Lake Airport station).

6.2.2.2 Air Quality

Local Baseline Monitoring Program

The local baseline ambient air monitoring program was conducted in 2015 and 2016 and measured concentrations of $PM_{2.5}$ and PM_{10} and dustfall. The monitoring program was conducted during summer months when exposed surfaces generate the highest concentrations of particulate matter. During the first months of the monitoring program in 2015 (late June and early July), air emissions from forest fires in northern Saskatchewan and Manitoba influenced the PM readings and the measurements of dustfall. Therefore, baseline levels for PM and dustfall were derived based only on the 2016 measurements. This section summarizes the results from the baseline ambient air quality monitoring program in 2015 and 2016.

Table 6-5 Baseline Climate Data Summary based on Lynn Lake Airport Climate Normals (1981-2010)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Monthly Average Max Temperature (°C)	-19	-14	-6.2	3.2	12	19	22	20	12	3.1	-8.4	-17	2.3
Monthly Average Temperature (°C)	-24	-20	-13	-3.1	5.6	13	16	15	7.7	-0.6	-13	-21	-3.2
Monthly Average Min Temperature (°C)	-29	-26	-20	-9.4	-0.8	6.6	10	9.0	3.0	-4.2	-17	-26	-8.6
Average Total Precipitation (mm)	20	16	20	24	37	62	85	69	61	38	27	19	478
Average Total Rainfall (mm)	0.2	0.1	1.4	4.5	27	61	85	69	57	12	0.8	0.1	318
Average Total Snowfall (cm)	28	24	25	24	10	1.3	0.1	0.1	3.5	31	36	26	208
Average of Snow on Ground (cm)	34	37	33	14	1.0	0	0	0	0	3.0	17	26	14
Source: Historical Climate Data (ECCC 2019b)													

Table 6-6 Monthly Average Wind Speed and Direction at Lynn Lake Airport (2015-2018)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Maximum Wind Speed (m/s)	12.8	13.3	14.4	11.4	11.9	13.9	12.8	9.7	12.8	11.9	12.8	10.3	14.4
Average Wind Speed (m/s)	3.6	3.9	3.9	3.8	4.1	4.1	3.6	3.5	3.5	3.8	3.3	3.1	3.7
Average Wind Direction	NW	WNW	WNW	S & N	E & N	E	E & W	W	NW & W	N & NW	W	WNW & NW	WNW
Source: Historical Climate Data (ECCC 2019b)													

$PM_{2.5}$ Concentrations

The 24-hour $PM_{2.5}$ measurements at the MacLellan site and Black Sturgeon Reserve are summarized in Table 6-7. There were 67 complete days of $PM_{2.5}$ measurements (i.e., more than 18 hours in each 24-hour period) at the MacLellan site out of 113 total monitoring days in 2015, and 105 complete days out of 114

total monitoring days in 2016. The average and maximum $PM_{2.5}$ concentrations for the 67 complete days in 2015 are 11.4 and 99.4 µg/m³, respectively. The average and maximum $PM_{2.5}$ concentrations for the 105 complete days in 2016 are 2.9 and 10.5 µg/m³, respectively. There are 17 complete days of $PM_{2.5}$

measurements at Black Sturgeon Reserve out of 19 total monitoring days in 2015; the average and maximum $PM_{2.5}$ concentrations for these 17 days are 0.5 and 2.3 µg/m³, respectively.

An analysis of the results indicates that the maximum measured $PM_{2.5}$ concentrations at the MacLellan site during 2015 are greater than the CAAQS of 27 µg/m³. The maximum $PM_{2.5}$ concentrations recorded in 2015 occurred in July when the measurements were influenced by the forest fires in northern Manitoba and Saskatchewan. Average $PM_{2.5}$ concentrations measured during 2016 tend to be in the 2 to 5 µg/m³ range. The maximum measured values in 2016 are less than the CAAQS of 27 µg/m³. The average $PM_{2.5}$ concentration at the MacLellan site for the 105 complete days in 2016 (2.9 µg/m³) was selected as a representative baseline $PM_{2.5}$ concentration in the LAA.

PM_{10} Concentrations

The 24-hour PM_{10} measurements at the MacLellan site and Black Sturgeon Reserve are summarized in Table 6-7. There were 56 complete days of PM_{10} measurements (i.e., more than 18 hours in each 24-hour period) at the MacLellan site out of 113 total monitoring days in 2015, and 59 complete days out of 114 total monitoring days in 2016. The average and maximum PM_{10} concentrations for the 56 complete days in 2015 are 15.8 and 103.2 µg/m³, respectively. The average and maximum PM_{10} concentrations for the 59 complete days in 2016 are 4.6 and 11.6 µg/m³, respectively. There are 17 complete days of PM_{10} measurements at Black Sturgeon Reserve out of 19 total monitoring days in 2015; the average and maximum PM_{10} concentrations for these 17 days are 0.8 and 3.1 µg/m³, respectively.

The results indicate that the maximum measured PM_{10} concentrations at the MacLellan site during 2015 are greater than Manitoba AAQC of 50 µg/m³. The maximum PM_{10} concentrations recorded in 2015 occurred during July, when the measurements were influenced by the forest fires in northern Manitoba and Saskatchewan. Average PM_{10} concentrations measured during 2016 tend to be in the 3 to 10 µg/m³ range. The maximum measured values in 2016 are less than Manitoba AAQC of 50 µg/m³. The average PM_{10} concentration at the MacLellan site for the 59 complete days in 2016 (4.6 µg/m³) was selected as a representative baseline PM_{10} concentration in the LAA.

Table 6-7 Summary of 24-hour Average $PM_{2.5}$ and PM_{10} Concentrations Measured during the Baseline Program 2015-2016

Year	Parameter	MacLellan Site				Black Sturgeon Reserve			
		Days [a]	Maximum [a] (µg/m³)	Mean [a] (µg/m³)	Median [a] (µg/m³)	Days [a]	Maximum (µg/m³)	Mean (µg/m³)	Median (µg/m³)
2015 [b]	$PM_{2.5}$	67	99.4	11.4	4.1	17	2.3	0.5	0.3
	PM_{10}	56	103.2	15.8	7.1	17	3.1	0.8	0.5
2016	$PM_{2.5}$	105	10.5	**2.9**	2.6	NA	NA	NA	NA
	PM_{10}	59	11.6	**4.6**	4.1	NA	NA	NA	NA

NOTES:
[a] Based on complete days with greater than 18 hours of monitoring data per day
[b] The 2015 measurements are affected by forest fires
NA – not available
Values in **BOLD** text represent the selected representative baseline ambient air concentrations for the LAA.

Dustfall

Three dustfall measurements were collected at each dustfall collection site in 2015 and in 2016; the first measurement for the period June to July, the second measurement for the period July to August and the third measurement for the period August to September.

Based on four dustfall collection sites in 2015 and three measurement periods, the average dustfall is 0.51 mg/dm²/day. The overall average and the individual measurements in 2015 are less than the AAQC of 7 g/m²/30-day (2.3 mg/dm²/day).

Based on seven dustfall collection sites in 2016 and three measurement periods, the average dustfall is 0.33 mg/dm²/day. The overall average and the individual measurements in 2016 are less than the AAQC of 7 g/m²/30-day (2.3 mg/dm²/day). The overall average dustfall measured at seven sites in 2016 (0.33 mg/dm²/day or 0.99 g/m²/30-day) was selected as a representative baseline dustfall in the LAA. The dustfall measurements in 2015 were not considered because they were influenced by regional forest fires.

Table 6-8 Summary of Dustfall Measured during the Baseline Program 2015-2016

Station	2015 Total Dustfall (mg/dm²/day)				2016 Total Dustfall (mg/dm²/day)			
	June-July	July-August	August-September	Mean	June-July	July-August	August-September	Mean
01 MacLellan Site	0.72	0.35	0.23	0.43	0.17	0.17	0.38	0.24
02 Lynn Lake	0.79	0.14	0.31	0.41	0.49	<0.10 [a]	0.29	0.29
03 Burge Lake	0.86	1.21	0.24	0.77	0.22	0.13	0.46	0.27
04 Farley Lake	0.94	0.19	0.14	0.42	0.57	0.11	0.26	0.31
06 Cockeram Lake	NA	NA	NA	NA	NA [b]	NA [c]	0.40	0.40

Table 6-8 Summary of Dustfall Measured during the Baseline Program 2015-2016

Station	2015 Total Dustfall (mg/dm²/day)				2016 Total Dustfall (mg/dm²/day)			
	June-July	July-August	August-September	Mean	June-July	July-August	August-September	Mean
07 Black Sturgeon Reserve Road	NA	NA	NA	NA	0.64	0.73	0.28	0.55
08 Westdal Lake	NA	NA	NA	NA	0.48	0.23	0.14	0.28
Mean Monthly Dustfall	0.83	0.47	0.23	0.51	0.43	0.25	0.32	**0.33**

NOTES:

[a] The July-August result for Lynn Lake was below the detection limit. For the purposes of calculating a conservative overall average, the measured value was assumed to be equal to the detection limit i.e., 0.10 mg/dm²/day.

[b] No data was collected at Cockeram Lake during the June-July period as the measurement unit fell over and hence did not collect valid data.

[c] The July-August value for Cockeram Lake was excluded from the results, as large insects contaminated the sample.

NA – not available

Value in **BOLD** text represents the selected representative baseline dustfall for the LAA.

Other Measurements

To provide a more robust definition of baseline ambient air quality conditions, the results from the baseline monitoring program were combined with ambient air monitoring data from three continuous monitoring stations in Manitoba (Winnipeg Ellen Street, Thompson and Flin Flon) and one continuous monitoring station in Northwest Territories (Fort Smith).

The baseline ambient concentrations used in the environmental assessment for the Wanipigow Sand Extraction Project (AECOM 2018) were reviewed and compared to the measurements from Manitoba and the Northwest Territories. The baseline concentrations from the Wanipigow Sand Extraction Project are largely based on 2017 monitoring data from the Winnipeg Ellen Street station except for SO_2 concentrations which are based on monitoring data from the Thompson station.

The 90th percentile of hourly measurements for the most recent year (2018) with a complete data record (at least 75% complete) was selected to represent the baseline air quality level for each substance of interest. The 90th percentile of measurements is considered adequate to account for uncertainties due the use of distant monitoring stations and the limited number of monitoring stations used for analysis. Baseline concentrations for averaging periods greater than one hour (8-hour, 24-hour, annual) were calculated from the hourly measurements after removing hourly values greater than the 90th percentile. Baseline concentrations based on monitoring data from Manitoba and Northwest Territories, and from the Wanipigow Sand Extraction Project are summarized and compared to the applicable AAQC in Table 6-9.

The baseline ambient air quality concentrations from the monitoring stations in Manitoba and Northwest Territories are less than the Manitoba AAQC. The baseline gaseous concentration levels based on the four monitoring stations and the Wanipigow Sand Extraction Project range from 1% to 18% of Manitoba AAQC with the highest percentages associated with measured NO_2 concentrations at Winnipeg Ellen Street station and the highest SO_2 concentrations measured at Thompson station (Wanipigow Sand Extraction Project). Baseline PM concentrations range from 33% to 73% of the most stringent AAQC with the highest percentages associated with measured PM concentrations at Thompson station and Winnipeg Ellen Street station.

The Fort Smith station measured the lowest ambient concentrations compared to measurements from monitoring stations in Manitoba, except for the SO_2 concentrations, which were lowest at Winnipeg Ellen Street station. The Thompson and Flin Flon monitoring stations are the most influenced by industrial emissions and the Winnipeg Ellen Street station is the most influenced by urban and traffic emissions. The baseline concentrations based on measurements from the Fort Smith station are considered the most representative for the LAA as the station is in a similarly remote area with low population density and with similar meteorological and topographical conditions.

Table 6-9 Baseline Concentrations Derived from Continuous Monitoring Stations in Manitoba and Northwest Territories

Substance	Averaging Period	Baseline Concentration (µg/m³)					Manitoba Ambient Air Quality Criteria (µg/m³) [c]
		Winnipeg Ellen Street[a]	Thompson[a]	Flin Flon[a]	Fort Smith [a]	Wanipigow Sand Extraction Project [b]	
NO_2	1-hour	28.8	NA	NA	**7.5**	29.3	400
	24-hour	25.2	NA	NA	**5.6**	29.3	200
	Annual	10.8	NA	NA	**1.9**	10.9	60
CO	1-hour	696 [d]	NA	NA	**406**	277	15,000
	8-hour	665 [d]	NA	NA	**406**	275	6,000
SO_2	1-hour	2.6	2.6	4.4	**6.0**	23.6 [e]	450
	24-hour	2.6	2.6	4.4	**6.0**	23.6 [e]	150
	Annual	0.36	0.71	2.1	**1.5**	1.81 [e]	30
PM_{10}	24-hour	21.4	29.4	20.3	19.0 [f]	25.6	50
$PM_{2.5}$	24-hour	11.8	13.5	8.8 [g]	12.0	11.7	27
	Annual	5.0	3.9	3.7 [g]	6.4	NA	8.8

NOTES:

[a] Baseline concentration based on monitoring data from 2018 unless noted otherwise and the 90th percentile of hourly measurements. Baseline concentrations for averaging periods greater than one hour (8-hour, 24-hour, annual) are calculated from the hourly measurements after removing values greater than the 90th percentile.

[b] Baseline concentrations from the Wanipigow Sand Extraction Project - Environmental Act Proposal Application (AECOM 2018). Baseline concentration based on monitoring data from Winnipeg Ellen Street station for 2017 unless noted otherwise and the 90th percentile of measured hourly concentrations.

[c] Manitoba Ambient Air Quality Criteria (MSD 2005) and Canadian Ambient Air Quality Standards (CAAQS) for $PM_{2.5}$

[d] Baseline concentration based on monitoring data from 2016 as the 2017 and 2018 data is less than 75% complete

[e] Baseline concentration based on 2017 monitoring data from Thompson station as the 2017 data from Winnipeg Ellen Street station is less than 75% complete

[f] Baseline concentration based on monitoring data from 2017 as the 2018 data is less than 75% complete

Table 6-9 Baseline Concentrations Derived from Continuous Monitoring Stations in Manitoba and Northwest Territories

Substance	Averaging Period	Baseline Concentration (µg/m³)					Manitoba Ambient Air Quality Criteria (µg/m³) [c]
		Winnipeg Ellen Street[a]	Thompson[a]	Flin Flon[a]	Fort Smith [a]	Wanipigow Sand Extraction Project [b]	

[g] Baseline concentration based on monitoring data from the year with the highest data completeness (2017, 62% complete) out of the three most recent years with data record (2016, 2017 and 2018) as the data completeness for all three years is less than 75%.

NA – not available

Value in **BOLD** text represents the selected representative baseline concentration for the LAA.

Summary of Baseline Ambient Air Quality Concentrations

The representative baseline ambient air concentrations selected for the Project are summarized in Table 6-10 and compared to the applicable AAQC. Baseline PM_{10} and $PM_{2.5}$ concentrations and dustfall were derived from the baseline ambient air quality monitoring program in 2016. Baseline TSP concentrations were estimated from the baseline PM_{10} concentration using a correlation proposed by Brooks et al. (1997) which suggests that ambient PM_{10} concentrations comprise approximately 44% of TSP. The 2015 and 2016 baseline monitoring programs did not measure ambient NO_2, SO_2 and CO concentrations because of the remote location of the Project and the absence of nearby industrial activities. Representative baseline concentrations of NO_2, CO, and SO_2 were based on analysis of ambient air monitoring data from the Fort Smith continuous monitoring station in the Northwest Territories. The 90th percentile of hourly measurements from the most recent year with complete data record (2018) was selected to represent the baseline air quality level for each substance of interest. The Fort Smith station is considered the most representative for the LAA as the station is in a similarly remote area with low population density and with similar meteorological and topographical conditions. Baseline ambient concentrations of HCN, metals, VOCs and PAHs are assumed negligible because of the remote location of the Project and the absence of industrial activities in the LAA. Baseline metal deposition values were derived from analysis of metals composition in dustfall during the baseline ambient air monitoring program in 2016. The baseline metal deposition values were used in the human health assessment (Chapter 18).

Table 6-10 indicates that the selected baseline ambient air concentrations are less than the AAQC. The baseline gaseous concentration levels range from 1.3% to 6.8% of Manitoba AAQC. Baseline PM concentrations and dustfall range from 8.8% to 33% of the most stringent AAQC with the highest percentages associated with ambient $PM_{2.5}$ concentrations. Historical mine tailings and associated contamination had no influence on the definition of the baseline air quality concentrations. There are no historical tailings present on the MacLellan and Gordon sites. Overall, the existing air quality in the LAA can be characterized as very good.

Table 6-10 Summary of Baseline Ambient Air Quality Concentrations

Substance	Averaging Period	Baseline Concentration ($\mu g/m^3$)	Manitoba AAQC [a] ($\mu g/m^3$)	Percent of AAQC (%)
NO_2 [b]	1-hour	7.5	400	1.9
	24-hour	5.6	200	2.8
	Annual	1.9	60	3.2
CO [b]	1-hour	406	15,000	2.7
	8-hour	406	6,000	6.8
SO_2 [b]	1-hour	6.0	450	1.3
	24-hour	6.0	150	4.0
	Annual	1.5	30	5.0
TSP [c]	24-hour	10.5	120	8.8
	Annual	10.5	60	17.5
PM_{10} [d]	24-hour	4.6	50	9.2
$PM_{2.5}$ [d]	24-hour	2.9	27 [e]	10.7
	Annual	2.9	8.8 [e]	33.0
Dustfall [d]	30-day	0.99 g/m²	7 g/m² [f]	14.3
	Annual	0.99 g/m²	4.6 g/m² [f]	14.3

NOTES:
[a] Manitoba Ambient Air Quality Criteria (MSD 2005)
[b] Baseline concentration based on monitoring data from Fort Smith station (2018) and the 90th percentile of hourly measurements. Baseline concentrations for averaging periods greater than one hour (8-hour, 24-hour, annual) were calculated from the hourly measurements after removing values greater than the 90th percentile.
[c] TSP background concentrations were estimated using the PM_{10} background concentration and correlation proposed by Brook et al. (1997)
[d] Baseline concentrations based on the local ambient air monitoring program (2016)
[e] Canadian Ambient Air Quality Standards (CCME 2017)
[f] Ontario Ambient Air Quality Criteria (MOECC 2012)

6.2.2.3 Greenhouse Gases

According to the CEA Agency 2003 guidance (CEA Agency 2003), Project GHG emissions should be compared to local, provincial, and federal GHG inventories. There are no local GHG emission inventories for the Lynn Lake area; therefore, Project GHG emissions cannot be compared to local emissions.

The provincial and national GHG emissions (ECCC 2019d) are presented in Table 6-11. The emissions presented are for the latest year for which data has been published (2017). Manitoba GHG emissions accounted for 3% of the national GHG emissions.

Table 6-11 Provincial and National GHG Emissions (2017)

Parameter	Units	CO_2	CH_4	N_2O	Other GHGs [a] (expressed as CO_{2e})	Total (expressed as CO_{2e})
Manitoba GHG Emissions	kt/y	13,328	3,933	3,910	497	**21,668**
National GHG Emissions	kt/y	571,137	92,862	38,037	13,723	**715,760**
Manitoba contribution to National GHG Emissions	%	2.3%	4.2%	10.3%	3.6%	**3.0%**

NOTE:
[a] Other GHGs include sulphur hexafluoride, hydrofluorocarbons, perfluorocarbons, and nitrogen trifluoride.
SOURCE: ECCC NIR (ECCC 2019d)

6.3 PROJECT INTERACTIONS WITH ATMOSPHERIC ENVIRONMENT

Table 6-12 identifies, for each potential effect, the physical activities that might interact with the atmospheric environment and result in the identified environmental effect. These interactions are indicated by check mark and are discussed in detail in Section 6.4 in the context of effects pathways, standard and project-specific mitigation/enhancement, and residual effects. A justification for no interaction (and therefore no effect) is also provided below.

Project activities for each phase are described in detail in Chapter 2, Section 2.3 and 2.4. Project related emissions and discharges are described in Chapter 2, Section 2.8.

The potential interactions between Project activities and the environment were considered for the construction, operation, and decommissioning/closure phases of the Project. The identification of Project activities and their potential interactions was based on engagement with interested parties, the professional judgment of technical specialists involved in the assessment, and a review of existing conditions. The selection of interactions is also informed by the potential effects and effects pathways for each VC as described in Section 6.1.3.

Emissions of air contaminants and GHGs to the atmospheric environment may result in a change in air quality or a change in atmospheric greenhouse gases. Emissions, discharges, and wastes (e.g., air, waste, noise, light, liquid, and solid effluents) are generated by many and varied Project activities. Rather than acknowledging this by placing a check mark against each of these activities, “Emissions, Discharges and Wastes” have been consolidated as an integrated activity for efficiency with relevant detail described in the text. This category includes the emissions, discharges, and wastes generated by all project activities under each Project phase. As potential interactions between the Project and the Atmospheric Environment are limited to those related to emissions, other Project activities in Table 6-12 have not been selected.

Table 6-12 Potential Project-Environment Interactions with Atmospheric Environment

Project Activities and Components	Environmental Effects			
	Change in Air Quality		Change in Atmospheric Greenhouse Gases	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Construction				
Site Preparation at Both Sites (removal of existing buildings; removal of contaminated materials; vegetation clearing and earthworks; development of temporary construction camp at the MacLellan site)	–	–	–	–
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA)	–	–	–	–
Mine Components at Both Sites (construction of: ore pads; ore, overburden and mine rock storage areas; mill feed storage area and crushing plant, ore milling and processing plant, and TMF at the MacLellan site; water management facilities [e.g., sumps, ponds and ditches])	–	–	–	–
Utilities, Infrastructure, and Other Facilities at Both Sites (construction of: buildings and yards; access roads [i.e., upgrades at the Gordon and MacLellan sites] and internal mine roads; site lighting and security; power supply and distribution system; potable water treatment plant at the MacLellan site; on-site pipelines at the MacLellan site; fuel storage and distribution systems; sewage treatment facilities; domestic solid waste handling facilities)	–	–	–	–
Water Development and Control at Both Sites (dewatering of existing pits at the Gordon site and underground workings at the MacLellan site; re-alignment of existing diversion channel at the Gordon site; interceptor wells at the Gordon site)	–	–	–	–
Emissions, Discharges, and Wastes[1]	✓	✓	✓	✓
Employment and Expenditure[2]	–	–	–	–
Operation				
Open Pit Mining at Both Sites (drilling; blasting; removal, loading and on-site hauling of mined material [i.e., ore, ore, overburden, and mine rock])	–	–	–	–

Table 6-12 Potential Project-Environment Interactions with Atmospheric Environment

Project Activities and Components	Environmental Effects			
	Change in Air Quality		Change in Atmospheric Greenhouse Gases	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA, including truck transportation of ore from the Gordon site to the MacLellan site)	–	–	–	–
Storage/Stockpiling of Ore, Overburden, and Mine Rock at Both Sites	–	–	–	–
Ore Milling and Processing at the MacLellan Site (ore crushing and conveyance; ore milling)	–	–	–	–
Water Management at Both Sites (mine water collection and storage; process water supply for the MacLellan site including water intake on Keewatin River at the MacLellan site; pumping fresh/fire water from Farley Lake at Gordon site; operation of interceptor wells at the Gordon site)	–	–	–	–
Tailings Management at the MacLellan Site	–	–	–	–
Utilities, Infrastructure, and Other Facilities at Both Sites (presence and operation of: buildings and yards; access roads and internal mine roads; site lighting and security; power supply and distribution system; potable water treatment plant at the MacLellan site; on-site pipelines at the MacLellan site; fuel storage and distribution systems; sewage treatment facilities; domestic solid waste handling facilities; explosives storage, maintenance of access roads and bridges)	–	–	–	–
Emissions, Discharges, and Wastes[1]	✓	✓	✓	✓
Employment and Expenditure[2]	–	–	–	–
Decommissioning/Closure				
Decommissioning at Both Sites	–	–	–	–
Reclamation at Both Sites	–	–	–	–
Post-Closure at Both Sites (long-term monitoring)	–	–	–	–
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA)	–	–	–	–
Emissions, Discharges, and Wastes[1]	✓	✓	✓	✓

Table 6-12 Potential Project-Environment Interactions with Atmospheric Environment

Project Activities and Components	Environmental Effects			
	Change in Air Quality		Change in Atmospheric Greenhouse Gases	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Employment and Expenditure[2]	–	–	–	–

NOTES:
✓ = Potential interaction
– = No interaction
[1] Emissions, Discharges, and Wastes (e.g., air, waste, noise, light, liquid, and solid effluents) are generated by many Project activities. Rather than acknowledging this by placing a check mark against each of these activities, "Emissions, Discharges and Wastes" has been introduced as an additional component under each Project phase.
[2] Project employment and expenditures are generated by most Project activities and components and are the main drivers of many socio-economic effects. Rather than acknowledging this by placing a check mark against each of these activities, "Employment and Expenditures" have been introduced as an additional component under each Project phase.

6.4 ASSESSMENT OF RESIDUAL ENVIRONMENTAL EFFECTS ON ATMOSPHERIC ENVIRONMENT

6.4.1 Air Quality

6.4.1.1 Analytical Assessment Techniques

The first stage of the ambient air quality assessment estimates emission rates for the worst-case year of construction (Q2 Year -2 to Q1 Year -1) and operation (Year 2 for the Gordon site and Year 7 for the MacLellan site). Emissions during construction include diesel exhaust emissions from mobile equipment and fugitive dust emissions from construction activities. Emissions during operation include diesel exhaust emissions from mining equipment and fugitive dust emissions from mining activities. The magnitude of emissions and emission estimation methods for the worst-case years of construction and operation are presented in Volume 5, Appendix A, Attachment C.

The effects of Project emissions on ambient air quality are evaluated by using a numerical atmospheric dispersion model. Atmospheric dispersion models simulate the transport, dispersion, transformation, and deposition of emissions in the atmosphere. Dispersion models are used to predict ambient concentrations for a wide range of meteorological conditions and accounting for terrain influences. For this assessment, the CALMET/CALPUFF® model system (Scire et al. 2000a; 2000b; 2011) was used to determine the effect of Project operation emissions on ambient air quality. The CALPUFF® model is a multi-layer, multi-species, non-steady state puff dispersion model that can simulate the effects of time and space-varying meteorological conditions on substance transport, transformation, and removal. CALPUFF® contains algorithms for near-source effects such as building downwash, transitional plume rise, partial plume penetration, as well as long-range effects such as chemical transformation, and pollutant removal (dry deposition and wet scavenging). The most recent model versions available at the time of the assessment were used:

- CALMET® version 6.5.0 (level 150223) – a diagnostic three-dimensional meteorological model
- CALPUFF® version 7.2.1 (level 150618) – a numerical atmospheric dispersion model.

The modelling system was applied in accordance with the draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation 2006) and in the absence of specific requirements in the Manitoba draft Guidelines, the modelling approach followed guidance from the Air Dispersion Modelling Guideline (ADMG) for Ontario (MOECC 2016) and the Alberta Air Quality Model Guideline (AEP 2013).

The CALMET® model (Scire et al. 2000a) was used to provide three-dimensional hourly meteorological data (winds, temperatures, and turbulence) for a five-year period (2012-2016) required for the CALPUFF® transport, dispersion, and deposition model. The CALMET® model domain of 70 km by 48 km contains the LAA (50 km by 28 km) with a buffer of 10 km on each side to reduce potential computational boundary effects near the perimeter of the LAA. The CALMET® model used mesoscale meteorological data created with the WRF mesoscale prognostic model and incorporated surface meteorological observations from Lynn Lake Airport. The wind rose derived for the Project from the CALMET® model indicates dominant winds from northwest, west, north, and east. A comparison of the wind roses of measured and predicted (based on WRF and CALMET®) surface winds at Lynn Lake Airport for the five-year model period (2012-2016) is presented in Volume 5, Appendix A, Attachment D, Figure D-2. Figure D-2 shows that there is a general agreement between the measured and predicted wind roses, both indicating predominant winds from northwest, west, north, and east, and with most frequent wind speeds between 2 m/s and 4 m/s. The five-year meteorological data is therefore viewed as being representative of the wide range of weather conditions that could occur in the region.

The CALPUFF® atmospheric dispersion model (Scire et al. 2000b; 2011) was used to simulate the transport, dispersion, and deposition of emissions during operation. Construction and decommissioning emissions were not modelled as they are less than the worst-case (peak mining) year of operation as discussed in Section 6.4.1.2 . The CALPUFF® model domain coincides with the LAA (50 km by 28 km) and includes the Town of Lynn Lake and the Black Sturgeon Reserve. The extent of the CALPUFF® domain is sufficient to capture the overall predicted maximum concentrations of substances of interest for the worst-case operation emission scenario. A nested receptor grid was created in the model domain following the spacing requirements in the draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation 2006). The model predicted concentrations and deposition patterns for the substances of interest at the receptor grid locations. In addition, concentrations and depositions were predicted at 203 human receptors and Potential Indigenous Use Receptor sites and at the permanent work camp to provide input to the human health assessment (Chapter 18). Some of the remote cottages and trapper cabins identified as human receptors are only temporarily occupied and some are currently not occupied; however, they are conservatively included in the air quality assessment. Map 6-1 shows the locations of human receptors and TLU sites in the LAA.

The air quality assessment considers substances for which there are AAQC adopted by either provincial (Manitoba) or national regulatory agencies. The predicted ambient concentrations and dustfall during worst-case (peak mining) year of operation, in combination with baseline ambient concentration levels accounting for other more distant natural and anthropogenic emission sources are compared to the AAQC in Table 6-1. Ambient concentrations are expressed in units of $\mu g/m^3$, and dustfall is expressed as a deposition rate in g/m^2/30-days. Concentrations inside the Project Boundary are not compared to the AAQC because public access is generally restricted in this region.

Details on the CALMET/CALPUFF® model implementation are provided in Volume 5, Appendix A, Attachment D and Attachment E. A list of the 203 human receptors and Potential Indigenous Receptor sites and the work camp locations is provided in Volume 5, Appendix A, Attachment E.

The effects of construction and decommissioning/closure are assessed in comparison to emissions during operation. Emissions during these two phases are substantively lower than those of operation. As a result, the potential residual air quality effects will be substantively lower as well.

6.4.1.2 Project Pathways

The sources of air emissions during Project construction and operation are typical for an open pit mine and gold ore processing. Pathways from decommissioning/closure will be similar to those from construction and operation. The same types of air emissions are expected from the decommissioning/closure activities (i.e., vehicle movements, equipment operation, bulk materials, supplies and personnel movements). Project construction and operation are associated with three types of air emissions:

- Exhaust emissions from construction and mining equipment that include but are not limited to drills, excavators, bulldozers, graders, and haul trucks. The off-road equipment and vehicles consume diesel fuel and the products of combustion are released to the atmosphere. The exhaust emissions contain the by-products of diesel fuel combustion that include oxides of nitrogen (NO_X), sulphur dioxide (SO_2), carbon monoxide (CO), hydrocarbons, DPM, PAHs and metals. DPM is respirable particulate matter that has an aerodynamic diameter less than 10 µm (PM_{10}). It is assumed that 97% of DPM is $PM_{2.5}$ or respirable particulate matter that has an aerodynamic diameter less than 2.5 µm, based on the US EPA NONROAD model documentation (US EPA 2010a).

- Explosives detonation emissions from blasting. Blasting emissions include explosives emissions (NO_X, CO and SO_2) from the detonation of ammonium nitrate fuel oil emulsion explosives.

- Fugitive dust emissions from drilling and blasting, surface disturbance activities, loading and unloading of material, haul roads, access roads and wind erosion result in PM emissions of various size ranges (e.g., TSP, PM_{10} and $PM_{2.5}$) that can also be deposited to off-site ground and water surfaces (i.e., dustfall). TSP includes larger particles, nominally up to 30 µm in diameter. The larger dust particles are removed near the disturbance area by gravitational settling and are the main contributor to dustfall. TSP, PM_{10} and $PM_{2.5}$ emissions are carried off-site by the wind; the smaller $PM_{2.5}$ and PM_{10} fractions tend to be transported further downwind than the TSP.

Additionally, the mill feed storage area and crushing plant, the ore milling and processing plant and the TMF at the MacLellan site are associated with the following emissions:

- PM emissions from dust collectors and wet scrubbers at the primary crusher, secondary crusher and the ore milling and processing plant gold room. The crushing plant conveyors and the fine ore stockpile are fully covered and therefore, fugitive dust emissions from these areas are not expected.
- Fugitive hydrogen cyanide (HCN) emissions from the carbon-in-pulp adsorption tanks due to volatilization losses of sodium cyanide (NaCN) used in the leach and adsorption train.
- Fugitive HCN emissions from the TMF pond due to natural degradation and volatilization of a residual amount of cyanide contained in tailings (a maximum of 10 mg/L, by design, of weak acid dissociable cyanide (wad-CN) in wastewater discharged to the TMF) after cyanide detoxification. After gold extraction, the cyanide used in the processing plant is extracted in the cyanide detoxification area before tailings are pumped to the TMF. The wastewater discharge to the TMF after cyanide detoxification treatment might contain up to a maximum of 10 mg/L of wad-CN by design (Ausenco 2019), which has the potential to volatilize from the TMF pond in the form of gaseous HCN.

Project emission sources during construction and operation are discussed separately for the Gordon site and the MacLellan site in the following sections. Project emissions were estimated using Project description information (Stantec 2017b; Stantec 2018a; Ausenco 2018; Ausenco 2019a; Ausenco 2019b; Q'Pit 2019) as well as published emission factors.

Predicted ambient concentrations due to Project activities are combined with baseline concentrations, which account for other natural and anthropogenic emission sources not directly included in the dispersion model and are compared to relevant AAQC.

Since the construction and mining equipment is not 100% used and some construction and mining activities are not constant with time, emission rates are estimated for maximum short-term periods (i.e., hourly emission rates) and for daily average periods (i.e., daily emission rates). The primary mining equipment operates for 15 hours per day on an average and the supporting equipment operates for 8 hours per day (Q'Pit 2019). The maximum hourly emission rates assume that all equipment and mining activities occur simultaneously at their maximum intensity for short periods of time (less than 24 hours). Daily average emission rates consider the actual operating hours per day for each equipment and mining activity. Maximum hourly emission rates are used to predict short-term average (e.g. 1-hour, 8-hour) ambient concentrations for the substances of interest and compare them to the short-term AAQC. Daily average emission rates are used to predict long-term average (e.g., 24-hour, monthly, annual) ambient concentrations and compare them to the long-term AAQC. The assumptions used to estimate the maximum hourly emission rates and daily average emission rates are provided in Volume 5, Appendix A, Attachment C.

Gordon Site

Construction Emissions

The air emissions during construction and pre-production at the Gordon site are associated with the operation of the off-road construction and mining equipment and movement of construction material for the construction of the major components of the Project such as internal haul roads and stockpile pads. Emissions from construction are estimated for the worst-case year of construction that will result in the highest air emissions. The worst-case year of construction is selected based on the greatest intensity of concurrent construction activities, the highest number of construction equipment units and highest construction material movement. The worst-case construction annual period for emissions from the Gordon site is Q2 Year -2 to Q1 Year -1. The following emissions due to construction activities are estimated for the worst-case construction year:

- Diesel combustion exhaust emissions from construction off-road equipment and haul trucks.
- Diesel combustion exhaust emissions from on-highway trucks and on-road vehicles.
- Fugitive dust and explosives detonation emissions from drilling and blasting.
- Mechanically generated dust by construction off-road equipment movement.
- Fugitive dust emissions from bulldozing and grading.
- Fugitive dust emissions from truck loading and unloading.
- Mechanically generated dust by truck traffic along haul roads and the access road.
- Fugitive dust emissions from wind erosion of stockpiles.

Diesel exhaust emissions from construction off-road equipment are based on the Canadian off-road compression-ignition engine emission standards (ECCC 2005). Emissions were conservatively estimated based on Tier 3 emission standards for off-road diesel engines assuming that the majority of the construction fleet will be rented and will include older equipment. Tier 4 emission standards are the most stringent emission standards for new manufactured equipment that came into effect in 2014. The estimated emissions based on Tier 3 standards are therefore conservative. If newer, Tier 4 off-road diesel equipment is used during construction the exhaust emissions would be lower.

Diesel exhaust emissions from on-highway trucks and other on-road vehicles travelling on the access road were estimated using emission factors for on-road vehicles derived using the US EPA Motor Vehicle Emission Simulator model version 2014a (MOVES2014a; US EPA 2015). Since MOVES2014a was originally developed for the United States, a surrogate US county and state (Hill County, Montana) was selected to represent the Project in terms of local meteorological conditions and vehicle populations. The model was run for a rural unrestricted road type that best represents the access road, for year 2018 to represent current vehicle populations and age distributions, separately for winter and summer, and with fuel formulations specific to Manitoba and Canada. Diesel exhaust emissions were estimated using the

MOVES 2014a emission factors in grams per vehicle-mile travelled (g/VMT) for each vehicle type, the number of vehicles, round trips per day and the length of the road.

Blasting emissions include fugitive dust generated from the blast and explosives emissions (NO_X, CO and SO_2) from the detonation of a mixture of ammonium nitrate fuel oil emulsion explosives.

Blasting emissions and fugitive dust emissions from construction activities and wind erosion were estimated using emission factors from various chapters of the US EPA AP-42 Fifth Edition Compilation of Air Pollutant Emission Factors (US EPA 1995). A detailed description of construction emission calculations is provided in Volume 5, Appendix A, Attachment C.

A summary of annual emissions during the worst-case year of construction (Q2 Year -2 to Q1 Year -1) at the Gordon site is provided in Table 6-13. Total annual emissions during construction are less than the annual emissions during operation (Table 6-16). The data in Table 6-13 indicate that, on an annual basis:

- Emissions of gaseous CACs (NO_X, CO, SO_2, DPM and VOC) during construction are 65% to 85% less than the corresponding annual emission totals during operation. The highest difference (85%) corresponds to NO_X emissions.
- Fugitive particulate matter emissions (TSP, PM_{10} and $PM_{2.5}$) during construction are 70% to 76% less than the corresponding annual emission totals during operation. The highest difference (76%) corresponds to PM_{10} and $PM_{2.5}$ emissions.

Operation Emissions

Emissions during operation at the Gordon site are associated with diesel combustion exhaust from the mining equipment and fugitive dust emissions generated from mining activities and wind erosion. The Gordon site emissions include emissions associated with run-of-mine (ROM) ore haulage on PR 391. Emissions from operation are estimated for the worst-case year of mine operation that will result in the highest air emissions. The worst-case year is selected based on highest mining rate, highest anticipated number of mining equipment units and highest anticipated material movement. The worst-case year for emissions from the Gordon site and ROM ore haulage on PR 391 is Year 2 of operation. The following emissions due to mining activities are estimated for Year 2:

- Diesel combustion exhaust emissions from mining off-road equipment and haul trucks.
- Diesel combustion exhaust emissions from on-highway trucks and on-road vehicles.
- Diesel combustion emissions from a permanent diesel generator.
- Fugitive dust and explosives detonation emissions from drilling and blasting.
- Mechanically generated dust by mining off-road equipment movement.
- Fugitive dust emissions from bulldozing and grading.
- Fugitive dust emissions from truck loading and unloading.

- Mechanically generated dust by truck traffic along haul roads and the access road.
- Mechanically generated dust by truck traffic along PR 391.
- Fugitive dust emissions from wind erosion of stockpiles.

Diesel exhaust emissions from mining off-road equipment are based on the Canadian off-road compression-ignition engine emission standards (ECCC 2005a). The Proponent will procure new mining equipment that complies with Tier 4 standards (i.e., the strictest EPA emissions requirements) for off-road diesel engines and therefore, emissions were based on the Tier 4 standards. Emission speciation profiles for VOCs, PAHs, and metals for off-road diesel equipment were derived using the US EPA MOVES model (MOVES2014a; US EPA, 2015) and the integrated NONROAD2008 model. The MOVES2014a-NONROAD model uses a compilation of equipment of different ages up to the year that is modelled. Emissions were estimated for year 2018 to represent mining equipment that complies with Tier 4 emission standards for off-road diesel engines.

Diesel exhaust emissions from on-highway trucks and other on-road vehicles travelling on the access road and PR 391 were estimated using emission factors for on-road vehicles derived from the MOVES2014a model (US EPA 2015). The model was run for a rural unrestricted road type that best represents the access road and PR 391, for year 2018 to represent current vehicle populations and vehicle age distributions, separately for winter and summer, and with fuel formulations specific to Manitoba and Canada. Diesel exhaust emissions were estimated using the MOVES2014 emission factors in g/VMT for each vehicle type, the number of vehicles round trips per day and the length of the road.

A permanent diesel generator will provide power to the facilities at the Gordon site. Diesel exhaust emissions from the generator are based on manufacturer specifications. The diesel generator complies with Tier 3 emission standards for off-road diesel engines.

Blasting emissions and fugitive dust emissions from mining activities and wind erosion were estimated using emission factors from various chapters of the US EPA AP-42 Fifth Edition Compilation of Air Pollutant Emission Factors (US EPA 1995). Emission speciation profiles for metals in fugitive dust are based on laboratory analysis of mine rock, ore, overburden, and tailings samples collected during the geochemistry baseline program in 2015 and 2016. Details of the geochemistry baseline program are provided in the Geochemistry Baseline TDR and associated Validation Report in Volume 4, Appendix F. A detailed description of emission calculations is provided in Volume 5, Appendix A, Attachment C.

Summaries of hourly, daily, and annual emission rates during the worst-case year of operation (Year 2) at the Gordon site and PR 391 are provided in Table 6-14, Table 6-15, and Table 6-16, respectively. NO_X, CO, SO_2, DPM, and VOC emissions are associated with combustion sources only. The maximum hourly emission rates assume that all equipment and mining activities occur simultaneously at their maximum intensity for short periods of time, while daily average emission rates consider the actual operating hours per day for each equipment and mining activity. The daily equivalent emissions rates are about 48% of the maximum hourly emission rates. Table 6-15 indicates that, on a daily basis:

- Most of SO_2 emissions are associated with explosives detonation.

- Most of NO_X, CO and DPM emissions are associated with mining off-road equipment exhaust and haul trucks on PR 391.
- Most of VOC emissions are associated with mining off-road equipment exhaust.
- Most of the fugitive TSP, PM_{10} and $PM_{2.5}$ emissions are associated with the fugitive haul road dust emissions and fugitive dust generated by mining off-road equipment movement.

MacLellan Site

Construction Emissions

Emissions during construction and pre-production at the MacLellan site are associated with the operation of the off-road construction and mining equipment, and movement of construction material for the construction of the major components of the Project such as internal haul roads, stockpile pads, ore milling and processing plant infrastructure and the TMF. Emissions from construction are estimated for the worst-case year of construction that will result in the highest air emissions. The worst-case year of construction is selected based on the most concurrent construction activities, the highest anticipated number of construction equipment units and highest anticipated construction material movement. The worst-case construction annual period for emissions from the MacLellan site is Q2 Year -2 to Q1 Year -1. The following emissions due to construction activities are estimated for the worst-case construction year:

- Diesel combustion exhaust emissions from construction off-road equipment and haul trucks.
- Diesel combustion exhaust emissions from on-highway trucks and on-road vehicles.
- Fugitive dust and explosives detonation emissions from drilling and blasting.
- Diesel combustion exhaust emissions and fugitive dust emissions from a mobile crusher.
- Mechanically generated dust by construction off-road equipment movement.
- Fugitive dust emissions from bulldozing and grading.
- Fugitive dust emissions from truck loading and unloading.
- Mechanically generated dust by truck traffic along haul roads and the access roads.
- Fugitive dust emissions from wind erosion of stockpiles.

Diesel exhaust emissions from construction off-road equipment are based on the Canadian off-road compression-ignition engine emission standards (ECCC 2005a). Emissions were conservatively estimated based on Tier 3 emission standards for off-road diesel engines assuming that the majority of the construction fleet will be rented and will include older equipment. The estimated emissions based on Tier 3 standard are therefore conservative. If newer, Tier 4 off-road diesel equipment is used during construction the exhaust emissions would be lower.

Table 6-13 Annual Emission Rates during Construction at Gordon Site (Q2 Year -2 to Q1 Year -1)

Emission Source	Annual Emission Rates [a] (t/y)									
	NO_X	CO	SO_2	DTSP	DPM_{10}	$DPM_{2.5}$	FTSP	FPM_{10}	$FPM_{2.5}$	VOC
Diesel Exhaust Emissions from Construction Off-Road Equipment	15.2	36.5	0.069	0.585	0.585	0.568	-	-	-	2.36
Diesel Exhaust Emissions from On-Highway Trucks and On-Road Vehicles	0.735	0.350	0.002	0.062	0.062	0.037	-	-	-	0.085
Drilling and Blasting	11.2	47.6	1.40	-	-	-	5.43	2.83	0.841	-
Fugitive Dust Emissions from Construction Off-Road Equipment Movement	-	-	-	-	-	-	316	90.1	9.01	-
Fugitive Dust Emissions from Bulldozing and Grading	-	-	-	-	-	-	51.3	12.9	2.71	-
Fugitive Dust Emissions from Truck Loading and Unloading	-	-	-	-	-	-	5.09	2.41	0.365	-
Fugitive Dust Emissions from Haul Roads and Access Road [b]	-	-	-	-	-	-	147	41.8	4.18	-
Fugitive Dust Emissions from PR 391	-	-	-	-	-	-	5.07	1.01	0.249	-
Wind Erosion of Stockpiles [c]	-	-	-	-	-	-	0	0	0	-
Total Emissions	**27.2**	**84.5**	**1.47**	**0.648**	**0.648**	**0.605**	**530**	**151**	**17.4**	**2.44**

NOTES:

[a] Annual average emission rates based on the actual hours of operation per day for each construction activity.

[b] Fugitive dust emission rates for haul roads and the access road include 75% dust control efficiency due to water application in summer and 90% natural mitigation efficiency in winter. Summer is assumed six months, May to October.

[c] Wind erosion emissions represent emissions at hourly average wind speed greater than 16.4 m/s. At wind speeds less than 16.4 m/s, no wind erosion emissions are generated (Volume 5, Appendix A, Attachment C).

DTSP, DPM_{10}, $DPM_{2.5}$ – diesel particulate matter of different particle size ranges; FTSP, FPM_{10}, $FPM_{2.5}$ – fugitive particulate matter of different particle size ranges

"-" Not applicable

Table 6-14 Hourly Emission Rates during Operation at Gordon Site (Year 2)

Emission Source	Hourly Emission Rates [a] (kg/h)									
	NO_X	CO	SO_2	DTSP	DPM_{10}	$DPM_{2.5}$	FTSP	FPM_{10}	$FPM_{2.5}$	VOC
Diesel Exhaust Emissions from Mining Off-Road Equipment	22.5	30.4	0.058	0.319	0.319	0.310	-	-	-	1.79
Diesel Exhaust Emissions from On-Highway Trucks and On-Road Vehicles [b]	4.59	1.23	0.011	0.299	0.299	0.191	-	-	-	0.265
Diesel Generator	1.33	0.178	0.002	0.014	0.014	0.013	-	-	-	0.093
Drilling and Blasting	256	1,089	32.0	-	-	-	30.1	29.8	2.37	-
Fugitive Dust Emissions from Mining Off-Road Equipment Movement	-	-	-	-	-	-	72.2	30.5	3.13	-
Fugitive Dust Emissions from Bulldozing and Grading	-	-	-	-	-	-	7.14	3.34	0.637	-
Fugitive Dust Emissions from Truck Loading and Unloading	-	-	-	-	-	-	4.84	2.94	0.454	-
Fugitive Dust Emissions from Haul Roads and Access Road [c]	-	-	-	-	-	-	470	152	15.3	-
Fugitive Dust Emissions from PR 391	-	-	-	-	-	-	49.6	9.91	2.43	-
Wind Erosion of Stockpiles [d]	-	-	-	-	-	-	0	0	0	-
Total Emissions	**285**	**1,120**	**32.1**	**0.632**	**0.632**	**0.514**	**633**	**228**	**24.3**	**2.15**

NOTES:

[a] Maximum hourly emission rates

[b] Diesel exhaust emissions from on-highway trucks and on-road vehicles represent emissions during summer. Summer is assumed six months, May to October.

[c] Fugitive dust emission rates for haul roads and the access road represent emissions during summer with applied dust control efficiency of 75% corresponding to water application. Summer is assumed six months, May to October.

[d] Wind erosion emissions represent emissions of hourly average wind speed greater than 16.4 m/s. At wind speeds less than 16.4 m/s, no wind erosion emissions are generated (Volume 5, Appendix A, Attachment C).

DTSP, DPM_{10}, $DPM_{2.5}$ – diesel particulate matter of different particle size ranges; FTSP, FPM_{10}, $FPM_{2.5}$ – fugitive particulate matter of different particle size ranges

"-" Not applicable

Table 6-15 Daily Emission Rates during Operation at Gordon Site (Year 2)

Emission Source	Daily Emission Rates [a] (kg/d)									
	NO_X	CO	SO_2	DTSP	DPM_{10}	$DPM_{2.5}$	FTSP	FPM_{10}	$FPM_{2.5}$	VOC
Diesel Exhaust Emissions from Mining Off-Road Equipment	314	380	0.73	4.0	4.0	3.9	-	-	-	22.4
Diesel Exhaust Emissions from On-Highway Trucks and On-Road Vehicles [b]	53.3	12.9	0.130	3.33	3.33	2.16	-	-	-	2.70
Diesel Generator	32.0	4.27	0.042	0.328	0.328	0.318	-	-	-	2.22
Drilling and Blasting	256	1,089	32.0	-	-	-	37.6	37.2	10.1	-
Fugitive Dust Emissions from Mining Off-Road Equipment Movement	-	-	-	-	-	-	755	331	34.1	-
Fugitive Dust Emissions from Bulldozing and Grading	-	-	-	-	-	-	89.2	41.7	7.96	-
Fugitive Dust Emissions from Truck Loading and Unloading	-	-	-	-	-	-	67.4	40.9	6.32	-
Fugitive Dust Emissions from Haul Roads and Access Road [c]	-	-	-	-	-	-	5,209	1,738	176	-
Fugitive Dust Emissions from PR 391	-	-	-	-	-	-	530	106	26.0	-
Wind Erosion of Stockpiles [d]	-	-	-	-	-	-	0	0	0	-
Total Emissions	**656**	**1,486**	**32.9**	**7.68**	**7.68**	**6.38**	**6,688**	**2,295**	**261**	**27.3**

NOTES:

[a] Daily average emission rates based on the actual hours of operation per day for each mining activity.

[b] Diesel exhaust emissions from on-highway trucks and on-road vehicles represent emissions during summer. Summer is assumed six months, May to October.

[c] Fugitive dust emission rates for haul roads and the access road represent emissions during summer with applied dust control efficiency of 75% corresponding to water application. Summer is assumed six months, May to October.

[d] Wind erosion emissions represent emissions of hourly average wind speed greater than 16.4 m/s. At wind speeds less than 16.4 m/s, no wind erosion emissions are generated (Volume 5, Appendix A, Attachment C).

DTSP, DPM_{10}, $DPM_{2.5}$ – diesel particulate matter of different particle size ranges; FTSP, FPM_{10}, $FPM_{2.5}$ – fugitive particulate matter of different particle size ranges

"-" Not applicable

Table 6-16 Annual Emission Rates during Operation at Gordon Site (Year 2)

Emission Source	Annual Emission Rates [a] (t/y)									
	NO_X	CO	SO_2	DTSP	DPM_{10}	$DPM_{2.5}$	FTSP	FPM_{10}	$FPM_{2.5}$	VOC
Diesel Exhaust Emissions from Mining Off-Road Equipment	113	137	0.261	1.45	1.45	1.40	-	-	-	8.05
Diesel Exhaust Emissions from On-Highway Trucks and On-Road Vehicles	20.0	4.72	0.047	1.22	1.22	0.788	-	-	-	0.985
Diesel Generator	11.7	1.56	0.015	0.120	0.120	0.116	-	-	-	0.811
Drilling and Blasting	31.2	133	3.91	-	-	-	6.49	6.45	3.22	-
Fugitive Dust Emissions from Mining Off-Road Equipment Movement	-	-	-	-	-	-	275	121	12.4	-
Fugitive Dust Emissions from Bulldozing and Grading	-	-	-	-	-	-	32.6	15.2	2.90	-
Fugitive Dust Emissions from Truck Loading and Unloading	-	-	-	-	-	-	24.3	14.7	2.28	-
Fugitive Dust Emissions from Haul Roads and Access Road [b]	-	-	-	-	-	-	1,336	446	45.1	-
Fugitive Dust Emissions from PR 391	-	-	-	-	-	-	101	20.1	4.94	-
Wind Erosion of Stockpiles [c]	-	-	-	-	-	-	0	0	0	-
Total Emissions	**176**	**276**	**4.23**	**2.78**	**2.78**	**2.31**	**1,775**	**623**	**70.9**	**9.84**

NOTES:

[a] Annual average emission rates based on the actual hours of operation per day for each mining activity.

[b] Fugitive dust emission rates for haul roads and the access road include 75% dust control efficiency due to water application in summer and 90% natural mitigation efficiency in winter. Summer is assumed six months, May to October.

[c] Wind erosion emissions represent emissions at hourly average wind speed greater than 16.4 m/s. At wind speeds less than 16.4 m/s, no wind erosion emissions are generated (Volume 5, Appendix A, Attachment C).

DTSP, DPM_{10}, $DPM_{2.5}$ – diesel particulate matter of different particle size ranges; FTSP, FPM_{10}, $FPM_{2.5}$ – fugitive particulate matter of different particle size ranges

"-" Not applicable

Diesel exhaust emissions from on-highway trucks and other on-road vehicles travelling on the access roads were estimated using emission factors for on-road vehicles derived from the MOVES2014a model (US EPA 2015). The model was run for a rural unrestricted road type that best represents the access roads, for 2018 to represent current vehicle populations and vehicle age distributions, separately for winter and summer, and with fuel formulations specific to Manitoba and Canada. Diesel exhaust emissions were estimated using the MOVES2014 emission factors in g/VMT for each vehicle type, the number of vehicles round trips per day and the length of the road.

Blasting emissions and fugitive dust emissions from construction activities and wind erosion were estimated using emission factors from various chapters of the US EPA AP-42 Fifth Edition Compilation of Air Pollutant Emission Factors (US EPA 1995). A detailed description of construction emission calculations is provided in Volume 5, Appendix A, Attachment C.

A summary of annual emissions during the worst-case year of construction at the MacLellan site is provided in Table 6-17. Total annual emissions during construction are less than the annual emissions during operation (Table 6-20). The data in Table 6-17 indicate that, on an annual basis:

- Emissions of gaseous CACs (NO_X, CO, SO_2 and VOC) during construction are 39% to 65% less than the corresponding annual emission totals during operation. The highest difference (65%) corresponds to NO_X emissions.
- Emissions of DPM are approximately 20% higher than the corresponding annual emissions totals during operation.
- Fugitive particulate matter emissions (TSP, PM_{10} and $PM_{2.5}$) during construction are 20% to 41% less than the corresponding annual emission totals during operation. The highest difference (41%) corresponds to PM_{10} emissions.

Operation Emissions

Emissions during operation at the MacLellan site are associated with diesel combustion exhaust from the mining equipment, fugitive dust emissions generated from mining activities and wind erosion, fugitive dust emissions from the mill feed storage area and crushing plant, emissions from the ore milling and processing plant and the TMF. Emissions from operation are estimated for the worst-case year of mine operation that will result in the highest air emissions. The worst-case year is selected based on highest anticipated mining rate, largest number of mining equipment units and highest material movement. The worst-case year for emissions from the MacLellan site is Year 7 of operation. The following emissions due to mining activities are estimated for Year 7:

- Diesel combustion exhaust emissions from mining off-road equipment and haul trucks.
- Diesel combustion exhaust emissions from on-highway trucks and on-road vehicles.
- Fugitive dust and explosives detonation emissions from drilling and blasting.
- Mechanically generated dust by mining off-road equipment movement.

- Fugitive dust emissions from bulldozing and grading.
- Fugitive dust emissions from truck loading and unloading.
- Mechanically generated dust by truck traffic along haul roads and the access roads.
- Fugitive dust emissions from wind erosion of stockpiles.
- PM emissions from the primary and secondary crushers.
- PM emissions from dust collectors at the ore milling and processing plant gold room.
- Fugitive dust emissions from wind erosion of the TMF dry banks.
- Fugitive HCN emissions from the processing plant leach and adsorption tanks.
- Fugitive HCN emissions from the TMF pond.

Diesel exhaust emissions from mining off-road equipment are based on the Canadian off-road compression-ignition engine emission standards (ECCC 2005a). The Proponent will procure new mining equipment that complies with Tier 4 standards and therefore, emissions are based on the Tier 4 standards. Emission speciation profiles for VOCs, PAHs and metals for off-road diesel equipment were derived using the US EPA MOVES model (MOVES2014a; US EPA 2015) and the integrated NONROAD2008 model. Emissions were estimated for year 2018 to represent mining equipment that complies with Tier 4 emission standards for off-road diesel engines.

Diesel exhaust emissions from on-highway trucks and other on-road vehicles travelling on the access roads were estimated using emission factors for on-road vehicles derived from the MOVES2014a model (US EPA 2015). The model was run for a rural unrestricted road type that best represents the access roads, for year 2018 to represent current vehicle populations and vehicle age distributions, separately for winter and summer, and with fuel formulations specific to Manitoba and Canada. Diesel exhaust emissions were estimated using the MOVES2014 emission factors in g/VMT for each vehicle type, the number of vehicles round trips per day and the length of the road.

Blasting and fugitive dust emissions from mining activities and wind erosion were estimated using emission factors from various chapters of the US EPA AP-42 Fifth Edition Compilation of Air Pollutant Emission Factors (US EPA 1995). Emission speciation profiles for metals in fugitive dust are based on laboratory analysis of mine rock, ore, overburden, and tailings samples collected during the geochemistry baseline program in 2015 and 2016. Details of the geochemistry baseline program are provided in the Geochemistry Baseline TDR and associated Validation Report in Volume 4, Appendix F.

PM emissions occur from the primary crusher dust collector, the secondary crusher wet scrubber and the dust collectors at the ore milling and processing plant gold room. PM emissions from the dust collectors and the wet scrubber were estimated based on the dust loading (g/m^3), exhaust flow rate and the dust collection efficiency provided by Ausenco Engineering Canada Inc. (Ausenco 2017).

Fugitive HCN emissions result from volatilization of sodium cyanide used in the processing plant leach and adsorption tanks, and from residual cyanide (after cyanide detoxification) in the TMF pond. HCN emissions from the processing plant and the TMF were estimated following the Australian Emission Manual for Gold Ore Processing (Australian Government 2006). A detailed description of emission calculations is provided in Volume 5, Appendix A, Attachment C.

Summaries of hourly, daily, and annual emission rates during the worst-case year of operation (Year 7) at the MacLellan site are provided in Table 6-18, Table 6-19, and Table 6-20, respectively. NO_X, CO, SO_2, DPM and VOC emissions are associated with combustion sources only. The maximum hourly emission rates assume that all equipment and mining activities occur simultaneously at their maximum intensity for short periods of time, while daily average emission rates consider the actual operating hours per day for each equipment and mining activity. The daily equivalent emissions rates are about 58% of the maximum hourly emission rates. Table 6-19 shows that, on a daily basis:

- Most SO_2 emissions are associated with explosives detonation.
- Most NO_X, CO and DPM emissions are associated with mining off-road equipment exhaust.
- Most VOC emissions are associated with mining off-road equipment exhaust.
- Most of the fugitive TSP, PM_{10} and $PM_{2.5}$ emissions are associated with the fugitive haul road dust emissions and fugitive dust generated by mining off-road equipment movement.
- HCN emissions from the TMF are about twice the emissions from the ore milling and processing plant.

6.4.1.3 Mitigation

The implementation of the mitigation measures and other commitments described in this section will be the responsibility of Alamos and/or contractors. The mechanisms used to require contractors and subcontractors to comply with these measures will include environmental protection plans and contract documents.

Mitigation measures proposed are generally considered to be industry standards and are effective for use in similar applications and environmental conditions. This assessment is based on professional judgment of engineers and scientists in consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited where applicable to justify the selection. The key industry standard mitigation measures related to the control of fugitive dust are regular road watering and the speed of the haul trucks on unpaved roads. Both of these mitigation measure have been proven to be effective and will be implemented.

Detailed design of the Project and mitigation strategies is currently ongoing. Mitigation measures will be refined in consideration of environmental assessment approval conditions and permit stipulations which will be incorporated into final environmental management planning. The effectiveness of these mitigation measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs including adaptive management procedures will be reviewed by applicable regulatory agencies prior to their implementation.

Mitigation measures will be implemented to manage and reduce emissions during construction and operation. Ambient air quality monitoring will be implemented in conjunction with emissions mitigation to provide understanding of meteorological conditions and off-site ambient concentrations, and to determine the need for additional mitigation. Monitoring systems will include the installation and operation of a meteorological tower (wind speed and wind direction) and particulate matter (TSP, PM_{10}, $PM_{2.5}$) monitoring equipment. Based on the current wind conditions and measured ambient concentration levels, appropriate and effective mitigation options will be implemented to reduce emissions. This emissions mitigation management is referred to as “adaptive management.” For example, if it was determined that fugitive dust from traffic along unpaved roads was causing elevated PM concentrations then additional road watering could be implemented.

Mitigation by Project Design

Mitigation measures to reduce air emissions that are incorporated in the Project design include:

- Enclosure of the mill feed storage area and crushing plant conveyors and the fine ore stockpile to reduce fugitive dust emissions. Particulate emissions from the enclosed conveyors and fine ore stockpile are assumed negligible.
- Use of dust collection/control systems (e.g., baghouse) at the primary crusher and the processing plant gold room to reduce PM emissions. Use of a wet scrubber at the secondary crusher. The dust collection efficiencies of the dust collectors and wet scrubber are considered in the calculation for PM emissions.
- Optimization of haul roads and infrastructure to reduce transportation and haul distances.
- Optimization of the TMF to reduce the area of exposed dry surfaces to reduce the potential for windblown dust emissions.
- Enclosed leaching and adsorption processes at the ore milling and processing plant to reduce fugitive HCN emissions due to volatilization loses.
- Limited concentration of wad-cyanide (after cyanide detoxification) in water discharge to the TMF to 10 mg/L to reduce fugitive HCN emissions from the TMF pond.

Table 6-17 Annual Emission Rates during Construction at MacLellan Site (Q2 Year -2 to Q1 Year -1)

Emission Source	Annual Emission Rates [a] (t/y)									
	NO_X	CO	SO_2	DTSP	DPM_{10}	$DPM_{2.5}$	FTSP	FPM_{10}	$FPM_{2.5}$	VOC
Diesel Exhaust Emissions from Construction Off-Road Equipment	86.5	129	0.243	4.07	4.07	3.95	-	-	-	9.30
Diesel Exhaust Emissions from On-Highway Trucks and On-Road Vehicles	0.990	0.465	0.003	0.067	0.067	0.042	-	-	-	0.083
Drilling and Blasting	27.6	117	3.44	-	-	-	8.62	4.49	1.50	-
Mobile Crusher	2.33	2.16	0.003	0.125	0.125	0.121	30.1	10.9	10.9	0.18
Fugitive Dust Emissions from Construction Off-Road Equipment Movement	-	-	-	-	-	-	947	270	27.0	-
Fugitive Dust Emissions from Bulldozing and Grading	-	-	-	-	-	-	173.2	44.1	9.72	-
Fugitive Dust Emissions from Truck Loading and Unloading	-	-	-	-	-	-	22.9	10.8	1.64	-
Fugitive Dust Emissions from Haul Roads and Access Roads [b]	-	-	-	-	-	-	1,191	339	33.9	-
Wind Erosion of Stockpiles [c]	-	-	-	-	-	-	0	0	0	-
Total Emissions	**117**	**249**	**3.69**	**4.26**	**4.26**	**4.11**	**2,372**	**680**	**84.7**	**9.57**

NOTES:

[a] Annual average emission rates based on the actual hours of operation per day for each construction activity.

[b] Fugitive dust emission rates for haul roads and the access road include 75% dust control efficiency due to water application in summer and 90% natural mitigation efficiency in winter. Summer is assumed six months, May to October.

[c] Wind erosion emissions represent emissions of hourly average wind speed greater than 16.4 m/s. At wind speeds less than 16.4 m/s, no wind erosion emissions are generated (Volume 5, Appendix A, Attachment C).

DTSP, DPM_{10}, $DPM_{2.5}$ – diesel particulate matter of different particle size ranges; FTSP, FPM_{10}, $FPM_{2.5}$ – fugitive particulate matter of different particle size ranges

"-" Not applicable

Table 6-18 Hourly Emission Rates during Operation at MacLellan Site (Year 7)

Emission Source	Hourly Emission Rates [a] (kg/h)										
	NO_X	CO	SO_2	DTSP	DPM_{10}	$DPM_{2.5}$	FTSP	FPM_{10}	$FPM_{2.5}$	VOC	HCN
Diesel Exhaust Emissions from Mining Off-Road Equipment	50.9	60.5	0.116	0.657	0.657	0.638	-	-	-	3.58	-
Diesel Exhaust Emissions from On-Highway Trucks and On-Road Vehicles [b]	0.602	0.191	0.002	0.039	0.039	0.025	-	-	-	0.040	-
Drilling and Blasting	354	1506	44.3	-	-	-	49.0	48.4	3.74	-	-
Fugitive Dust Emissions from Mining Off-Road Equipment Movement	-	-	-	-	-	-	82.1	36.7	3.76	-	-
Fugitive Dust Emissions from Bulldozing and Grading	-	-	-	-	-	-	12.7	6.29	1.05	-	-
Fugitive Dust Emissions from Truck Loading and Unloading	-	-	-	-	-	-	7.85	4.75	0.730	-	-
Fugitive Dust Emissions from Haul Roads and Access Roads [c]	-	-	-	-	-	-	627	219	22.2	-	-
Wind Erosion of Stockpiles [d]	-	-	-	-	-	-	0	0	0	-	-
Primary and Secondary Crushers	-	-	-	-	-	-	25.1	10.0	1.81	-	-
Ore Milling and Processing Plant	-	-	0.288	-	-	-	1.76	1.41	1.41	-	1.13
TMF [e]	-	-	-	-	-	-	8.24	4.12	0.618	-	2.62
Total Emissions	**406**	**1,566**	**44.7**	**0.696**	**0.696**	**0.662**	**814**	**331**	**35.3**	**3.62**	**3.75**

NOTES:
[a] Maximum hourly emission rates
[b] Diesel exhaust emissions from on-highway trucks and on-road vehicles represent emissions during summer. Summer is assumed six months, May to October.
[c] Fugitive dust emission rates for haul roads and the access roads represent emissions during summer with applied dust control efficiency of 75% corresponding to water application. Summer is assumed six months, May to October.
[d] Wind erosion emissions represent emissions at hourly average wind speed greater than 16.4 m/s. At wind speeds less than 16.4 m/s, no wind erosion emissions are generated (Volume 5, Appendix A, Attachment C).
[e] Wind erosion emissions from TMF dry banks represent emissions at hourly average wind speed greater than 7.2 m/s. At wind speeds less than 7.2 m/s, no wind erosion emissions are generated.
DTSP, DPM_{10}, $DPM_{2.5}$ – diesel particulate matter of different particle size ranges; FTSP, FPM_{10}, $FPM_{2.5}$ – fugitive particulate matter of different particle size ranges
"-" Not applicable

Table 6-19 Daily Emission Rates during Operation at MacLellan Site (Year 7)

Emission Source	Daily Emission Rates [a] (kg/d)										
	NO_X	CO	SO_2	DTSP	DPM_{10}	$DPM_{2.5}$	FTSP	FPM_{10}	$FPM_{2.5}$	VOC	HCN
Diesel Exhaust Emissions from Mining Off-Road Equipment	803	889	1.70	9.76	9.76	9.47	-	-	-	52.4	-
Diesel Exhaust Emissions from On-Highway Trucks and On-Road Vehicles [b]	6.01	1.54	0.014	0.363	0.363	0.234	-	-	-	0.313	-
Drilling and Blasting	354	1,506	44.3	-	-	-	60.8	60.2	16.0	-	-
Fugitive Dust Emissions from Mining Off-Road Equipment Movement	-	-	-	-	-	-	863	414	42.6	-	-
Fugitive Dust Emissions from Bulldozing and Grading	-	-	-	-	-	-	160	78.9	13.2	-	-
Fugitive Dust Emissions from Truck Loading and Unloading	-	-	-	-	-	-	117	71.0	10.9	-	-
Fugitive Dust Emissions from Haul Roads and Access Road [c]	-	-	-	-	-	-	8,802	3,157	320	-	-
Wind Erosion of Stockpiles [d]	-	-	-	-	-	-	0	0	0	-	-
Primary and Secondary Crushers	-	-	-	-	-	-	552	221	39.7	-	-
Ore Milling and Processing Plant	-	-	0.288	-	-	-	1.76	1.41	1.41	-	27.2
TMF [e]	-	-	-	-	-	-	198	98.9	14.8	-	62.9
Total Emissions	**1,163**	**2,396**	**46.3**	**10.1**	**10.1**	**9.70**	**10,753**	**4,103**	**459**	**52.7**	**90.1**

NOTES:
[a] Daily average emission rates based on the actual hours of operation per day for each mining activity.
[b] Diesel exhaust emissions from on-highway trucks and on-road vehicles represent emissions during summer. Summer is assumed six months, May to October.
[c] Fugitive dust emission rates for haul roads and the access roads represent emissions during summer with applied dust control efficiency of 75% corresponding to water application. Summer is assumed six months, May to October.
[d] Wind erosion emissions represent emissions at hourly average wind speed greater than 16.4 m/s. At wind speeds less than 16.4 m/s, no wind erosion emissions are generated (Volume 5, Appendix A, Attachment C).
[e] Wind erosion emissions from TMF dry banks represent emissions at hourly average wind speed greater than 7.2 m/s. At wind speeds less than 7.2 m/s, no wind erosion emissions are generated.
DTSP, DPM_{10}, $DPM_{2.5}$ – diesel particulate matter of different particle size ranges; FTSP, FPM_{10}, $FPM_{2.5}$ – fugitive particulate matter of different particle size ranges
"-" Not applicable

Table 6-20 Annual Emission Rates during Operation at MacLellan Site (Year 7)

Emission Source	Emission Rates [a] (t/y)										
	NO_X	CO	SO_2	DTSP	DPM_{10}	$DPM_{2.5}$	FTSP	FPM_{10}	$FPM_{2.5}$	VOC	HCN
Diesel Exhaust Emissions from Mining Off-Road Equipment	289	320	0.612	3.51	3.51	3.41	-	-	-	18.9	-
Diesel Exhaust Emissions from On-Highway Trucks and On-Road Vehicles	2.19	0.561	0.005	0.132	0.132	0.085	-	-	-	0.114	-
Drilling and Blasting	43.2	184	5.40	-	-	-	10.5	10.4	5.07	-	-
Fugitive Dust Emissions from Mining Off-Road Equipment Movement	-	-	-	-	-	-	315	151	15.5	-	-
Fugitive Dust Emissions from Bulldozing and Grading	-	-	-	-	-	-	58.3	28.8	4.82	-	-
Fugitive Dust Emissions from Truck Loading and Unloading	-	-	-	-	-	-	42.0	25.6	3.93	-	-
Fugitive Dust Emissions from Haul Roads and Access Road [b]	-	-	-	-	-	-	2,257	810	82.1	-	-
Wind Erosion of Stockpiles [c]	-	-	-	-	-	-	0	0	0	-	-
Primary and Secondary Crushers	-	-	-	-	-	-	201	80.6	14.5	-	-
Ore Milling and Processing Plant	-	-	0.030	-	-	-	0.183	0.147	0.147	-	9.93
TMF [d]	-	-	-	-	-	-	72.2	36.1	5.41	-	23.0
Total Emissions	**335**	**504**	**6.05**	**3.65**	**3.65**	**3.49**	**2,956**	**1,142**	**131**	**19.0**	**32.9**

NOTES:

[a] Annual average emission rates based on the actual hours of operation per day for each mining activity.

[b] Fugitive dust emission rates for haul roads and the access road include 75% dust control efficiency due to water application in summer and 90% natural mitigation efficiency in winter. Summer is assumed six months, May to October.

[c] Wind erosion emissions represent emissions at hourly average wind speed greater than 16.4 m/s. At wind speeds less than 16.4 m/s, no wind erosion emissions are generated (Volume 5, Appendix A, Attachment C).

[d] Wind erosion emissions from TMF dry banks represent emissions at hourly average wind speed greater than 7.2 m/s. At wind speeds less than 7.2 m/s, no wind erosion emissions are generated (Volume 5, Appendix A, Attachment C).

DTSP, DPM_{10}, $DPM_{2.5}$ – diesel particulate matter of different particle size ranges; FTSP, FPM_{10}, $FPM_{2.5}$ – fugitive particulate matter of different particle size ranges

"-" Not applicable

Best Management Practices (BMPs)

Emission mitigation measures during Project construction and operation are based on standard BMPs for the reduction of air emissions from construction activities (ECCC 2005b) and mining activities (CEMI 2010).

The following BMPs will be implemented for the management and reduction of diesel exhaust emissions from off-road equipment and vehicles during construction and operation at the Gordon and MacLellan sites:

- Engines and exhaust systems will be properly maintained to keep construction and mining equipment in good working condition.
- The concentration of sulphur in diesel fuel shall not exceed 15 mg/kg, as per the Sulphur in Diesel Fuel Regulations (ECCC 2002) that came into effect in 2006 for on-road vehicles and in 2010 for off-road equipment. This sulphur concentration is used in the emissions quantification for the Project.
- Haul trucks and vehicle idling times will be reduced to the extent possible.
- Cold starts will be limited to the extent possible.

The following BMPs will be implemented for the management and reduction of fugitive dust emissions from construction and mining activities at the Gordon and MacLellan sites:

- On-site haul roads and access roads will be maintained in good condition, with regular inspections to monitor loose dust on the roads to reduce dust “track out” onto public roads.
- During dry periods, water will be applied to haul roads and access roads to reduce dust emissions. The application of water will be limited to non-freezing temperatures to avoid icing that can present a safety hazard. Watering is most effective immediately after application, and repeated watering several times a day might be required, depending on surface and meteorological conditions. A 75% control efficiency due to watering is applied to the quantified PM emissions from haul roads and access roads for the Project based on the Western Regional Air Partnership (WRAP) Fugitive Dust Handbook (WRAP 2006).
- Chemical dust suppressants will be applied to haul roads as an alternative option to watering. While chemical dust suppressants can be more effective at controlling fugitive dust than watering, they are also more expensive and can have adverse effects. Therefore, chemical dust suppression will be applied on an as-needed basis during high wind conditions or if measured ambient PM concentrations are in exceedance of the Manitoba AAQC and if an increase of watering is determined ineffective or unfeasible at the time. Examples of suppressants include chlorides, petroleum products, liquid polymer emulsions, and agglomerating chemicals. These suppressants, if required, will be applied, as per the manufacturer’s recommendations, to preclude unintended environmental effects.
- Haul truck speed on the on-site haul roads will be limited to 35 km/h (loaded) and 40 km/h (empty). Vehicle speed on the access roads will be limited to 40 km/h.

- Track-out of material to PR 391 will be reduced by dust sweeping and truck wheel washing stations prior to entering onto PR 391.
- Surfaces of topsoil and overburden stockpiles will be stabilized during extended periods between usage, by means of vegetating or covering the exposed surfaces.

Additional mitigation measures can be implemented on an as-required basis.

Proposed Air Quality Monitoring and Adaptive Management

An Air Quality Management Plan (AQMP) will be created for Project construction and operation. The AQMP will specify the mitigation measures for the management and reduction of air emissions during Project construction and operation, the proposed ambient air quality monitoring program, and the reporting requirements of monitoring results to Manitoba Conservation and Climate.

Ambient air monitoring will include:

- Meteorological monitoring (wind speed and wind direction)
- Ambient PM monitoring (TSP, PM_{10} and $PM_{2.5}$)

The results of the ambient PM monitoring will be used to assess the effectiveness of the dust mitigation measures and to evaluate the need for more rigorous dust mitigation.

For example, if the monitoring program indicates that ground-level TSP, PM_{10} and/or $PM_{2.5}$ concentrations are greater than the Manitoba AAQC, additional mitigation measures to reduce PM emissions will be implemented. Given that dust from the haul roads is the largest source of particulate emissions, more frequent road watering or an application of a dust suppressant will be implemented.

6.4.1.4 Project Residual Effects

The quantities of air contaminants released during the worst-case year of construction (Q2 Year -2 to Q1 Year -1 for both the Gordon and MacLellan sites) are substantively less than the worst-case year of operation (Year 2 for the Gordon site and Year 7 for the MacLellan site), and therefore, the effects on air quality will be less than operation. Comparisons of annual emissions during worst-case year of construction and operation for the Gordon site and the MacLellan site are presented in Section 6.4.1.2.

The quantities of air contaminants released during decommissioning/closure are typically much less than construction and operation, are short-term in duration during active closure and can be managed to negligible or acceptable levels through the application of standard operating procedures (SOPs) and BMPs. Therefore, effects on air quality from emissions associated with decommissioning/closure activities will be less than those of construction and operation.

Maximum ambient concentrations and dustfall for the substances of interest are predicted for the worst-case year of operation at the Gordon site and ore haul on PR 391 (Year 2) and the worst-case year of operation at the MacLellan site (Year 7). The predicted 1-hour and 8-hour average concentrations are based on the maximum hourly emission rates. Predicted 24-hour, monthly and average concentrations are based on the daily average emission rates that consider the actual operating hours per day for each mining activity.

Based on the Ontario ADMG (MOECC 2016), certain extreme, rare, and transient meteorological conditions may be present in the data sets and may be considered as outliers that can be eliminated from the model results. When assessing predicted 1-hour average concentrations, the eight highest meteorological hours in each modelled year are considered meteorological anomalies and the ninth highest value was used for comparison with the AAQC. Similarly, when assessing predicted 24-hour average concentrations, the highest meteorological day in each modelled year is considered a meteorological anomaly and the second highest value in each modelled year was used for comparison with the AAQC. The CAAQS concentration values were calculated using the statistical metric described in the CCME Guidance Document on Air Zone Management (CCME 2019). Further details are found in Volume 5, Appendix A.

Baseline concentrations are added to the predicted maximum concentrations to account for other existing emission sources (natural and anthropogenic) that are not directly included in the model simulation. The model predicted maximum concentrations with the baseline contribution are compared to the Manitoba AAQC and the CAAQS. The CAAQS are reference values for regional air quality management and are applicable to measured ambient concentrations at human receptor locations away from industrial facility boundaries. Maximum predicted concentrations in the LAA are compared to the CAAQS in this context and do not imply compliance with the AAQC at the Project boundary. The maximum predicted concentrations are based on areas along and outside the Project Boundary (i.e., locations where public access is not restricted). The predicted maximum concentrations and dustfall are discussed separately for the Gordon site and the MacLellan site in the following sections.

Corresponding concentration contour maps are presented in Volume 5, Appendix A, Attachment G. The colored contours represent concentrations greater than 10% of the respective AAQC or in case of the background concentration greater than 10% of the AAQC (e.g. annual TSP, $PM_{2.5}$ and dustfall) – greater than the background value. Concentration contour figures are presented only for substances and averaging periods for which maximum predicted concentrations are greater than 10% of the AAQC.

The model predicted maximum ambient VOC, PAH and metal concentrations, and PAH and metal depositions are evaluated in the human health assessment (Chapter 18) and several other VCs (i.e., surface water [Chapter 9], fish and fish habitat [Chapter 10], vegetation and wetlands [Chapter 11], and wildlife and wildlife habitat [Chapter 12]).

Gordon Site

The predicted maximum ground-level concentrations and dustfall from the Gordon site operation are summarized in Table 6-21. Maximum predicted concentrations in Table 6-21 are presented at the following areas:

- An overall maximum in the LAA.
- Maximum predicted concentrations at human receptors.

- Maximum predicted concentrations within Black Sturgeon Reserve. Concentrations are predicted at 30 grid receptors spaced at 500 m to 1,000 m covering the Black Sturgeon Reserve and 30 discrete receptors in Black Sturgeon Reserve (i.e., 14 residences, 1 infrastructure receptor, 2 potential residences and 13 Potential Indigenous Receptors).
- Maximum predicted concentrations along PR 391. Concentrations are predicted at discrete receptors located along PR 391 with a buffer of 300 m from both sides of the road and spaced at 250 m.

Associated concentration and dustfall contours in the LAA, including human receptors, Black Sturgeon Reserve and PR 391, are presented in Map G-1 to Map G-25 in Volume 5, Appendix A, Attachment G. (Note that Maps G-# referenced below are all located in Volume 5, Appendix A, Attachment G).

The model results indicate that the maximum 1-hour average NO_2, CO and SO_2 concentrations and 24-hour average TSP and PM_{10} concentrations are greater than the respective AAQC and the CAAQS. For the other gaseous and PM CACs, dustfall and metals, the maximum predicted values are less than the applicable AAQC. The highest predicted concentrations from the Gordon site operation for substances of interest occur along the Project Boundary and reduce with increased distance from the boundary. Predicted HCN concentrations in Black Sturgeon Reserve and along PR 391 are associated entirely with air emissions from the ore milling and processing plant and the TMF at the MacLellan site.

Maximum NO_2 Concentrations

The maximum predicted 1-hour NO_2 concentration, 459 µg/m³, is greater than the Manitoba AAQC (400 µg/m³). The maximum predicted 24-hour and annual NO_2 concentrations are 74.1 and 11.2 µg/m³, respectively and are less than the Manitoba AAQC and the annual CAAQS. The maximum predicted 1-hour average NO_2 concentration in the metric of the CAAQS (224 µg/m³) is greater than the 1-hour CAAQS (79 µg/m³). The maximum predicted NO_2 concentrations at sensitive receptors for all averaging periods are less than the Manitoba AAQC. The maximum predicted NO_2 concentrations are greater than the 1-hour CAAQS at three sensitive receptors. The maximum predicted NO_2 concentrations in Black Sturgeon Reserve for all averaging periods are less than the applicable AAQC and CAAQS. The maximum predicted NO_2 concentrations along PR 391 for all averaging periods are less than the Manitoba AAQC. The maximum predicted NO_2 concentrations are greater than the 1-hour CAAQS along a segment of PR 391 with an approximate length of 5 km near MacLellan site (Map G-2). Along PR 391, values greater than the 1-hour CAAQS are predicted for less than 15 days in a year.

The maximum predicted 1-hour, 24-hour and annual NO_2 concentrations occur on the northeast Project boundary near the open pit (Maps G-1, G-4, and G-5). The predicted NO_2 concentrations greater than the 1-hour Manitoba AAQC (400 µg/m³) occur for two hours per year and are limited to the northeast Project Boundary near the open pit. There are no sensitive receptors (e.g., residences, trapping areas) on or near the boundary at this location.

The predicted NO_2 concentrations greater than the 1-hour CAAQS (79 µg/m³) extend approximately 2.3 km from the Gordon site boundary (Maps G-2 and G-5). Along the Project boundary, values greater than the 1-hour CAAQS are predicted for 99 days in a year, reducing to one day per year with increasing distance. There are three sensitive receptors (trapping areas) within this area.

Maximum CO Concentrations

The maximum predicted 1-hour CO concentration, 16,096 µg/m³, is greater than the Manitoba AAQC (15,000 µg/m³). The maximum predicted 8-hour CO concentration, 4,952 µg/m³, is less than the Manitoba AAQC (6,000 µg/m³). The maximum predicted CO concentrations at sensitive receptors for all averaging periods are less than the AAQC. The maximum predicted CO concentrations in Black Sturgeon Reserve and along PR 391 for all averaging periods are less than the AAQC.

The maximum predicted 1-hour and 8-hour CO concentrations occur on the northeast Project Boundary near the open pit (Maps G-6 and G-7). The predicted CO concentrations greater than the 1-hour Manitoba AAQC (15,000 µg/m³) occur for one hour per year and are limited to the northeast Project Boundary near the open pit. There are no sensitive receptors on or near the boundary at this location.

Maximum SO_2 Concentrations

The maximum predicted 1-hour SO_2 concentration, 460 µg/m³, is greater than the Manitoba AAQC (450 µg/m³). The maximum predicted 24-hour and annual SO_2 concentrations are 48.7 and 2.45 µg/m³, respectively and are less than the Manitoba AAQC and the annual CAAQS. The maximum predicted 1-hour average SO_2 concentration in the metric of the CAAQS (342 µg/m³) is greater than the 1-hour CAAQS (170 µg/m³; Map G-9). The maximum predicted SO_2 concentrations at sensitive receptors for all averaging periods are less than the AAQC. The maximum predicted SO_2 concentrations in Black Sturgeon Reserve and along PR 391 for all averaging periods are less than the applicable AAQC and CAAQS.

The maximum predicted 1-hour, 24-hour and annual SO_2 concentrations occur on the northeast Project Boundary near the open pit (Maps G-8, G-11, and G-12). Predicted SO_2 concentrations greater than the 1-hour Manitoba AAQC (450 µg/m³) occur for one hour per year and are limited to the northeast Project Boundary near the open pit. There are no sensitive receptors on or near the boundary at this location.

The predicted SO_2 concentrations greater than the 1-hour CAAQS (170 µg/m³) extend approximately 400 m from the Gordon northeast boundary (Maps G-9 and G-10). Along the Project boundary, values greater than the 1-hour CAAQS are predicted for 5 days in a year, reducing to one day per year with increasing distance. There are no sensitive receptors within this area.

Maximum HCN Concentrations

The maximum predicted 1-hour, 24-hour and annual HCN concentrations are 0.592 µg/m³, 0.196 µg/m³ and 0.014 µg/m³, respectively and are less than the Manitoba AAQC and the 24-hour Ontario AAQC. The maximum predicted HCN concentrations at sensitive receptors for all averaging periods are less than the ambient criteria. The maximum predicted HCN concentrations in Black Sturgeon Reserve and along PR 391 for all averaging periods are less than the AAQC.

The maximum predicted 1-hour, 24-hour and annual HCN concentrations occur along PR 391 near MacLellan site (Maps G-13, G-14, and G-15).

Maximum TSP Concentrations

The maximum predicted 24-hour TSP concentration, 606 µg/m³, is greater than the Manitoba AAQC (120 µg/m³). The maximum predicted annual TSP concentration,14.8 µg/m³, is less than the Manitoba AAQC. The maximum predicted TSP concentrations are greater than the Manitoba 24-hour AAQC at one sensitive receptor (trapping area). The maximum predicted TSP concentrations in Black Sturgeon Reserve for all averaging periods are less than the AAQC. The maximum predicted TSP concentrations are greater than the Manitoba 24-hour AAQC along a segment of PR 391 with an approximate length of 5 km near MacLellan site (Map G-16). Along PR 391, values greater than the 24-hour AAQC are predicted for less than 15 days in a year (Map G-17).

The maximum predicted 24-hour and annual TSP concentrations occur on the north and northeast Project boundary, respectively, near the open pit (Maps G-16 and G-18). Predicted TSP concentrations greater than the 24-hour Manitoba AAQC (120 µg/m³) extend approximately 2.2 km from the Gordon site boundary (Map G-17). Along the Project boundary, values greater than the 24-hour AAQC are predicted for 73 days in a year, reducing to one day per year with increasing distance. There is one sensitive receptor (trapping area) within this area.

Maximum PM_{10} Concentrations

The maximum predicted 24-hour PM_{10} concentration, 361 µg/m³, is greater than the Manitoba AAQC (50 µg/m³). The maximum predicted PM_{10} concentrations are greater than the Manitoba 24-hour AAQC at three sensitive receptors (trapping areas). The maximum predicted 24-hour PM_{10} concentrations in Black Sturgeon Reserve are less than the AAQC. The maximum predicted PM_{10} concentrations are greater than the Manitoba 24-hour AAQC along a segment of PR 391 with an approximate length of 6 km near MacLellan site (Map G-19). Along PR 391, values greater than the 24-hour AAQC are predicted for less than 15 days in a year (G-20).

The maximum predicted 24-hour PM_{10} concentration occurs on the north Project Boundary near the open pit (Map G-19). Predicted PM_{10} concentrations greater than the 24-hour Manitoba AAQC (50 µg/m³) extend approximately 3.3 km from the Gordon site boundary (Map G-20). Along the Project boundary, values greater than the 24-hour AAQC are predicted for 110 days in a year, reducing to one day per year with increasing distance. There are three sensitive receptors (trapping areas) within this area.

Maximum $PM_{2.5}$ Concentrations

The maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are 23.5 µg/m³ and 6.87 µg/m³, respectively, and are less than the CAAQS. The maximum predicted $PM_{2.5}$ concentrations at sensitive receptors for all averaging periods are less than the AAQC. The maximum predicted $PM_{2.5}$ concentrations in Black Sturgeon Reserve and along PR 391 for all averaging periods are less than the AAQC.

The maximum predicted 24-hour and annual $PM_{2.5}$ concentrations occur on the northeast Project Boundary near the open pit (Maps G-21 and G-22).

Maximum Dustfall

The maximum predicted 30-day and annual average dustfall are 4.90 g/m²/30-day and 1.87 g/m²/30-day and are less than the Ontario AAQC. The maximum predicted 30-day and annual average dustfall at sensitive receptors are less than the dustfall criteria. The maximum predicted 30-day and annual average dustfall in Black Sturgeon Reserve and along PR 391 are less than the dustfall criteria.

The maximum predicted 30-day and annual dustfall occur on the east Project Boundary near the open pit (Maps G-23 and G-24).

Maximum Metal Concentrations

The maximum predicted metal concentrations for all averaging periods are less than the Manitoba AAQC. The maximum predicted metal concentrations at sensitive receptors for all averaging periods are also less than the ambient criteria. The maximum predicted metal concentrations in Black Sturgeon Reserve and along PR 391 for all averaging periods are less than the AAQC.

The maximum predicted 24-hour and 30-day metal concentrations occur along PR 391 near the MacLellan site. A concentration contour map is presented only for arsenic (Map G-25) because maximum predicted concentrations for arsenic are greater than 10% of the AAQC. Maximum predicted concentrations for the other metals are less than 10% of the AAQC.

Table 6-21 Predicted Maximum Ground-Level Concentrations from Gordon Site Operation

Substance	Averaging Period	Existing/ Baseline Conditions (µg/m³)	Maximum Ground-level Concentration (µg/m³) (includes Baseline Conditions)						Ambient Air Quality Criteria [a] (µg/m³)
			Max. Value in LAA	Max. Value at Human Receptors	Max. Value in Black Sturgeon Reserve	Max. Value along PR 391	Max. No. of Exceedances per Year	% Max. Value of AAQC	
Gaseous CACs									
NO_2	1-hour [b]	7.5	**459**	180	94.0	251	2 h/y	**115%**	400
	1-hour [e]	7.5	**224**	**95.5**	28.8	**90.7**	99 d/y	**283%**	79 [d,e]
	24-hour [c]	5.6	74.1	34.0	14.2	57.0	0	37%	200
	Annual	1.9	11.2	3.61	2.27	4.39	0	19%	60
							0	49%	23 [d,f]
CO	1-hour [b]	406	**16,096**	6,040	1,153	7,747	1 h/y	**107%**	15,000
	8-hour	406	4,952	1,192	515	1,866	0	83%	6,000
SO_2	1-hour [b]	6.0	**460**	168	27.3	215	1 h/y	**102%**	450
	1-hour [g]	6.0	**342**	44.7	8.56	41.1	5 d/y	**201%**	170 [d,g]
	24-hour [c]	6.0	48.7	13.5	6.98	18.8	0	32%	150
	Annual	1.5	2.45	1.60	1.51	1.59	0	8%	30
							0	25%	10 [d,h]
Other Gaseous Species									
HCN	1-hour [b]	0	4.29	0.481	0.296	4.29	0	11%	40
	24-hour [c]	0	2.34	0.114	0.099	2.34	0	29%	8 [i]
	Annual	0	0.077	0.008	0.0081	0.077	0	3%	3
Particulate CACs									
TSP	24-hour [c]	10.5	**606**	**162**	24.3	**235**	73 d/y	**505%**	120
	Annual [j]	10.5	14.8	11.9	10.8	11.4	0	25%	60 [j]
PM_{10}	24-hour	4.6	**361**	**100**	15.4	**160**	110 d/y	**721%**	50

Table 6-21 Predicted Maximum Ground-Level Concentrations from Gordon Site Operation

Substance	Averaging Period	Existing/ Baseline Conditions (µg/m³)	Maximum Ground-level Concentration (µg/m³) (includes Baseline Conditions)						Ambient Air Quality Criteria [a] (µg/m³)
			Max. Value in LAA	Max. Value at Human Receptors	Max. Value in Black Sturgeon Reserve	Max. Value along PR 391	Max. No. of Exceedances per Year	% Max. Value of AAQC	
$PM_{2.5}$	24-hour [k]	2.9	23.5	8.45	3.71	9.19	0	87%	27 [d,k]
	Annual [l]	2.9	6.87	3.54	3.04	3.73	0	78%	8.8 [d,l]
Dustfall (g/m²/30-day)	30-day	0.99	4.90	1.72	1.10	2.09	0	70%	7 [i]
	Annual [j]	0.99	1.87	1.43	1.05	1.36	0	41%	4.6 [i,j]
Metals									
Arsenic	24-hour [c]	0	0.126	0.0106	0.00393	0.126	0	42%	0.3
Cadmium	24-hour [c]	0	0.00148	0.0000323	0.0000333	0.00148	0	0.1%	2
Copper	24-hour [c]	0	0.0456	0.0102	0.00104	0.0456	0	0.1%	50
Lead	24-hour [c]	0	0.0440	0.000923	0.00105	0.0440	0	2%	2
	30-day	0	0.00328	0.000139	0.00016	0.00328	0	0.5%	0.7
Nickel	24-hour [c]	0	0.0827	0.00676	0.00186	0.0827	0	4%	2
Zinc	24-hour [c]	0	0.267	0.0100	0.00568	0.267	0	0.2%	120

NOTES:

[a] Manitoba Ambient Air Quality Criteria (MSD 2005) unless otherwise noted

[b] The maximum 1-hour concentration after eliminating 8 highest meteorological hours in each year

[c] The maximum 24-hour concentration after eliminating the 1st highest meteorological day in each year

[d] CAAQS (CCME 2017)

[e] The 1-hour CAAQS for NO_2 is referenced to the three-year average of the annual 98th percentile of the NO_2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).

[f] The annual CAAQS for NO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average NO_2 concentrations (effective 2025) (CCME 2017).

[g] The 1-hour CAAQS for SO_2 is referenced to the three-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).

[h] The annual CAAQS for SO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average SO_2 concentrations (effective 2025) (CCME 2017).

[i] Ontario AAQC (MOECC 2012)

[j] Annual geometric mean

Table 6-21 Predicted Maximum Ground-Level Concentrations from Gordon Site Operation

Substance	Averaging Period	Existing/ Baseline Conditions (µg/m³)	Maximum Ground-level Concentration (µg/m³) (includes Baseline Conditions)						Ambient Air Quality Criteria [a] (µg/m³)
			Max. Value in LAA	Max. Value at Human Receptors	Max. Value in Black Sturgeon Reserve	Max. Value along PR 391	Max. No. of Exceedances per Year	% Max. Value of AAQC	

[k] The CAAQS for 24-hour $PM_{2.5}$ is referenced to the annual 98th percentile of daily 24-hour average concentrations, averaged over three years (effective 2020) (CCME 2017).
[l] The CAAQS for annual $PM_{2.5}$ is referenced to the three-year mean of annual average concentrations (effective 2020) (CCME, 2017).
Predicted maximum 1-hour and 8-hour average concentrations are based on maximum hourly emission rates.
Predicted maximum 24-hour, 30-day and annual average concentrations are based on daily average emission rates.
Values in **BOLD** exceed the AAQC

MacLellan Site

The predicted maximum ground-level concentrations and dustfall from the MacLellan site operation are summarized in Table 6-22. Maximum predicted concentrations in Table 6-22 are presented at the following areas:

- An overall maximum in the LAA.
- Maximum predicted concentrations at human receptors.

Associated concentration and dustfall contours in the LAA, including human receptors, are presented in Map G-1 to Map G-25 in Volume 5, Appendix A, Attachment G.

The model results indicate that the maximum 1-hour average NO_2 concentrations and 24-hour average TSP and PM_{10} concentrations are greater than the respective AAQC and the CAAQS. For the other gaseous and particulate CACs, dustfall and metals, the maximum predicted values are less than the applicable AAQC. The highest predicted concentrations from the MacLellan site operation for all substances of interest occur along the Project Boundary and reduce with increased distance from the boundary.

Maximum NO_2 Concentrations

The maximum predicted 1-hour NO_2 concentration, 404 µg/m³, is greater than the Manitoba AAQC (400 µg/m³). The maximum predicted 24-hour and annual NO_2 concentrations are 84.5 and 9.03 µg/m³, respectively, and are less than the Manitoba AAQC and the annual CAAQS. The maximum predicted 1-hour average NO_2 concentration in the metric of the CAAQS (146 µg/m³) is greater than the 1-hour CAAQS (79 µg/m³). The maximum predicted NO_2 concentrations at sensitive receptors for all averaging periods are less than the Manitoba AAQC. The maximum predicted NO_2 concentrations are greater than the 1-hour CAAQS at four sensitive receptors.

The maximum predicted 1-hour, 24-hour and annual NO_2 concentrations occur on the south and southwest Project Boundary near the ore milling and processing plant (Maps G-1, G-4, and G-5). The predicted NO_2 concentrations greater than the 1-hour Manitoba AAQC, 400 µg/m³, occur for one hour per year and are limited to the south Project Boundary near the ore milling and processing plant. There are no sensitive receptors on or near the boundary at this location.

The predicted NO_2 concentrations greater than the 1-hour CAAQS,79 µg/m³, extend approximately 3.5 km from the MacLellan site boundary (Maps G-2 and G-3). Along the Project boundary, values greater than the 1-hour CAAQS are predicted for 79 days in a year, reducing to one day per year with increasing distance. There are four sensitive receptors (a youth camp, two trapping areas and a waste disposal site) within this area. The status of the youth camp is unknown because there were reports of a fire and it is unclear if the camp will be operational in the future.

Maximum CO Concentrations

The maximum predicted 1-hour and 8-hour CO concentrations are 13,328 µg/m³ and 4,144 µg/m³, respectively and are less than the Manitoba AAQC. The maximum predicted CO concentrations at sensitive receptors for all averaging periods are less than the AAQC.

The maximum predicted 1-hour and 8-hour CO concentrations occur on the south and southwest Project boundary, respectively, near the ore milling and processing plant (Maps G-6 and G-7).

Maximum SO_2 Concentrations

The maximum predicted 1-hour, 24-hour and annual SO_2 concentrations are 370 µg/m³, 39.0 µg/m³ and 1.95 µg/m³, respectively and are less than the Manitoba AAQC and the annual CAAQS. The maximum predicted 1-hour average SO_2 concentration in the metric of the CAAQS (147 µg/m³) is less than the 1-hour CAAQS (170 µg/m³ ;Map G-9). The maximum predicted SO_2 concentrations at sensitive receptors for all averaging periods are less than the AAQC.

The maximum predicted 1-hour, 24-hour and annual SO_2 concentrations occur on the southwest Project Boundary near the ore milling and processing plant (Maps G-8, G-11, and G-12).

Maximum HCN Concentrations

The maximum predicted 1-hour, 24-hour and annual HCN concentrations are 14.4 µg/m³, 6.50 µg/m³ and 0.55 µg/m³, respectively and are less than the Manitoba AAQC and the 24-hour Ontario AAQC. The maximum predicted HCN concentrations at sensitive receptors for all averaging periods are less than the ambient criteria.

The maximum predicted 1-hour, 24-hour and annual HCN concentrations occur on the northwest Project Boundary near the TMF (Maps G-13, G-14, and G-15).

Maximum TSP Concentrations

The maximum predicted 24-hour TSP concentration, 513 µg/m³, is greater than the Manitoba AAQC (120 µg/m³). The maximum predicted annual TSP concentration, 14.2 µg/m³, is less than the Manitoba AAQC. The maximum predicted TSP concentrations are greater than the Manitoba 24-hour AAQC at three sensitive receptors (two trapping areas and a waste disposal site).

The maximum predicted 24-hour and annual TSP concentrations occur on the southwest Project Boundary near the ore milling and processing plant (Maps G-16 and G-18). The predicted TSP concentrations greater than the 24-hour Manitoba AAQC, 120 µg/m³, extend approximately 2.7 km from the MacLellan site boundary (Map G-17). Along the Project boundary, values greater than the 24-hour AAQC are predicted for 64 days in a year, reducing to one day per year with increasing distance. There are three sensitive receptors (two trapping areas and a waste disposal site) within this area.

Maximum PM_{10} Concentrations

The maximum predicted 24-hour PM_{10} concentration, 315 µg/m³, is greater than the Manitoba AAQC (50 µg/m³). The maximum predicted PM_{10} concentrations are greater than the Manitoba 24-hour AAQC at five sensitive receptors (a youth camp, three trapping areas and a waste disposal site). The status of the youth camp is unknown because there were reports of a fire and it is unclear if the camp will be operational in the future.

The maximum predicted 24-hour PM_{10} concentration occurs on the southeast Project Boundary near the ore milling and processing plant (Map G-19). The predicted PM_{10} concentrations greater than the 24-hour Manitoba AAQC (50 µg/m³) extend approximately 4.2 km from the MacLellan site boundary (Map G-20). Along the Project boundary, values greater than the 24-hour AAQC are predicted for 89 days in a year, reducing to one day per year with increasing distance. There are five sensitive receptors (a youth camp, three trapping areas and a waste disposal site) within this area. Currently, the youth camp is inactive.

Maximum $PM_{2.5}$ Concentrations

The maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are 24.1 µg/m³ and 6.23 µg/m³ and are less than the CAAQS. The maximum predicted $PM_{2.5}$ concentrations at sensitive receptors for all averaging periods are less than the AAQC.

The maximum predicted 24-hour and annual $PM_{2.5}$ concentrations occur on the southwest Project Boundary near the ore milling and processing plant (Maps G-21 and G-22).

Maximum Dustfall

The maximum predicted 30-day and annual average dustfall are 5.51 g/m²/30-day and 1.97 g/m²/30-day and are less than the Ontario AAQC. The maximum predicted 30-day and annual average dustfall at sensitive receptors are less than the dustfall criteria.

The maximum predicted 30-day and annual dustfall occur on the southeast Project Boundary near the ore milling and processing plant. (Maps G-23 and G-24).

Maximum Metal Concentrations

The maximum predicted metal concentrations for all averaging periods are less than the Manitoba AAQC. The maximum predicted metal concentrations at sensitive receptors for all averaging periods are also less than the AAQC. The maximum predicted 24-hour and 30-day metal concentrations for all metals occur on the southwest and south Project Boundary near the ore milling and processing plant. A concentration contour map is presented only for arsenic (Map G-25) because the maximum predicted concentrations for arsenic are greater than 10% of the AAQC. The maximum predicted concentrations for the other metals are less than 10% of the AAQC.

Table 6-22 Predicted Maximum Ground-Level Concentrations from MacLellan Site Operation

Substance	Averaging Period	Existing/ Baseline Conditions (µg/m³)	Maximum Ground-level Concentration (µg/m³) (includes Baseline Conditions)				Ambient Air Quality Criteria [a] (µg/m³)
			Max. Value in LAA	Max. Value at Human Receptors	Max. No. of Exceedances per Year	% Max. Value of AAQC	
Gaseous CACs							
NO_2	1-hour [b]	7.5	**404**	223	1 h/y	**101%**	400
	1-hour [e]	7.5	**146**	**91.5**	79 d/y	**185%**	79 [d,e]
	24-hour [c]	5.6	84.5	48.5	0	42%	200
	Annual	1.9	9.03	3.96	0	15%	60
					0	39%	23 [d,f]
CO	1-hour [b]	406	13,328	6,282	0	89%	15,000
	8-hour	406	4,144	1,445	0	69%	6,000
SO_2	1-hour [b]	6.0	370	173	0	82%	450
	1-hour [g]	6.0	147	36.2	0	86%	170 [d,g]
	24-hour [c]	6.0	39.0	15.7	0	26%	150
	Annual	1.5	1.95	1.60	0	7%	30
					0	20%	10 [d,h]
Other Gaseous Species							
HCN	1-hour [b]	0	14.4	7.15	0	36%	40
	24-hour [c]	0	6.50	2.92	0	81%	8 [i]
	Annual	0	0.55	0.22	0	18%	3
Particulate CACs							
TSP	24-hour [c]	10.5	**513**	**205**	64 d/y	**428%**	120
	Annual [j]	10.5	14.2	12.0	0	24%	60 [j]
PM_{10}	24-hour	4.6	**315**	**132**	89 d/y	**630%**	50
$PM_{2.5}$	24-hour [k]	2.9	24.1	8.40	0	89%	27 [d,k]
	Annual [l]	2.9	6.23	3.74	0	71%	8.8 [d,l]
Dustfall (g/m²/30-day)	30-day	0.99	5.51	2.02	0	79%	7 [i]
	Annual [j]	0.99	1.97	1.60	0	43%	4.6 [i,j]
Metals							
Arsenic	24-hour [c]	0	0.278	0.0969	0	93%	0.3
Cadmium	24-hour [c]	0	0.00314	0.00113	0	0.2%	2
Copper	24-hour [c]	0	0.10074	0.0394	0	0.2%	50
Lead	24-hour [c]	0	0.0984	0.0342	0	5%	2

Table 6-22 Predicted Maximum Ground-Level Concentrations from MacLellan Site Operation

Substance	Averaging Period	Existing/ Baseline Conditions (µg/m³)	Maximum Ground-level Concentration (µg/m³) (includes Baseline Conditions)				Ambient Air Quality Criteria [a] (µg/m³)
			Max. Value in LAA	Max. Value at Human Receptors	Max. No. of Exceedances per Year	% Max. Value of AAQC	
	30-day	0	0.0171	0.00383	0	2%	0.7
Nickel	24-hour [c]	0	0.176	0.0653	0	9%	2
Zinc	24-hour [c]	0	0.479	0.197	0	0.4%	120

NOTES:
[a] Manitoba AAQC (MSD 2005) unless otherwise noted
[b] The maximum 1-hour concentration after eliminating 8 highest meteorological hours in each year
[c] The maximum 24-hour concentration after eliminating the 1st highest meteorological day in each year
[d] CAAQS (CCME 2017)
[e] The 1-hour CAAQS for NO_2 is referenced to the three-year average of the annual 98th percentile of the NO_2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).
[f] The annual CAAQS for NO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average NO_2 concentrations (effective 2025) (CCME 2017).
[g] The 1-hour CAAQS for SO_2 is referenced to the three-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).
[h] The annual CAAQS for SO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average SO_2 concentrations (effective 2025) (CCME 2017).
[i] Ontario AAQC (MOECC 2012)
[j] Annual geometric mean
[k] The CAAQS for 24-hour $PM_{2.5}$ is referenced to the annual 98th percentile of daily 24-hour average concentrations, averaged over three years (effective 2020) (CCME 2017).
[l] The CAAQS for annual $PM_{2.5}$ is referenced to the three-year mean of annual average concentrations (effective 2020) (CCME 2017).
Predicted maximum 1-hour and 8-hour average concentrations are based on maximum hourly emission rates.
Predicted maximum 24-hour, 30-day and annual average concentrations are based on daily average emission rates.
"—" Not applicable
Values in **BOLD** exceed the AAQC

6.4.2 GHG Emissions

6.4.2.1 Analytical Assessment Techniques

The Canadian Environmental Assessment Agency guidance document (CEA Agency 2003) outlines how to incorporate GHG considerations in environmental assessments. This assessment aligns with the guidance document by comparing Project GHG emissions to provincial and national GHG inventories. As stated in the guidance document (CEA Agency 2003), GHG assessments cannot address the significance of a single project's potential effect on climate change, as the small effect of one project on climate change cannot be accurately quantified or measured. Although it is understood that there is a relationship between GHG emissions from anthropogenic sources over the past 100+ years and a changing climate as an effect thereof, effects on climate change cannot be addressed in this GHG assessment. The science of climate change has not advanced to the point where a clear cause and effect relationship can be established between individual project releases and measurable changes to global climate.

The Government of Canada agreed in 2016 to reduce GHG emissions by 30 percent below 2005 levels by 2030 as part of the Paris Agreement (Government of Canada 2016). In June 2017, the House of Commons reconfirmed Canada’s commitment to the Paris Agreement. Closely related to these decisions, recent guidance from the federal government has become available for the strategic assessment of climate change that applies to federal impact assessments. This guidance explains how to consider GHG emissions of a designated project considering public policy beyond the scope of a single project (Government of Canada 2019). The focus of this guidance is on the following:

- Quantification of GHG emissions for the Project
- Quantification of GHGs from upstream activities
- Review of best available technologies
- Assessment of climate change resilience.

The requirement is to establish whether a designated project will hinder or contribute to Canada’s ability to meet its international commitments to reduce GHG emissions by 30% below 2005 levels by 2030, and to help to achieve a low carbon economy by 2050. The assessment presented herein will consider this guidance by comparing estimated GHG emissions from the Project activities to the current regional, national, and global totals, and to the current federal targets.

Since there are no upstream emissions associated with this mining project, the upstream emissions and best available technologies are not assessed here. For those activities with more substantial fuel consumption, as described above, the releases of air contaminants and GHGs have the potential to cause local impacts on sensitive receptors and contribute to climate change. These are, therefore carried forward for more detailed assessment.

The GHG emissions associated with construction and operation activities are estimated and compared to provincial and national totals. The methods used to estimate GHG emissions from the Project are guided by the principles of the GHG Protocol (WRI 2013). The GHG Protocol is an internationally accepted accounting standard and provides guidance on preparing a GHG emissions inventory. Relevance, completeness, consistency, transparency, and accuracy are the five principles that should build the base of GHG accounting and, therefore, guide this assessment.

The quantification methods used, including emission factors, are provided in Volume 5, Appendix A, Attachment F. The emission inventory is an estimate based on best available information at the time of the environmental assessment.

6.4.2.2 Project Pathways

Construction and mining equipment exhausts, blasting using an ammonium nitrate fuel oil emulsion and land clearing during construction are sources of GHG emissions. These GHG emissions consist primarily of CO_2, with smaller amounts of CH_4 and N_2O. Per the GHG Protocol (WRI 2013), the GHG emissions include direct emissions (i.e., Scope 1) from the Project during construction and operation, as well as indirect emissions associated with the consumption of purchased electricity (i.e., Scope 2). Other indirect GHG emissions associated with upstream sources such as production of purchased materials and upstream transportation and distribution (i.e., Scope 3) are assumed to be negligible compared to direct Project GHG emissions.

The US EPA NONROAD model (US EPA 2010a) was used to estimate the fuel consumption of construction and mining off-road equipment based on input information such as engine type, number of units, power rating, utilization factors and total operating hours of the off-road equipment. Diesel combustion emission factors from the ECCC National Inventory Report (ECCC 2019d) were used to estimate emissions from the construction and mining equipment and fuel consumption rates.

Diesel exhaust GHG emission factors for on-highway trucks transporting ore from the Gordon site to the MacLellan site ore milling and processing plant and on-highway trucks carrying fuel, explosives and consumables for the ore milling and processing plant and other on-road vehicles traveling on the access roads and PR 391 were derived from the US EPA MOVES model (MOVES2014a; US EPA 2015). The model was run for a rural unrestricted road type that best represents the access roads and PR 391, for year 2018 to represent current vehicle populations and age distributions, separately for winter and summer and with fuel formulations specific to Manitoba and Canada. Diesel exhaust emissions for on-road vehicles were estimated using the MOVES emission factors (g/VMT), the number of vehicles round trips per day and the length of the road.

The GHG emissions from explosives detonation were estimated using an emission factor (0.189 t CO_2/ tonne of explosives) recommended by the Mining Association of Canada (2014).

The GHG emissions from land clearing were estimated using Manitoba-specific emission factors derived by Natural Resources Canada for deforestation activities in Manitoba (NRCan 2017) as part of the 2017 National Inventory Report (ECCC 2019d). The emission factors were derived for four terrestrial ecozones in Manitoba. Based on the location of the Project, the emission factor for Boreal Shield West was used. GHG emissions from land clearing were estimated from the emission factor for salvage uprooting and burn (85.6 t CO_{2e}/ha) and the area of land clearing (861 ha within the MacLellan site and 187 ha within the Gordon site) during the Project construction phase. The GHG emissions from land clearing were divided by the two years of Project construction to estimate an annual GHG emission contribution. This annual estimate does not include GHG emissions from decay of biomass after the land clearing activities, assuming that merchantable timber will be transported out of the PDA and other cleared biomass will be open burnt with no salvage.

Indirect GHG emissions are associated with electricity consumption at the MacLellan site. Electrical power for the Gordon site will be provided by on-site diesel generators. The indirect GHG emissions from electricity consumption at MacLellan site were calculated using electricity consumption emission factor for Manitoba

(2.1 g CO_{2e}/kWh) from the ECCC National Inventory Report (ECCC 2019d) and the estimated electricity usage at the MacLellan site during operation (16,900 kWh).

6.4.2.3 Mitigation

The implementation of the mitigation measures and other commitments described in this section will be the responsibility of Alamos and or contractors. As described in Section 2.2.3, the mechanisms used to require contractors and subcontractors to comply with these measures will include environmental protection plans and contract documents.

Mitigation measures proposed are considered to be effective for use in similar applications and environmental conditions. This assessment is based on professional judgment of engineers and scientists consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited where applicable to justify the selection. The key industry standard mitigation measures related to the control of GHG emissions are regular maintenance for the mobile equipment, reducing idling time, limiting cold starts and controlling speed of the mobile equipment. These mitigation measure have been proven to be effective at reducing GHG emissions and will be implemented.

Detailed design of the Project and mitigation strategies is currently ongoing. Mitigation measures will be refined in consideration of environmental assessment approval conditions and permit stipulations which will be incorporated into final environmental management planning. The effectiveness of these mitigation measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs including adaptive management procedures will be reviewed by applicable regulatory agencies prior to their implementation.

The mitigation measures associated with ambient air quality (see Section 6.4.1.3) to reduce combustion emissions are also applicable to the mitigation of GHG emissions because combustion sources account for virtually all the GHG emissions associated with the Project construction and operation.

6.4.2.4 Project Residual Effect

Gordon Site

Construction GHG Emissions

The maximum annual GHG emissions from the Gordon site construction are presented in Table 6-23. The Gordon site construction GHG emissions include emissions from heavy off-road equipment, on-highway trucks and vehicles, the stationary generator, blasting and land clearing. Approximately 16.0 kt CO_{2e} are estimated to be released during the worst-case year of construction (Q2 Year -2 to Q1 Year -1). Conservatively assuming continuous release of the worst-case year GHG emissions over the construction period (two years), the total GHG emissions during construction are estimated to be 32.0 kt CO_{2e}. On an annual basis, the Gordon site construction contributes approximately 0.074% and 0.002% to provincial and national GHG emission totals, respectively.

Table 6-23 Estimated GHG Emissions from Gordon Site Construction

Parameter	Units	CO_2	CH_4	N_2O	Total (expressed as CO_{2e})
Construction GHG Emissions	kt/y	15.8	0.0002	0.0006	**16.0**
Manitoba GHG Emissions	kt/y	13,328	3,933	3,910	**21,668** [b]
National GHG Emissions	kt/y	571,137	92,862	38,037	**715,760** [b]
Project construction contribution to Manitoba GHG Emissions	%	0.12%	0.00001%	0.00002%	**0.074%**
Project construction contribution to national GHG Emissions	%	0.003%	0.0000002%	0.0000016%	**0.002%**

NOTE:
[a] Provincial and national GHG emission totals from ECCC NIR (ECCC 2019d)
[b] Provincial and national GHG emission totals include other fluorinated GHGs

Operation GHG Emissions

The maximum estimated annual GHG emissions from the Gordon site operation are presented in Table 6-24. The Gordon site GHG operation emissions include emissions from heavy off-road equipment, on-highway trucks and vehicles, the stationary generator and blasting. Approximately 36.5 kt CO_{2e} are estimated to be released during the worst-case year of operation and corresponding ore haulage on PR 391 (Year 2). Conservatively assuming continuous release of the worst-case year GHG emissions over the operation period (five years), the total GHG emissions during operation are estimated to be 183 kt CO_{2e}. On an annual basis, the Gordon site operation contributes approximately 0.17% and 0.005% to the provincial and national GHG emission totals, respectively.

Table 6-24 Estimated GHG Emissions from Gordon Site Operation

Parameter	Units	CO_2	CH_4	N_2O	Total (expressed as CO_{2e})
Operation GHG Emissions	kt/y	35.8	0.0009	0.0025	**36.5**
Manitoba GHG Emissions [a]	kt/y	13,328	3,933	3,910	**21,668** [b]
National GHG Emissions [a]	kt/y	571,137	92,862	38,037	**715,760** [b]
Project operation contribution to Manitoba GHG Emissions	%	0.27%	0.00002%	0.00006%	**0.17%**
Project operation contribution to national GHG Emissions	%	0.006%	0.000001%	0.000007%	**0.005%**

NOTE:
[a] Provincial and national GHG emission totals from ECCC NIR (ECCC 2019d)
[b] Provincial and national GHG emission totals include other fluorinated GHGs

Decommissioning GHG Emissions

The equipment used for decommissioning at the Gordon Site is very similar to the equipment used for construction. Professional judgement and industry experience suggest that approximately 30% of the construction equipment will be used during decommissioning. Therefore, the GHG emissions estimated for decommissioning at the Gordon Site is 0.46 kt/y CO_{2e}, which represents 30% of the construction GHG emissions for the equipment used to build the on-site infrastructure (1.53 kt/y CO_{2e}).

MacLellan Site

Construction GHG Emissions

The maximum annual GHG emissions from the MacLellan site construction are presented in Table 6-25. The MacLellan site construction GHG emissions include emissions from heavy off-road equipment, on-highway trucks, and vehicles, blasting and land clearing. Approximately 64.6 kt CO_{2e} are estimated to be released during the worst-case year of construction (Q2 Year -2 to Q1 Year -1). Conservatively assuming continuous release of the worst-case year GHG emissions over the construction period (two years), the total GHG emissions during construction are estimated to be 129 kt CO_{2e}. On an annual basis, the MacLellan site construction contributes approximately 0.30% and 0.009% to provincial and national GHG emission totals, respectively.

Table 6-25 Estimated GHG Emissions from MacLellan Site Construction

Parameter	Units	CO_2	CH_4	N_2O	Total (expressed as CO_{2e})
Construction GHG Emissions	kt/y	63.9	0.0007	0.0022	**64.6**
Manitoba GHG Emissions [a]	kt/y	13,328	3,933	3,910	**21,668** [b]
National GHG Emissions [a]	kt/y	571,137	92,862	38,037	**715,760** [b]
Project construction contribution to Manitoba GHG Emissions	%	0.48%	0.00002%	0.00006%	**0.30%**
Project construction contribution to National GHG Emissions	%	0.011%	0.000001%	0.000006%	**0.009%**

NOTE:
[a] Provincial and national GHG emission totals from ECCC NIR (ECCC 2019d)
[b] Provincial and national GHG emission totals include other fluorinated GHGs

Operation GHG Emissions

The maximum estimated annual GHG emissions from the MacLellan site operation are presented in Table 6-26. The MacLellan site operation GHG emissions include emissions from heavy off-road equipment, on-highway trucks and vehicles and blasting. Approximately 68 kt CO_{2e} are estimated to be released during the worst-case year of operation (Year 7). Conservatively assuming continuous release of the worst-case year GHG emissions over operation period (13 years), the total GHG emissions during operation are estimated to be 884 kt CO_{2e}. On an annual basis, the MacLellan site operation contributes approximately 0.31% and 0.01% to the provincial and national emission totals, respectively.

The estimated total indirect GHG emissions from electricity consumption at the MacLellan site during operation is 0.311 kt CO_{2e}/year, which is less than 1% of the total direct annual GHG emissions (68 kt CO_{2e}/year). Indirect GHG emissions are included into the annual GHG emissions totals for the Project in Table 6-26.

Decommissioning GHG Emissions

The equipment used for decommissioning at the MacLellan Site is very similar to the equipment used for construction. Professional judgement and industry experience suggest that approximately 30% of the construction equipment will be used during decommissioning. Therefore, the GHG emissions estimated for decommissioning at the MacLellan Site is 3.78 kt/y CO_{2e}, which is 30% of the construction GHG emissions for the equipment used to build the on-site infrastructure (12.59 kt/y CO_{2e}).

Table 6-26 Estimated GHG Emissions from MacLellan Site Operation

Parameter	Units	CO_2	CH_4	N_2O	Total (expressed as CO_{2e})
Operation GHG Emissions	kt/y	66.7	0.0018	0.0055	**68.3**
Manitoba GHG Emissions [a]	kt/y	13,328	3,933	3,910	**21,668 [b]**
National GHG Emissions [a]	kt/y	571,137	92,862	38,037	**715,760 [b]**
Project operation contribution to Manitoba GHG Emissions	%	0.50%	0.00005%	0.00014%	**0.32%**
Project operation contribution to National GHG Emissions	%	0.01%	0.000002%	0.00001%	**0.01%**

NOTE:
[a] Provincial and national GHG emission totals from ECCC NIR (ECCC 2019d)
[b] Provincial and national GHG emission totals include other fluorinated GHGs

6.4.3 Summary of Project Residual Environmental Effects on Atmospheric Environment

Table 6-27 summarizes the residual environmental effects on air quality and GHG emissions during construction, operation, and decommissioning/closure.

6.4.3.1 Construction

Air Quality

The residual environmental effects during construction are the same for the Gordon site and the MacLellan site and therefore, they are summarized together.

- Direction: The direction for change in air quality during construction is rated adverse (A) because the Project construction results in a predicted increase of ambient concentrations and dustfall compared to baseline conditions.
- Magnitude: The magnitude for change in air quality during construction is rated low (L) because air emissions released during the worst-case year of construction (Q2 Year -2 to Q1 Year -1 for both, the Gordon site and the MacLellan site) are less than the worst-case year of operation (Year 2 for the Gordon site and Year 7 for the MacLellan site). Because the annual emissions during construction are estimated to be less than the emissions during operation (65% to 85% less for the Gordon site and 20% to 65% less for the MacLellan site, Section 6.4.1.2), the magnitude of the air quality residual effects during construction is also expected to be lower than the predicted air quality effects during operation, and is therefore rates as low (L).
- Geographic Extent: The geographic extent for change in air quality during construction is expected to be limited to the LAA because construction emissions are less than operation emissions and the areas

where the Project operation emissions result in predicted ambient concentrations and dustfall greater than baseline conditions is limited to the extent of the LAA.

- Duration: The duration for change in air quality during construction is short-term (ST) because the predicted increase in ambient concentrations and dustfall due to the Project construction is restricted to the duration of the construction phase (two years).
- Timing: Air emissions released during construction and the corresponding ambient concentrations and dustfall vary with season and time of day and therefore, timing is applicable (A) to air quality.
- Frequency: The frequency for change in air quality during construction is rated irregular event (IR) because the ambient concentrations at a given location are variable in time depending on the current meteorological conditions, although emissions could be continuous.
- Reversibility: The reversibility for change in air quality during construction is rated reversible (R) because the predicted increase in ambient concentrations and dustfall due to the Project construction would return to baseline conditions after the end of the construction phase.
- Ecological and Socio-Economic Context: The LAA where the changes in air quality are assessed is rated as disturbed (D) because there has been past human development (anthropogenic sources of emissions) within the LAA prior to the Project.

GHG Emissions

The residual environmental effects on GHG emissions during construction are the same for the Gordon site and the MacLellan site and therefore, they are summarized together.

- Direction: The direction for GHGs during construction is rated adverse (A) because the Project construction results in a predicted increase of GHG emissions compared to baseline conditions.
- Magnitude: The magnitude for GHGs during construction is rated low (L) because the Project construction results in a relatively small change of GHG emissions compared to provincial and national totals.
- Geographic Extent: The geographic extent for change in GHGs during operation is not applicable because the effect is determined at the provincial, national, and global scales.
- Duration: The duration for change in GHGs during construction is short-term (ST) because the predicted increase in GHG emissions due to the Project construction is restricted to the duration of the construction phase (two years).
- Timing: Seasonality is not applicable to GHG emissions.
- Frequency: The frequency for change in GHGs during construction is rated continuous (C) because GHG emissions occur continuously during the construction phase.

- Reversibility: The reversibility for change in GHGs during construction is rated irreversible (I) because effect related to the release of GHG emissions from the Project construction is not reversible for at least 100 years.
- Ecological and Socio-Economic Context: The LAA where GHGs are assessed, is rated as disturbed (D) because there has been past human development (anthropogenic sources of emissions) within the LAA prior to the Project.

6.4.3.2 Operation

The residual environmental effects during operation are the same for the Gordon site and the MacLellan site and therefore, they are summarized together.

Air Quality

- Direction: The direction for change in air quality during operation is rated adverse (A) because the Project operation results in a predicted increase of ambient concentrations and dustfall compared to baseline conditions.
- Magnitude: The magnitude for change in air quality during operation is rated low to high (L/M/H) because the Project operation results in predicted ambient concentrations for the various substances of interest and averaging periods that are greater than 10% of baseline concentrations but less than 50% of the AAQC (L), greater than 50% of the AAQC (M) or greater than the AAQC (H).
- Geographic Extent: The geographic extent for change in air quality during operation is limited to the LAA because the areas where the Project operation results in predicted ambient concentrations and dustfall greater than baseline conditions are limited to the extent of the LAA.
- Duration: The duration for change in air quality during operation is medium-term (MT) because the predicted increase in ambient concentrations and dustfall due to the Project operation extends through operation (five years for the Gordon site and 13 years for the MacLellan site).
- Timing: Air emissions released during operation and the corresponding ambient concentrations and dustfall vary with season and time of day and therefore, timing is applicable (A) to air quality.
- Frequency: The frequency for change in air quality during operation is rated irregular event (IR) because the predicted ambient concentrations at a given location are variable in time depending on the current meteorological conditions, although emissions could be continuous.
- Reversibility: The reversibility for change in air quality during operation is rated reversible (R) because the predicted increase in ambient concentrations and dustfall due to the Project operation would return to baseline conditions after the end of operation.
- Ecological and Socio-Economic Context: The LAA where the changes in air quality are assessed is rated as disturbed (D) because there has been past human development (anthropogenic sources of emissions) within the LAA prior to the Project.

GHG Emissions

The residual environmental effects on GHG emissions during operation are the same for the Gordon site and the MacLellan site and therefore, they are summarized together.

- Direction: The direction for greenhouse gases during operation is rated adverse (A) because the Project operation results in a predicted increase of GHG emissions compared to baseline conditions.
- Magnitude: The magnitude for GHGs during operation is rated low (L) because the Project operation results in a relatively small change of GHG emissions compared to provincial and national totals.
- Geographic Extent: The geographic extent for change in GHGs during operation is not applicable because the effect is determined at the provincial, national, and global scales.
- Duration: The duration for change in GHGs during operation is medium-term (MT) because the predicted increase in GHG emissions due to the Project operation is restricted to the duration of operation (five years for the Gordon site and 13 years for the MacLellan site).
- Timing: Seasonality is not applicable to GHG emissions.
- Frequency: The frequency for change in GHGs during operation is rated continuous (C) because GHG emissions occur continuously during operation.
- Reversibility: The reversibility for change in GHGs during operation is rated irreversible (I) because the effect related to the release of GHG emissions from the Project operation is not reversible for at least 100 years.
- Ecological and Socio-Economic Context: The LAA where GHGs are assessed, is rated as disturbed (D) because there has been past human development (anthropogenic sources of emissions) within the LAA prior to the Project.

6.4.3.3 Decommissioning/Closure

Air Quality

The residual environmental effects during decommissioning/closure are the same for the Gordon site and the MacLellan site and therefore, they are summarized together.

- Direction: The direction for change in air quality during decommissioning/closure is rated adverse (A) because the Project decommissioning/closure result in a predicted increase of ambient concentrations and dustfall compared to baseline conditions.
- Magnitude: The magnitude for change in air quality during decommissioning/closure is rated negligible (N) because the air emissions released and the associated air quality effects during decommissioning/closure activities (i.e., vehicle movements, equipment operation, bulk materials, supplies and personnel movements) are typically much less than construction and operation, are short-

term in duration during active closure and can be managed to negligible or acceptable levels through the application of SOPs and BMPs.

- Geographic Extent: The geographic extent for change in air quality during decommissioning/closure is expected to be limited to the LAA because decommissioning/closure emissions are much less than construction and operation emissions and the areas where the Project operation emissions result in predicted ambient concentrations and dustfall greater than baseline conditions is limited to the extent of the LAA.
- Duration: The duration for change in air quality during decommissioning/closure is long-term (LT) because the predicted increase in ambient concentrations and dustfall due to the Project decommissioning/closure extends beyond operation (five years for the Gordon site and 13 years for the MacLellan site).
- Timing: Air emissions released during decommissioning/closure and the corresponding ambient concentrations and dustfall vary with season and time of day and therefore, timing is applicable (A) to air quality.
- Frequency: The frequency for change in air quality during decommissioning/closure is rated irregular event (IR) because the ambient concentrations at a given location are variable in time depending on the current meteorological conditions, although emissions could be continuous.
- Reversibility: The reversibility for change in air quality during decommissioning/closure is rated reversible (R) because the predicted increase in ambient concentrations and dustfall due to the Project would return to baseline conditions after the end of the decommissioning/closure phase.
- Ecological and Socio-Economic Context: The LAA where the changes in air quality are assessed is rated as disturbed (D) because there has been past human development (anthropogenic sources of emissions) within the LAA prior to the Project.

GHG Emissions

The residual environmental effects on GHG emissions during decommissioning/closure are the same for the Gordon site and the MacLellan site and therefore, they are summarized together.

- Direction: The direction for GHGs during decommissioning/closure/ is rated adverse (A) because the Project decommissioning/closure result in a predicted increase of GHG emissions compared to baseline conditions.
- Magnitude: The magnitude for GHGs during decommissioning/closure is rated negligible (N) because GHG emissions released during decommissioning/closure activities (i.e., vehicle movements, equipment operation, bulk materials, supplies and personnel movements) are typically much less (e.g., approximately 30%) than construction, are short-term in duration during active closure and can be managed to negligible or acceptable levels through the application of SOPs and BMPs.

- Geographic Extent: The geographic extent for change in GHGs during decommissioning/closure is not applicable because the effect is global.
- Duration: The duration for change in GHGs during decommissioning/closure is long-term (LT) because the predicted increase in GHG emissions due to the Project decommissioning/closure extends beyond operation (five years for the Gordon site and 13 years for the MacLellan site).
- Timing: Seasonality is not applicable to GHG emissions.
- Frequency: The frequency for change in GHGs during decommissioning/closure is rated irregular event (IR) because GHG emissions occur intermittently during the decommissioning/closure phase.
- Reversibility: The reversibility for change in GHGs during decommissioning/closure is rated irreversible (I) because effect related to the release of GHG emissions from the Project decommissioning/closure is not reversible for at least 100 years.
- Ecological and Socio-Economic Context: The LAA where GHGs are assessed, is rated as disturbed (D) because there has been past human development (anthropogenic sources of emissions) within the LAA prior to the Project.

Table 6-27 Project Residual Effects on Atmospheric Environment

Residual Effect	Residual Effects Characterization								
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-Economic Context
Construction									
Gordon Site									
Changes in Air Quality	C	A	L	LAA	ST	A	IR	R	D
Change in Atmospheric Greenhouse Gases	C	A	L	N/A	ST	N/A	C	I	D
MacLellan Site									
Changes in Air Quality	C	A	L	LAA	ST	A	IR	R	D
Change in Atmospheric Greenhouse Gases	C	A	L	N/A	ST	N/A	C	I	D

Table 6-27 Project Residual Effects on Atmospheric Environment

Residual Effect	Residual Effects Characterization								
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-Economic Context
Operation									
Gordon Site									
Changes in Air Quality	O	A	L/M/H	LAA	MT	A	IR	R	D
Change in Atmospheric Greenhouse Gases	O	A	L	N/A	MT	N/A	C	I	D
MacLellan Site									
Changes in Air Quality	O	A	L/M/H	LAA	MT	A	IR	R	D
Change in Atmospheric Greenhouse Gases	O	A	L	N/A	MT	N/A	C	I	D
Decommissioning/Closure									
Gordon Site									
Changes in Air Quality	D	A	N	LAA	LT	A	IR	R	D
Change in Atmospheric Greenhouse Gases	D	A	N	N/A	LT	N/A	IR	I	D
MacLellan Site									
Changes in Air Quality	D	A	N	LAA	LT	A	IR	R	D
Change in Atmospheric Greenhouse Gases	D	A	N	N/A	LT	N/A	IR	I	D

Table 6-27 Project Residual Effects on Atmospheric Environment

Residual Effect	Residual Effects Characterization								
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-Economic Context

KEY
See Table 6-3 for detailed definitions

Project Phase
C: Construction
O: Operation
D: Decommissioning

Direction:
P: Positive
A: Adverse

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PDA: Project Development Area
LAA: Local Assessment Area
RAA: Regional Assessment Area

Duration:
ST: Short-term;
MT: Medium-term
LT: Long-term
N/A: Not applicable

Timing:
N/A: Not Applicable
A: Applicable

Frequency:
S: Single event
IR: Irregular event
R: Regular event
C: Continuous

Reversibility:
R: Reversible
I: Irreversible

Ecological/Socio-Economic Context:
D: Disturbed
U: Undisturbed

6.5 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS ON ATMOSPHERIC ENVIRONMENT

The project residual effects described in Section 6.4 may interact cumulatively with residual environmental effects from other physical activities (past, present, and future reasonably foreseeable).

The effects of past and current projects relative to conditions prior to historical mining activities contribute to baseline conditions upon which Project effects are assessed. Conditions prior to historical mining activities are generally considered to be similar to currently undisturbed areas of the RAA.

Future projects and activities that are reasonably foreseeable are defined as those that; (a) have been publicly announced with a defined project execution period and with sufficient project details that allow for a meaningful assessment, (b) are currently undergoing an environmental assessment or, (c) are in a permitting process.

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- The Project has residual environmental effects on the VC, and
- The residual effects could act cumulatively with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either is not met, the assessment of cumulative effects concludes with a statement that further assessment of cumulative effects is not warranted because the Project does not interact cumulatively with other projects or activities.

6.5.1 Project Residual Effects Likely to Interact Cumulatively

Table 4C-1 in Chapter 4, Environmental Effects Assessment Scope and Methods, presents the project and physical activities inclusion list, which identifies other projects and physical activities that might act cumulatively with the Project. Where residual environmental effects from the Project act cumulatively with residual effects from other projects and physical activities (Table 6-28), a cumulative effects assessment is undertaken to determine their significance. The environmental effects identified in Table 6-28 marked as not likely to interact cumulatively with residual effects of other projects and physical activities (no check mark) are not discussed further.

Table 6-28 Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Environmental Effects	Environmental Effects	
	Change in Air Quality	Change in Atmospheric Greenhouse Gases
Past and Present Physical Activities and Resource Use		
"A" Mine	–	–
EL Mine	–	–
Fox Mine	–	–
Farley Mine	–	–
Ruttan Mine	–	–
MacLellan Mine (Historical)	–	–
Burnt Timber Mine	–	–
Farley Lake Mine	–	–
Keystone Gold Mine	–	–
East/West Tailings Management Areas	–	–
Mineral Exploration	–	–
Water and Waste Projects (sewage plants, waste disposal grounds)	–	–
Residential and Community Development (including cottage subdivisions)	–	–
Infrastructure Development (transmission line, airport, highways, roads, rail)	–	–
Other Resource Activities (hunting, fishing, berry picking)	–	–
Future Physical Activities		
Mineral Development	–	–
Mineral Exploration	–	–

Table 6-28 Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Environmental Effects	Environmental Effects	
	Change in Air Quality	Change in Atmospheric Greenhouse Gases
Traditional Land Use	–	–
Resource Use Activities	–	–
Recreation	–	–

NOTES:
✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with Project residual environmental effects.
– = Interactions between the residual effects of other projects and residual effects of the Project are not expected.
For a detailed description and mapped locations of Projects and Physical Activities, where applicable, see Chapter 4, Table 4D-2 and Maps 4-1 and 4-2.

Past and present physical activities identified in Table 6-28 include mineral development, mineral exploration, water and waste projects, residential and community development, infrastructure development, traditional land and resource use, and recreation activities. Past physical activities (e.g., not operating, closed or decommissioned facilities) will not have effects on air quality as they do not overlap temporally with the Project, therefore, cannot interact cumulatively. Baseline ambient concentrations provided in Section 6.2 account for present (currently active) projects and activities that are sources of air emissions (i.e., residential, industrial, commercial, and natural environment) in the LAA. As such, the contribution of present projects and activities are considered in the assessment of Project residual effects (Section 6.4).

Cumulative effects on air quality depend on the proximity of the Project to the other facilities. Changes in air quality associated with an industrial facility tend to be the greatest near the facility and decrease with increasing distance from the facility area. Furthermore, the zone of influence for transport and dispersion of gaseous air emissions is generally less than 10 km. The zone of influence is defined as the distance from the facility to the point where the ambient air quality decreases to background levels. The zone of influence for TSP concentrations and dustfall is generally less than 5 km since TSP and dustfall are primarily composed of particles larger than 10 µm, which settle on the ground due to gravitational influences.

Future physical activities identified in Table 6-28 include mineral development, mineral exploration, traditional land use, resource use activities and recreation. Activities such as traditional land and resources use, hunting, outfitting, trapping, fishing, and recreation activities have negligible air and GHG emissions that would not be distinguishable from baseline, and therefore, do not warrant further consideration. Future mineral development activities are located further than 10 km from the Project and therefore, are not expected to have an overlapping effect with the Project with respect to air quality. The reasonably foreseeable mineral exploration activities in Lynn Lake and the surrounding area include claim staking and advanced exploration. Claim staking activities have negligible air and GHG emissions. Advanced exploration involves the on-site investigation of local geology. Advanced exploration activities may include drilling, surface stripping, excavation, ground geophysics, downhole geophysics, and geochemistry. Air emissions (primarily PM emissions) associated with advanced exploration are short in duration and much smaller in magnitude than Project emissions. Due to the short periods and small magnitude of these emissions, the maximum concentrations associated with advanced exploration activities are not expected to overlap with the maximum model predicted ambient air quality concentrations associated with the Project emissions. Similarly, the GHG emissions expected from short term projects (e.g., reasonably foreseeable advanced mineral exploration activities) is expected to be low in magnitude compared to provincial and national GHG totals.

While GHG emissions from a single project are negligible compared to global emissions, they do contribute to global emissions which are responsible for causing climate change. The GHG emissions from the Project are 104,885 tonnes CO_{2e} per year and are anticipated to be less than 0.015% of national emissions. Though the GHG emissions from the Project are expected to be a small fraction (< 0.015%) of Canada's total emissions, the Project-related GHG emissions may affect Canada's ability to meet its commitments with respect of climate change. Similarly, Manitoba set a GHG reduction goal of no less than 1 Mt of CO_{2e} cumulative emissions reductions for the province's first five-year carbon savings account period of 2018-2022. The GHG emissions from the Project are 104,885 tonnes CO_{2e} per year and are anticipated to be less than 0.48% of the provincial emissions. The Project-related GHG emissions may affect Manitoba's ability to meet their emission reduction target, though the GHG emissions are expected to be a small fraction (< 0.48%) of Manitoba's total emissions.

Therefore, there are no cumulative effects as a result of the residual effects of the Project in combination with the effects of other reasonably foreseeable emission sources for air quality and GHG.

6.6 EFFECTS TO FEDERAL LANDS

Federal lands within the LAA and RAA for Atmospheric Environment consist of Black Sturgeon Reserve which falls within the LAA.

The potential residual effects on ambient air quality at the Black Sturgeon Reserve are summarized in Section 6.4 and Volume 5, Appendix A. The air dispersion modelling included 30 grid receptors spaced at 500 m to 1,000 m covering the Black Sturgeon Reserve and 30 discrete receptors in Black Sturgeon Reserve (i.e., 14 residences, one infrastructure receptor, two potential residences and 13 Potential Indigenous Receptors).

The maximum predicted ambient air concentrations at the Black Sturgeon Reserve are discussed in Section 6.4.1.4 and presented in Table 6-21. Overall, the model predicted ambient air concentrations at the Black Sturgeon Reserve are well below the AAQC because the Black Sturgeon Reserve is located at a substantial distance from the Project activities at the Gordon Site (approximately 6 km) and the MacLellan Site (approximately 20 km). The maps showing the model predicted ambient air concentrations at the Black Sturgeon Reserve are included in Volume 5, Appendix A, Attachment G.

6.7 DETERMINATION OF SIGNIFICANCE

6.7.1 Significance of Project Residual Effects

6.7.1.1 Changes in Air Quality

As defined in Section 6.1.6 , a significant effect on air quality is one that results in predicted values that are greater than the applicable AAQC (e.g., high in magnitude) and are of concern relative to one or more of geographic extent, frequency of occurrence, and the presence of potentially sensitive receptors (e.g., human, wildlife, vegetation, soils or waterbodies).

Predicted concentrations that are greater than the applicable AAQC, in themselves, do not imply that the effect on ambient air quality is significant. Dispersion models often produce results that are conservative (i.e., they overpredict concentrations).

Gordon Site

Gaseous CAC and HCN

The maximum predicted 24-hour and annual NO_2 and SO_2 concentrations and 8-hour CO concentrations along and outside of the Project Boundary are less than the applicable AAQC. The maximum predicted 1-hour NO_2, SO_2 and CO concentrations are greater than the respective 1-hour AAQC. Emissions of HCN are not expected at the Gordon site because air emissions of HCN are only associated with the ore milling and processing plant and the TMF at the MacLellan site which is located more than 30 km away.

The maximum predicted 1-hour NO_2, CO and SO_2 concentrations range from 102% to 115% of the AAQC and are predicted on the northeast Project Boundary near the open pit. There are no sensitive receptors on or near the Project Boundary at this location. Although the predicted maximum values are greater than the AAQC, these occurrences are only predicted to occur on the Project with a very small aerial extent of the exceedances (Maps G-1, G-6 and G-8 in Volume 5, Appendix A, Attachment G), are limited to a maximum of two hours per year and are not near sensitive receptors.

Particulate CAC and Dustfall

The maximum predicted 24-hour and annual $PM_{2.5}$ concentrations, annual TSP concentrations and dustfall along and outside the Project Boundary are less than the applicable AAQC. The maximum predicted 24-hour TSP and PM_{10} concentrations are greater than the respective AAQC. As maximum TSP and PM_{10} concentrations are predicted to be greater than the AAQC outside the Project Boundary due primarily to fugitive emissions, an ambient air quality monitoring program will be implemented to monitor ambient TSP, PM_{10} and $PM_{2.5}$ concentrations during construction and operation. The monitoring program will be used to determine whether additional mitigation measures are needed to further reduce fugitive PM emissions.

For example, if the monitoring program indicates that ambient TSP, PM_{10} and/or $PM_{2.5}$ concentrations are greater than the Manitoba AAQC, additional mitigation measures to reduce PM emissions will be implemented. Given that fugitive dust from the haul roads is the largest source of particulate emissions, more frequent road watering or an application of a dust suppressant could be implemented. There are a wide range of industry proven mitigation measures that can further reduce fugitive dust emissions from haul roads.

Although the predicted TSP and PM_{10} concentrations are greater than the AAQC, an ambient air quality monitoring program will be implemented to determine the need for additional mitigation measures to reduce fugitive dust emissions. The details of the monitoring program will be documented in an AQMP for Project construction and operation.

Metals

The assessment considers six metals. The maximum predicted concentrations for the six metals along and outside of the Project Boundary are less than the applicable AAQC.

Summary for Gordon Site

Maximum predicted 1-hour average NO_2, CO and SO_2 concentrations are greater than the AAQC but these occurrences are only predicted to occur on the Project boundary, are limited to a maximum of two hours per year and are not near sensitive receptors. Maximum predicted 24-hour TSP and PM_{10} concentrations are greater than the AAQC outside the Project Boundary due primarily to fugitive dust emissions, and therefore, an ambient air quality monitoring program will be implemented to monitor ambient TSP, PM_{10} and $PM_{2.5}$ concentrations during construction and operation. With these considerations, and with mitigation and environmental protection measures, the residual environmental effects on air quality at the Gordon site are predicted to be not significant.

MacLellan Site

Gaseous CAC and HCN

The maximum predicted SO_2, CO and HCN concentrations along and outside of the Project Boundary are less than the applicable AAQC for all averaging periods. The maximum predicted 24-hour and annual NO_2 concentrations along and outside of the Project Boundary are less than the AAQC. The maximum predicted 1-hour NO_2 concentrations are greater than the 1-hour AAQC.

The maximum predicted 1-hour NO_2 concentration is 101% of the 1-hour AAQC and is predicted on the south Project Boundary near the ore milling and processing plant. There are no sensitive receptors on or near the Project Boundary at this location. Although the predicted maximum value is greater than the AAQC, the exceedances are only predicted to occur on the Project Boundary with a very small aerial extent of the exceedances (Map G-1 in Volume 5, Appendix A, Attachment G), are limited to only one hour per year and are not near sensitive receptors.

Particulate CAC and Dustfall

The maximum predicted 24-hour and annual $PM_{2.5}$ concentrations, annual TSP concentrations and dustfall along and outside the Project Boundary are less than the applicable AAQC. The maximum predicted

24-hour TSP and PM_{10} concentrations are greater than the respective AAQC due primarily to fugitive emissions. As maximum TSP and PM_{10} concentrations are predicted to be greater than the AAQC outside the Project boundary, an ambient air quality monitoring program will be implemented to monitor ambient TSP, PM_{10} and $PM_{2.5}$ concentrations during construction and operation. The monitoring program will be used to evaluate whether additional mitigation measures are needed to further reduce fugitive PM emissions.

For example, if the monitoring program indicates that ambient TSP, PM_{10} and/or $PM_{2.5}$ concentrations are greater than the Manitoba AAQC, additional mitigation measures to reduce PM emissions will be implemented. Given that fugitive dust from the haul roads is the largest source of PM emissions, more frequent road watering or an application of a dust suppressant could be implemented. There are a wide range of industry-proven mitigation measures that can further reduce fugitive dust emissions.

Although the predicted PM concentrations are greater than the AAQC, an ambient air monitoring program will be implemented to evaluate the need for additional mitigation measures to reduce fugitive dust emissions. The details of the monitoring program will be documented in an AQMP for Project construction and operation.

Metals

The assessment considers six metals. The maximum predicted concentrations for the six metals along and outside of the Project Boundary are less than the applicable AAQC.

Summary for MacLellan Site

Maximum predicted 1-hour average NO_2 concentrations are greater than the AAQC, but these occurrences are only predicted to occur on the Project Boundary, are limited to a maximum of one hour per year and are not near sensitive receptors. Maximum predicted 24-hour TSP and PM_{10} concentrations are greater than the AAQC outside the Project Boundary due primarily to fugitive dust emissions, and therefore, an ambient air quality monitoring program will be implemented to monitor ambient TSP, PM_{10} and $PM_{2.5}$ concentrations during construction and operation. With these considerations, and with mitigation and environmental protection measures, the residual environmental effects on air quality at the MacLellan site are predicted to be not significant.

6.7.1.2 Greenhouse Gases

As defined in Section 6.1.6, a significant effect on greenhouse gases cannot be determined quantitatively. Provincial and federal policies and regulations do not identify specific thresholds or standards that could be used to determine significance when assessing the residual effects of the Project's GHG emissions. The primary criterion used to assess Project-related changes in GHG emissions is magnitude. The GHG emissions from the Project are compared to provincial and national inventories to establish a context for the magnitude of emissions. The significance of Project GHG emission totals will be determined at the provincial and national jurisdictional boundaries by comparing Project GHG emission totals to provincial and national GHG emission totals.

Gordon Site

The Project GHG emissions during construction and operation represent a small contribution to provincial and national GHG emissions. On an annual basis, the Gordon site construction contributes approximately 0.11% and 0.003% to provincial and national GHG emission totals, respectively. The Gordon site operation contributes approximately 0.17% and 0.005% to the provincial and national emission totals, respectively. Based on these results and the characterization of residual effects in Section 6.1.5, the residual environmental effects on GHG emissions at the Gordon site are predicted to be not significant.

MacLellan Site

The Project GHG emissions during construction and operation represent a small contribution to provincial and national GHG emissions. On an annual basis, the MacLellan site construction contributes approximately 0.44% and 0.013% to provincial and national GHG emission totals, respectively. The MacLellan site operation contributes approximately 0.32% and 0.01% to the provincial and national emission totals, respectively. Based on these results and the characterization of residual effects in Section 6.1.5, the residual environmental effects on GHG emissions at the MacLellan site are predicted to be not significant.

6.7.2 Significance of Effects on Federal Lands

The only federal land within the LAA and RAA is Black Sturgeon Reserve. Based on the results in Section 6.6, the residual environmental effects from changes to the Atmospheric Environment on federal land are predicted to be not significant.

6.8 PREDICTION CONFIDENCE

6.8.1 Air Quality

The air quality assessment depends on air quality simulation models to link emissions to air quality changes, and the model predictions depend on the representativeness of the source and emission inventory, the meteorological conditions used in the model, and the algorithms used to represent atmospheric physics and chemistry processes in the models.

6.8.1.1 Emission Uncertainty

Diesel exhaust emissions from construction and mining off-road equipment are based on the Canadian emission standards for off-road compression-ignition engines (ECCC 2005a) and published equipment load factors (US EPA 2010b). Therefore, the level of confidence associated with the estimation of gaseous CAC emissions (e.g., NO_X, CO, SO_2 and VOC) and DPM from these sources is high. The level of confidence for the estimation of emission rates for individual VOC, PAH and metal species is medium because emission factors for these species are derived using a transportation model (MOVES2014a) based on vehicle population distributions built into the model.

Fugitive TSP (and associated PM_{10} and $PM_{2.5}$) emission rates depend on the properties of the surface material, the occurrence and history of surface disturbances, and meteorological conditions. While the air quality assessment uses emission estimation algorithms developed by the US EPA, there is uncertainty associated with estimating these emissions. Particularly, fugitive road dust emissions estimated with the US EPA emission factors have been found to substantially overpredict PM emissions. This overprediction results in overprediction of the associated ambient TSP, PM_{10} and $PM_{2.5}$ concentrations and dustfall deposition. Multiple investigators have found consistent overpredictions when comparing the predicted fugitive PM concentrations from air quality models to measured PM concentrations, typically by a factor of 2 to 6 (Pace 2005; Countess 2007; Pouliot et al. 2010).

Pace (2005) states that "*Most experts agree that this overestimation is due to a combination of shortcomings in the inventory-modeling process: 1) the multiplier used to "scale" or infer $PM_{2.5}$ from PM_{10} emissions in the inventory, 2) faulty emission factor algorithms, 3) imprecise or difficult to obtain activity data to apply these algorithms (including inability to account for the effect of actual meteorological conditions on emissions), and 4) modeling deficiencies (especially in the treatment of particles near their point of emissions)*".

Practitioners often reduce particulate matter emission rates by a factor between 2 to 6 to account for these issues. In this assessment, fugitive dust emissions estimated using the US EPA approach were used without reduction to obtain a first order understanding of potential magnitude, geographic extent, and frequency of the maximum concentrations in the LAA due to Project operation. Therefore, the PM concentration and deposition predictions should be interpreted with a bias to overprediction in mind.

6.8.1.2 Meteorology Uncertainty

The application of five years of hourly meteorological data includes a wide range of conditions which reduces the level of uncertainty related to meteorology. The use of five years of meteorology data is consistent with the recommendations provided in the draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation 2006). The CALMET® model domain for this assessment is relatively flat and therefore, large variations in meteorology across the domain are not expected. The level of confidence related to the meteorological data is rated as moderate to high.

6.8.1.3 Model Uncertainty

In terms of the air quality model algorithms, the US Environmental Protection Agency (US EPA 2005) states:

> *"Models are reasonably reliable in estimating the magnitude of highest concentrations occurring sometime, somewhere within an area. For example, errors in highest estimated concentrations of ±10 to ±40% are found to be typical, i.e., certainly well within the often-quoted factor-of-two accuracy that has long been recognized for these models."*

In addition, they also state, "*it is desirable to quantify the accuracy or uncertainty associated with concentration estimates used in decision-making. Communications between modelers and decision-makers must be fostered and further developed*."

The US EPA (2005) indicates that the application of regulatory dispersion models is viewed as a best estimate approach and that this approach should be viewed as acceptable to the decision maker. MSD (2006) has issued guidelines for air dispersion modelling recognizing that the modelling is a best estimate approach and to provide consistency with respect to the application of models to assess projects in Manitoba. The model approach that was used for this assessment is viewed as being a best-practice approach. The level of confidence related to the air dispersion model is rated as moderate to high.

6.8.1.4 Overall Prediction Confidence for Changes in Air Quality

The level of confidence is high for the estimated combustion emissions, the representativeness of the meteorological data, the selected model approach, and the overall effectiveness of the proposed mitigation measures. The prediction confidence associated with the estimation of fugitive dust emissions is medium to low. For this reason, an ambient monitoring program would be conducted during construction and operation to determine the effectiveness of fugitive dust mitigation. With these considerations, the overall prediction confidence that change in air quality due to the Project is not significant is moderate to high.

6.8.2 GHG Emissions

The estimation of GHG emissions associated with construction and operation depends on the engineering design and on the estimated fuel consumption. The prediction confidence for GHG emissions is rated as high because published GHG emission factors and manufacturer specifications were used. The confidence in the effectiveness of the GHG mitigation measures is also high because most of the mitigation measures are known to effectively reduce the source of GHG emissions (e.g., lower fuel consumption is directly proportional to lower GHG emissions).

6.9 FOLLOW-UP AND MONITORING

As described in Section 6.4.1.3, an AQMP will be created for Project construction and operation. The AQMP will specify the mitigation measures for the management and reduction of air emissions during Project construction and operation and the proposed ambient air quality monitoring program.

Ambient air and meteorology monitoring will be implemented in conjunction with emissions mitigation to provide an understanding of the meteorological conditions and off-site concentrations and evaluate the need for more rigorous mitigation. Monitoring will include meteorological monitoring (wind speed and wind direction) and monitoring of ambient TSP, PM_{10} and $PM_{2.5}$ concentrations.

The results of the ambient PM monitoring will be used to assess the effectiveness of the dust mitigation and to evaluate the need for more rigorous dust mitigation. If the monitoring program indicates that ground-level TSP, PM_{10} or $PM_{2.5}$ concentrations are greater than the Manitoba AAQC, additional mitigation measures to reduce PM emissions will be implemented. Given that fugitive dust from the haul roads is the largest source of PM emissions, more frequent road watering or an application of a dust suppressant will be implemented as an intervention mechanism. See Chapter 23 for additional information on Environmental Management and Monitoring Programs.

In the event that an unexpected deterioration of the environment is observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process described in Chapter 23, Section 23.2. This may include an investigation of the cause of the deterioration and identification of existing and/or new mitigation measures to be implemented to address it.

Expected site conditions, criteria and monitoring to determine that site is stable and may enter permanent closure is proposed in the Conceptual Closure Plan (Chapter 23, Appendix 23 A), and the Vegetation and Wetlands VC (Chapter 11). There is no specific monitoring proposed, or conditions required, for the Atmospheric Environment VC regarding permanent closure.

6.10 SUMMARY OF COMMITMENTS

As described in Section 6.4.1.3, the following mitigation measures will be implemented for the management and reduction of diesel exhaust emissions from off-road equipment and vehicles during construction and operation at the Gordon and MacLellan sites:

- Engines and exhaust systems will be properly maintained to keep construction and mining equipment in good working condition.
- The concentration of sulphur in diesel fuel shall not exceed 15 mg/kg, as per the Sulphur in Diesel Fuel Regulations (ECCC 2002).
- Haul trucks and vehicle idling times will be reduced to the extent possible to reduce emissions.
- Cold starts will be limited to the extent possible to reduce emissions.

The following mitigation measures will be implemented for the management and reduction of fugitive dust emissions from construction and mining activities at the Gordon and MacLellan sites:

- On-site haul roads and access roads will be maintained in good condition, with regular inspections to monitor loose dust on the roads.
- During dry periods, water will be applied to haul roads and access roads to mitigate dust emissions. The application of water will be limited to non-freezing temperatures to avoid icing that can present a safety hazard. Watering is most effective immediately after application, and repeated watering several times a day might be required, depending on surface and meteorological conditions. Watering of the haul roads will be implemented in the required quantity and frequency to achieve 75% control efficiency of dust emissions from haul roads and access roads.
- Chemical dust suppressants will be applied to haul roads as an alternative option to watering. Chemical dust suppression will be applied on an as-needed basis during high wind conditions or if measured ambient PM concentrations are in exceedance of the Manitoba AAQC and if an increase of watering is determined ineffective or unfeasible at the time. Examples of suppressants include chlorides, petroleum products, liquid polymer emulsions, and agglomerating chemicals. These suppressants, if required, will be applied, as per the manufacturer's recommendations, to preclude unintended environmental effects.

- Haul truck speed on the on-site haul roads will be limited to 35 km/h (loaded) and 40 km/h (empty). Vehicle speed on the access roads will be limited to 40 km/h.
- Track-out of PM material to PR 391 will be reduced by dust sweeping and truck wheel washing stations prior to entering PR 391.
- Surfaces of topsoil and overburden stockpiles will be stabilized during extended periods between usage, by means of vegetating or covering the exposed surfaces.

Additional mitigation measures can be implemented on an as-required basis.

As described in Section 6.4.1.3, an ambient air monitoring program will be implemented that will include:

- Meteorological monitoring (wind speed and wind direction)
- Ambient PM monitoring (TSP, PM_{10} and $PM_{2.5}$).

The results of the ambient PM monitoring will be used to assess the effectiveness of the dust mitigation measures and to evaluate the need for more rigorous dust mitigation. The combined implementation of ambient monitoring and emissions mitigation is referred to as “adaptive management”. For example, if the monitoring program indicates that ground-level TSP, PM_{10} and/or $PM_{2.5}$ concentrations are greater than the Manitoba AAQC, additional mitigation measures to reduce PM emissions will be implemented. Given that dust from the haul roads is the largest source of particulate emissions, more frequent road watering or an application of a dust suppressant will be implemented.

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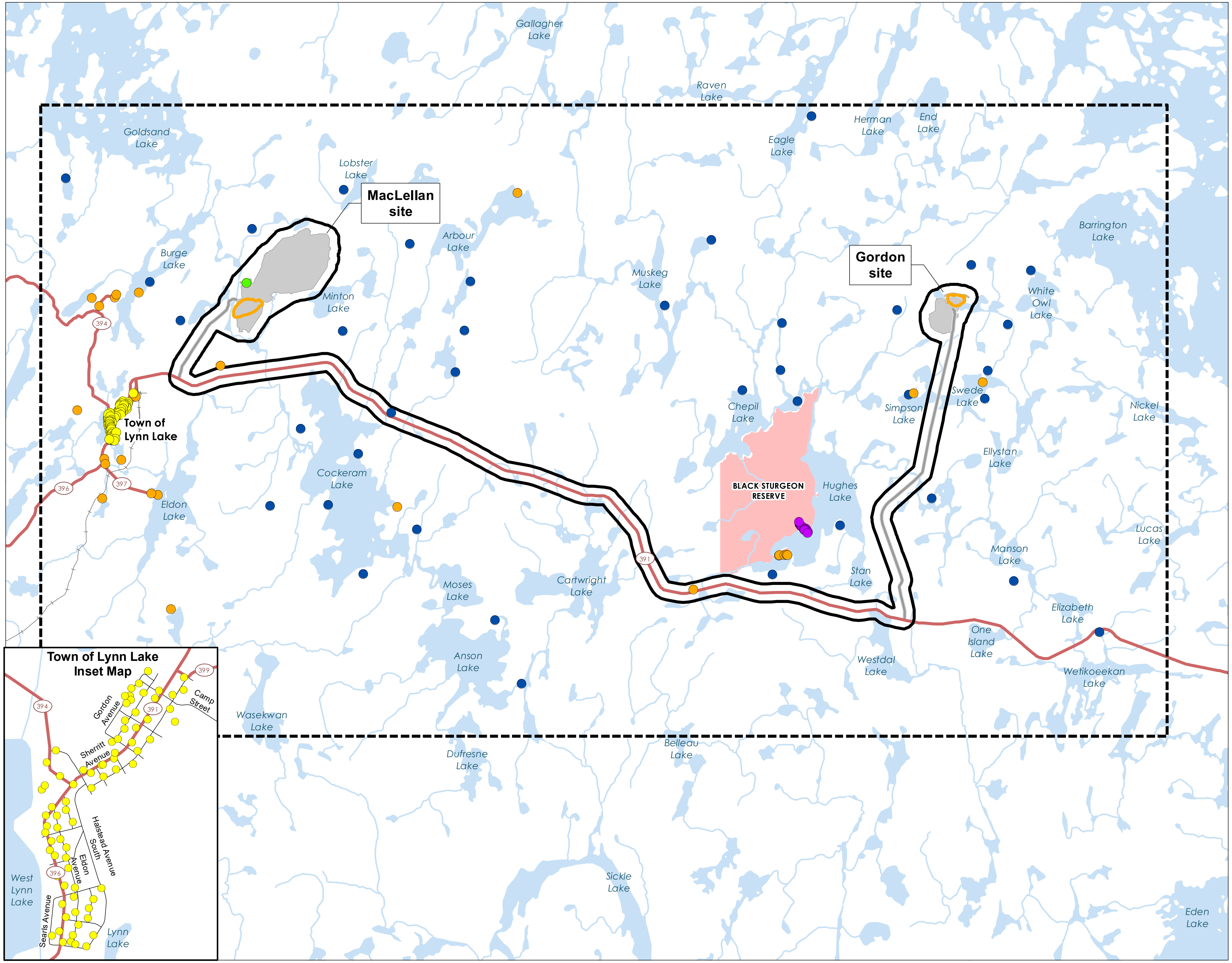

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Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Project Boundary
- Air Quality Local Assessment Area (LAA)

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

- Highway
- Access Road
- Rail
- Watercourse
- Waterbody
- First Nation Reserve

N

0 2.5 5 Kilometres

(At original document size of 11x17)
1:175,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-04-07
Technical Review by DJarratt on 2020-04-07
Senior GIS Review by GKroupa on 2020-04-07

Client/Project 111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
6-1

Title
Air Quality Local Assessment Area and Human Receptor Locations

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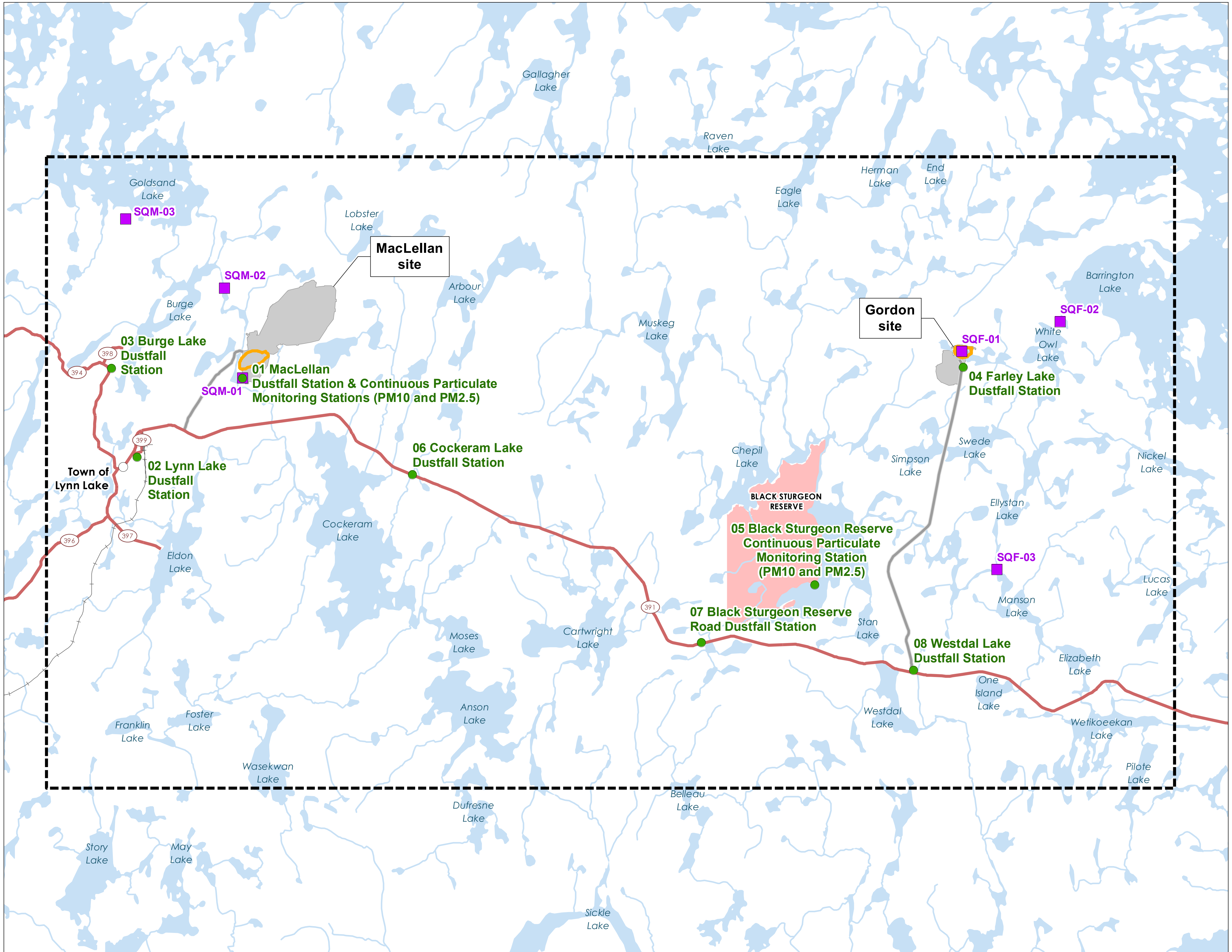

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Alamos Gold Inc.

Project Infrastructure
Proposed Open Pit
Project Development Area

Study Area
Air Quality Local Assessment Area

Monitoring Locations
Air Quality Monitoring Station

Sample Locations
Snow Sample Location

Landbase
Highway
Access Road
Rail
Watercourse
Waterbody
First Nation Reserve

N

0 2.5 5 Kilometres

(At original document size of 11x17)
1:175,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2019-11-06
Technical Review by DJarratt on 2019-11-06
Senior GIS Review by GKroupa on 2019-12-16

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
6-2

Title
Ambient Air Quality Monitoring Locations

Appendix 6A FIGURES

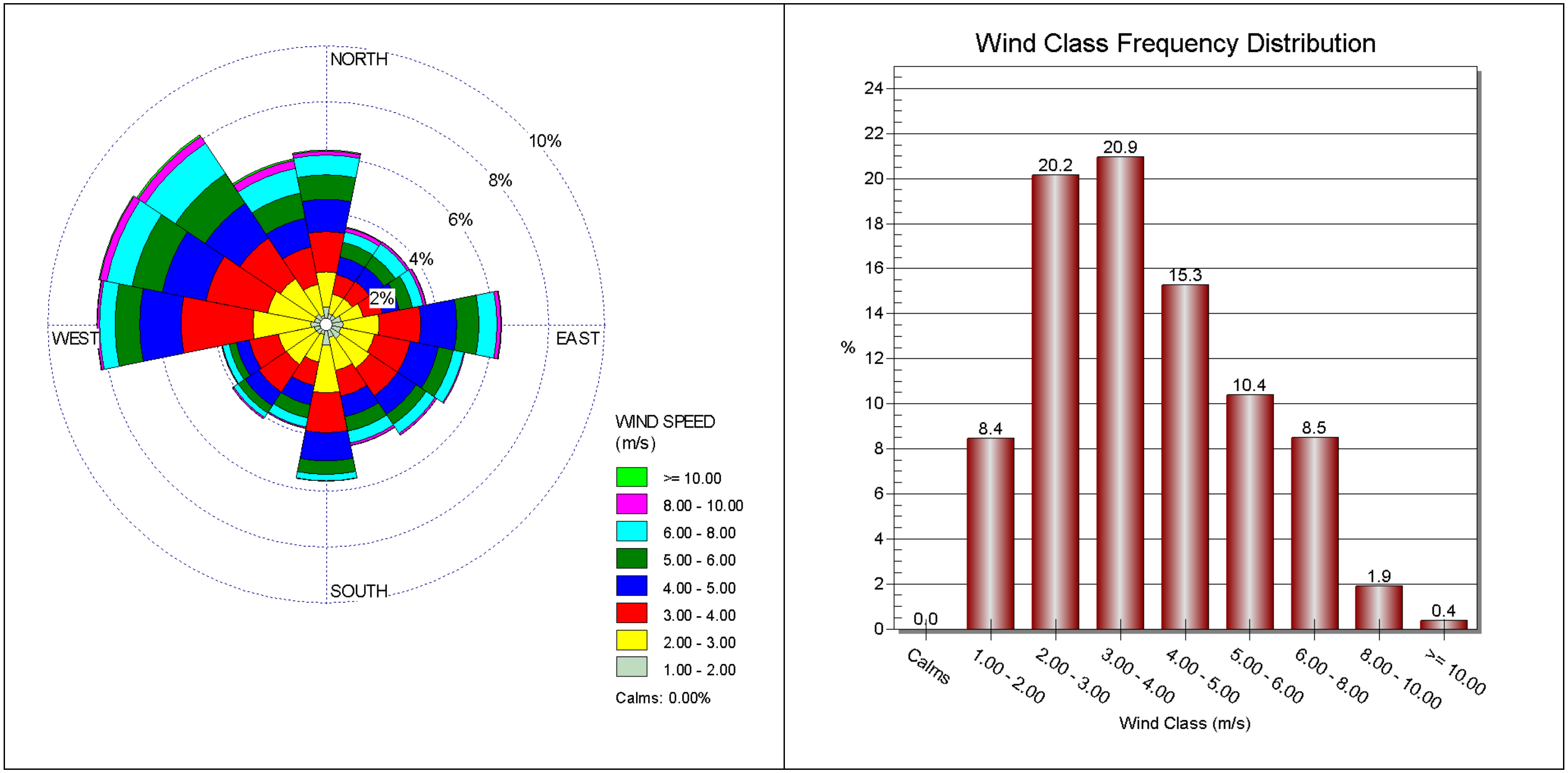

Figure 6A-1 Wind Rose and Wind Frequency Distribution Diagram at Lynn Lake Airport, Manitoba (2015-2018)

Lynn Lake Gold Project
Environmental Impact Statement
Chapter 7 – Assessment of Potential Effects on Noise and Vibration

Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Acronyms and Abbreviations

%HA	percent highly annoyed
C	confinement constant
D	distance from equipment to receptor
dBA	a-weighted decibel sound level
dBC	c-weighted decibel sound level
dBL	linear (unweighted) decibel sound level
FTA	Federal Transit Administration
ID	identification
km	kilometre
LAA	Local Assessment Area
L_d	daytime equivalent sound level
L_{dn}	day-night average sound level
L_{eq}	equivalent sound level
$L_{eq,\ 1hr}$	one-hour equivalent sound level
LFN	low frequency noise
L_n	nighttime equivalent sound level
$L_{v\ distance}$	root mean square velocity level adjusted for distance
$L_{v\ ref}$	source reference vibration level at 25 feet
MECP	Ontario Ministry of Environment, Conservation and Parks
mm/s	millimetres per second
MNL	mitigation noise level
ms	milliseconds
PDA	Project Development Area

PPV	peak particle velocity
PWL	sound power level
RAA	Regional Assessment Area
rms	root mean square
s	second
SLM	sound level meter
TDR	Technical Data Report
TLRU	traditional land and resource use
TMF	tailings management facility
TMR	technical modelling report
US	United States
VC	valued component
VdB	vibration velocity in decibel scale
W	highest weight of explosives fired per delay
WHO	World Health Organization

7.0 ASSESSMENT OF POTENTIAL EFFECTS ON NOISE AND VIBRATION

Noise and Vibration was selected as a valued component (VC) because noise and vibration resulting from the Project have the potential to affect human health and well-being, land and resource use, wildlife and wildlife habitat, and fish and fish habitat. Noise and vibration have been identified as topics of concern by regulators, Indigenous communities, stakeholders, and the public. For the purpose of this assessment, noise is defined as unwanted sound and has the potential to affect the health and well-being of humans. The VC also considers effects on humans and infrastructure from vibration caused by blast-induced ground movement and air overpressure, as well as vibration from construction equipment and piling.

Ground vibration is an oscillatory motion, which can be measured in terms of displacement, velocity, or acceleration. Because of the oscillatory nature of vibration, the average of the motion descriptors (i.e., displacement, velocity, or acceleration) is zero. The ground vibration level in this assessment is defined in terms of peak particle velocity (PPV) and is measured in millimeters per second (mm/s), representing the highest instantaneous positive or negative peak of the vibration signal.

Air overpressure is measured in decibels (dBL). Air overpressure is the additional pressure above normal atmospheric pressure that is generated from a blast. Air overpressure often feels like a gust of wind by a receptor because a confined blast will generally result in inaudible air overpressure. Air overpressure and sound are different phenomena although both are measured in the units of decibels. An event with an air overpressure value of 115 dBL, which may be inaudible due to the low frequency content, is entirely different from a sound event with the level of 115 dBL. The usual rating terms associated with community noise standards are based on A-weighted noise (dBA), an adjustment scale that accounts for the human ear sensitivity to different frequencies (i.e., less at lower frequencies). This A-weighted noise criteria does not apply to air overpressure.

This assessment is linked to other VC assessments by supporting them (i.e., information from this assessment is incorporated into the assessment of other VCs). The other VCs that are supported by components of this assessment include:

- Fish and Fish Habitat (Chapter 10)
- Wildlife and Wildlife Habitat (Chapter 12)
- Land and Resource Use (Chapter 15)
- Current Use of Lands for Traditional Purposes (Chapter 17)
- Human Health (Chapter 18).

7.1 SCOPE OF ASSESSMENT

7.1.1 Regulatory and Policy Setting

This section identifies and describes the regulatory requirements, policies, and guidance for the noise and vibration effects assessment.

7.1.1.1 Noise

Provincial Guidelines

The Guidelines for Sound Pollution (Province of Manitoba n.d.) provides environmental sound level objectives for the assessment of noise in the outdoor environment. The highest desirable level for residential areas is 55 dBA during the daytime (7:00 AM to 10:00 PM) and 45 dBA during the nighttime (defined as 10:00 PM to 7:00 AM).

Federal Guidance

Health Canada's Useful Information for Environmental Assessments document (Health Canada 2017) provides noise targets for annoyance, sleep disturbance, and low-frequency noise effects. Health Canada's approach to noise assessment is based on several international standards and technical publications. This document and the technical standards and publications it references can be used as guidance for assessments.

The following selected noise sensitive receptor locations are based on Health Canada Noise Guidance (Health Canada 2017):

- Indigenous communities
- Traditional land use area
- Permanent and seasonal residences
- Places of worship
- Recreation area
- Schools
- Hospitals.

Health Canada Noise Guidance recommends the assessment of noise impacts such as sleep disturbance on off-duty workers residing in or near the Project area, with consideration of mitigation measures in the design of living quarters for workers to limit noise (Health Canada 2017). As a result, the temporary and permanent work camps have been included as noise sensitive receptors in the context of sleep disturbance effects.

The Noise and Vibration Impact Assessment Technical Modelling Report (TMR; Volume 5, Appendix C) provides detailed descriptions of the Health Canada Noise Guidance (Health Canada 2017).

Noise Targets

The Health Canada Noise Guidance uses daytime or nighttime equivalent sound levels (L_d and L_n, respectively), adjusted day-night average sound levels (L_{dn}), and percent highly annoyed (%HA) to quantify noise effects for activities with a duration of more than 12 months (Health Canada 2017). The daytime sound level (L_d) is a 15-hour time average over the daytime period from 7:00 AM to 10:00 PM. The nighttime sound level (L_n) is a 9-hour time average over the nighttime period from 10:00 PM to 7:00 AM. The adjusted day-night average sound level (L_{dn}) is a 24-hour time-averaged L_{eq}, with a 10-dB penalty applied to nighttime hours and adjustments made for certain characteristics of sound such as tonality or impulsiveness.

Based on Health Canada Noise Guidance, the noise target for the highest change in %HA is 6.5%. Impulsive and tonal characteristics of source noise are accounted for in the %HA calculations because their presence can increase annoyance (Health Canada 2017). If the change in %HA is exceeded, effects are considered to be of concern and may require mitigation.

For activities with a duration of less than 12 months, Health Canada Noise Guidance considers the mitigation noise level (MNL) to assess noise effects (Health Canada 2017). The MNL was used as a target for reducing noise annoyance effects related to short-term construction activities such as pile driving. If the noise effects from the activities exceed the MNL, the implementation of mitigation measures is recommended to reduce the effect. The MNL of 47 dBA (L_{dn}) for a quiet suburban or rural community is applicable.

Sleep Disturbance

The noise guidance from Health Canada (Health Canada 2017) references the guidelines and recommendations of the World Health Organization (WHO) for community noise (WHO 1999) and Night Noise Guidelines for Europe regarding sleep disturbance (WHO 2009). The WHO guideline recommends a target for sleep disturbance as being an indoor sound level of no more than 30 dBA L_{eq} for continuous noise during the sleep period (WHO 1999). Health Canada recommends that an outdoor-to-indoor transmission loss with windows at least partially open is 15 dBA and fully closed windows are assumed to reduce outdoor sound levels by approximately 27 dBA (Health Canada 2017). The corresponding outdoor sound level targets for sleep disturbance is 45 dBA and 57 dBA for partially open windows and fully closed windows, respectively.

More recently, the WHO (2009) has published nighttime noise guidelines that are intended to protect the public, including the most vulnerable groups, from adverse health effects associated with sleep disturbance due to nighttime noise. The recommended annual average is 40 dBA L_n to be considered outdoors.

Low-Frequency Noise

Sounds with strong low frequency noise (LFN) content may result in noise-induced rattles within buildings, resulting in greater annoyance. Health Canada Noise Guidance recommends that the energy sum of the linear sound levels in the 16, 31.5 and 63-Hz octave bands not exceed 70 dBL (Health Canada 2017).

7.1.1.2 Vibration

Manitoba does not have provincial guidelines for vibration. Provincially, the Ontario Ministry of Environment, Conservation, and Parks (MECP) provides guidance on blast-related vibration which is referenced herein in absence of Manitoba guidance. The MECP Guidelines on Information Required for the Assessment of Blasting Noise and Vibration (MECP 1985) guidance recommends the following vibration targets:

- Standard targets - ground vibration of 12.5 mm/s and air overpressure of 128 dBL.
- Cautionary targets - ground vibration of 10 mm/s and air overpressure of 120 dBL.

The cautionary targets of 10 mm/s and 120 dBL are the most conservative blast-related vibration targets in this assessment. These targets will be applied to all receptors outside the Project Development Area (PDA).

Federally, Health Canada Noise Guidance (Health Canada 2017) only provides threshold for air overpressure effect. The guidance recommends that little or no public annoyance is expected to result from any number of daytime sonic booms per day if their measured or predicted peak value is below 125-10 logN (dBL) where N is number of blasts per day. For one blast per day, the limit is 125 dBL. At receptors inside the PDA, such as the permanent work camp, the Health Canada overpressure target of 125 dBL will be used.

For non-blast-related construction activities, there is no Manitoba or federal construction vibration guidance available for remote locations or smaller population centers. As published codes and guidance for non-blast-related vibration levels are limited, the United State Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (FTA 2018) is referenced for the ground-borne vibration target. Structural damage targets for ground-borne vibration are expressed in terms of PPV levels in inch per second (in/s) or mm/s. The structural damage target at a residential building due to ground-borne vibration effect is the PPV of 0.2 in/s or 5 mm/s for non-engineered timber and masonry buildings. The annoyance target for frequent ground-borne vibration is 72 VdB (Vibration Velocity in Decibel Scale). Annoyance target for ground-borne vibration are expressed in terms of root mean square (rms) velocity levels in VdB.

7.1.2 The Influence of Engagement on the Assessment

Engagement has been ongoing prior to and throughout the EIS process, and will continue with local Indigenous communities, stakeholders, the public, and government agencies through the life of the Project. More detail on the Engagement process can be found in Chapter 3.

Engagement feedback related to noise and/or vibration has been addressed through direct responses, updates to baseline information, and in the EIS, as appropriate. Key feedback that influenced the noise and vibration effects assessment is provided below.

7.1.2.1 Indigenous Engagement

As part of the information sharing throughout the engagement process, Project-related information was provided by Indigenous communities in the form of traditional land and resource use (TLRU) studies and other forms of information sharing.

A Project-specific TLRU study was completed collaboratively with Marcel Colomb First Nation with a final report provided to the community on January 11, 2018 (Stantec 2018). The TLRU study included interviews with participants selected by Marcel Colomb First Nation regarding traditional land use in the Project area, including availability of traditional resources, access to traditional resources or areas, occupancy, cultural sites and areas, and experience of TLRU.

A Project-specific TLRU study was completed in collaboration with Peter Ballantyne Cree Nation but has not yet been released by community leadership for use in the environmental assessment. The TLRU study included interviews with community members in Kinoosao, Saskatchewan.

A TLRU study (Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study for the Lynn Lake Gold Mine Project) was completed by an independent consultant for the Manitoba Metis Federation (SVS 2020), the results of which were received in February 2020. The study documents harvesting and land use by the Manitoba Métis Community within a 100 km radius of the Project.

In open house questionnaires from the Marcel Colomb First Nation (Chapter 3), nine out of 12 respondents indicated that noise and vibration are some of the most important components to focus on as part of the EIS.

Manitoba Metis Federation expressed general concerns about development projects disrupting the environment and creating changes to weather patterns, wind, and the species present on the land. Specifically, regarding noise pollution and wildlife, Manitoba Metis Federation indicated the activities along the roads may affect the caribou movement (SVS 2020). This information was considered in the environment effects assessment for the Wildlife and Wildlife Habitat VC (Chapter 12).

Indigenous receptor locations were incorporated into the atmospheric environment, acoustic environment, human health, and Indigenous peoples assessments (Chapters 6, 7, 18 and 19, respectively). The selection of these receptors was informed by Alamos' engagement with Indigenous communities and publicly available sources of traditional land use information. Indigenous receptors were selected early in the assessment process and represent potential receptor locations rather than individual use sites. This information informed and aligned with the potential Project interactions considered in this chapter.

7.1.3 Potential Effects, Pathways and Measurable Parameters

The Project will result in emissions of noise and vibration. The potential environmental effects, effects pathways, and measurable parameters used in the assessment of effects on noise and vibration are provided in Table 7-1. Measurable parameters facilitate the quantitative measurement of Project and cumulative effects and provide a means to characterize potential effects.

Table 7-1 Potential Effects, Effects Pathways and Measurable Parameters for Noise and Vibration

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in noise level	• Noise emissions from Project equipment and activities, including pile driving, ore movement, and equipment operation	• Daytime equivalent sound level (L_d), measured in A-weighted decibels (dBA), C-weighted decibels (dBC), and linear decibels (dBL) • Equivalent sound level (L_n), measured in dBA, dBC, and dBL • Day-night equivalent sound level (L_{dn}), measured in dBA, dBC, and dBL • Percent highly annoyed (%HA), measured in percentage (%)
Change in vibration level	• Vibration from activities such as pile driving, compacting, and haul truck traffic • Blast-related ground-borne vibration and air overpressure	• Ground-borne peak-particle velocity (PPV) vibration level measured in millimeters per second (mm/s) or decibels (VdB) • Ground-borne rms vibration level measured in mm/s or VdB • Air overpressure measured in dBL

7.1.4 Boundaries

7.1.4.1 Spatial Boundaries

The following spatial boundaries are used to assess residual and cumulative environmental effects of the Project on noise and vibration:

- The PDA encompasses the immediate area in which Project activities and components may occur plus a 30 metre (m) buffer. It is the anticipated area of direct physical disturbance associated with construction and operation of the Project. The Gordon site (Map 7-1) has an area of approximately 5 square kilometres (km^2) and the size of the MacLellan site (Map 7-2) is approximately 11 km^2. The PDA does not include Provincial Road 391 (PR 391).
- The Local Assessment Area (LAA) includes an area extending 2 km out from the PDA and a section of PR 391 between the Gordon and MacLellan access roads. The LAA is the area where Project-specific environmental effects on noise and vibration can be predicted or measured with a reasonable degree of accuracy and confidence.
- The Regional Assessment Area (RAA) represents the area within which cumulative effects on noise and vibration effects are likely to occur, depending on the location of other existing, approved, or planned developments. The RAA is defined as an area extending five km out from the PDA and a

section of PR 391 between the Gordon and MacLellan access roads. Noise from project activities is likely to attenuate below the background levels beyond the RAA.

Map 7-1 shows the LAA and RAA associated with the Gordon site. Map 7-2 shows the LAA and RAA associated with the MacLellan site.

7.1.4.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on noise and vibration are as follows:

- Construction – two years (scheduled to be carried out concurrently from Year -2 to Year -1 at both sites).
- Operation – 13 years (scheduled to be carried out from Year 1 to Year 6 at the Gordon site and from Year 1 to Year 13 at the MacLellan site).
- Decommissioning/closure – five to six years of active closure (scheduled to begin in Year 6 at the Gordon site and in Year 14 at the MacLellan site). Active closure will be followed by post-closure, which is the time period during which active reclamation measures are complete, but monitoring is still required. The expected duration for post-closure is approximately 10 years. Pit filling is expected to take 11 years at the Gordon site and 21 years at the MacLellan site under average conditions (Chapter 9, Section 9.4.1). Permanent closure will occur when the site is stable, and monitoring is no longer required. For the noise and vibration this would occur when site activities (e.g., use of heavy equipment and trucking) have ceased. The duration and conditions for post-closure monitoring and permanent closure will be detailed in subsequent submissions of the Closure Plan to regulatory agencies as Project design and execution progresses.

The years with the highest level of activity at the sites, and thus the highest expected noise emissions (or worst-case years) during construction and operation were assessed. The worst-case years for construction and operation were selected based on mobile equipment activities and the peak in production of mine rock and ore. The noise and vibration effects during decommissioning/closure are expected to be lower than those for construction and operation.

The time period from the second quarter (Q2) in Year -2 to the fourth quarter (Q4) in Year -1 was chosen for assessment of the construction phase at the Gordon and the MacLellan sites because it represents the worst-case scenario of equipment usage during activities such as bulk earth work, pre-production mining activities, and piling activities for the bridge construction over the Keewatin River.

The operation phase scenario that was considered representative of the worst-cases for noise emissions was modeled for each site as follows: Year 2 of the Gordon site operation and Year 7 of the MacLellan site operation. These were chosen because they represent the production year with the highest mining rates, respectively.

7.1.5 Residual Effects Characterization

The characterizations used to assess residual effects on noise and vibration are provided in Table 7-2.

Table 7-2 Definition of Terms Used to Characterize Residual Effects on Noise and Vibration

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to noise and vibration relative to baseline **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to noise and vibration relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible –** no measurable change **Low –** a measurable change but within normal variability of baseline conditions **Moderate –** a measurable change with regard to the baseline but within applicable regulatory criteria **High –** Singly or as a substantial contributor in combination with other sources causing exceedances of applicable regulatory criteria beyond the PDA
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA –** residual effects extend into the LAA **RAA –** residual effects interact with those of other projects in the RAA
Timing	Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.	**Not Applicable –** seasonal aspects are unlikely to affect noise and vibration **Applicable –** seasonal aspects may affect noise and vibration
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** residual effect restricted to no more than the duration of the construction phase **Medium-term –** residual effect extends through operation **Long-term –** residual effect extends beyond operation
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed

Table 7-2 Definition of Terms Used to Characterize Residual Effects on Noise and Vibration

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activity **Disturbed –** area has been substantially previously disturbed by human development or human development is still present

7.1.6 Significance Definition

Significance definitions for both potential environmental effects (a change in noise level and a change in vibration level) are presented below.

7.1.6.1 Noise

A significant residual adverse effect for noise is one where Project-related noise levels at noise-sensitive receptors are likely to exceed the annoyance target, sleep disturbance, and/or low frequency noise targets recommended by Health Canada (Health Canada 2017). If the predicted noise levels do not frequently exceed these targets, they are deemed to be not significant.

7.1.6.2 Vibration

A significant residual adverse effect for vibration is one where Project-related vibration level at vibration-sensitive receptors are likely to exceed the applicable vibration targets (i.e. MECP, Health Canada, or FTA). If the residual effects for vibration do not exceed these target thresholds, they are deemed to be not significant.

7.2 EXISTING CONDITIONS FOR NOISE AND VIBRATION

A description of existing noise and vibration conditions (or baseline conditions) near the Project allows a characterization of the interaction between the Project and the existing environment.

7.2.1 Noise

An understanding of the baseline noise environment within the Project area is required to assess the potential effects of noise resulting from the Project. A baseline noise field survey in the Project area was conducted in 2015 (Volume 4, Appendix D). The purpose of the noise baseline survey was to quantify the baseline sound levels at noise-sensitive receptors that were close to the Project area to establish baseline conditions against which potential Project effects could be evaluated in the environmental assessment.

The Health Canada Noise Guidance recognizes that both measurements and estimates are acceptable methods in establishing the baseline sound levels for receptors (Health Canada 2017). The baseline sound level at the receptors can be estimated from two data sources. The first data source uses the measurement results from the baseline monitoring program. The baseline sound level at some of the receptors is based on the results from one of the three monitoring locations, due to the proximity to the measurement location or similar acoustic environment (i.e., remote locations). The second data source uses the estimated baseline sound level for different communities (i.e., L_{dn} less than or equal to 45 dBA for quiet rural area) recommended in the Health Canada Noise Guidance for a receptor location (Health Canada 2017).

7.2.1.1 Methods

The Acoustic Baseline Technical Data Report (TDR) and associated Validation Report contain detailed descriptions of assessment methods (Volume 4, Appendix D).

Three locations (NM1, NM2, and NM3) were selected to monitor the existing noise level for five days. NM1 was at a cottage adjacent to Burge Lake, west of the MacLellan site (NM1). NM2 was located at a remote site south of the Gordon site. NM3 was within the Black Sturgeon Reserve. These locations are presented in the Acoustic Baseline TDR and associated Validation Report (Volume 4, Appendix D). Map 7-1 also shows the noise monitoring locations within the RAA.

Three Type 1 integrating sound level meters (SLMs) meeting the ANSI S1.43-1997 standard were used for measuring ambient noise (ANSI 2005). The equipment used comprised Brüel and Kjær® 2250 (B&K 2250) Type 1 SLM and Type 4952 outdoor microphone and preamp. Each SLM was enclosed in an individual weather-proof hard case and powered by an external battery for overnight continuous unattended monitoring. The outdoor microphones were set up on a tripod at a height of 1.5 m and connected to the SLM using an extension cable. Each SLM collected the following data:

- One-minute integrated A-weighted overall sound levels ($L_{eq,\ 1\ minute}$) in dBA.
- One-minute integrated linear sound levels at One Third Octave Band Frequency (L_{eq}) in dB.
- Continuous audio sound recording for the duration of the field survey.

Each SLM was laboratory-calibrated within the previous 24 months, which meets the best practice for SLM calibration interval. A portable field calibrator, Brüel and Kjær® Type 4231, was used to calibrate the SLMs immediately before and after each measurement series and after changes in equipment conditions (e.g., cable or battery replacement). The field calibrator was calibrated within the previous 12 months.

The data from the field study were analyzed to identify noise sources for each monitoring period such as natural sounds and local activities. Data that were not representative of normal site activity or non-representative weather conditions were isolated from the data set prior to the calculation of averages or other statistical values. Filtered hourly ($L_{eq,\ 1hr}$), daytime (L_d), and nighttime (L_n) equivalent sound levels were then calculated for the measurement period. There were 92, 85, and 70 hours of monitoring at NM1, NM2, and NM3, respectively.

Invalid or abnormal data not typical of ambient sound levels were excluded from the measurements. Invalid data generally includes periods with non-representative weather conditions (e.g., rain precipitation and high wind), which are typically associated with excessive sound level recordings. The approach of isolating non-representative events is considered appropriate and results in a lower baseline sound level or quieter existing acoustic environments. Consistent with environmental assessment principles, this is a conservative approach.

7.2.1.2 Overview

The average daytime and nighttime sound level (L_d and L_n) monitoring results are summarized in Table 7-3.

Table 7-3 Average Daytime and Nighttime Sound Level

Monitoring Location	Description	Average Daytime Sound Level, L_d (dBA)	Average Nighttime Sound Level, L_n (dBA)
NM1	Burge Lake Provincial Park	40.6	35.2
NM2	Gordon Site	34.3	33.4
NM3	Black Sturgeon Reserve	39.4	37.9

Location NM1 is representative of a rural area with dominant noise sources from residents' activities, local traffic, watersport and recreational activities, occasional aircraft flyovers, vegetation rustling, wildlife, insects, and water ripple noise. The average L_d and L_n values are 40.6 dBA and 35.2 dBA, respectively. The L_d values are higher than the L_n values. This is due to residential, watersport, and recreational activities occurring at Burge Lake Provincial Park, which occur mostly during the daytime periods. During the nighttime period, the acoustic environment is quieter, characterized by occasional wildlife calling and dawn chorus around sunrise. The NM1 results provide a baseline evaluation of the acoustic environment for the residences along the lake shores in Burge Lake Provincial Park during the summer season.

Location NM2 is representative of a remote area with limited human activity. The dominant noise sources observed during the field survey at NM2 included wildlife, birds, insects, occasional aircraft flyovers, vegetation rustling, and wind noise. The average daytime L_d and nighttime L_n values are 34.3 dBA and 33.4 dBA, respectively. There was limited human activity recorded during the measurement period other than the personnel setting up the acoustic environment monitoring equipment and two vehicle pass-by events, that were isolated from the L_d and L_n calculations. Therefore, NM2 results provide a baseline evaluation of the acoustic environment in remote areas within the RAA during the summer season.

Location NM3 is representative of a sparsely populated area with frequent noise events from the residents, children, domestic animals, birds, and insects. The average L_d and L_n values are 39.4 dBA and 37.9 dBA, respectively. The acoustic environment is dominated by residential and recreational activities during the daytime and earlier part of the nighttime period (due to longer daylight hours), occasional dog barking, wildlife calling, and dawn bird chorus during sunrise. The NM3 results provide a baseline evaluation of the acoustic environment for the residential area within the Black Sturgeon Reserve during the summer season.

The results at the three monitoring locations (NM1, NM2, and NM3) can be used to represent the existing sound level at some of the receptors. The baseline sound level at the recreation lot, youth camp, and park vacation home near Burge Lake are represented by the monitoring results from NM1. First Nations' traplines, First Nations' trapping areas, First Nations' fishing camps, trapper cabin, remote cottages, and recreation lot are in a remote area. The baseline sound level at these locations are represented by the monitoring results from NM2. Receptor locations within the Black Sturgeon Reserve community are represented by monitoring results from NM3.

Baseline sound levels at receptors located in the community of Lynn Lake were based on levels advised in Health Canada Noise Guidance (Health Canada 2017) for quiet rural communities (i.e., population density of 28 per square km). The Health Canada quiet rural community baseline sound level is 45 dBA L_d and 35 dBA L_n (or L_{dn} of 45 dBA). This actual baseline sound level is likely to be higher because the population density at Lynn Lake is more than 28 per square km. However, the quieter baseline sound level is considered a more conservative approach.

The baseline sound level at each receptor is listed in Table 7-4 and Table 7-5 for the Gordon site and MacLellan site, respectively. These locations are included in maps in the Acoustic Baseline Validation Report (Volume 4, Appendix D). These values were used in the noise assessment in accordance with the Health Canada Noise Guidance (Health Canada 2017).

Table 7-4 Receptor Existing Sound Level – Gordon Site

Receptor ID	Description	Daytime Sound Level, L_d (dBA)	Nighttime Sound Level, L_n (dBA)	Day-Night Sound Level, L_{dn} (dBA)	Based on Monitoring Location
59	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
61	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
62	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
72	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
73	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
74	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
76	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
77	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
93	Black Sturgeon Reserve Residence	39.4	37.9	44.6	NM3
101	Black Sturgeon Reserve Residence	39.4	37.9	44.6	NM3
104	Remote Cottage	34.3	33.4	40.0	NM2
126	Recreation Lot	34.3	33.4	40.0	NM2
130	Remote Cottage	34.3	33.4	40.0	NM2
131	Remote Cottage	34.3	33.4	40.0	NM2
132	Trapper Cabin	34.3	33.4	40.0	NM2
139	Park Vacation Home	34.3	33.4	40.0	NM2

Table 7-5 Receptor Existing Sound Level – MacLellan Site

Receptor ID	Description	Daytime Sound Level, L_d (dBA)	Nighttime Sound Level, L_n (dBA)	Day-Night Sound Level, L_{dn} (dBA)	Based on Monitoring Location or Health Canada [1]
66	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
67	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
68	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
69	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
78	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
79	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
81	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
82	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
83	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
84	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
85	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
86	Potential Indigenous Receptor	34.3	33.4	40.0	NM2
105	Remote Cottage	34.3	33.4	40.0	NM2
115	Museum Site	45.0	35.0	45.0	Health Canada
116	Communication Site	45.0	35.0	45.0	Health Canada
121	Recreation Lot	40.6	35.2	42.9	NM1
123	Potential Indigenous Receptor [2]	40.6	35.2	42.9	NM1
135	Park Vacation Home	40.6	35.2	42.9	NM1
163	Lynn Lake Friendship Center	45.0	35.0	45.0	Health Canada
166	Lynn Lake Gospel Church	45.0	35.0	45.0	Health Canada
169	Lynn Lake Library	45.0	35.0	45.0	Health Canada
172	West Lynn Lake High School	45.0	35.0	45.0	Health Canada
173	Lynn Lake Hospital	45.0	35.0	45.0	Health Canada
177	Lynn Lake Residence	45.0	35.0	45.0	Health Canada
178	Lynn Lake Residence	45.0	35.0	45.0	Health Canada
225	Lynn Lake Residence	45.0	35.0	45.0	Health Canada

Note:

[1] Baseline sound levels at receptors located in the community of Lynn Lake were based on levels advised in Health Canada Noise Guidance for quiet rural communities (Health Canada 2017)

[2] The receptor location was a youth camp. This receptor status is unknown because there were reports of a fire, and it is unclear if the camp will be operational in the future

7.2.2 Vibration

In contrast to audible noise, the background environmental ground-borne vibration levels in an outdoor rural area without local human activities is typically below the threshold of human perception (FTA 2018). The typical threshold of human perception of ground vibration is 0.5 mm/s PPV (ISEE 2011); however, the perceptibility threshold varies from person to person. In an urban and suburban environment, a person may be subjected to a wide range of vibration effects depending on the location, time of the day, proximity to day-to-day vibration sources (e.g., vehicle, train, construction activities). In rural and remote areas, vibration effects are uncommon. The background vibration velocity level in residences is usually 50 VdB or lower, and the threshold of perception for humans is approximately 65 VdB (FTA 2018).

Vibration targets are applicable to individual events or occurrences only and do not consider existing vibration levels. The vibration assessment is therefore based on comparing the effects from Project only events (e.g., blasting) to the targets. The masking effect from background vibration level or cumulative vibration level from another event is typically not included. Therefore, a vibration baseline study for the existing condition was not warranted and not conducted.

7.3 PROJECT INTERACTIONS WITH NOISE AND VIBRATION

Table 7-6 identifies, for each potential effect, the physical activities that might interact with the VC and result in the identified environmental effects. These interactions are indicated by check mark and are discussed in detail in Section 7.4, in the context of effects pathways, standard and project-specific mitigation/ enhancement, and residual effects. Project activities for each phase are described in detail in Chapter 2, Section 2.3 and 2.4. Project related emissions and discharges are described in Chapter 2, Section 2.8.

The potential interactions between Project activities and the environment were considered for the construction, operation, and decommissioning/closure phases of the Project. The identification of Project activities and their potential interactions was based on engagement with interested parties, the professional judgment of technical specialists involved in the assessment, and a review of existing conditions. The selection of interactions is also informed by the potential effects and effects pathways for each VC as described in Section 7.1.3.

Emissions, discharges, and wastes (e.g., air, waste, noise, light, liquid and solid effluents) are generated by many and varied Project activities. Rather than acknowledging this by placing a check mark against each of these activities, “Emissions, Discharges and Wastes” have been consolidated as an integrated activity for efficiency with relevant detail described in the text. This category includes the emissions, discharges, and wastes generated by all project activities under each Project phase. As interactions between the Project and Noise and Vibration is limited to the emission of noise and vibration, interactions with other Project activities have not been selected. Note that most Project activities will generate noise and vibration; however, not all Project components result in substantial noise and vibration effects from a human perspective.

Table 7-6 Potential Project-Environment Interactions with Noise and Vibration

Project Activities and Components	Environmental Effects: Change in Noise Level		Environmental Effects: Change in Vibration Level	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Construction				
Site Preparation at Both Sites (removal of existing buildings; removal of contaminated materials; vegetation clearing and earthworks; development of temporary construction camp at the MacLellan site)	–	–	–	–
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA)	–	–	–	–
Mine Components at Both Sites (construction of: ore pads; ore, overburden and mine rock storage areas; mill feed storage area and crushing plant, ore milling and processing plant, and TMF at the MacLellan site; water management facilities [e.g., sumps, ponds and ditches])	–	–	–	–
Utilities, Infrastructure, and Other Facilities at Both Sites (construction of: buildings and yards; access roads [i.e., upgrades at the Gordon and MacLellan site] and internal mine roads; site lighting and security; power supply and distribution system; potable water treatment plant at the MacLellan site; on-site pipelines at the MacLellan site; fuel storage and distribution systems; sewage treatment facilities; domestic solid waste handling facilities at the Gordon site)	–	–	–	–
Water Development and Control at Both Sites (dewatering of existing pits at the Gordon site and underground workings at the MacLellan site; re-alignment of existing diversion channel; interceptor wells at the Gordon site)	–	–	–	–
Emissions, Discharges, and Wastes[1]	✓	✓	✓	✓
Employment and Expenditure[2]	–	–	–	–
Operation				
Open Pit Mining at Both Sites (drilling; blasting; removal, loading and on-site hauling of mined material [i.e., ore, overburden, and mine rock])	–	–	–	–
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA, including truck transportation of ore from the Gordon site to the MacLellan site)	–	–	–	–
Storage/Stockpiling of Ore, Overburden, and Mine Rock at both sites	–	–	–	–

Table 7-6 Potential Project-Environment Interactions with Noise and Vibration

Project Activities and Components	Environmental Effects			
	Change in Noise Level		Change in Vibration Level	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Ore Milling and Processing at the MacLellan Site (ore crushing and conveyance; ore milling)	–	–	–	–
Water Management at Both Sites (mine water collection and storage; process water supply for the MacLellan site including water intake on Keewatin River at the MacLellan site; pumping fresh/fire water from Farley Lake at Gordon site; operation of interceptor wells at the Gordon site)	–	–	–	–
Tailings Management at the MacLellan Site	–	–	–	–
Utilities, Infrastructure, and Other Facilities at Both Sites (presence and operation of: buildings and yards; access roads and internal mine roads; site lighting and security at the Gordon site; power supply and distribution system; potable water treatment plant at the MacLellan site; on-site pipelines at the MacLellan site; fuel storage and distribution systems; sewage treatment facilities; domestic solid waste handling facilities; explosives storage, maintenance of access roads and bridges)	–	–	–	–
Emissions, Discharges, and Wastes[1]	✓	✓	✓	✓
Employment and Expenditure[2]	–	–	–	–
Decommissioning/Closure				
Decommissioning at Both Sites	–	–	–	–
Reclamation at Both Sites	–	–	–	–
Post-Closure at Both Sites (long-term monitoring)	–	–	–	–
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA)	–	–	–	–
Emissions, Discharges, and Wastes[1]	✓	✓	✓	✓
Employment and Expenditure[2]	–	–	–	–

NOTES:
✓ = Potential interaction
– = No interaction

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Table 7-6 Potential Project-Environment Interactions with Noise and Vibration

Project Activities and Components	Environmental Effects			
	Change in Noise Level		Change in Vibration Level	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site

[1] Emissions, Discharges, and Wastes (e.g., air, waste, noise, light, liquid and solid effluents) are generated by many Project activities. Rather than acknowledging this by placing a check mark against each of these activities, "Emissions, Discharges, and Wastes" have been introduced as an additional component under each Project phase.

[2] Project employment and expenditures are generated by most Project activities and components and are the main drivers of many socio-economic effects. Rather than acknowledging this by placing a check mark against each of these activities, "Employment and Expenditures" have been introduced as an additional component under each Project phase.

7.4 ASSESSMENT OF RESIDUAL ENVIRONMENTAL EFFECTS ON NOISE AND VIBRATION

The assessment of potential effects on noise and vibration considers changes in noise levels and changes in vibration levels as a result of the Project. This section first describes the analytical methods and assumptions used in the assessment of each potential effect, then describes the Project effect mechanisms, applicable mitigation measures, and characterization and likelihood of residual effects.

7.4.1 Noise

7.4.1.1 Analytical Assessment Techniques

Potential noise effects during construction and operation of the facility are assessed based on the following approach:

- Conducted noise baseline study at selected locations.
- Defined the LAA, RAA, and receptors.
- Established the existing sound level at the noise sensitive receptors.
- Identified modelling scenarios that will reflect worst-case construction and operation in terms of noise emissions.
- Determined noise emission sources from Project construction and operation activities.

- Characterized these sources by their sound power levels (PWLs) using manufacturers' data, acceptable theoretical calculation methods, or similar equipment noise data from an archived database of measurements.
- Developed an acoustic model for each modelling scenario.
- Established the sound levels within the LAA and RAA, and at receptors by applying the emission sources in noise models for construction and operation.
- Assessed compliance of the Project by comparing the modelled results to the applicable noise targets (i.e., Health Canada Noise Guidance and Manitoba Noise Guidelines).

If the modelled results are in compliance with applicable criteria, the noise effect is considered to be acceptable. Otherwise, mitigation measures are identified to manage the noise effects.

Noise modelling used the latest version of the Cadna/A® software (DataKustik 2019), which incorporates International Organization for Standardization (ISO) Standard 9613 (ISO 1993, 1996) algorithms. ISO 9613 standards are commonly used by acoustic practitioners for modelling sound propagation and are accepted by Health Canada. Details on acoustic modelling are provided in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix C).

The following assumptions were used in the effects assessment:

Construction Phase

- Baseline sound level for receptors within the Town of Lynn Lake is based on Health Canada Noise Guidance recommended sound level for a quiet rural area (Health Canada 2017). The actual baseline sound level is likely to be higher because the population density at Lynn Lake is more than 28 per square km. However, the quieter baseline sound level is considered a more conservative approach.
- Worst-case scenario is based on the period between Q2 Year -2 and Q4 Year -1.
- Stationery equipment (i.e., pumps and motors) operates at 100% capacity continuously during a 24-hour period and mobile equipment operates 10 hours (6 hours daytime and 4 hours nighttime) during a 24-hour period.
- Mobile equipment back-up alarms are included in the noise emissions.
- Pile driving activities occur during a 15-hour period (7:00 to 22:00) at the Keewatin River bridge (MacLellan site) and old diversion channel (Gordon site) for a total time period less than 12 months.

Operation Phase

- Assume baseline sound level for receptors at the Lynn Lake community.
- Operation phase noise assessment considered the worst-case year for the Gordon site (Year 2) and the MacLellan site (Year 7).

- Stationery equipment (i.e., crushers) operates at 100% capacity continuously during a 24-hour period and mobile equipment operates 20 hours (12.5 hours daytime and 7.5 hours nighttime) during a 24-hour period.
- Mobile equipment back-up alarms are included in the noise emissions.

Blasting effects are addressed in Section 7.4.2.

Decommissioning/Closure Phase

The quantity of equipment required for the decommissioning/closure phase is expected to be below the requirement for construction and operation.

7.4.1.2 Project Pathways

During construction, noise emission from activities such as site preparation, utility and infrastructure development, and processing facility construction will result in a change in noise levels. During operation, noise emitted from the processing facility and mobile equipment (i.e., haul trucks) will result in a change in noise levels. In the decommissioning/closure phase, noise emissions from excavation and reclamation activities will result in a change in noise levels.

7.4.1.3 Mitigation

Mitigation measures will be implemented as needed to reduce potential noise effects during construction and operation.

The implementation of the mitigation measures and other commitments described in this section will be the responsibility of Alamos and or contractors. The mechanisms used to require contractors and subcontractors to comply with these measures will include environmental protection plans and contract documents.

Mitigation measures proposed are generally considered to be effective for use in similar applications and environmental conditions. This assessment is based on professional judgment of engineers and scientists consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited where applicable to justify the selection.

Detailed design of the Project and mitigation strategies is currently ongoing. Mitigation measures will be refined in consideration of environmental assessment approval conditions and permit stipulations which will be incorporated into final environmental management planning. The effectiveness of these mitigation measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs including adaptive management procedures will be reviewed by applicable regulatory agencies prior to their implementation.

The mitigation measures are applicable to both the Gordon and MacLellan sites and include the following:

- Where possible, large stationary machinery (i.e., crushers) will be located inside buildings.
- Fully enclosed conveyor between buildings in the processing plant.
- Large transportation trucks will be used to reduce the number of trips.
- Mobile equipment will have exhaust mufflers.
- Work camp building walls and roof will include noise-insulated panels.
- Work camp building will include an air conditioning system such that double pane windows and insulated doors can be closed during the summer season.
- Reduce heavy fleet idling when not operating, where practical.

The operational sound levels listed in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix C) are the estimated equipment sound power levels used in the acoustic modelling; it is assumed that these acoustical specifications are achievable by the suppliers. If the sound power level cannot be achieved, additional mitigation measures may be required.

7.4.1.4 Project Residual Effects

The assessment considered noise effects during construction phase and operation. The time period from the Q2 Year -2 to Q4 Year -1 were chosen for the construction phase at both sites because it represents a worst-case scenario of equipment usage during activities such as bulk earth work. Year 2 of the Gordon site operation and Year 7 of the MacLellan site operation was chosen because it represented the production year with the highest mining rate. The operation scenario includes noise emissions from the Gordon site and the MacLellan site during the worst-case years. Details on noise sources used as inputs in the noise modelling are presented in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix C).

Construction

Table 7-7 and Table 7-8 summarize the baseline sound level, the Project sound level, and the change in %HA results at the receptors for the Gordon site and the MacLellan site construction phase, respectively. Map 7-3 and Map 7-4 show the noise contour maps for construction phase at the Gordon site and the MacLellan site, respectively. The same maps are included in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix C).

The change in percent highly annoyed (or %HA) associated with the Project is compared with the target for change in %HA of 6.5% advised in the Health Canada Noise Guidance (Health Canada 2017). The changes in %HA at receptors are below the 6.5% target for the construction phase. The results indicate compliance with the Health Canada Noise Guidance (Health Canada 2017). Details on the determination of %HA are described in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix C).

During pile driving activities with a duration of less than 12 months, the MNL was used as a target for noise effects related to short-term construction activities. The MNL of 47 dBA (L_{dn}) for a quiet suburban or rural community is applicable. Table 7-9 summarizes the predicted sound level for the receptors during pile driving activities for closing off the old diversion channel north of the Gordan open pit. The predicted L_{dn} levels at receptors are below the target of 47 dBA. Table 7-10 summarizes the predicted sound level for the receptors during pile driving activities at the Keewatin River bridge at the MacLellan site.

LFN effects are not expected at receptors because the predicted sound levels are below the Health Canada Noise Guidance targets (Health Canada 2017). Details on the determination of LFN effects are described in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix C, Section 6.1.3.3).

The sleep disturbance noise guideline of 40 dBA (outside, during nighttime) was used for this assessment based on the WHO Night Guidelines for Europe (WHO 2009). The L_n results in Table 7-7 and Table 7-8 indicate that the nighttime equivalent sound level from the Project construction is below 40 dBA at residential receptors. No noise-related sleep disturbances of residential receptors are predicted from the Project during the nighttime period.

During the construction phase, the work camp building design will affect the sound level inside the temporary work camp due to sound transmission loss through the building structure. Based on the temporary work camp building design, a minimum of 30-dB noise reduction is expected for the building walls with the windows closed. Air conditioning units are recommended for the temporary work camp building such that exterior windows and doors can be closed during the summer season. The WHO (1999) recommends a target for sleep disturbance as being an indoor sound level of no more than 30 dBA. The predicted daytime and nighttime outdoor level at the temporary work camp during the construction phase is 56.7 dBA. The Project-related construction noise level inside the temporary work camp is predicted to be 26.7 dBA, based on a building transmission loss of 30 dB with the exterior windows and doors closed. The results are below the WHO (1999) indoor sound level target of 30 dBA. No noise-related sleep disturbances of workers are predicted from the Project construction during the daytime and nighttime period.

After the application of mitigation, the residual noise effects at the receptors during the construction phase are adverse, low to moderate in magnitude, short-term, continuous, and reversible.

Table 7-7 Construction Phase Sound Level – Gordon Site

Receptor ID	Description	Baseline Day-Sound Level, L_{dn} (dBA)	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)	Change in %HA (%)
59	Potential Indigenous Receptor	40.0	21.8	21.8	28.2	0.1
61	Potential Indigenous Receptor	40.0	12.8	12.8	19.2	0.0
62	Potential Indigenous Receptor	40.0	12.5	12.5	18.9	0.0
72	Potential Indigenous Receptor	40.0	24.9	24.9	31.3	0.2
73	Potential Indigenous Receptor	40.0	25.7	25.7	32.1	0.2
74	Potential Indigenous Receptor	40.0	20.5	20.5	26.9	0.1
76	Potential Indigenous Receptor	40.0	30.5	30.5	36.9	0.5
77	Potential Indigenous Receptor	40.0	30.7	30.7	37.1	0.6
93	Black Sturgeon Reserve Residence	44.6	12.7	12.7	19.1	0.0
101	Black Sturgeon Reserve Residence	44.6	14.1	14.1	20.5	0.0
104	Remote Cottage	40.0	27.0	27.0	33.4	0.3
126	Recreation Lot	40.0	14.7	14.7	21.1	0.0
130	Remote Cottage	40.0	14.3	14.3	20.7	0.0
131	Remote Cottage	40.0	25.9	25.9	32.3	0.2
132	Trapper Cabin	40.0	25.0	25.0	31.4	0.2
139	Park Vacation Home	40.0	14.2	14.2	20.6	0.0

Table 7-8 Construction Phase Sound Level – MacLellan Site

Receptor ID	Description	Baseline Day-Sound Level, L_{dn} (dBA)	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)	Change in %HA (%)
66	Potential Indigenous Receptor	40.0	6.2	6.2	12.6	0.0
67	Potential Indigenous Receptor	40.0	14.8	14.8	21.2	0.0
68	Potential Indigenous Receptor	40.0	14.9	14.9	21.3	0.0
69	Potential Indigenous Receptor	40.0	6.6	6.6	13.0	0.0
78	Potential Indigenous Receptor	40.0	6.4	6.4	12.8	0.0
79	Potential Indigenous Receptor	40.0	2.4	2.4	8.8	0.0
81	Potential Indigenous Receptor	40.0	22.9	22.9	29.3	0.1
82	Potential Indigenous Receptor	40.0	27.4	27.4	33.8	0.3
83	Potential Indigenous Receptor	40.0	16.2	16.2	22.6	0.0
84	Potential Indigenous Receptor	40.0	23.7	23.7	30.1	0.1
85	Potential Indigenous Receptor	40.0	35.5	35.5	41.9	1.5
86	Potential Indigenous Receptor	40.0	31.2	31.2	37.6	0.6
105	Remote Cottage	40.0	5.3	5.3	11.7	0.0
115	Museum Site	45.0	13.2	13.2	19.6	0.0
116	Communication Site	45.0	15.7	15.7	22.1	0.0
121	Recreation Lot	42.9	21.4	21.4	27.8	0.1
123	Potential Indigenous Receptor	42.9	24.2	24.2	30.6	0.1
135	Park Vacation Home	42.9	21.1	21.1	27.5	0.1
163	Lynn Lake Friendship Center	45.0	13.1	13.1	19.5	0.0
166	Lynn Lake Gospel Church	45.0	13.9	13.9	20.3	0.0
169	Lynn Lake Library	45.0	13.0	13.0	19.4	0.0
172	West Lynn Lake High School	45.0	11.8	11.8	18.2	0.0
173	Lynn Lake Hospital	45.0	17.0	17.0	23.4	0.0
177	Lynn Lake Residence	45.0	11.0	11.0	17.4	0.0
178	Lynn Lake Residence	45.0	16.5	16.5	22.9	0.0
225	Lynn Lake Residence	45.0	10.8	10.8	17.2	0.0

Table 7-9 Construction Phase Pile Driving Activities Sound Level – Gordon Site

Receptor ID	Description	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)
59	Potential Indigenous Receptor	12.3	--	10.2
61	Potential Indigenous Receptor	7.0	--	5.0
62	Potential Indigenous Receptor	--	--	--
72	Potential Indigenous Receptor	31.0	--	29.0
73	Potential Indigenous Receptor	37.0	--	34.9
74	Potential Indigenous Receptor	32.2	--	30.1
76	Potential Indigenous Receptor	42.9	--	40.8
77	Potential Indigenous Receptor	32.0	--	30.0
93	Black Sturgeon Reserve Residence	5.3	--	3.2
101	Black Sturgeon Reserve Residence	5.4	--	3.4
104	Remote Cottage	--	--	--
126	Recreation Lot	2.8	--	0.8
130	Remote Cottage	3.1	--	1.0
131	Remote Cottage	24.8	--	22.7
132	Trapper Cabin	28.6	--	26.6
139	Park Vacation Home	3.1	--	1.0
Note: "-" Not applicable as pile driving occurs during the daytime period only				

Table 7-10 Construction Phase Pile Driving Activities Sound Level – MacLellan Site

Receptor ID	Description	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)
66	Potential Indigenous Receptor	10.3	--	8.3
67	Potential Indigenous Receptor	13.5	--	11.4
68	Potential Indigenous Receptor	19.5	--	17.4
69	Potential Indigenous Receptor	9.6	--	7.6
78	Potential Indigenous Receptor	9.8	--	7.7
79	Potential Indigenous Receptor	--	--	--
81	Potential Indigenous Receptor	13.6	--	11.5
82	Potential Indigenous Receptor	24.4	--	22.4
83	Potential Indigenous Receptor	14.6	--	12.6
84	Potential Indigenous Receptor	18.2	--	16.1
85	Potential Indigenous Receptor	31.5	--	29.4
86	Potential Indigenous Receptor	35.1	--	33.1
105	Remote Cottage	7.0		5.0
115	Museum Site	16.4	--	14.3
116	Communication Site	20.2	--	18.1
121	Recreation Lot	23.2	--	21.2
123	Potential Indigenous Receptor	28.6	--	26.5
135	Park Vacation Home	28.2	--	26.1
163	Lynn Lake Friendship Center	17.9	--	15.9
166	Lynn Lake Gospel Church	16.8	--	14.8
169	Lynn Lake Library	16.7	--	14.6
172	West Lynn Lake High School	15.7	--	13.7
173	Lynn Lake Hospital	18.5	--	16.4
177	Lynn Lake Residence	18.9	--	16.9
178	Lynn Lake Residence	18.7	--	16.7
225	Lynn Lake Residence	15.0	--	13.0

Note:
"-" Not applicable as pile driving occurs during the daytime period only

Operation

Table 7-11 and Table 7-12 summarize the baseline sound level, Project sound level, and change in %HA results at the receptors for the Gordon site and the MacLellan site operation, respectively. Map 7-5 and Map 7-6 show the noise contour maps for operation at the Gordon site and the MacLellan site, respectively. The same maps are included in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix C).

The predicted Project sound levels at all receptors are below the Manitoba noise guideline target of 55 dBA daytime and 45 dBA nighttime. The change in %HA associated with the Project is compared with the target for change in %HA of 6.5% advised in the Health Canada Noise Guidance (Health Canada 2017). The changes in %HA at the receptors are below the 6.5% target for operation. The results indicate compliance with the Health Canada Noise Guidance (Health Canada 2017). Details on the determination of %HA are described in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix C).

Effects related to LFN are not expected at the receptors because the predicted sound levels are below the Health Canada targets (Health Canada 2017). Details on the determination of LFN effect are described in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix C).

The outdoor nighttime annual sound level of 40 dBA was used as the sleep disturbance noise target for this assessment, based on the WHO Night Guidelines for Europe (WHO 2009). The L_n results in Table 7-11 and Table 7-12 indicate that the nighttime equivalent sound level from the Project is below 40 dBA at residential receptors. No noise-related sleep disturbances of residential receptors are predicted from the Project operation during the nighttime period.

During the operation phase, the work camp building design will affect the sound level inside the permanent work camp due to sound transmission loss through the building structure. Based on the permanent work camp building design, a minimum of 30-dB noise reduction is expected for the building walls with the windows closed. Air conditioning units are recommended for the permanent work camp building such that exterior windows and doors can be closed during summer season. The WHO (1999) recommends a target for sleep disturbance as being an indoor sound level of no more than 30 dBA. The predicted daytime or nighttime sound level at the permanent work camp is 53.5 dBA. The Project related operation noise level inside the permanent work camp is predicted to be 23 dBA, based on a building transmission loss of 30 dB with the exterior windows and doors closed. The results are below the WHO 1999 indoor sound level target of 30 dBA. No noise-related sleep disturbances of workers are predicted from the Project operation during the daytime and nighttime period.

After the application of mitigation, the residual noise effects at the receptors during operation are adverse, low to moderate in magnitude, medium-term, continuous, and reversible.

Table 7-11 Operation Phase Sound Level – Gordon Site

Receptor ID	Description	Baseline Day-Sound Level, L_{dn} (dBA)	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)	Change in %HA (%)
59	Potential Indigenous Receptor	40.0	30.1	30.1	36.5	0.5
61	Potential Indigenous Receptor	40.0	20.2	20.2	26.6	0.1
62	Potential Indigenous Receptor	40.0	20.3	20.3	26.7	0.1
72	Potential Indigenous Receptor	40.0	30.2	30.2	36.6	0.5
73	Potential Indigenous Receptor	40.0	29.6	29.6	36.0	0.5
74	Potential Indigenous Receptor	40.0	25.4	25.4	31.8	0.2
76	Potential Indigenous Receptor	40.0	38.5	38.5	44.9	2.6
77	Potential Indigenous Receptor	40.0	37.2	37.2	43.6	2.1
93	Black Sturgeon Reserve Residence	44.6	20.1	20.1	26.6	0.0
101	Black Sturgeon Reserve Residence	44.6	21.3	21.3	27.7	0.0
104	Remote Cottage	40.0	34.7	34.7	41.1	1.3
126	Recreation Lot	40.0	22.2	22.2	28.6	0.1
130	Remote Cottage	40.0	21.7	21.7	28.1	0.1
131	Remote Cottage	40.0	32.8	32.8	39.2	0.9
132	Trapper Cabin	40.0	30.7	30.7	37.1	0.6
139	Park Vacation Home	40.0	21.7	21.7	28.1	0.1

Table 7-12 Operation Phase Sound Level – MacLellan Site

Receptor ID	Description	Baseline Day-Sound Level, L_{dn} (dBA)	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)	Change in %HA (%)
66	Potential Indigenous Receptor	40.0	14.0	14.0	20.4	0.0
67	Potential Indigenous Receptor	40.0	22.5	22.5	28.9	0.1
68	Potential Indigenous Receptor	40.0	22.7	22.7	29.1	0.1
69	Potential Indigenous Receptor	40.0	14.4	14.4	20.8	0.0
78	Potential Indigenous Receptor	40.0	14.2	14.2	20.6	0.0
79	Potential Indigenous Receptor	40.0	10.2	10.2	16.6	0.0
81	Potential Indigenous Receptor	40.0	30.6	30.6	37.0	0.6
82	Potential Indigenous Receptor	40.0	33.5	33.5	39.9	1.0
83	Potential Indigenous Receptor	40.0	16.0	16.0	22.4	0.0
84	Potential Indigenous Receptor	40.0	23.6	23.6	30.0	0.1
85	Potential Indigenous Receptor	40.0	35.2	35.2	41.6	1.4
86	Potential Indigenous Receptor	40.0	37.3	37.3	43.7	2.1
105	Remote Cottage	40.0	13.2	13.2	19.6	0.0
115	Museum Site	45.0	14.2	14.2	20.6	0.0
116	Communication Site	45.0	23.0	23.0	29.4	0.1
121	Recreation Lot	42.9	25.9	25.9	32.3	0.2
123	Potential Indigenous Receptor	42.9	28.0	28.0	34.4	0.2
135	Park Vacation Home	42.9	24.5	24.5	30.9	0.1
163	Lynn Lake Friendship Center	45.0	14.0	14.0	20.4	0.0
166	Lynn Lake Gospel Church	45.0	13.7	13.7	20.1	0.0
169	Lynn Lake Library	45.0	14.3	14.3	20.7	0.0
172	West Lynn Lake High School	45.0	13.4	13.4	19.8	0.0
173	Lynn Lake Hospital	45.0	18.4	18.4	24.8	0.0
177	Lynn Lake Residence	45.0	13.0	13.0	19.4	0.0
178	Lynn Lake Residence	45.0	15.5	15.5	21.9	0.0
225	Lynn Lake Residence	45.0	14.9	14.9	21.3	0.0

Decommissioning/Closure

The noise effects assessment focused on activities during the construction and operation phase. The quantity of equipment required for the decommissioning/closure phase is expected to be below that required for the construction and operation phases. Noise emissions during decommissioning/closure activities are expected to be similar to but less than that in the construction phase, and as such noise effects will be less than those of construction. Accordingly, a full sound profile of decommissioning/closure was not warranted. Decommissioning/closure phase noise effects will be managed to acceptable levels using best management practices and are thus not expected to exceed regulatory criteria. The residual noise effects at the receptors during the decommissioning/closure phase are adverse, low to moderate in magnitude, short-term, continuous, and reversible.

7.4.2 Vibration

7.4.2.1 Analytical Assessment Techniques

Ground vibration effects from the use of heavy equipment (i.e., piling, clearing and grubbing, earthworks) during the construction phase were considered in the assessment. The prediction of vibration effects at the receptors and vibration targets for the assessment were based on the FTA (2018) guidance.

The FTA guidance recommends the vibration assessment for building damage be performed for each piece of equipment individually using PPV as the measurable parameter. The vibration level at a receptor is predicted by using the reference vibration level (PPV_{ref}) for each piece of equipment at a reference distance of 25 ft or 7.62 m and the distance from equipment to receptor, as described by the following equation:

$$PPV = PPV_{ref} \times (25/D)^{1.5}$$

Where:

- PPV = Peak particle velocity at the receptor (ft/s)
- PPV_{ref} = The source reference vibration level at 25 ft or 7.62 m (ft/s)
- D = Distance from equipment to receptor (ft).

The FTA guidance recommends that annoyance due to vibration be performed for each piece of equipment individually. Ground-borne vibration related to human annoyance is related to rms velocity levels, expressed in VdB. The vibration level at a receptor is predicted by using the vibration source level (L_{vref}) for each piece of equipment at a reference distance of 25 ft or 7.62 m and the distance from equipment to receptor, as described by the following equation:

$$L_{v,distance} = L_{vref} - 30\ LOG\ (D/25)$$

Where:

- $L_{v,distance}$ = The root mean square velocity level adjusted for distance (VdB)
- L_{vref} = The source reference vibration level at 25 ft or 7.62 m (VdB)
- D = Distance from equipment to receptor (ft).

The Project operation activities that may cause vibration effects are related to blasting. Equations commonly used and accepted by the industry were used to predict the blast-induced ground vibration and air level (ISEE 2011). The MECP guidance provides vibration targets for blast-related activities.

In blasting activity, the explosive energy is intended to break hard rock. However, some energy travels beyond the intended work zone through the ground. The ground vibration level in this assessment is defined in terms of PPV and is measured in mm/s, representing the highest instantaneous positive or negative peak of the vibration signal. A commonly used and accepted equation from the International Society of Explosives Engineers (ISEE) technical literature Blasters' Handbook (ISEE 2011) was used to predict vibration levels for a coal mine. The equation is listed as follows:

$$PPV = 3330(D/W^{1/2})^{-1.52}$$

Where:

- PPV = Peak particle velocity at a receptor (mm/s).
- D = Distance from the blast to nearest inhabited residential dwelling (m).
- W = Highest weight of explosives fired per delay (kg).

During blasting, blast energy that liberates into the atmosphere generates air overpressure. Air overpressure is the additional pressure above normal atmospheric pressure that is generated from a blast and is measured in decibels (dBL). Air overpressure often feels like a gust of wind by a receptor as a confined blast will generally result in an inaudible air overpressure. The following is equation commonly accepted by the industry to predict air overpressure levels at a point of concern was developed by the Blasters' Handbook (ISEE 2011) for a metal mine:

$$\text{Air overpressure} = 14.3\ (D/W^{1/3})^{-0.71}\ [\text{Pa}]$$

Where:

- Air overpressure in Pascals
- C = Confinement constant
- D = Distance from blast to point of concern (m)
- W = Weight of explosives per delay (kg).

The overpressure can be converted from Pascal (Pa) to dBL using the following equation:

$$\text{Air overpressure \{dBL\}} = 20\ \text{LOG}\ (\text{Air overpressure \{Pa\}}/2 \times 10^{-5})$$

The following assumptions were used in the effects assessment:

- Vibration predictions used a conservative method with the highest explosive charge weight. The actual blast charges could be lower.
- Blast-related vibration prediction was based on the shortest distance between receptor and the pit boundary.

7.4.2.2 Project Pathways

In the construction phase, activities such as site preparation, utility and infrastructure development, and processing facility construction will result in a change in vibration levels. Project construction activities such as earthworks, piling, and drilling were considered to cause potential vibration effects. During the operation phase, blasting activities at both the Gordon and MacLellan sites will result in ground-borne vibration and air overpressure. The vibration effects from ground vibration and air overpressure on human receptors were considered. In the decommissioning/closure phase, excavation and reclamation activities will result in a change in vibration levels.

7.4.2.3 Mitigation

Mitigation will be achieved by blast design related to quantities of explosives, blast hole locations and time delays between blasts.

The implementation of the mitigation measures and other commitments described in this section will be the responsibility of Alamos and or contractors. The mechanisms used to require contractors and subcontractors to comply with these measures will include environmental protection plans and contract documents.

Mitigation measures proposed are generally considered to be effective for use in similar applications and environmental conditions. This assessment is based on professional judgment of engineers and scientists in consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited where applicable to justify the selection.

Detailed design of the Project and mitigation strategies is currently ongoing. Mitigation measures will be refined in consideration of environmental assessment approval conditions and permit stipulations which will be incorporated into final environmental management planning. The effectiveness of these mitigation measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs including adaptive management procedures will be reviewed by applicable regulatory agencies prior to their implementation.

The mitigation measures that apply to both the Gordon and MacLellan sites are summarized as follows:

- Highest explosive per time delay that do not exceed 207.9 kg.
- Only one hole/delay will be fired in the blast.
- Minimum time delay between holes in blasts will not be less than 8 milliseconds (ms).

The specific mitigation measures for receptor ID 76 and ID 73 near the Gordon site are as follows:

- The reduced blast charge of 43 kg can be increased if the distance between the blast and closest receptor ID 76 and ID 73 is more than 1,430 m and 2,170 m (distance based on receptor location to open pit boundary), respectively.

- The reduced blast charge of 43 kg can be increased if monitoring results indicate air overpressure level below 120 dBL at ID 76 and ID 73.

Engagement with Marcel Colomb First Nation to discuss the potential of a seasonal mitigation approach, which relaxes the reduced blast charge of 43 kg during off-season period when trapping activities at receptors (ID 76 and ID 73) is not expected.

The specific mitigation measures for the permanent work camp within the MacLellan site are as follows:

- Reduced blast charge of 85 kg can be increased if the distance between the blast and permanent work camp is more than 800 m.
- The reduced blast charge of 85 kg can be increased if monitoring results indicate air overpressure level below 125 dBL at the permanent work camp.
- Blasting will be scheduled during shift change (e.g., less workers sleeping and more local activities) to reduce potential annoyance at the permanent work camp.

7.4.2.4 Project Residual Effects

Construction

During the construction phase, heavy equipment such as excavators, compactors, piling equipment, and haul trucks will be used. The ground-borne vibration effect due to high impact piling equipment, excavator, compactor, and large bulldozer were assessed at receptors closest to the construction activities. These pieces of equipment were selected in this assessment because they typically produce higher vibration levels than other construction equipment.

The greatest distance that will result in a structural damage vibration level target of 0.2 in/s or 5 mm/s (FTA 2018) is 29 m for impact pile driving, 8 m for a compactor or excavator, 4.5 m for a bulldozer, and 4.5 m for drilling. Vibration beyond these distances from the activities are not expected to cause structural damage. This distance is expected to be less for other heavy equipment required for construction that have lower vibratory emissions. The closest receptor to potential construction activities at the Gordon site is located at a distance more than 1 km (ID 76 and ID 131). The closest receptor to potential construction activities at the MacLellan site is located at a distance more than 1 km (ID 85 and ID 86). These receptors are located at a sufficient distance that structural damage due to construction equipment vibration is unlikely.

The greatest distance at which the vibration levels are above the annoyance target of 72 VdB (FTA 2018) is 280 m for impact pile driving, 71 m for a compactor or excavator, 42 m for a bulldozer, and 42 m for drilling. This distance is expected to be less for other heavy equipment required for construction that have lower vibratory emissions. The closest receptors to potential construction activities at the Gordon site or the MacLellan site are both located at a distance of more than 1 km. These receptors are located at sufficient distances that annoyance due to construction equipment vibration is unlikely. Table 7-13 summarizes the predicted vibration level for annoyance effect at the closest receptor for the Gordon site and the MacLellan site. The predicted vibration levels at both receptors are below the annoyance target of 72 VdB.

The residual vibration effects at the receptors during the construction phase are adverse, negligible to low magnitude, short-term, regular event frequency, and reversible.

Table 7-13 Construction Phase Ground-borne Vibration Annoyance Effects

Receptor ID	Description	High Impact Piling (VdB, rms)	Excavator (VdB, rms)	Compactor (VdB, rms)	Bulldozer (VdB, rms)	Drilling (VdB, rms)
76 [a]	Potential Indigenous Receptor	60	42	42	35	35
86 [b]	Potential Indigenous Receptor	51	33	33	26	26

Note:
[a] closest receptor to the Gordon site piling location
[b] closest receptor to the MacLellan site piling location

Operation

During the operation phase, the primary vibration effects are ground vibration and air overpressure due to blasting activities within the open pit at the Gordon site or the MacLellan site. Given the same distance from a blast to the receptor, the primary factor affecting vibration is the explosive charge per delay. The highest explosive charge specification in the blast design is 208 kg per hole per delay for both the Gordon and MacLellan sites. However, the explosive charge could be reduced during operation due to site conditions. The closest receptors to the Gordon site open pit are receptors ID 76 and ID 73 at the approximate distance of 1.4 km and 2.2 km, respectively. Both receptors are First Nations' traplines or trapping areas. The closest receptor (the permanent work camp) is approximately 800 m from the MacLellan site open pit.

Table 7-14 and Table 7-15 presents the prediction ground-borne vibration and air overpressure for receptors at the Gordon site and the MacLellan site, respectively. To be conservative in the predictions, the distance to each receptor was taken from the final open pit boundary, and blasts were assumed to be fired with 208 kg of explosives. These receptor locations are presented in Maps 7-1 and 7-2.

The highest blast charge of 208 kg will result in ground-borne vibration below the vibration target of 10 mm/s at all receptors for the Gordon site. The predicted air overpressures are below the vibration target of 120 dBL at all receptors, with the exception of receptor ID 73 and ID 76 near the Gordon site. The predicted air overpressure at receptor ID 73 and 76 is 121 dBL and 123 dBL, respectively. When the blast charge is reduced from 208 kg to 43 kg per hole per delay, the predicted overpressures at receptor ID 73 and ID 76 meet the 120 dBL target.

The highest blast charge of 208 kg will result in ground-borne vibration below the vibration target of 10 mm/s at all receptors for the MacLellan site. The predicted air overpressures are below the vibration target of 120 dBL at all receptors, with the exception of the permanent work camp in the MacLellan site. The predicted air overpressure at receptor is 127 dBL. This level is also above the Health Canada target of 125 dBL for one blast per day. To meet the Health Canada target of 125 dBL, the blast charge reduction to 85 kg per hole per delay is required. The reduced blast charge of 85 kg can be implemented initially to achieve the overpressure level of 125 dBL at the permanent work camp. Reduced blast charge of 85 kg can be increased if monitoring results indicate an air overpressure level below 125 dBL at the permanent work camp.

The primary factor in the blasting plan that influence the air overpressure is the charge-weight per delay. Charge weight dictates the amount of energy release. Decreasing the charge-weight per delay will effectively reduce the overpressure effect. The blasting plan will consider distance to receptors and will size the charges to avoid exceeding regulatory targets at receptors.

Other mine plan factors such as depth of burial, volume of displaced rock, delay time interval, and type of explosive will also affect the overpressure. A deeply buried or heavily confined charge will cause mostly ground vibration. Lightly confined blast will transfer most blast energy to atmosphere. Blast that displace large volume of rock create high air overpressure with low frequency content.

Air overpressure monitoring can be conducted at nearby receptors during a blast event to confirm vibrations are below regulatory targets. With mitigation measures the overpressures are predicted to meet the most conservative target of 120 dBL at all receptors outside the PDA and 125 dBL at the permanent work camp.

After applying the mitigation measures, the residual vibration effects at the receptors during the operation phase are adverse, negligible to moderate in magnitude, medium-term, regular event frequency, and reversible.

Decommissioning/Closure

The vibration effects assessment focused on activities during the construction and operation phases. The quantity of equipment required for the decommissioning/closure phase is expected to be below the requirement for the construction and operation phases, and activities such as blasting or pile driving, will not be conducted during decommissioning. As such, vibration effects during decommissioning/closure activities are expected to be less than the construction phase. The decommissioning/closure phase vibration effect can be managed to acceptable levels using best management practices and are thus not expected to exceed acceptable levels. The residual vibration effects at the receptors during the decommissioning/closure phase are adverse, negligible to low in magnitude, short-term, regular event frequency, and reversible.

Table 7-14 Operation Phase Vibration Effects – Gordon Site

Receptor ID	Description	Distance to Open Pit (m)	Ground-borne Vibration (mm/s)	Air Overpressure with blast charge of 208 kg per hole per delay (dBL)	Air Overpressure with blast charge of 43 kg per hole per delay (dBL)
59	Potential Indigenous Receptor	8590	0.2	112	109
61	Potential Indigenous Receptor	10960	0.1	111	107
62	Potential Indigenous Receptor	14430	0.1	109	106
72	Potential Indigenous Receptor	3130	0.9	118	115
73	Potential Indigenous Receptor	2170	1.6	121 [a]	118
74	Potential Indigenous Receptor	3180	0.9	118	115
76	Potential Indigenous Receptor	1430	3.1	123 [a]	120
77	Potential Indigenous Receptor	2270	1.5	120	117
93	Black Sturgeon Reserve Residence	11850	0.1	110	107
101	Black Sturgeon Reserve Residence	11760	0.1	110	107
104	Remote Cottage	17070	0.1	108	105
126	Recreation Lot	13470	0.1	109	106
130	Remote Cottage	13290	0.1	110	106
131	Remote Cottage	4260	0.6	117	113
132	Trapper Cabin	3550	0.8	118	114
139	Park Vacation Home	13270	0.1	110	106

Note:

[a] exceeds the MECP cautionary target of 120 dBL based on the blast charge of 280 kg per hole per delay. However, the reduced charge as recommended in the mitigation section will lower the air overpressure to 120 dBA.at Receptor ID 76.

Table 7-15 Operation Phase Vibration Effects – MacLellan Site

Receptor ID	Description	Distance to Open Pit (m)	Ground-borne Vibration (mm/s)	Air Overpressure with blast charge of 208 kg per hole per delay (dBL)	Air Overpressure with blast charge of 85 kg per hole per delay (dBL)
66	Potential Indigenous Receptor	9170	0.2	112	110
67	Potential Indigenous Receptor	7850	0.2	113	111
68	Potential Indigenous Receptor	5590	0.4	115	113
69	Potential Indigenous Receptor	9100	0.2	112	110
78	Potential Indigenous Receptor	9050	0.2	112	110
79	Potential Indigenous Receptor	12100	0.1	110	108
81	Potential Indigenous Receptor	7620	0.2	113	111
82	Potential Indigenous Receptor	3770	0.7	117	115
83	Potential Indigenous Receptor	7070	0.3	113	112
84	Potential Indigenous Receptor	6140	0.3	114	112
85	Potential Indigenous Receptor	3120	0.9	118	117
86	Potential Indigenous Receptor	2370	1.4	120	118
105	Remote Cottage	10780	0.1	111	109
115	Museum Site	6910	0.3	114	112
116	Communication Site	5630	0.4	115	113
121	Recreation Lot	5260	0.4	115	113
123	Potential Indigenous Receptor	3940	0.7	117	115
135	Park Vacation Home	3960	0.7	117	115
163	Lynn Lake Friendship Center	6390	0.3	114	112
166	Lynn Lake Gospel Church	6750	0.3	114	112
169	Lynn Lake Library	6800	0.3	114	112
172	West Lynn Lake High School	7160	0.3	113	112
173	Lynn Lake Hospital	6200	0.3	114	112
177	Lynn Lake Residence	6040	0.3	114	113
178	Lynn Lake Residence	6910	0.3	114	112
225	Lynn Lake Residence	7390	0.3	113	111
	Permanent Work Camp (outdoor)	800	7.4	127 [a]	125

Note:
[a] exceeds the Health Canada target of 125 dBL based on the blast charge of 280 kg per hole per delay. However, the reduced charge of 85 kg per hole per delay will lower the air overpressure to 125 dBA at the permanent work camp.

7.4.3 Summary of Project Residual Environmental Effects on Noise and Vibration

Table 7-16 Project Residual Effects on Noise and Vibration

Residual Effect	Residual Effects Characterization								
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context
Gordon Site									
Change in Noise Level	C	A	L-M	RAA	ST	N/A	C	R	D
	O	A	L-M	RAA	MT	N/A	C	R	D
	D	A	L-M	RAA	ST	N/A	C	R	D
Change in Vibration Level	C	A	N-L	LAA	ST	N/A	R	R	D
	O	A	N-M	RAA	MT	N/A	R	R	D
	D	A	N-L	LAA	ST	N/A	R	R	D
MacLellan Site									
Change in Noise Level	C	A	L-M	RAA	ST	N/A	C	R	D
	O	A	L-M	RAA	MT	N/A	C	R	D
	D	A	L-M	RAA	ST	N/A	C	R	D
Change in Vibration Level	C	A	N-L	LAA	ST	N/A	R	R	D
	O	A	N-M	RAA	MT	N/A	R	R	D
	D	A	N-L	LAA	ST	N/A	R	R	D

KEY
See Table 7-2 for detailed definitions

Project Phase
C: Construction
O: Operation
D: Decommissioning

Direction:
P: Positive
A: Adverse

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PDA: Project Development Area
LAA: Local Assessment Area
RAA: Regional Assessment Area

Duration:
ST: Short-term;
MT: Medium-term
LT: Long-term

N/A: Not applicable

Timing:
N/A: Not Applicable
A: Applicable

Frequency:
S: Single event
IR: Irregular event
R: Regular event
C: Continuous

Reversibility:
R: Reversible
I: Irreversible

Ecological/Socio-Economic Context:
D: Disturbed
U: Undisturbed

7.5 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS ON NOISE AND VIBRATION

The Project residual effects described in Section 7.4.1 regarding noise and vibration may interact cumulatively with residual environmental effects from other physical activities.

The effects of past and current projects relative to conditions prior to historical mining activities contribute to baseline conditions upon which Project effects are assessed. Conditions prior to historical mining activities are generally considered to be similar to currently undisturbed areas of the RAA.

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- The Project has residual environmental effects on the VC, and
- The residual effects could act cumulatively with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either is not met, the assessment of cumulative effects concludes with a statement that further assessment of cumulative effects is not warranted because the Project does not interact cumulatively with other projects or activities.

7.5.1 Project Residual Effects Likely to Interact Cumulatively

Table 4C-1 in Chapter 4, Environmental Effects Assessment Scope and Methods, presents the Project and physical activities inclusion list, which identifies other projects and physical activities that might act cumulatively with the Project. Where residual environmental effects from the Project have the potential to interact cumulatively with residual effects from other projects and physical activities (Table 7-17), a cumulative effects assessment is undertaken.

Table 7-17 Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Environmental Effects	Environmental Effects	
	Change in Noise Level	Change in Vibration Level
Past and Present Physical Activities and Resource Use		
Mineral Development		
• “A” Mine	–	–
• EL Mine	–	–
• Fox Mine	–	–
• Farley Mine	–	–
• Ruttan Mine	–	–
• MacLellan Mine (Historical)	–	–

Table 7-17 Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Environmental Effects	Environmental Effects	
	Change in Noise Level	Change in Vibration Level
• Burnt Timber Mine	–	–
• Farley Lake Mine	–	–
• Keystone Gold Mine	–	–
• East/West Tailings Management Areas	–	–
Mineral Exploration	–	–
Water and Waste Projects (sewage plants, waste disposal grounds)	–	–
Residential and Community Development (including cottage subdivisions)	–	–
Infrastructure Development (transmission line, airport, highways, roads, rail)	–	–
Other Resource Activities (hunting, fishing, berry picking)	–	–
Future Physical Activities		
Mineral Development	–	–
Mineral Exploration	–	–
Traditional Land Use	–	–
Resource Use Activities	–	–
Recreation	–	–

NOTES:
✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with Project residual environmental effects.
– = Interactions between the residual effects of other projects and residual effects of the Project are not expected.
For a detailed description and mapped locations of Projects and Physical Activities, where applicable, see Chapter 4, Table 4D-2 and Maps 4-3 and 4-4.

There are no cumulative noise or vibration effects with past projects and activities because the effects cease after the activities are completed and there is no temporal overlap with Project effects.

The present projects and activities include a combination of residential, industrial, and commercial activities, and the natural environment. The existing sound level considers existing activities resulting in noise emissions (i.e., residential, industrial, commercial, and natural environment) in the RAA. Section 7.2 provides information on the existing noise level in the RAA. As such, the contribution of existing projects and activities are considered in the assessment of Project residual effects (Section 7.4).

Noise and vibration effects from future projects or physical activities may overlap with the residual effects of the Project if emissions from a future project or activity overlaps temporally and spatially with those of the Project. Mining Development is the only activity likely to generate substantial noise and vibration emission but would be at sufficient distance from the Project that an overlap in effects is unlikely. As such, cumulative noise and vibration effects from a future project or activity are not anticipated.

7.6 EFFECTS TO FEDERAL LANDS

Federal lands within the LAA and RAA for Atmospheric Environment consist of Black Sturgeon Reserve which falls within the RAA. Two representative Black Sturgeon Reserve receptors ID 83 and ID 101) are included in this assessment. These effects are anticipated to be similar to other receptors in the RAA as described in Sections 7.4 and 7.5.

7.7 DETERMINATION OF SIGNIFICANCE

7.7.1 Significance of Project Residual Effects

Noise effects from construction and operation of the Project will comply with the Health Canada Noise Guidance (Health Canada 2017). Vibration effects from construction and operation of the Project will comply with the FTA vibration guidance. With mitigation and environmental protection measures, the residual environmental effects on Noise and Vibration are predicted to be not significant.

7.7.2 Significant of Effects on Federal Lands

The only federal land within the RAA is Black Sturgeon Reserve. Based on these results in Section 7.6, the residual environmental effects from changes to the Atmospheric Environment are predicted to be not significant.

7.8 PREDICTION CONFIDENCE

Confidence in the predictions for this assessment is high. Overall, the accuracy of predictions depends on several factors, including the accuracy of the Project design information, noise source data, the sound propagation algorithm, and the effectiveness of mitigation. The PWLs of the noise sources were established with field measurements of similar equipment or vendor sound emission data, where available.

The Cadna/A® model predicts outdoor noise in accordance with ISO 9613. The ISO 9613 sound propagation algorithms have a published accuracy of ±3 dB over source receiver distances between 100 m and 1 km. The accuracy for distances up to or over 1 km is not stated. The ISO 9613 algorithms also produce results representative of meteorological conditions enhancing sound propagation (e.g., downwind and temperature inversion conditions). These conditions do not occur continuously; therefore, model predictions are expected to be conservative.

Prediction method for blast-related ground-borne vibration are based on upper bound equations. Upper bound equations will generally estimate the highest potential vibration level with at least 95% confidence. Prediction method for blast-related overpressure levels are based on best fit equation. Statistically the best fit equations are meant to estimate the expected air overpressure level. The equations are useful for blasts that are well designed and implemented properly in the field.

To account for the level of uncertainty in the noise predictions, some conservative assumptions (Section 7.4.1.1 and 7.4.2.1) regarding the Project have been made. These include selecting assessment scenarios based on years of operation with the highest mining rates, assuming full equipment usage, and traffic volume, and assessing vibration predictions with the highest explosive charge weight. The blast-related vibration prediction was based on the shortest distance between receptor and the open pit boundary. The modelling conducted for this assessment was conservative, and there are effective and known mitigation measures that will be implemented. With these considerations, the overall prediction confidence is high that change in noise level and vibration level due to the Project is not significant.

7.9 FOLLOW-UP AND MONITORING

With the implementation of mitigation measures, the Project will result in construction and operation noise and vibration effects that are not expected to exceed guidance levels. A Noise Monitoring Program is recommended at the most affected receptor locations (temporary work camp, permanent work camp, receptor ID 73, and receptor ID 76) to monitor the effectiveness of Project mitigation measures. In addition to the outdoor noise monitoring, an indoor noise monitoring program is proposed at the temporary and permanent work camps. The indoor noise monitoring program will measure the indoor daytime and nighttime noise level to confirm the effectiveness of mitigation.

A Vibration Monitoring Program is recommended at receptor IDs 73, 76, 85, 86, and the permanent work camp to measure the vibration air overpressure level during a blast event. Reduced blast charge may be increased if monitoring results indicate air overpressure level below the recommended targets. In the events that the measured values exceed the recommended targets, corrective actions including additional mitigation (e.g., further reduction of blast charge) will be considered. See Chapter 23 for additional information on Environmental Management and Monitoring Programs.

In the event that an unexpected deterioration of the environment is observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process described in Chapter 23, Section 23.2. This may include an investigation of the cause of the deterioration and identification of existing and/or new mitigation measures to be implemented to address it.

7.10 SUMMARY OF COMMITMENTS

As described in Section 7.4.1.3, the following mitigation measures will be implemented as needed to reduce potential noise effects during construction and operation at the Gordon and MacLellan sites:

- Where possible, large stationary machinery (i.e., crushers) will be located inside buildings.
- Fully enclosed conveyor will be used between buildings in processing plant.
- Large transportation trucks will be used to reduce the number of trips.
- Mobile equipment will have exhaust mufflers.
- Work camp building walls and roof will include noise insulated panels.

- Work camp building will include an air conditioning system such that double pane windows and insulated doors can be closed during the summer season.
- Reduce idling of heavy fleet vehicles when not operating.

As described in Section 7.4.2.3, the following mitigation measures will be implemented as needed to reduce potential blast-related vibration effects during blasting operation at the Gordon and MacLellan sites:

- Highest explosive per time delay that do not exceed 207.9 kg.
- Only one hole/delay will be fired in the blast.
- Minimum time delay between holes in blasts will not be less than 8 ms.

The specific blast design mitigation measures for receptor ID 76 and ID 73 near the Gordon site are as follows:

- The reduced blast charge of 43 kg can be increased if the distance between the blast and closest receptor ID 76 and ID 73 is more than 1,430 m and 2,170 m (distance based on receptor location to open pit boundary), respectively.
- The reduced blast charge of 43 kg can be increased if monitoring results indicate air overpressure level below 120 dBL at ID 76 and ID 73.

Engagement with Marcel Colomb First Nation to discuss the potential of a seasonal mitigation approach, which relaxes the reduced blast charge of 43 kg during off-season period when trapping activities at receptors (ID 76 and ID 73) is not expected.

The specific mitigation measures for the permanent work camp within the MacLellan site are as follows:

- The reduced blast charge of 85 kg can be implemented initially to achieve the overpressure level of 125 dBL at the permanent work camp.
- Reduced blast charge of 85 kg can be increased if monitoring results indicate air overpressure level below 125 dBL at permanent work camp.
- Reduced blast charge of 85 kg can be increased if the distance between the blast permanent work camp is more than 800 m.
- Blasting will be scheduled during shift change (e.g. less worker sleeping and more local activities) to reduce potential annoyance at the permanent work camp.

An indoor noise monitoring program is proposed at the temporary work camp, permanent work camp. A vibration air overpressure monitoring program is recommended at receptor IDs 73, 76, 85, 86, and permanent work camp to confirm the effectiveness of mitigation.

7.11 REFERENCES

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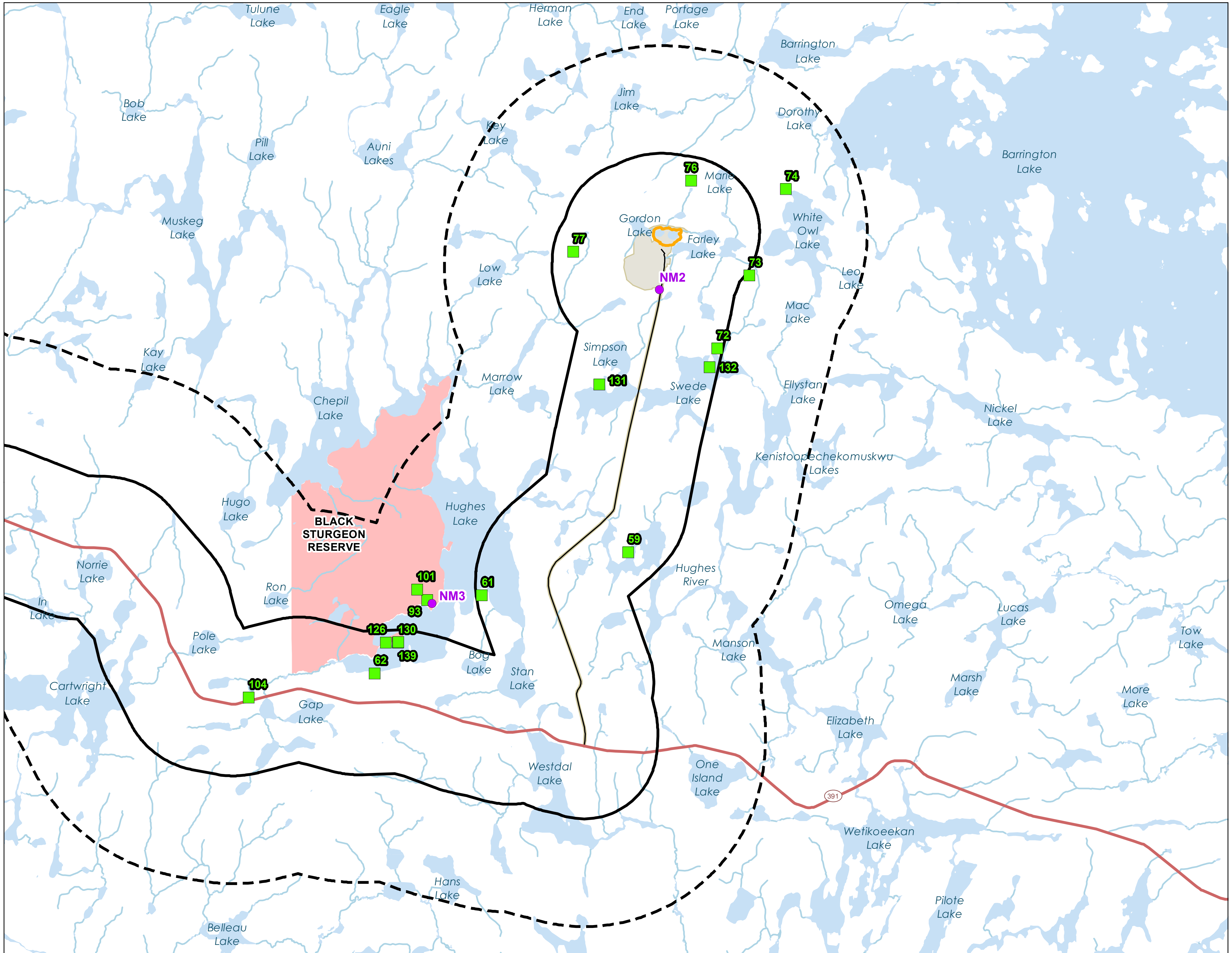


Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Noise and Vibration Local Assessment Area (LAA)
- Noise and Vibration Regional Assessment Area (RAA)

Locations

- Noise Monitoring Location
- Receptor Location

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody
- First Nation Reserve

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

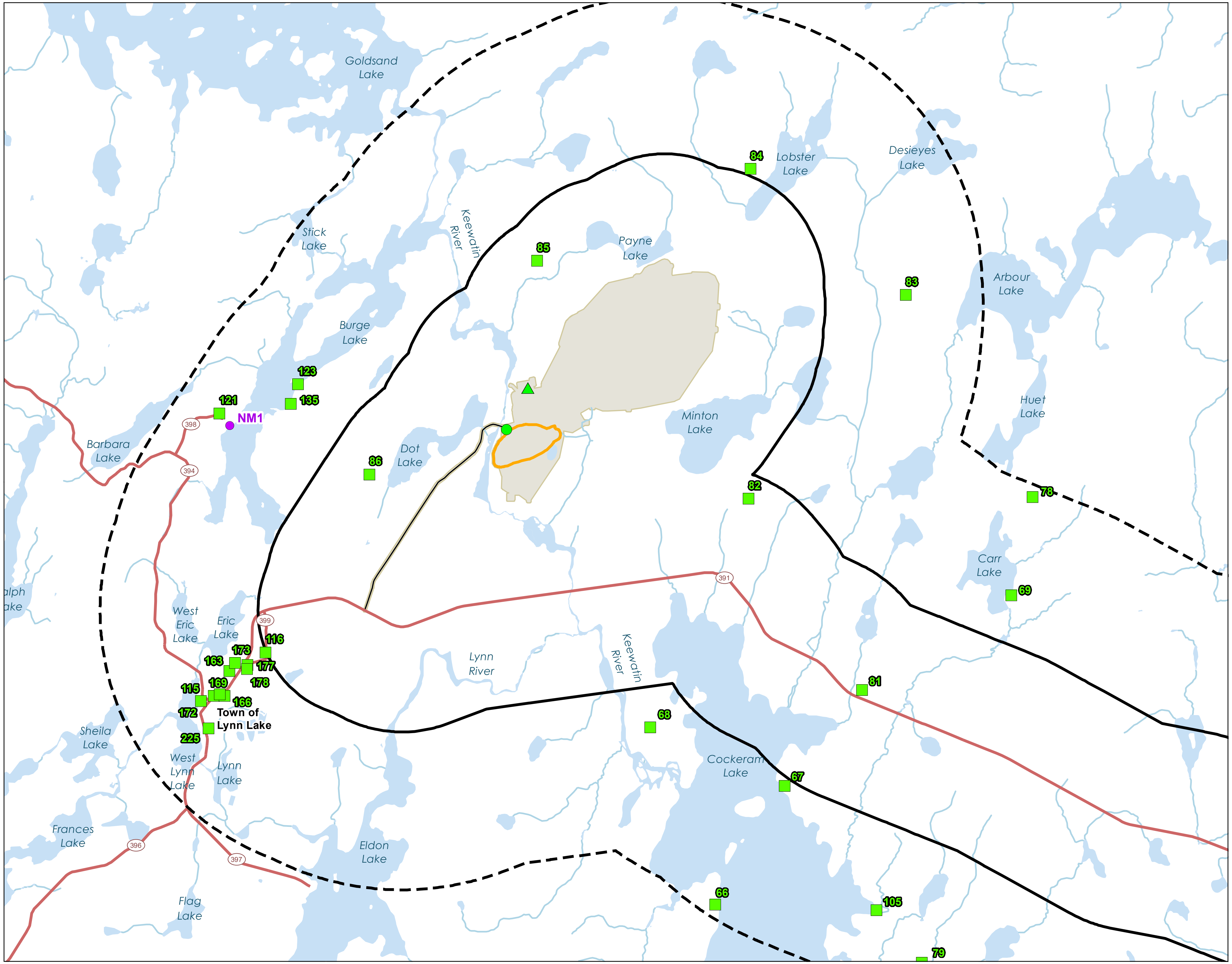
Project Location
Lynn Lake, Manitoba

Prepared by JHiebert on 2020-07-10
Technical Review by JChui on 2020-07-10
Senior GIS Review by GKroupa on 2020-07-10

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
7-1

Title
Noise and Vibration Assessment Areas - Gordon Site



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Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Noise and Vibration Regional Assessment Area (RAA)

Locations

- Noise Monitoring Location
- Receptor Location
- Future Worker Camp
- Temporary Worker Camp

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 1 2 Kilometres

(At original document size of 11x17)
1:75,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

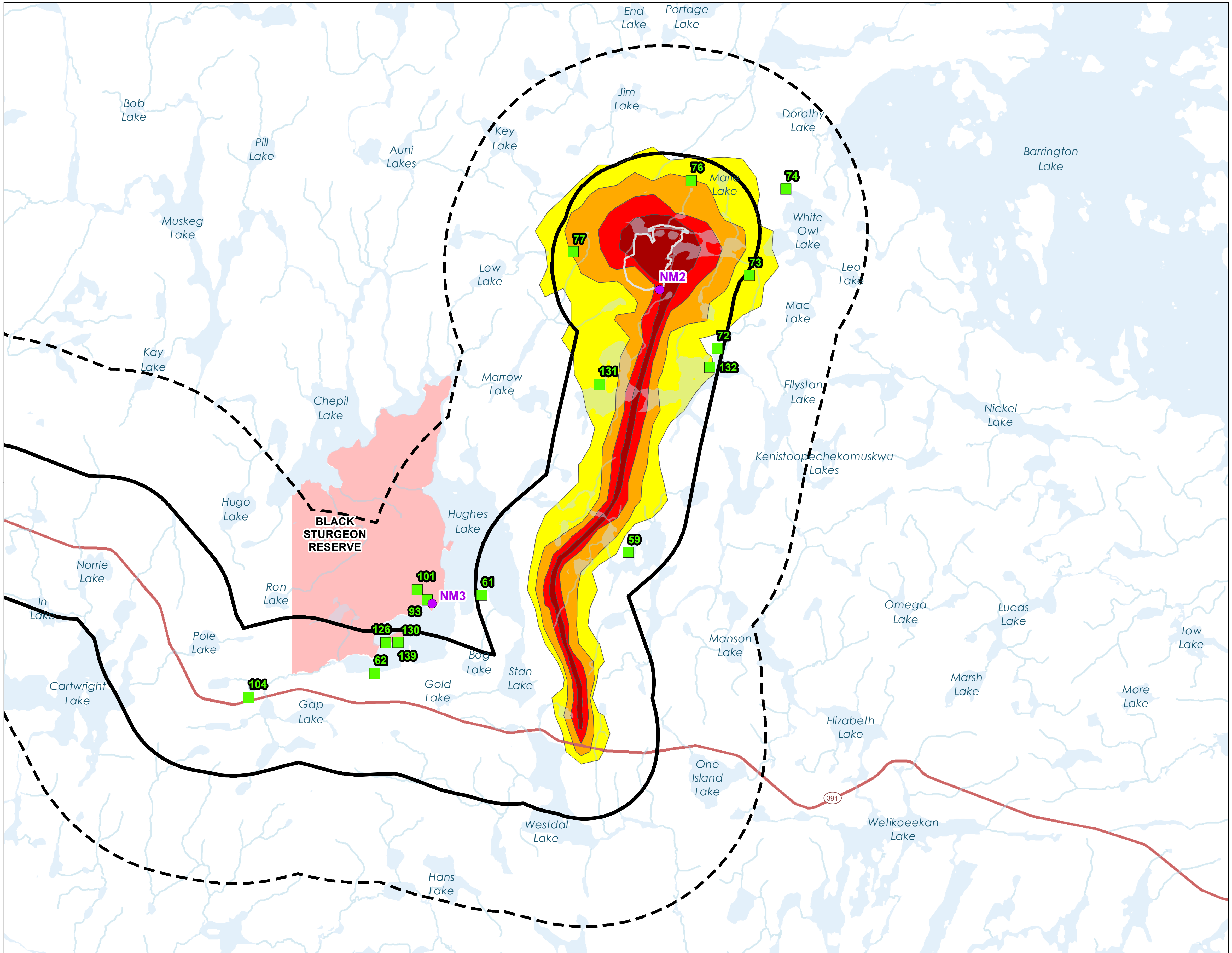
Project Location
Lynn Lake, Manitoba

Prepared by JHiebert on 2020-07-10
Technical Review by JChui on 2020-07-10
Senior GIS Review by GKroupa on 2020-07-10

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
7-2

Title
Noise and Vibration Assessment Areas - MacLellan Site



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Alamos Gold Inc.

Study Area

Project Development Area at Mine Site

Noise and Vibration Local Assessment Area (LAA)

Noise and Vibration Regional Assessment Area (RAA)

Locations

Noise Monitoring Location

Receptor Location

Noise Level (dBA)

>40 dBA

>35 dBA

>30 dBA

>25 dBA

Landbase

Highway

Watercourse

Waterbody

First Nation Reserve

N

0 2 4 Kilometres

(At original document size of 11x17)
1:110,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

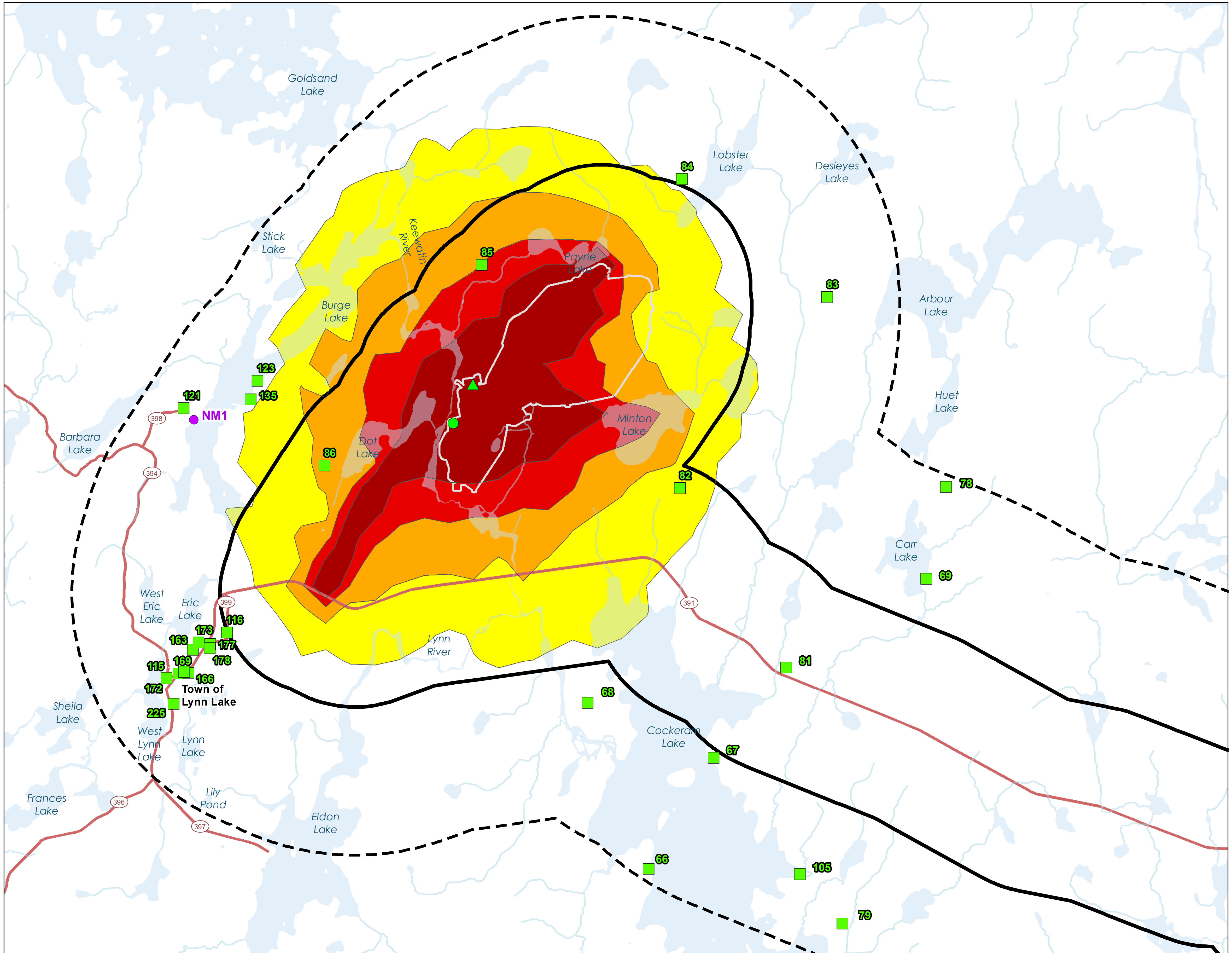
Project Location
Lynn Lake, Manitoba

Prepared by JHiebert on 2020-07-10
Technical Review by JChui on 2020-07-10
Senior GIS Review by GKroupa on 2020-07-10

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
7-3

Title
Construction Phase Noise Contours - Gordon Site



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Alamos Gold Inc.

Study Area

- Project Development Area at Mine Site
- Noise and Vibration Local Assessment Area (LAA)
- Noise and Vibration Regional Assessment Area (RAA)

Locations

- Noise Monitoring Location
- Receptor Location
- Future Worker Camp
- Temporary Worker Camp

Noise Level (dBA)

- >40 dBA
- >35 dBA
- >30 dBA
- >25 dBA

Landbase

- Highway
- Watercourse
- Waterbody

N

0 1.5 3 Kilometres

(At original document size of 11x17)
1:80,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

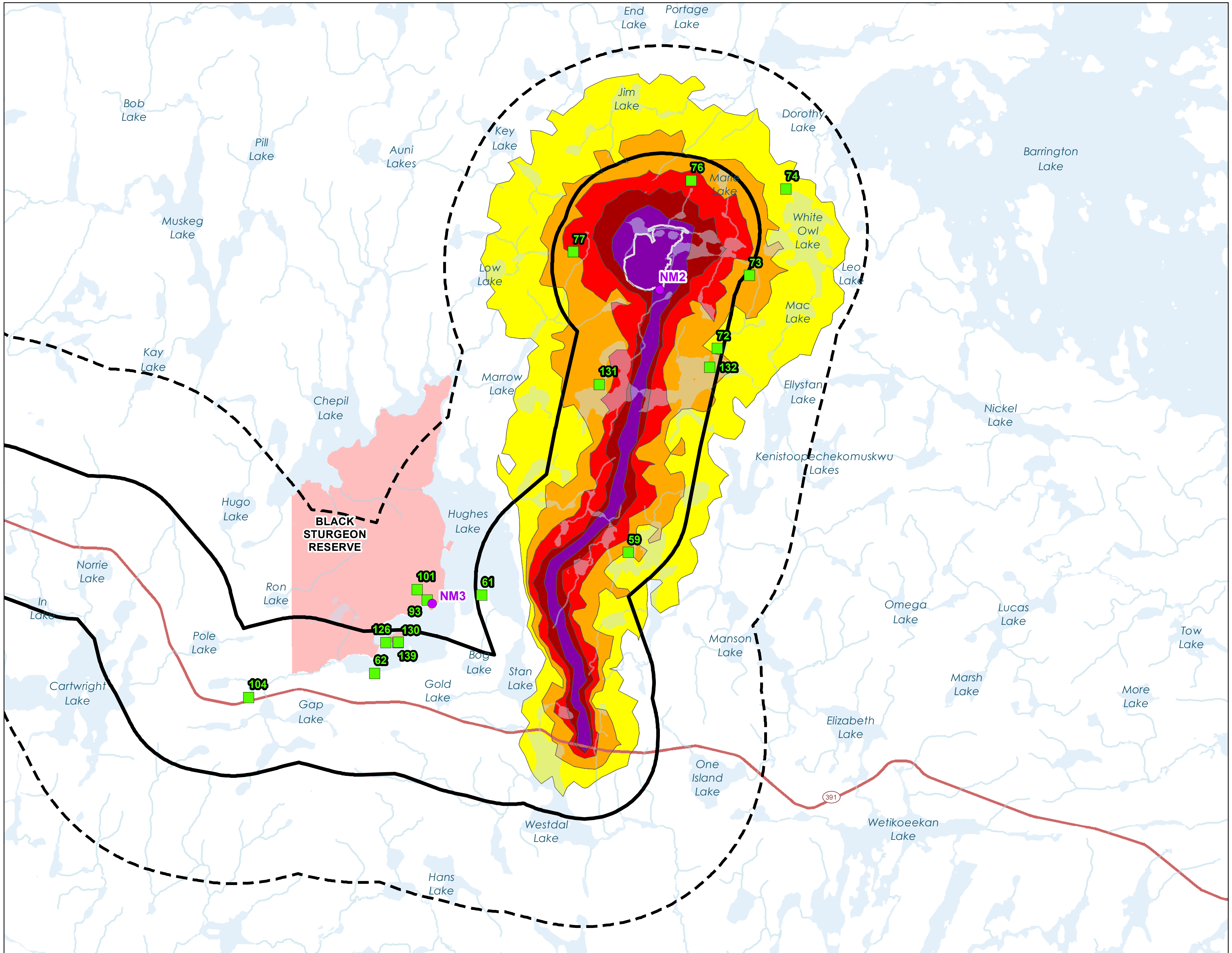
Project Location
Lynn Lake,
Manitoba

Prepared by JHiebert on 2020-07-10
Technical Review by JChui on 2020-07-10
Senior GIS Review by GKroupa on 2020-07-10

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
7-4

Title
Construction Phase Noise Contours - MacLellan Site



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Alamos Gold Inc.

Study Area

- Project Development Area at Mine
- Noise and Vibration Local Assessment Area (LAA)
- Noise and Vibration Regional Assessment Area (RAA)

Locations

- Noise Monitoring Location
- Receptor Location

Noise Level (dBA)

- >45 dBA
- >40 dBA
- >35 dBA
- >30 dBA
- >25 dBA

Landbase

- Highway
- Watercourse
- Waterbody
- First Nation Reserve

N

0 2 4 Kilometres

(At original document size of 11x17)
1:110,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

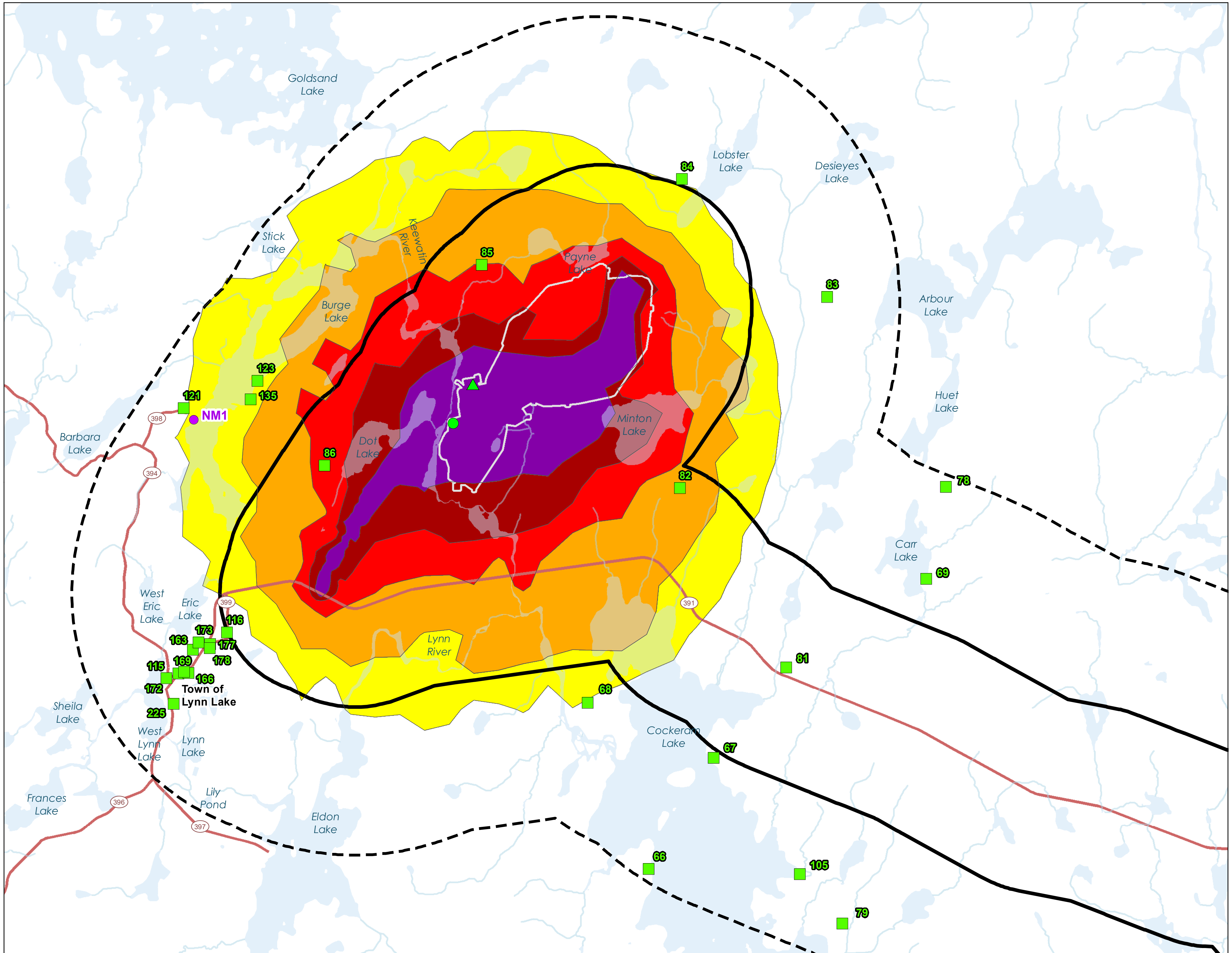
Project Location
Lynn Lake,
Manitoba

Prepared by JHiebert on 2020-07-10
Technical Review by JChui on 2020-07-10
Senior GIS Review by GKroupa on 2020-07-10

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
7-5

Title
Operation Phase Noise Contours - Gordon Site



Stantec

Alamos Gold Inc.

Study Area

- Project Development Area at Mine Site
- Noise and Vibration Local Assessment Area (LAA)
- Noise and Vibration Regional Assessment Area (RAA)

Locations

- Noise Monitoring Location
- Receptor Location
- Future Worker Camp
- Temporary Worker Camp

Noise Level (dBA)

- >45 dBA
- >40 dBA
- >35 dBA
- >30 dBA
- >25 dBA

Landbase

- Highway
- Watercourse
- Waterbody

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

Prepared by JHiebert on 2020-07-10
Technical Review by JChui on 2020-07-10
Senior GIS Review by GKroupa on 2020-07-10

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
7-6

Title
Operation Phase Noise Contours - MacLellan Site

ALAMOS GOLD INC.

Lynn Lake Gold Project Environmental Impact Statement Chapter 8 – Assessment of Potential Effects on Groundwater

Stantec

Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Acronyms and Abbreviations

Alamos	Alamos Gold Inc.
amsl	above mean sea level
bgs	below ground surface
BIF	banded iron formation
CCME	Canadian Council of Ministers of the Environment
CWQG-FAL	Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
EIS	environmental impact statement
FAL	freshwater aquatic life
Golder	Golder Associates
ha	hectares
LAA	Local Assessment Area
LOM	life of mine
MCC	Manitoba Conservation and Climate
MDMER	Metal and Diamond Mining Effluent Regulations
MMER	Metal Mining Effluent Regulations
MRSA	mine rock storage area
MSD	Manitoba Sustainable Development (now MCC)
MWQSOG	Manitoba Water Quality Standards, Objectives, and Guidelines
NSZ	north shear zone
PDA	Project Development Area

RAA	Regional Assessment Area
RQD	rock quality designation
TDR	technical data report
TMF	tailings management facility
TMR	technical modelling report
VC	valued component

8.0 ASSESSMENT OF POTENTIAL EFFECTS ON GROUNDWATER

Groundwater includes domestic, commercial, and industrial groundwater-source water supplies, and the groundwater component of freshwater ecosystems, including stream flow, vegetation, and wetlands. Groundwater was selected as a valued component (VC) for assessment because it has potential to be a source of potable water, is important in maintaining ecological habitats by supporting stream flow, vegetation, and wetlands, and is of cultural importance.

Groundwater is an integral component of the hydrologic cycle, is an important source of potable water for human consumption and is a pathway to the following VCs:

- Surface Water VC (Chapter 9) – groundwater can interact directly with surface water resources and surface water ecosystems at points of discharge (e.g., lakes and streams).
- Vegetation and Wetlands VC (Chapter 11) – changes in groundwater levels can affect vegetation communities (wetlands) that are formed by or supported by groundwater.
- Community Services, Infrastructure, and Wellbeing VC (Chapter 14) – changes in groundwater levels and quality (e.g., changes in groundwater wells) have the potential to directly affect residential, municipal, industrial, and commercial groundwater users.
- Current Use of Lands and Resources for Traditional Purposes VC (Chapter 17) – changes in groundwater quality and/or quantity can affect the ability or desire of Indigenous peoples to participate in traditional water-based activities (e.g., fishing, trapping, hunting).
- Human Health VC (Chapter 18) – groundwater is a transport pathway to humans through seepage to surface water followed by consumption of surface water.

8.1 SCOPE OF ASSESSMENT

The scope of the assessment of potential effects to the Groundwater VC was guided by the federal Environmental Impact Statement (EIS) Guidelines developed for the Project (Appendix 4A); Manitoba Sustainable Development's (MSD), now Manitoba Conservation and Climate's (MCC), Environment Act Proposal Report Guidelines; as well as the various federal and provincial laws, regulations, policies, and guidelines protecting groundwater quantity and quality in Canada and Manitoba.

In addition to regulations, policies, and guidelines, this section describes how engagement with the public and local Indigenous communities has influenced the scope of the assessment; the understanding of potential effects and pathways between the Project and groundwater quantity and quality during construction, operation, and decommissioning/closure of the Project; measurable parameters to be used to quantify potential effects of the Project on groundwater quantity and quality; spatial and temporal boundaries of the assessment; and the approach for characterizing and determining the significance of residual effects.

8.1.1 Regulatory and Policy Setting

Federal and provincial water quality guidelines are used to protect drinking water and freshwater aquatic biota. This assessment uses the guidelines to screen potential adverse effects to groundwater quantity and quality during construction, operation, and decommissioning/closure of the Gordon and MacLellan sites. These guidelines are described below, along with other laws, policies, and guidelines that govern the management and protection of groundwater in Canada and Manitoba.

8.1.1.1 Federal

The following provides a summary of federal regulations, policies, and/or guidelines that apply directly or indirectly to groundwater.

Fisheries Act

The *Fisheries Act*, administered primarily by Fisheries and Oceans Canada (DFO) with some provisions administered by Environment and Climate Change Canada (ECCC), restricts or controls the deposit of deleterious substances into waters or locations frequented by fish unless authorized by regulation. A number of regulations have been made to carry out the purposes and provisions of the *Fisheries Act*. The *Metal and Diamond Mining Effluent Regulations* (MDMER) define unionized ammonia, arsenic, copper, cyanide, lead, nickel, zinc, total suspended solids (TSS), and radium 226 as deleterious substances and Schedule 4 of the MDMER imposes limits on their concentrations in effluent at the final discharge point to the receiving body of water. With respect to groundwater, the MDMER defines effluent as seepage containing any deleterious substance that flows over, through, or out of the site of a mine. The MDMER Schedule 4 criteria are used to screen the quality of seepage from waste rock and tailings at the Project sites.

The MDMER came into effect on June 1, 2018 and replace the *Metal Mining Effluent Regulations* (MMER). The MDMER includes the phasing in of more stringent effluent discharge limits than the previous MMER for deleterious substances for new and existing mines, a new effluent discharge limit for unionized ammonia, and the requirement that effluent be non-acutely lethal to Daphnia magna, all of which come into force on June 1, 2021. The more stringent future effluent limits have been considered in this assessment based on the assumption that the Project will not be in commercial operation before June 1, 2021.

Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life

The Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life (CWQG-FAL) are established by the Canadian Council of Ministers of the Environment (CCME 2018). These guidelines are developed collaboratively among provincial, territorial, and federal jurisdictions and regularly updated to reflect current toxicology information and guideline derivation approaches. For the parameters analyzed as part of the Project, the CWQG-FAL generally have more stringent values than the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG) for freshwater aquatic life, particularly for cyanide, arsenic, cadmium, copper, lead, nickel, and zinc. The CWQG-FAL are used conservatively as a screening criteria for areas where groundwater is anticipated to discharge to surface water. Because of the similarity between the CWQG-FAL and the MWQSOG, further discussion is limited to the more stringent guideline for a given parameter.

Guidelines for Canadian Drinking Water Quality

The Guidelines for Canadian Drinking Water Quality (GCDWQ) are established by Health Canada in collaboration with the Federal-Provincial-Territorial Committee on Drinking Water and other federal government departments and are published by Health Canada (2019). These guidelines are based on current published scientific research related to health effects, aesthetic effects, and operational conditions of various parameters in drinking water. For the parameters analyzed as part of the Project, the GCDWQ generally have the same values as the MWQSOG for drinking water, except for copper, lead, manganese, nitrite, and selenium, as follows:

- The GCDWQ for copper are 1.0 mg/L as an aesthetic objective, and 2.0 mg/L as a maximum acceptable concentration versus the MWQSOG aesthetic objective of 1.0 mg/L.
- The GCDWQ maximum acceptable concentration for lead is 0.005 mg/L versus 0.010 mg/L for the MWQSOG maximum acceptable concentration.
- The GCDWQ for manganese are 0.02 mg/L as an aesthetic objective, and 0.12 mg/L as a maximum acceptable concentration versus the MWQSOG aesthetic objective of 0.050 mg/L.
- The GCDWQ maximum acceptable concentration for nitrite (as N) is 1.0 mg/L versus 3.2 mg/L for the MWQSOG maximum acceptable concentration.
- The GCDWQ maximum acceptable concentration for selenium is 0.05 mg/L versus 0.010 mg/L for the MWQSOG maximum acceptable concentration.

There are no groundwater supply users identified within the vicinity of the Gordon or MacLellan sites. Therefore, the GCDWQ are used conservatively as a screening criteria for areas where groundwater is anticipated to flow beyond the spatial boundary of the Gordon or MacLellan sites prior to discharging to a surface water feature. Because of the similarity between the GCDWQ and the MWQSOG, further discussion is limited to the more stringent guideline for a given parameter.

8.1.1.2 Provincial

The Mines and Minerals Act

The Mines and Minerals Act and *Mine Closure Regulation* under Part 14 of the Act sets out standards for mine closure. The monitoring requirements for the Project related to groundwater will be developed to meet the requirements under the Act.

The Environment Act

The Environment Act is the principal environmental protection and control statute in Manitoba and is used in conjunction with *The Water Protection Act* to address sources of water pollution. *The Environment Act* contains general provisions associated with Class 1, 2, and 3 developments that can be used to protect surface water and groundwater quality (Chapter 1, Section 1.4.1.2).

The Water Protection Act

The Water Protection Act is the principal statute governing water management and water quality in Manitoba and is designed to be protective of environmental, economic, and social well-being of Manitoba now and in the future. The MWQSOG for use under Part 2 of the Act sets out prescribed water quality standards for a number of activities, including drinking water, freshwater aquatic life, and common classes of discharge.

Under Tier I MWQSOG, the quality of metal mining liquid effluents are specified to comply with the discharge limits in the MMER. As discussed above, the MMER were amended to the MDMER on June 1, 2018. For the purpose of discussion, the more stringent MDMER (Table 2) are presented in the effects assessment for groundwater.

The Tier III MWQSOG were developed for the protection of groundwater and surface water from constituents attributable to sewage, industrial, agricultural, and other land use practices, or other human-induced point or non-point source discharges that may unacceptably impair water quality. Under the Tier III MWQSOG, standards are set for the protection of drinking water (groundwater and surface water) and freshwater aquatic life (surface water) as well as irrigation, livestock, sediment, and recreational uses. The Tier III MWQSOG are used where there are potential effects of groundwater on drinking water quality. There are no groundwater supply users identified within the spatial boundaries of the Gordon or MacLellan sites; therefore, the Tier III MWQSOG are used as a screening criteria for areas where groundwater is anticipated to flow beyond the boundary of the Project prior to discharging to a surface water feature. The MWQSOG for the protection of freshwater aquatic life (FAL) are used as a screening criteria for areas where groundwater is anticipated to discharge to surface water.

Because of the similarity between the GCDWQ and the MWQSOG for drinking water and the CWQG-FAL and MWQSOG for the protection of freshwater aquatic life, further discussion is limited to the more stringent guideline for a given parameter.

MCC Assessment Criteria for Groundwater

MCC released an information bulletin in June 2016, with respect to Assessment Criteria for Groundwater. The information bulletin provides guidance on appropriate criteria to assess the risk to human and ecological receptors from contaminants in groundwater at sites in Manitoba. Where groundwater discharges to surface water, the following Canadian Environmental Quality Guidelines are recommended: CWQG-FAL and Guidelines for Canadian Recreation Water Quality. These Canadian Environmental Quality Guidelines are surface water quality criteria and therefore are not directly applicable to groundwater quality. The information bulletin provides additional reference documents where the Canadian Environmental Quality Guidelines do not provide guidance for the risk to receptor via a particular pathway. One of the recommended references is the Ontario Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the *Environmental Protection Act* (Ontario Ministry of the Environment 2011b).

The criteria presented in Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the *Environmental Protection Act* (Ontario Ministry of the Environment 2011b) are referred to as Site Condition Standards. The Site Condition Standards were developed based on a series of pathways such as drinking water, groundwater discharge, and vapour migration for a variety of receptors (e.g., drinking water, aquatic life, human health) with the criteria often being set to be representative of the most sensitive receptor. The development of the Site Condition Standards is documented in the Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario (Ontario Ministry of the Environment 2011a).

The Site Condition Standards rationale document (Ontario Ministry of the Environment 2011a) presents Aquatic Protection Values to protect aquatic biota from migration of impacted groundwater to surface water. The Aquatic Protection Values are designed to provide a scientifically defensible and reasonably conservative level of protection for aquatic organisms from the migration of contaminated groundwater to surface water resources. The Aquatic Protection Values are the established water quality criteria in surface water and are used to determine the acceptable concentrations in groundwater (GW3 criteria) by back calculating through a defined modelling process that considers a ten times dilution in the receiving environment. For this Project, the GW3 are used as a screening criteria in areas where groundwater is anticipated to discharge to surface water features.

8.1.2 The Influence of Engagement on the Assessment

Engagement has been ongoing prior to and throughout the EIS process, and will continue with local Indigenous communities, stakeholders, the public, and government agencies through the life of the Project. More detail on the Engagement process can be found in Chapter 3.

Engagement feedback related to groundwater has been addressed through direct responses, updates to baseline information, and in the EIS, as appropriate. Key feedback that influenced the groundwater effects assessment is provided below.

8.1.2.1 Indigenous Engagement

As part of the information sharing throughout the engagement process, Project-related information was provided by Indigenous communities in the form of traditional land and resource use (TLRU) studies and other forms of information sharing.

A Project-specific TLRU study was completed collaboratively with Marcel Colomb First Nation with a final report provided to the community on January 11, 2018 (Stantec 2018). The TLRU study included interviews with participants selected by Marcel Colomb First Nation regarding traditional land use in the Project area, including availability of traditional resources, access to traditional resources or areas, occupancy, cultural sites and areas, and experience of TLRU.

A Project-specific TLRU study was completed in collaboration with Peter Ballantyne Cree Nation but has not yet been released by community leadership for use in the environmental assessment. The TLRU study included interviews with community members in Kinoosao, Saskatchewan.

A TLRU study (Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study for the Lynn Lake Gold Mine Project) was completed by an independent consultant for the Manitoba Metis Federation (SVS 2020), the results of which were received in February 2020. The study documents harvesting and land use by the Manitoba Métis Community within a 100 km radius of the Project.

At an open house event held in Winnipeg in March of 2015, several members of Marcel Colomb First Nation expressed that groundwater, surface water, tailings and waste rock management are of high importance (Chapter 3). Marcel Colomb First Nation and the former Marcel Colomb Development Corporation also expressed the need to protect natural springs.

Manitoba Metis Federation indicated in the Manitoba Metis Federation Métis Land Use and Occupancy Study that safe water is of utmost importance (Chapter 17). Of the resources harvested by Manitoba Metis Federation within the land use and occupancy study area, spring water is the most frequently consumed (Shared Value Solutions 2020).

In a letter from Mathias Colomb Cree Nation to the Canadian Environmental Assessment Agency dated October 6, 2017, concern was expressed regarding the potential for acid rock drainage.

8.1.2.2 Public Engagement

Several respondents to questionnaires distributed as part of public open houses held in Lynn Lake between March 2015 and February 2020 indicated that impacts to groundwater and surface water are of high importance (Chapter 3). Other areas of importance noted included tailings and mine rock management and tailings containment.

8.1.2.3 Regulatory Engagement

During a conference call with DFO in fall 2019, DFO requested that a sensitivity analysis be completed using the groundwater flow model to evaluate the sensitivity of model results to hydraulic conductivity and recharge.

8.1.3 Potential Effects, Pathways and Measurable Parameters

Table 8-1 summarizes the potential environmental effects of the Project on groundwater, effect pathways and measurable parameters. These potential environmental effects and measurable parameters are selected based on professional judgement, understanding of the Project, recent environmental assessments for mining projects in Canada, and comments provided during engagement.

Table 8-1 Potential Effects, Effects Pathways and Measurable Parameters for Groundwater

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in Groundwater Quantity and/or Flow	• Project activities will result in changes in groundwater recharge and changes to groundwater levels and flow. A decrease in groundwater levels may result in loss of yield to dug or drilled wells, reducing their ability to meet water supply requirements. • As a pathway to surface water and wetlands, a decrease in groundwater levels and changes in the natural groundwater flow could affect discharge to nearby surface water bodies (assessed in Chapter 9) and water levels within wetlands (assessed in Chapter 11).	• Shallow and deep groundwater levels as measured in monitoring wells (m) and baseflow to surface water bodies (L/s).
Change in Groundwater Quality	• Changes in groundwater levels and flow direction and recharge or infiltration from the Project activities may alter groundwater quality in dug or drilled wells, reducing their ability to meet water supply requirements without treatment. • As a pathway to surface water and wetlands, recharge or infiltration from Project activities may result in changes to groundwater quality discharging to surface water (assessed in Chapter 9).	• Concentration of physical and chemical parameters in groundwater (mg/L or µg/L).

8.1.4 Boundaries

8.1.4.1 Spatial Boundaries

The spatial boundaries defined for the assessment of potential environmental effects on groundwater are described below and shown in Map 8-1 for the Gordon site and Map 8-2 for the MacLellan site.

Project Development Area

A Project Development Area (PDA) was delineated for each of the Gordon and MacLellan sites. The PDA encompasses the immediate area in which Project activities and components may occur plus a 30-m buffer (Map 8-1 and Map 8-2) and is the anticipated area of direct physical disturbance associated with construction and operation of the Project (i.e., the Project footprint). The Gordon site PDA is approximately 270 hectares (ha) in size. The MacLellan site PDA is approximately 940 ha in size.

Local and Regional Assessment Areas

A Local Assessment Area (LAA) and Regional Assessment Area (RAA) was delineated for each of the Gordon and MacLellan sites. The LAA and RAA for groundwater are based on the likely extent of drawdown from open pit dewatering and changes to flow or groundwater quality due to recharge from the Tailings Management Facility (TMF) and mine rock storage areas (MRSA). The LAA and RAA are used to provide regional context for the significance of residual effects and are also the area within which the potential for cumulative effects of the Project in combination with other past, present, or reasonably foreseeable projects or activities are considered.

The LAAs and the RAAs for the Gordon and MacLellan sites are represented by the same geographical area due to the localized nature of potential Project effects. The LAA and RAA boundaries (see Map 8-1 and Map 8-2) were determined based on the study areas described in the Hydrogeology Baseline Technical Data Report (TDR) and associated Validation Report (Volume 4; Appendix H), drainage divides, and results of groundwater modelling presented in the Hydrogeology Assessment Technical Modelling Reports (TMR) (Volume 5; Appendices F and G) and are described below.

Gordon Site

The LAA/RAA selected for the Gordon site is approximately 3,300 ha (see Map 8-1). The northern boundary of the LAA/RAA follows the northern shores of a series of unnamed lakes and Jim Lake. The eastern boundary of the LAA/RAA follows a series of drainage divides between White Owl Lake and Marie Lake and between Mac Lake and Marnie Lake. The southern boundary of the LAA/RAA follows the northern shores of Swede Lake and Simpson Lake. The western boundary of the LAA/RAA follows the western drainage divide for Susan Lake and Gordon Lake.

MacLellan Site

The LAA/RAA selected for the MacLellan site is approximately 15,500 ha (see Map 8-2). The northern boundary of the LAA/RAA follows the northern drainage divide for Lobster and Deseyes lakes. The eastern boundary of the LAA/RAA follows the eastern drainage divide for Deseyes Lake and the eastern shore of Arbour Lake continuing south toward the northern shore of Cockeram Lake. The southern boundary of the LAA/RAA follows the northern shore of Cockeram Lake before turning northwest toward the northern shore of Eldon Lake. The western boundary of the LAA/RAA follows the eastern drainage divide of the Lynn River and the eastern shores of Burge Lake and a series of unnamed lakes.

8.1.4.2 Temporal Boundaries

The temporal boundaries for the Project consist of the following phases:

- Construction – two years (scheduled to be carried out concurrently from Year -2 to Year -1 at both sites).

- Operation – 13 years (scheduled to be carried out from Year 1 to Year 6 at the Gordon site and from Year 1 to Year 13 at the MacLellan site).
- Decommissioning/closure – five to six years of active closure (scheduled to begin in Year 6 at the Gordon site and in Year 14 at the MacLellan site). Active closure will be followed by post-closure, which is the time period during which active reclamation measures are complete, but monitoring is still required. The expected duration for post-closure is approximately 10 years. Pit filling is expected to take 11 years at the Gordon site and 21 years at the MacLellan site under average conditions (Chapter 9, Section 9.4.1). Permanent closure will occur when the site is stable, and monitoring is no longer required. For groundwater this would occur when the water level elevations of the pit lakes meet the design criteria and groundwater quality of seepage from mine components is demonstrated to be decreasing and/or meet relevant regulatory criteria. The duration and conditions for post-closure monitoring and permanent closure will be detailed in subsequent submissions of the Closure Plan to regulatory agencies as Project design and execution progresses.

8.1.5 Residual Effects Characterization

Table 8-2 summarizes how residual environmental effects are characterized in terms of direction, magnitude, geographic extent, timing, frequency, duration, reversibility, and ecological and socio-economic context. Quantitative measures or definitions for qualitative categories are provided.

Table 8-2 Definitions of Terms used to Characterize Residual Effects on Groundwater

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to groundwater relative to baseline **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to groundwater relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Groundwater Quantity and/or Flow**[A] **Negligible –** no measurable change in groundwater level due to the Project **Low –** a change in groundwater level due to the Project predicted to be less than 1 m **Moderate –** a change in groundwater level due to the Project predicted to be between 1 m and 5 m and within or very close to the natural variation of groundwater level within the LAA/RAA **High –** a change in groundwater level due to the Project predicted to be greater than 5 m

Table 8-2 Definitions of Terms used to Characterize Residual Effects on Groundwater

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Groundwater Quality** **Negligible –** no measurable change in groundwater quality due to the Project **Low –** a Project-caused measurable change in groundwater quality, but within normal variability of baseline groundwater quality **Moderate –** a Project-caused measurable change in groundwater quality but quality remains within regulatory criteria and/or objectives **High –** a Project-caused measurable change in groundwater quality that results in an exceedance of health-based regulatory criteria and/or objectives for one or more parameters to the extent that a water supply well no longer meets the needs of current users or landowners beyond the PDA
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA **LAA/RAA –** residual effects extend into the LAA/RAA
Timing	Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.	**Not Applicable (N/A)** — seasonal aspects are unlikely to affect residual environmental effect on groundwater quantity, flow, and/or quality **Applicable** — seasonal aspects may affect residual environmental effect on groundwater quantity, flow, and/or quality
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single Event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** residual effect restricted to the construction or decommissioning/closure phase, or for periods of less than one year during operation **Medium-term –** the residual environmental effect extends through construction, operation, and decommissioning/closure **Long-term –** residual effect extends beyond decommissioning/closure and pit filling
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation **Irreversible –** the residual effect is unlikely to be reversed

Table 8-2 Definitions of Terms used to Characterize Residual Effects on Groundwater

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activity **Disturbed –** area has been substantially previously disturbed by human development or human development is still present

Notes:
A – Magnitude of effects of baseflow in waterbodies and watercourses is assessed in Chapter 9

8.1.6 Significance Definition

The following thresholds have been established to define a significant adverse residual effect on groundwater quantity and/or flow and groundwater quality. The definition of significance draws on the criteria presented in Section 8.1.3 and is focused on the effect of changes in groundwater quantity and quality on groundwater users. The evaluation of the effect of changes in groundwater discharge and quality of discharge on surface water levels, flow, and quality is evaluated in the effects assessment for surface water (Chapter 9).

Change in Groundwater Quantity and/or Flow

A significant adverse residual environmental effect on groundwater quantity is a Project-caused reduction in the groundwater level of an existing groundwater supply well located beyond the PDA and within the LAA/RAA such that, following the application of mitigation, the groundwater supply well no longer meets the needs of the current users.

Change in Groundwater Quality

A significant adverse residual environmental effect to a change in groundwater quality is one resulting in a Project-caused degradation of the quality of groundwater by exceeding one or more of the health-based standards specified in the MWQSOG or GCDWQ to the extent that a water supply well no longer meets the needs of current users or land owners beyond the PDA.

It is typical in northern Manitoba for groundwater to naturally exceed a number of water quality objectives (e.g., hardness). For parameters with baseline concentrations that exceed the health-based standards specified in the MWQSOG or GCDWQ, the determination of significance will be such that the quality of those parameters for an existing groundwater supply well will not be further impaired by the Project.

To account for natural variability in sampling results and laboratory analysis, the mean groundwater quality at a given monitoring well is compared to the GCDWQ and MWQSOG drinking water health-based standards to assess significance.

8.2 EXISTING CONDITIONS FOR GROUNDWATER

Existing hydrogeological conditions for the Project are presented in detail in the Hydrogeology Baseline TDR Report and associated Validation Report (Volume 4, Appendix H) as well as the Gordon and MacLellan Hydrogeology Assessment TMRs (Volume 5, Appendices F and G). The existing conditions and the methods used to characterize baseline conditions are summarized below.

8.2.1 Methods

Environmental studies have been conducted to determine baseline hydrogeological conditions. These baseline conditions form the basis for determining incremental changes and likely environmental effects of the Project on groundwater quantity and/or flow and groundwater quality. This includes consideration of historical and current land uses affecting baseline groundwater quantity and quality. The Project is located on a brownfield site, and as a result, existing environmental effects on groundwater from historical mining components (including the historical mine rock storage areas) represent the baseline conditions for this Project. This section summarizes the methods associated with the field programs, hydrogeologic model, and assessment of groundwater quality effects from historical mining completed to describe the existing conditions.

8.2.1.1 Baseline Hydrogeological Study

The baseline hydrogeological study included detailed field programs conducted from 2015 to 2019. The results of the field programs used to describe baseline hydrogeological conditions are documented in the Hydrogeology Baseline TDR and associated Validation Report (Volume 4, Appendix H). The following activities were completed between spring 2015 and spring 2019 as part of the baseline field program:

The Gordon Site LAA

- Completion of 45 monitoring wells, 23 boreholes, and numerous test pits.
- Four drive-point piezometers and one staff gauge were installed along lakes, creeks, or within wetland areas.
- Hydraulic conductivity testing at 35 monitoring wells.
- Pressure transducers were installed at 26 monitoring wells for continuous water level monitoring.
- Groundwater quality sampling at up to 30 locations in spring, summer and fall.
- Packer testing of one bedrock borehole.
- Three pumping tests on three separate bedrock boreholes that ranged in depth from 80 m to 83 m.

The Gordon site monitoring locations are located mostly within the PDA as shown on Map 8-3.

The MacLellan Site LAA

- Completion of 89 monitoring wells, 36 boreholes, and numerous test pits.
- Eight drive-point piezometers were installed along lakes, creeks, or within wetland areas.
- Hydraulic conductivity testing at 65 monitoring wells.
- Pressure transducers were installed at 33 monitoring wells for continuous water level monitoring.
- Groundwater quality sampling at up to 49 locations in spring, summer and fall.
- Packer testing of four inclined bedrock boreholes and seven vertical bedrock boreholes.

The MacLellan site monitoring locations are located mostly within the PDA as shown on Map 8-4.

The data collected from the field programs were used in conjunction with data from the following sources to develop a detailed understanding of the baseline hydrogeological conditions:

- Closed Farley Lake Mine Site, Farley Lake, Manitoba, Historical Surface Water Quality Review (KGS 2014).
- Farley Lake Project Feasibility Study (Kilborn Manitoba Limited 1989).
- Geotechnical and Hydrogeological Investigation, Proposed Farley Lake Gold Project (Machibroda Engineering Ltd. 1988).
- MacLellan Mine Project: Draft 2012 Environmental Baseline Study (Tetra Tech 2013).
- Preliminary Economic Assessment for the MacLellan and Farley Lake Properties, Lynn Lake Gold Camp, Manitoba (Tetra Tech 2014).
- Available geological maps from the Manitoba Geological Survey and Geological Survey of Canada and well record information from the MCC water well database.

The lithological data collected from borehole drilling and water level monitoring data was used to define hydrostratigraphic units for overburden and bedrock. A hydrostratigraphic unit is defined as a geologic formation, or part/groups of formation(s), with similar hydrogeological characteristics relating to groundwater flow. The development of the hydrostratigraphic units for the Gordon and MacLellan sites are presented in detail in the Hydrogeology Baseline TDR and associated Validation Report (Volume 4, Appendix H).

The horizontal hydraulic conductivity of a hydrostratigraphic unit was estimated based on single well response testing, packer testing, and short-term pumping tests. These results were compared with estimates of travel times to key receptors derived from the groundwater flow model.

Baseline groundwater quality was characterized using field data collected for the Project and historical investigations. Groundwater is anticipated to ultimately discharge to surface water features, and therefore groundwater quality was compared directly with the GW3, MWQSOG-FAL, and the CWQG-FAL. Because groundwater has the potential to be used as a water supply source, the baseline water quality was also compared with the MWQSOG for drinking water and the GCDWQ. Groundwater quality was further evaluated based on hydrostratigraphic unit, spatial distribution, and historical mining activities to develop summary water quality statistics. The mean concentrations for the water quality parameters at each monitoring well were used to determine the summary statistics based on the geometric mean for each hydrostratigraphic unit. Concentrations reported below the method detection limits were included in the statistics by assuming a concentration of half of the detection limit.

The Water Section of MCC administers the GWDrill database (MCC 2015). The GWDrill database is a provincial digital database containing geological, hydrogeological, and well construction information for test holes and water wells from well drillers' reports, providing the information has been forwarded to the Water Branch. The GWDrill database was used to assess groundwater use within the LAA/RAA.

8.2.1.2 Hydrogeological Model

A numerical, three-dimensional finite element groundwater flow model was developed for each LAA to represent baseline conditions and to assess the potential effects of the construction, operation, and decommissioning/closure phases of the Project on groundwater resources and the consequent indirect effects on surface water resources (Hydrogeology Assessment TMRs; Volume 5, Appendices F and G). The following provides a summary of the development and calibration of both the Gordon site and the MacLellan site groundwater flow models.

The Gordon Site Groundwater Flow Model

The Gordon site groundwater flow model is specifically used to provide estimates of:

- Changes in groundwater levels (drawdown), including changes to water table position and groundwater flow, due to dewatering of the open pit and the historical Wendy and East pits.
- The time to fill the open pit from groundwater inflow and the change in groundwater levels and flow once the open pit has filled.
- Changes to groundwater flow and discharge to wetlands, creeks and lakes under baseline, operation, and decommissioning/closure.
- Groundwater recharge and flow pathways from historical mine rock piles, overburden storage area, and MRSA developed for the Project under operation and decommissioning/closure.
- Evaluation of mitigation options to control groundwater inflow to the open pit.

The FEFLOW numerical groundwater flow code is used to simulate steady-state groundwater flow under baseline, construction, operation, and decommissioning/closure scenarios. The Gordon site groundwater flow model consists of 28 layers, including: overburden (layers 1 to 5), shallow bedrock and faulted shallow bedrock (layers 6 to 12), upper bedrock (layers 13 to 19), intermediate bedrock (layers 20 to 23), and deep bedrock (layers 24 to 28). The model mesh is simulated to grade from coarser around the limits of the domain, to finer in the vicinity of the surface water features and the area of the open pit. The mesh is composed of 160,764 elements in each model layer. The model boundaries generally correspond to subwatershed boundaries, which are assumed to be groundwater divides simulated as no-flow boundaries. The upper boundary of the model is defined by the ground surface from the digital elevation model (DEM) and the bottom boundary is set at 115 m above mean sea level (amsl), which corresponds with the base of the open pit. The groundwater flow model domain and location of surface water features simulated as boundary conditions are shown on Map 8-5.

Calibration of the model was achieved by adjusting hydraulic conductivity, recharge, specific yield, and specific storage. The calibration process involved varying model parameters using the parameter estimation and uncertainty analysis code, PEST® (Doherty 2009) until an acceptable match to water levels, vertical gradients, and baseflow targets was obtained. The model is calibrated to be within acceptable industry standards, and the model parameters fall within the observed ranges of hydraulic conductivity and estimated recharge rates. Details of the model development and calibration as well as a sensitivity analysis of recharge and hydraulic conductivity on model results are presented in the Hydrogeology Assessment TMR for the Gordon site (Volume 5, Appendix F).

The MacLellan Site Groundwater Flow Model

The MacLellan site groundwater flow model is specifically used to provide estimates of:

- Changes in groundwater levels (drawdown), including changes to water table position and groundwater flow, due to dewatering of the open pit, including the historical underground workings.
- The time to fill the open pit from groundwater inflow and the change in groundwater levels and flow once the open pit has filled.
- Changes to groundwater flow and discharge to wetlands, creeks and lakes under baseline, operation, and decommissioning/closure.
- Groundwater recharge and flow pathways from historical mine rock piles, overburden storage area, TMF, and MRSA developed for the Project under operation and decommissioning/closure.

The FEFLOW numerical groundwater flow code is used to simulate transient groundwater flow under baseline, construction, operation, and decommissioning/closure scenarios. The MacLellan site groundwater flow model consist of 44 layers including: overburden (layers 1 to 5), shallow bedrock (layers 6 to 7), upper bedrock (layers 8 to 14), intermediate bedrock (layers 15 to 37), and deep bedrock (layers 38 to 44). The model mesh is simulated to grade from coarser around the limits of the domain, to finer in the vicinity of the surface water features and the area of the open pit. The mesh is composed of 54,878 elements in each model layer. The model boundaries generally correspond to subwatershed boundaries and are assumed to correspond to groundwater flow divides simulated as no-flow boundaries. The upper boundary of the model is defined by the ground surface from the DEM and the bottom boundary is set at -50 m amsl, which corresponds with the approximate base of the open pit. The groundwater flow model domain and location of surface water features simulated as boundary conditions are shown on Map 8-6. Details of the model development and calibration as well as a sensitivity analysis of recharge and hydraulic conductivity on model results are presented in the Hydrogeology Assessment TMR for the MacLellan site (Volume 5, Appendix G).

8.2.2 Overview

8.2.2.1 Local Geology and Hydrostratigraphy

Throughout the MacLellan site and Gordon site LAAs/RAAs, bedrock is generally covered by overburden that is characterized as glaciolacustrine sediments overlying a discontinuous regional glacial sand diamicton. Organic deposits were observed as a thin veneer with thicker accumulations observed in low-lying areas. Isolated pockets of glaciofluvial sediments were encountered.

At the Gordon site, bedrock was encountered in 48 boreholes completed as part of environmental baseline studies and 389 boreholes completed as part of exploration and condemnation drilling. From the drilling, bedrock depth ranged from ground surface to greater than 45 m depth. At the MacLellan site, bedrock was encountered at 65 boreholes completed as part of environmental baseline studies and 1,341 boreholes completed as part of exploration and condemnation drilling. From the drilling, bedrock was encountered at depths up to 10 m.

Based on the detailed field investigations, the following hydrostratigraphic units are interpreted across the MacLellan and Gordon site LAAs/RAAs and are presented below from youngest to oldest. The hydrostratigraphic units are illustrated on the cross-sections presented on Map 8-7 and Map 8-8 for the Gordon site LAA/RAA and Map 8-9 to Map 8-11 for the MacLellan site LAA/RAA.

- **Historical MRSAs**
  - Two historical MRSAs, north and south, are located within the Gordon site LAA/RAA. The historical north MRSA is located outside of the PDA, north of the Wendy Pit. The historical south MRSA is located within the PDA, south of the Wendy and East pits. Both historical MRSAs are capped with native soils and contain surplus mine rock from historical mining operations within the Gordon site LAA/RAA.
  - One historical MRSA is located within the MacLellan site LAA/RAA, west of East Pond, which contains surplus mine rock from historical mining operations.
- **Organic deposits** in the form of fibric peat and topsoil were observed at ground surface across the LAA/RAA. Topsoil was observed in the upland portions of the LAA/RAA and was characterized as mineral soil with minor enrichment of organic material.
  - Gordon site LAA/RAA – Typical thicknesses of organic deposits were less than 1 m, but accumulations of up to 2.8 m (GBHF-06, Map 8-3) were observed in low-lying areas.
  - MacLellan site LAA/RAA – Typical thicknesses of organic deposits were between 0.5 and 1.5 m, but accumulations of up to 3.6 m (GBHM-22, Map 8-4) were observed in wetlands or low-lying areas.

- **Glaciolacustrine deposits** were observed across the LAA/RAA at either ground surface or underlying organic deposits. The glaciolacustrine deposits were discontinuous and consisted of nearshore coarse-grained deposits of well-sorted sand and gravel and offshore deposits of laminated silt and clay. Nearshore and offshore deposits were generally observed to grade laterally between the two units; however, in some areas the units were interlayered. These variations were interpreted to reflect changes to the level of former glacial Lake Agassiz. Each site is characterized as follows:
  - Gordon site LAA/RAA – Nearshore deposits ranged in thickness from 1 m to 10 m and offshore deposits ranged in thickness from less than 1 m to 6 m when present. In boreholes where both nearshore and offshore deposits were observed the offshore deposits overlaid the nearshore deposits.
  - MacLellan site LAA/RAA – Nearshore deposits ranged in thickness from less than 1 m to 6 m, except between the Keewatin River and the open pit, where up to 16 m of nearshore deposits were observed. To the east of the open pit, nearshore deposits transitioned to offshore deposits that were up to 7 m thick in the northeastern portion of the PDA.
- **Glaciofluvial deposits** consisting of gravel, cobbles, and boulders were observed as isolated pockets limited to a few boreholes. Each site is characterized as follows:
  - Gordon site LAA/RAA – Generally observed to be 1 m or less thick and overlaid glaciolacustrine nearshore deposits when present.
  - MacLellan site LAA/RAA – Ranged in thickness from 2 m to greater than 5 m and generally overlaid bedrock. Where present, the glaciofluvial deposits overlaid bedrock, glaciolacustrine deposits or sand diamicton.
- **Sand diamicton** was frequently observed across the LAA/RAA but is interpreted to be discontinuous, having been eroded by meltwaters associated with the retreat of glacial ice. When present, sand diamicton overlaid bedrock and was overlain by glaciolacustrine or organic deposits. Each site is characterized as follows:
  - Gordon site LAA/RAA – Ranged in thickness from less than 1 m to about 4 m. Thicker deposits of sand diamicton were noted south of the open pit (up to 5.6 m). The sand diamicton generally thinned in the area of the topographic and bedrock high located in the area of the MRSA.
  - MacLellan site LAA/RAA – Ranged in thickness from less than 1 m to greater than 28 m. The sand diamicton was generally observed to occupy bedrock valleys such as in the area north of Minton Lake (GBHM-14, GBHM-07, and GBHM-14, Map 8-4).
- **Bedrock** is associated with the Churchill Structural Province of the Canadian Shield and the north belt of the Lynn Lake greenstone belt. The north belt of the Lynn Lake greenstone belt comprises rhyolite, overlain by andesite and sedimentary rocks, and an upper unit of basaltic rocks (MEM 1986). The gold deposits of the PDA are hosted in the Agassiz Metallotect, which consists of picritic flows, iron formation, and felsic volcanic rocks. Further discussion regarding bedrock topography and structural features is provided below specific to each LAA/RAA.

Gordon Site

Map 8-12 presents the interpreted surface of bedrock from the conceptual hydrostratigraphic model presented in the Hydrogeology Baseline TDR Validation Report (Volume 4, Appendix H), which was used in the development of the Gordon site numerical groundwater flow model. Where data were unavailable, the top of bedrock was assumed to be a minimum of 1 m below ground surface (bgs).

Within the Gordon site LAA/RAA, the bedrock topography was interpreted to follow a similar trend to ground surface topography, with a topographic high associated with the MRSA, which steeply slopes to the south toward Susan Lake and gradually slopes to the north toward the historical Wendy and East pits. The Gordon site LAA has four zones of mineralization including the Wendy, East, Southeast, and the South zone (KGS 2014). The Wendy and East zones have been mined during historical mining activities. Two northwest trending parallel faults extend across the former open pit areas from Gordon Lake in the west to south of Farley Lake in the east and are called the Wendy and East faults (KGS 2014) (Map 8-12). Hydraulic testing and groundwater quality sampling of the bedrock along the Wendy and East faults, as well as groundwater flow modelling (Volume 5, Appendix F), support a higher hydraulic conductivity between the fault and the surrounding bedrock and the Wendy and East faults. Therefore, the zone of shallow bedrock associated with the Wendy and East faults was included as a separate hydrostratigraphic feature in the conceptual hydrostratigraphic model and the Gordon site numerical groundwater flow model as presented in Map 8-12.

MacLellan Site

Map 8-13 presents the interpreted surface of bedrock from the conceptual hydrostratigraphic model presented in the Hydrogeology Baseline TDR Validation Report (Volume 4, Appendix H). Where data were unavailable, the top of bedrock was assumed to be a minimum of 1 m bgs.

Within the MacLellan site LAA/RAA, bedrock topography was interpreted to follow a similar trend to ground surface topography and bedrock was observed near surface in areas associated with topographic highs and at depths up to 10 m bgs associated with topographic lows, except in areas where bedrock depressions or valleys were observed. Bedrock depressions or valleys were observed at the eastern edge of the open pit (GBHM-01), between the open pit and the Keewatin River (GBHM-05) and north of Minton Lake, where boreholes were terminated at 28 m bgs prior to encountering bedrock. A localized bedrock depression is located south of Payne Lake where bedrock was encountered at 11.7 m bgs (MWM-12). MWM-12 is located at the base of a bedrock ridge with 15 m relief.

The MacLellan site has three mineralized deposits: the Rainbow-Dot Deposit, the MacLellan Deposit, and the Nisku Deposit. The three deposits are located south of a major east-west trending North Shear Zone (NSZ) fault, which strikes southeast (065) and dips 75 to 85 degrees to the north. Hydraulic testing of the bedrock along the NSZ fault did not identify a variation in hydraulic conductivity between the fault and surrounding bedrock. The NSZ fault is therefore not included as a separate hydrostratigraphic feature in the conceptual hydrostratigraphic model or the MacLellan site numerical groundwater flow model (Volume 5, Appendix G).

8.2.2.2 Groundwater Use

Map 8-14 presents the locations of identified water wells in the vicinity of the LAA/RAA documented in the GWDrill database (MCC 2015).

Gordon Site

A review of the GWDrill database (MCC 2015) indicated that there are no known groundwater well users located within 30 km of the Gordon PDA.

MacLellan Site

A review of the GWDrill database (MCC 2015) indicated that there are no known groundwater well users located within the LAA/RAA. The nearest production well user, well 77546, is located about 2.4 km west of the MacLellan site LAA/RAA boundary and 6.7 km west of the MacLellan PDA boundary. Production well 77546 was drilled in 1993 and is owned by the Province of Manitoba. The well was completed in a sand and gravel unit to a depth of 12.2 m bgs. The current status of well 77546 is unknown.

There are no known groundwater supply users identified within the LAA/RAA. The Black Sturgeon Reserve, located between the Gordon and MacLellan sites, is supplied with potable water from a water treatment facility that withdraws water from Hughes Lake.

8.2.2.3 Estimation of Hydraulic Conductivity

Results of hydraulic conductivity testing are summarized below and discussed in terms of each hydrostratigraphic unit included in the groundwater flow models.

Mine Rock Storage Areas

Hydraulic testing of the historical mine rock was not completed due to the expected high hydraulic conductivity values and limited extent below the water table. Typical testing methods are difficult to perform under these conditions. Based on the grain size and material descriptions, hydraulic conductivity values for historical mine rock were assumed to vary between 1×10^{-3} and 1×10^{-2} (Fetter 2000) metres per second (m/s).

Organics

Hydraulic testing of the organic deposits was not completed due to their shallow nature and thickness. Hydraulic conductivity values from literature cover a wide range and are dependent on the texture of the sediments composing the organic deposit. Based on the geology and material descriptions hydraulic conductivity values for organic deposits were assumed to vary between 1×10^{-8} and 1×10^{-5} m/s (Fetter 2000).

Glaciolacustrine Offshore Deposits

Within the Gordon site LAA/RAA, horizontal hydraulic conductivity estimates from monitoring wells completed in glaciolacustrine offshore deposits ranged from 6×10^{-7} m/s to 1×10^{-6} m/s, with a geometric mean of 9×10^{-7} m/s.

Within the MacLellan site LAA/RAA, the glaciolacustrine offshore deposits hydraulic conductivity was based on hydraulic testing of MWM-13B, which resulted in a geometric mean hydraulic conductivity of $2.3\text{x}10^{-5}$ m/s.

Glaciolacustrine Nearshore Deposits

Within the Gordon site LAA/RAA, horizontal hydraulic conductivity estimates from monitoring wells completed in glaciolacustrine nearshore deposits ranged from 3×10^{-7} m/s to 1×10^{-4} m/s, with a geometric mean of 5×10^{-6} m/s. The slightly greater range in magnitude and geometric mean of the glaciolacustrine nearshore deposits compared to the glaciolacustrine offshore deposits reflect the greater variability and coarser material observed in the nearshore deposits as well as a larger dataset. The nearshore deposits were described as sand to silty sand and gravel.

Within the MacLellan site LAA/RAA, horizontal hydraulic conductivity estimates from monitoring wells completed in glaciolacustrine nearshore deposits ranged from 1×10^{-7} m/s to 6×10^{-5} m/s, with a geometric mean of 2×10^{-6} m/s. These estimates corresponded with lithological descriptions of screened material ranging from silty sand to sand. At the MacLellan site, nearshore and offshore deposits were generally observed to grade laterally between the two units; however, in some areas the units were interlayered. Therefore, these units were conceptualized to be one hydrostratigraphic unit and the hydraulic conductivity estimates from slug tests conducted in the glaciolacustrine nearshore deposits were used for the MacLellan site hydrogeologic model.

Sand Diamicton

Within the Gordon site LAA/RAA, hydraulic conductivity estimates from monitoring wells completed in sand diamicton ranged from 2×10^{-7} m/s to 3×10^{-5} m/s, with a geometric mean of 2×10^{-6} m/s. The sand diamicton was described as clayey silty sand to silty sand diamicton.

Within the MacLellan site LAA/RAA, hydraulic conductivity estimates from monitoring wells completed in glacial sand diamicton ranged from 4×10^{-7} m/s to 6×10^{-5} m/s with a geometric mean of 9×10^{-6} m/s. The glacial sand diamicton was described as sand to silty sand diamicton.

Bedrock

The hydraulic conductivity of the bedrock decreases with depth, with the upper portions being the most transmissive due to increased weathering and/or fracturing. The bedrock is subdivided into four hydrostratigraphic units based on transmissivity data collected from hydraulic testing conducted at each site.

Shallow Bedrock

Within the Gordon site LAA/RAA, rising and falling head tests were completed at 20 monitoring wells screened in shallow bedrock. Estimates of hydraulic conductivity range over four orders of magnitude from 7×10^{-8} to 2×10^{-4} m/s with a geometric mean of $1\text{x}10^{-5}$ m/s (Figure 8-1). The wide range of values reflects variable amounts of fracturing as indicated by the rock quality designation (RQD), which ranges from 45% (poor) to 99% (excellent) (Golder Associates [Golder] 2017b). Packer testing data collected by Golder (2017a) from GBHG-17-01, GBHG-17-02, and GTF-15-05 over depth intervals of 4.8 m to 34.9 m provide horizontal hydraulic conductivities generally ranging over two orders of magnitude in each borehole, with geometric mean horizontal hydraulic conductivities between $7\text{x}10^{-5}$ m/s to $4\text{x}10^{-6}$ m/s.

Within the MacLellan site LAA/RAA, rising and falling head tests were completed at 40 monitoring wells screened within shallow bedrock. Estimates of hydraulic conductivity range over four orders of magnitude from 2×10^{-8} to 5×10^{-4} m/s with a geometric mean of $7\text{x}10^{-6}$ m/s (Figure 8-1). The wide range of values reflects variable amounts of fracturing as indicated by the RQD, which generally ranges from 47% (poor) to 100% (excellent) (Golder 2017b, 2019b) with the exception of several boreholes in the area of the TMF with poorer RQD (less than 47%). Packer testing data collected by Golder (2017a; 2019a) from GTM-15-02 to GTM-15-04, GBHM-16-03, GBHM-16-04, and BH18-01 to BH18-03 over depth intervals of 0.8 m to 51.04 m provide horizontal hydraulic conductivities generally ranging from one to three orders of magnitude in each borehole, with geometric mean horizontal hydraulic conductivities between $2\text{x}10^{-5}$ to $1\text{x}10^{-7}$ m/s.

Deep Bedrock

Golder (2017b) completed a variety of packer testing on deep bedrock boreholes, at depths up to 129.8 m and 256.3 m below the top of bedrock in the LAA/RAA at the Gordon and MacLellan sites, respectively. The results of the hydraulic testing are summarized on Figure 8-1 for the LAA/RAA at both the Gordon and MacLellan sites. A general trend of decreasing hydraulic conductivity with depth in bedrock is interpreted in LAA/RAAs at both sites.

Within the Gordon site LAA/RAA, packer testing data collected by Golder (2017b) from GTF-15-05 over depth intervals of 33.4 to 125.8 m below the top of bedrock provide horizontal hydraulic conductivities ranging over two orders of magnitude with a geometric mean horizontal hydraulic conductivity of $2\text{x}10^{-7}$ m/s.

Within the MacLellan site LAA/RAA, packer testing data collected by Golder (2017b) from GTM-15-01 to GTM-15-04 over depth intervals of 30.2 m to 256.3 m below the top of bedrock provide horizontal hydraulic conductivities ranging from two to three orders of magnitude within each borehole with geometric mean horizontal hydraulic conductivities ranging from $2\text{x}10^{-8}$ to $4\text{x}10^{-8}$ m/s. Figure 8-1 presents a summary of the horizontal hydraulic conductivity compared to depth below top of bedrock. At depths shallower than 50 m below the top of bedrock, the horizontal hydraulic conductivity ranged from 6×10^{-9} m/s to 4×10^{-4} m/s. Between 50 m and 150 m below the top of bedrock, the hydraulic conductivity ranged from 3×10^{-9} m/s to 2×10^{-7} m/s. At a depth greater than 150 m below top of bedrock, the hydraulic conductivity was generally 1×10^{-8} m/s.

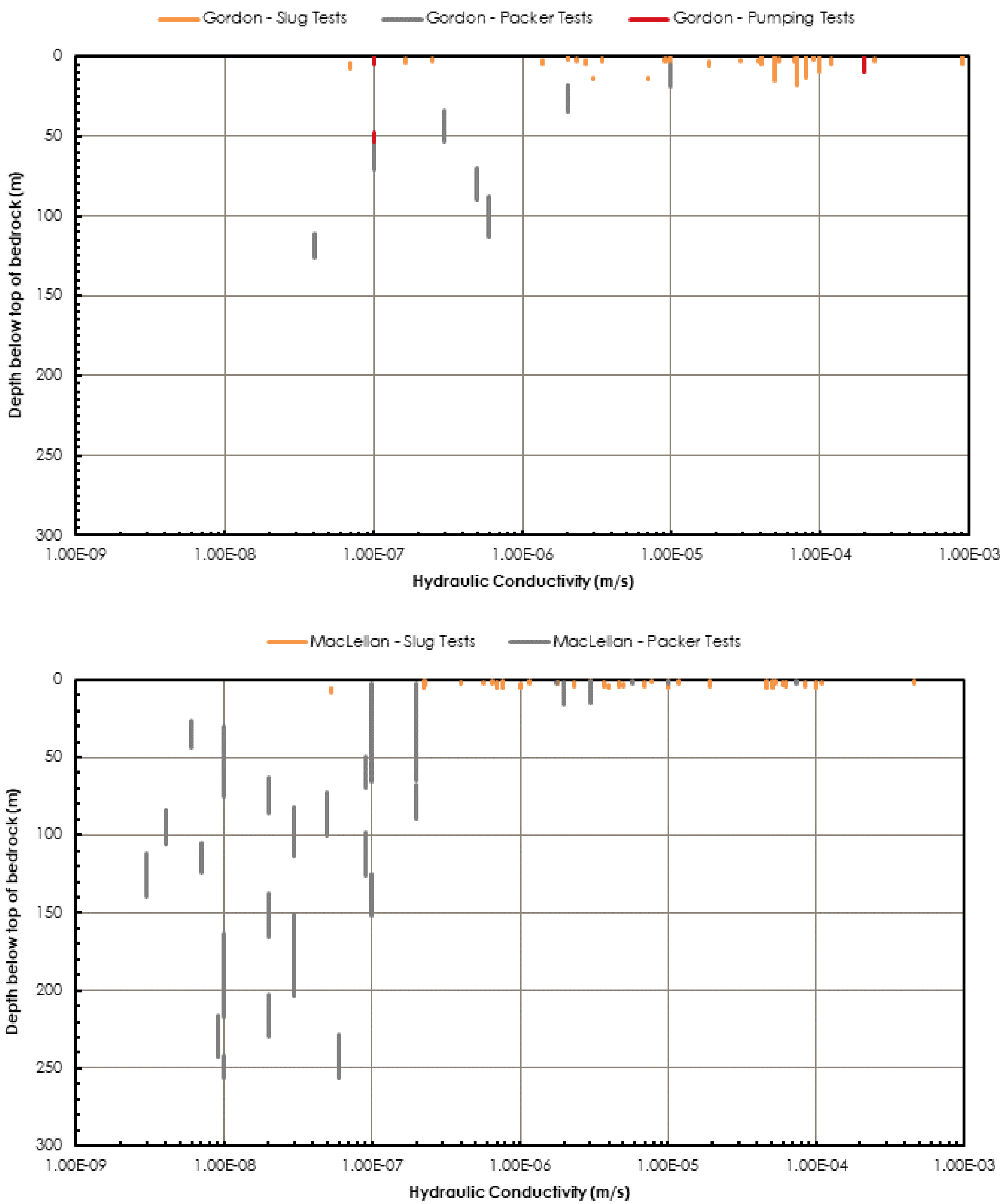

Figure 8-1 Horizontal Hydraulic Conductivity with Depth

Structural Features

Gordon Site

Two northwest trending parallel faults extend across the former Wendy and East pits from Gordon Lake in the west to south of Farley Lake in the east and are called the Wendy and East faults (Map 8-3). Golder (2017b) conducted pumping tests at bedrock boreholes GPW-01, GPW-02, and GPW-04 that were completed within the fault zone (Map 8-3). The aquifer parameters of shallow bedrock estimated from pumping tests at GPW-01, GPW-02, and GPW-04 are interpreted to be reflective of a zone of higher hydraulic conductivity associated with historical blasting and the presence of the fault zones. Groundwater flow modelling (Volume 5, Appendix F) confirms the presence of a higher hydraulic conductivity associated with the fault zone to obtain calibration of the model.

The pumping tests ranged from four- to 72-hour duration. The zone of pumping influence was generally limited to 100 m, which Golder (2019a) interpreted as a strong indication of surface water influence on aquifer response to pumping. The majority of water was interpreted by Golder (2019a) to be drawn from the shallow bedrock, less than 15 m below ground surface. The estimated horizontal hydraulic conductivity from the pumping tests ranged from $1x10^{-7}$ to $2x10^{-4}$ m/s. Contrary, GPW-03 was pumped dry which negated the ability to complete a pumping test and indicated competent bedrock. While the observations at GPW-03 indicate variable fracturing of bedrock, the overall hydraulic conductivity within the fault zone was estimated as one order of magnitude (i.e., ten times) greater within the fault zone than the surrounding bedrock.

MacLellan Site

The east-west trending NSZ fault was observed to cut across the open pit on the MacLellan site (Map 8-4). Packer testing completed by Golder (2017b), suggests horizontal hydraulic conductivity of the bedrock within the zone of the NSZ fault to be consistent with the horizontal hydraulic conductivity of the surrounding bedrock.

8.2.2.4 Groundwater Flow and Velocity

For LAA/RAA at both the Gordon and MacLellan sites, groundwater flow is strongly influenced by topography, which results in localized groundwater flow from topographic highs with groundwater discharge to wetland areas or surface water features. Permafrost at the Gordon and MacLellan sites, if present, is localized and does not affect overall groundwater flow directions (Chapter 5, Section 5.2.5.3).

Gordon Site LAA/RAA

Overall, the regional groundwater flow within the overburden is to the east in the central and southern portions of the Gordon site LAA/RAA and to the northeast in the northern portion of the LAA/RAA. Map 8-15 presents the interpreted groundwater elevation in overburden within the Gordon site LAA/RAA using a combination of automated (where available) and manual water level measurements collected from June 25 to July 4, 2018. The baseline groundwater elevations simulated using the groundwater flow model

(Volume 5, Appendix F) are also presented on Map 8-15 for comparison and demonstrate a good overall correlation between the simulated and observed water table elevation and groundwater flow directions.

Groundwater flow is strongly influenced by topography, which results in radial flow from the topographic high associated with the MRSA. Groundwater flow from the MRSA is directed towards Susan Lake in the south, Pump Lake in the east, Farley and Gordon lakes in the north, and a tributary of Gordon Lake in the west. Because of the strong influence of topography on groundwater flow there were no notable seasonal changes to the groundwater flow regime presented in Map 8-15. Artesian conditions, with groundwater levels above ground surface for at least a part of the monitoring period, were observed to the east of the MRSA where high horizontal hydraulic gradients are observed (e.g., MWF-03, GBHF-09, and GBHF-11). There were no flowing artesian wells observed during the monitoring events.

Groundwater flow converges from the north and south in the area of the open pit, Gordon and Farley lakes, and the Wendy and East faults. The vertical hydraulic gradient varies in the area of groundwater flow convergence associated with the open pit with upward vertical hydraulic gradients associated with Gordon Lake (e.g., DP-4) and downward vertical hydraulic gradients between overburden and shallow bedrock (e.g., GBHF-16-01, GBHF-16-02, GBHF-04).

Groundwater flow within the area of the historical north MRSA is to the south toward Gordon Lake and historical Wendy Pit. Groundwater flow within the area of the historical south MRSA is toward Farley Lake and historical Wendy and East pits.

Seasonal groundwater flow patterns, groundwater level fluctuations, and groundwater temperature fluctuations were similar in wells completed in overburden and shallow bedrock (Volume 4, Appendix H); therefore, these units were interpreted to be hydraulically connected. Hydrographs presenting seasonal groundwater level variations and vertical hydraulic gradients at nested monitoring wells are presented in Figures 1 (Appendix C) of Volume 4, Appendix H.

MacLellan Site LAA/RAA

Overall, the regional groundwater flow within the overburden is to the south, southeast across the MacLellan site LAA/RAA. Map 8-16 presents the interpreted groundwater elevation in overburden and shallow bedrock (less than 10 m) within the MacLellan site LAA/RAA using manual water level measurements collected from September 25 to 29, 2015. The baseline groundwater elevations simulated using the groundwater flow model (Volume 5, Appendix G) are also presented on Map 8-16 for comparison and demonstrate a good overall correlation between the simulated and observed water table elevation and groundwater flow directions.

Groundwater flow is strongly influenced by topography, which results in an overall flow direction from northwest to southeast across the PDA at the MacLellan site. Because of the strong influence of topography on groundwater flow there were no notable seasonal changes to the groundwater flow regime presented in Map 8-15. A groundwater flow divide is associated with a topographic high that extends along the northeastern boundary of the TMF. As a result, a portion of groundwater from the TMF is toward the Keewatin River and a tributary of Payne Lake, while the remainder of groundwater flow is toward Minton Lake and a tributary of the Keewatin River that is associated with a diffuse surface water drainage area west of Minton Lake. These surface water features are associated with upward vertical hydraulic gradients, indicating groundwater discharge.

Within the area of the MRSA, groundwater flow is toward Minton Lake and a tributary of the Keewatin River. Groundwater flow in the area of the open pit is radial with a portion of flow directed toward the Keewatin River and the tributary of the Keewatin River. Upward vertical hydraulic gradients between overburden and bedrock were observed along the southwest portion of the open pit which is associated with the flanks of the topographic high that extends to the north. In areas of topographic highs, the vertical hydraulic gradient between overburden and bedrock nested monitoring wells was downward, such as the north and northeast portion of the open pit (e.g., GBHM-01 and GBHM-10).

Seasonal groundwater flow patterns, groundwater level fluctuations, and groundwater temperature fluctuations were similar in wells completed in overburden and shallow bedrock (Volume 4, Appendix H); therefore, these units were interpreted to be hydraulically connected. Hydrographs presenting seasonal groundwater level variations and vertical hydraulic gradients at nested monitoring wells are presented in Figures 4 (Appendix C) of Volume 4, Appendix H.

8.2.2.5 Groundwater and Surface Water Interactions

Gordon Site

The calibrated groundwater flow model was used to estimate groundwater flow and discharge to several watercourses and lakes located within the Gordon site LAA/RAA under existing conditions (Volume 5, Appendix F). The predicted average annual discharge rates, for watercourses with greater than 8 m^3/d (0.1 L/s) average annual discharge, are summarized as follows:

- Susan Lake – 32 m^3/d
- Gordon Lake – 50 m^3/d
- Farley Lake – 208 m^3/d
- Marie Lake – 70 m^3/d
- Watercourse connecting Susan and Marrow lakes, SUS3 – 30 m^3/d
- Tributary of Simpson Lake, FAR3-SIM2 – 20 m^3/day
- Tributary of Swede Lake, FAR3-A1 – 72 m^3/day.

The predicted average annual rate of surface water recharging groundwater for watercourses and lakes with greater than 8 m^3/d (0.1 L/s) average annual recharge, are summarized as follows:

- Pump Lake – 24 m^3/d
- Marnie Lake – 23 m^3/d

- Watercourse connecting Unnamed South Lake and Farley Lake, FAR5-MAN1 – 20 m^3/d
- Tributary of Farley Lake, FAR5-A1 – 10 m^3/d
- Southern Tributary of Gordon Lake, FAR7-A1 – 35 m^3/d
- Diversion Channel, FAR6 – 25 m^3/d
- Northern Tributary of Gordon Lake, FAR7-B1 – 45 m^3/d.

The results of the groundwater flow modelling, interpreted groundwater flow contours (Map 8-15), pumping tests (Section 4.2.1.4 of the Hydrology Baseline Technical Data Report, Volume 4, Appendix H and groundwater quality sampling (Section 4.2.1.5.5 of Hydrology Baseline Technical Data Report Volume 4, Appendix H are consistent with groundwater temperature data which suggests groundwater and surface water interactions within the vicinity of the historical open pits, Gordon Lake, and Farley Lake. Seasonal groundwater temperature (Figure 1 of Appendix C of Hydrology Baseline Technical Data Validation Report Volume 4, Appendix H) in the vicinity of the historical open pits, Gordon Lake, and Farley Lake generally fluctuate over 5°C with low groundwater temperatures in the spring that increase gradually to a peak in the fall followed by a gradual decline in groundwater temperature through the winter. The groundwater temperature in this area of groundwater and surface water interaction is generally 3°C in the spring and about 6°C to 9°C in the fall compared to a surface water temperature generally 2°C to 6°C in the spring and 5°C to 18°C in the fall.

The fate of groundwater that originates in the historical north and south MRSAs within the Gordon site LAA/RAA under existing conditions was evaluated using particle tracking techniques. The discharge rates assumed that all groundwater recharge that enters the tailings areas would be carried through to the receptors and did not account for local seepage to intermittent surface water features or ditches in the area of the historical MRSAs. The particle traces for baseline conditions are presented on Map 8-15. Particle traces from the historical MRSAs under existing conditions show that water originating from the north and south MRSAs located within the Gordon site LAA/RAA discharges to either Gordon Lake, Farley Lake, and/or the Wendy and East pits as indicated in Table 8-3.

Table 8-3 Estimated Discharge and Travel Times Between Historical Mine Rock Storage Areas and Receiving Environment Under Baseline Conditions – Gordon Site

Mine Rock Storage Area	Receptor	Discharge (m^3/d)	Travel Time (years)		
			Minimum	Mean	Maximum
Historical North MRSA	Gordon Lake	0.55	83	156	286
	Wendy Pit	0.57	176	303	506
Historical South MRSA	Farley Lake	11.2	0.1	246	762
	East Pit	0.74	62	259	823
	Wendy Pit	0.19	1.5	424	969

MacLellan Site

The calibrated groundwater flow model is used to estimate groundwater flow and discharge to several watercourses and lakes located within the MacLellan site LAA/RAA under existing conditions (Volume 5, Appendix G). The predicted average annual discharge rates for watercourses and lakes with greater than 8 m^3/d (0.1 L/s) average annual discharge, are summarized as follows:

- Dot Lake – 518 m^3/d
- Minton Lake – 259 m^3/d
- Payne Lake – 60 m^3/d
- Lake 2 – 95 m^3/d
- Lake 3 – 78 m^3/d
- Keewatin River – 778 m^3/d
- Lynn River – 371 m^3/d.

The predicted average annual rate of surface water recharging groundwater for watercourses and lakes with greater than 8 m^3/d (0.1 L/s) average annual recharge, are summarized as follows:

- Tributary of Keewatin River connecting with East Pond, Kee3-A1 – 78 m^3/d
- Watercourse from East Pond to Tributary of Keewatin River , Kee3-B2-A1 – 86 m^3/d
- Watercourse connecting Payne Lake and Keewatin River, Kee3-Pay1 – 69 m^3/d.

Minton Lake, Payne Lake, and the Keewatin River were identified as areas of groundwater discharge and are locations where groundwater monitoring wells were installed adjacent to the surface water features. Seasonal groundwater temperature (Figure 4 of Appendix C of the Hydrology Baseline Technical Data Validation Report Volume 4, Appendix H) in the vicinity of these surface water features generally fluctuate over 5°C to 7°C with low groundwater temperatures in the spring that increase gradually to a peak in late summer followed by a gradual decline in groundwater temperature through the fall and winter. The groundwater temperature in these areas of groundwater and surface water interaction is generally 2°C in the spring and about 6°C to 9°C in late summer compared to a surface water temperature generally 1°C to 8°C in the spring and 4°C to 17°C in the fall.

The fate of groundwater that originates in the historical MRSA located within the PDA at the MacLellan site under existing conditions was evaluated using particle tracking techniques. The discharge rates assumed that groundwater recharge that enters the tailings areas would be carried through to the receptors and did not account for local seepage to intermittent surface water features or ditches in the area of the historical MRSA. Particle traces from the historical MRSA under existing conditions show that water originating from the MRSAs located within the PDA at the MacLellan site discharges to the Keewatin River as indicated in Table 8-4. Although the groundwater model predicts discharge to the Keewatin River, the minimum discharge times are estimated to be in excess of 2 million years, and therefore seepage from the historical MRSA is likely not affecting surface water quality or flow of the Keewatin River.

Table 8-4 Estimated Discharge and Travel Times Between Historical Mine Rock Storage Areas and Receiving Environment Under Baseline Conditions – MacLellan Site

Mine Rock Storage Area	Receptor	Discharge (m^3/d)	Travel Time (years)		
			Minimum	Mean	Maximum
MRSA	Keewatin River	0.95	2,085,000	2,477,000	3,452,000

8.2.2.6 Groundwater Quality

Groundwater quality is discussed in relation to the following:

- Groundwater Quality – Background (not affected) Areas (Appendix 8A, Table 8A-1 for Gordon and Table 8A-5 for MacLellan) – Water quality that is not known to have been affected by anthropogenic sources related to past or current land uses, including historical mining operations and other land uses. To define background monitoring locations, considerations include the locations of historical and existing land uses. Within the Gordon site LAA/RAA, groundwater near the MRSA and north of the open pit is considered to represent background groundwater quality in the PDA. Within the MacLellan site LAA/RAA, groundwater near the TMF and MRSA is considered to represent background groundwater quality in the PDA.

- Groundwater Quality – Historical Mine Operational (potentially affected) Areas (Appendix 8A, Tables 8A-2 and 8A-3 for Gordon and Tables 8A-6 and 8A-7 for MacLellan) – Overburden and shallow bedrock water quality that has the potential to be affected by historical mining activities, which includes the historical MRSAs.

- Groundwater Quality – Deep Bedrock (Appendix 8A, Table 8A-4 for Gordon and Table 8A-7 for MacLellan) – Deep bedrock groundwater quality samples are represented by water quality from deep exploration boreholes and historical underground mine workings and pits that are located within the footprint of the proposed open pit.

Water quality statistics, including minimum, maximum, geometric mean, median, and standard deviation were calculated from monitoring data from each of these areas and compared with the GCDWQ, CWQG, MWQSOG, and GW3 in Appendix 8A, Table 8A-1 to Table 8A-7. In the following discussions for each area, the mean groundwater concentrations were used to identify exceedances of the GCDWQ, CWQG, MWQSOG, and GW3. Indicator parameters for groundwater quality associated with various historical mine components and/or hydrostratigraphic units were determined by comparing the groundwater quality of the component and/or unit to groundwater thresholds for drinking water, GCDWQ and MWQSOG (drinking water) and groundwater thresholds for the discharge of groundwater to surface water, GW3. The CWQG-FAL and MWQSOG-FAL are surface water criteria provided for reference and evaluated in Chapter 9.

Gordon Site

Groundwater Quality – Background (not affected) Areas

Geometric mean groundwater concentrations in overburden and bedrock exceeded the drinking water MWQSOG and/or GCDWQ for dissolved manganese (Appendix 8A, Table 8A-1). Elevated concentrations of manganese are typical of groundwater in Manitoba and are reflective of the natural mineralization and geochemical processes in the area.

Geometric mean groundwater concentrations in overburden and bedrock exceeded the MWQSOG-FAL and/or CWQG-FAL for fluoride and dissolved phosphorus. No parameters analyzed had mean concentrations above the GW3.

Groundwater Quality – Historical Mine Operational (potentially affected) Areas

Groundwater quality associated with historical mining activities are discussed in relation to the following:

- Areas of historical mine activities.
- Historical north MRSA and historical south MRSA.
- Historical Wendy and East flooded pits.

Areas of Historical Mine Activities

Groundwater from the area of historical mine activities converges on Gordon and Farley lakes as well as the historical Wendy and East pits. Geometric mean concentrations in groundwater associated with the historical mine operational area (Appendix 8A, Table 8A-2) were calculated from groundwater samples collected from twelve monitoring wells over three years. Geometric mean concentrations of groundwater in overburden and/or bedrock within the area of historical mine activities exceeded the MWQSOG, GCDWQ, CWQG-FAL, and GW3 for the following parameters:

- GCDWQ: iron, manganese.
- MWQSOG Drinking Water: iron, manganese.
- MWQSOG-FAL: fluoride, phosphorous, iron.
- CWQG-FAL: fluoride, phosphorous, iron.
- GW3: no parameters.

The GCDWQ, MWQSOG (drinking water), and the GW3 were used to identify indicator parameters for groundwater quality associated with the area of historical mine activities. Manganese was noted to exceed guidelines in the background (not affected) areas and therefore, was not carried forward as indicator parameter for the area of historical mining activities. Although the geometric mean of iron did not exceed the GCDWQ or MWQSOG for drinking water in background water quality, the background water quality statistics indicated that iron is highly variable in background monitoring wells. Elevated concentrations of iron are typical of groundwater in Manitoba because it is generally reflective of natural mineralization and geochemical processes in the area. Therefore, iron is considered an indicator parameter with discretion for the area of historical mine activities.

The difference in groundwater quality between the background and area of historical mining activities does not necessarily directly imply an effect of historical mine activities because the difference in water quality may be related to differences in mineralization between the two areas.

Historical North and South MRSA

Groundwater from the area of the historical north and south MRSAs (Map 8-15) flows toward Gordon and Farley lakes as well as the historical Wendy and East pits. Geometric mean concentrations in groundwater associated with the north and south MRSAs (Table 8A-3, Appendix 8A) were calculated from groundwater samples collected from a nested monitoring well (overburden and bedrock) installed at the downgradient toe of each MRSA. Geometric mean concentrations of groundwater associated with the north and/or south MRSA exceeded the MWQSOG, GCDWQ, CWQG-FAL, and GW3 for the following parameters:

- GCDWQ: pH, sulphate, iron, manganese.
- MWQSOG Drinking Water: sulphate, iron, manganese.
- MWQSOG-FAL: iron.
- CWQG-FAL: phosphorus, iron.
- GW3: no parameters.

Using the GCDWQ, MWQSOG (drinking water), and the GW3 as reference, pH, sulphate, and iron were identified as indicator parameters for the historical north and south MRSA. Iron is identified as an indicator parameter with discretion for the historical north MRSA and south MRSA because iron was highly variable in background bedrock groundwater quality and is typical of groundwater in Manitoba due to natural mineralization and geochemical processes. Manganese was not carried forward as an indicator parameter for the Historical north or south MRSA because it was noted to exceed in background (not affected) areas.

Historical Wendy and East Flooded Pits

The historical Wendy and East pits are flooded and not connected directly to surface water features. A combination of overland surface water flow and groundwater seepage has filled the historical pits. Surface water quality associated with the historical Wendy and East pits was characterized from profile sampling of the flooded pits. The Hydrogeology Baseline TDR and associated Validation Report (Volume 4, Appendix H) present details regarding the historical pit water quality.

A clear increasing trend in sulphate concentration with depth was observed within both historical pits, as illustrated in the concentration profiles presented in Figure 8-2. Increasing concentrations of sulphate and dissolved iron, manganese, and arsenic with depth suggest oxidation of reduced sulphate minerals (i.e., pyrite) and changing redox conditions from aerobic to anaerobic conditions in the lower portions of the historical pits.

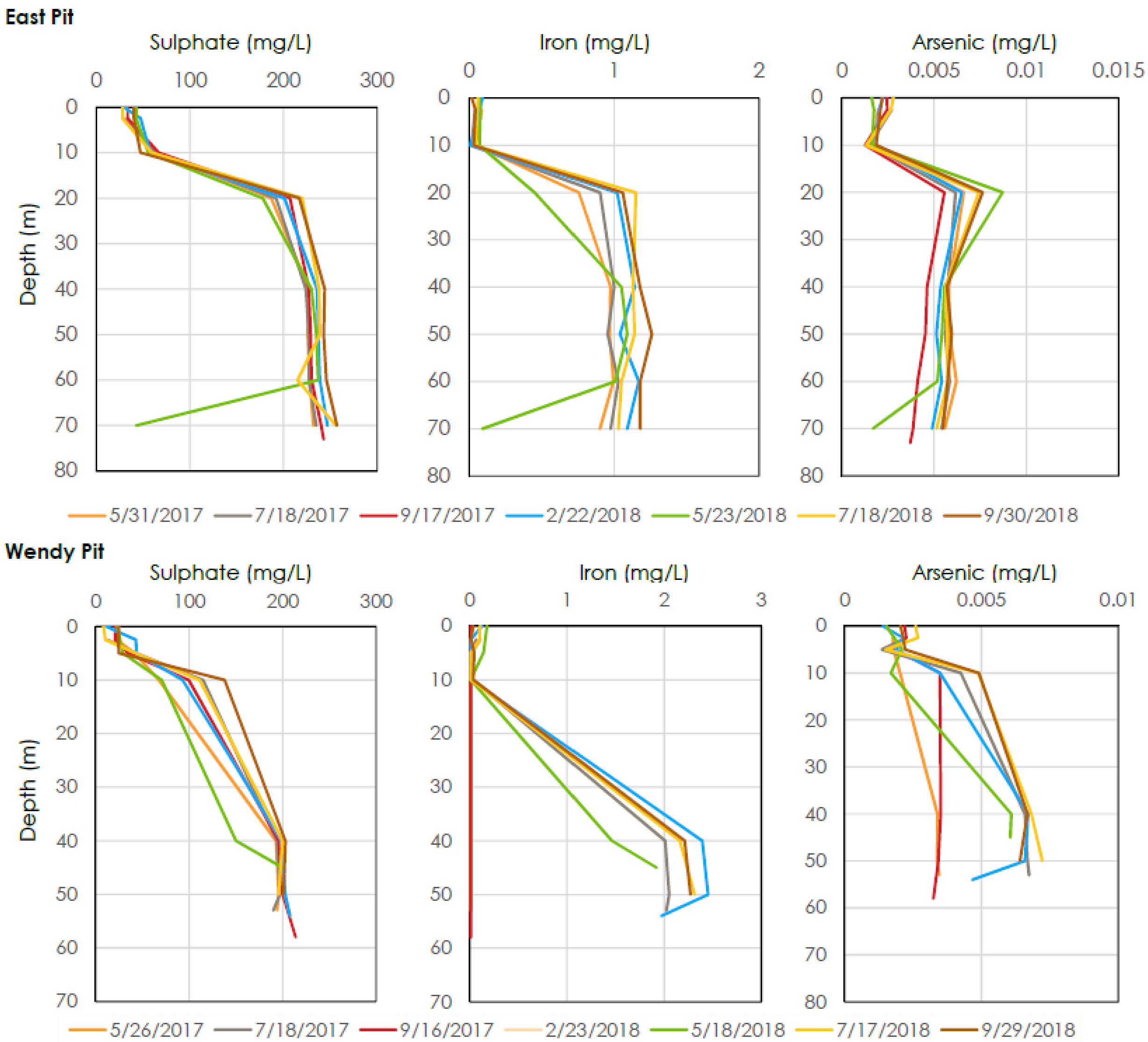

Figure 8-2 Concentration Profiles with Depth, Historical East and Wendy Pits

The geometric mean water quality from the Wendy and East pits from all depths collected during baseline monitoring was compared to the MWQSOG, GCDWQ, CWQG-FAL, and GW3 (Appendix 8A, Table 8A-4). Geometric mean concentrations exceed these guidelines for the following parameters:

- GCDWQ: iron, manganese.
- MWQSOG Drinking Water: iron, manganese.

- MWQSOG-FAL: iron.
- CWQG-FAL: iron.
- GW3: no parameters.

Because water from the historical open pits will be pumped out during dewatering and discharged to surface water, the MWQSOG-FAL and CWQG-FAL were used in addition to the GCDWQ, MWQSOG for drinking water and the GW3 to identify indicator parameters associated with the historical open pits water quality. Iron was identified as an indicator parameter for the historical pits. Manganese was not carried forward as an indicator parameter for the historical pits water quality because it is noted to exceed in background (not affected) areas.

Groundwater Quality – Deep Bedrock

Water quality associated with the deep bedrock was characterized from groundwater samples collected from two deep exploration boreholes, FL15-29 and FL15-40, by Golder (2016) in 2015 and 2016 (Map 8-3). Geometric mean concentrations in groundwater associated with the deep bedrock (Appendix 8A, Table 8A-4) exceeded the MWQSOG, GCDWQ, CWQG-FAL and GW3 for the following parameters:

- GCDWQ: iron, manganese.
- MWQSOG Drinking Water: iron, manganese.
- MWQSOG-FAL: iron, selenium.
- CWQG-FAL: iron, selenium.
- GW3: no parameters.

Using the GCDWQ, MWQSOG (drinking water), and the GW3 as reference, iron was identified as an indicator parameter for deep bedrock. Manganese was not carried forward as an indicator parameter for deep bedrock because it is noted to exceed in background (not affected) areas.

MacLellan Site

Groundwater Quality – Background (not affected) Areas

The geometric mean groundwater concentrations in overburden and bedrock exceeded the drinking water MWQSOG and/or GCDWQ for pH, and manganese (Appendix 8A, Table 8A-5). Elevated concentrations of these parameters are typical of groundwater in Manitoba and are reflective of the natural mineralization and geochemical processes in the area.

No parameters analyzed had a geometric mean concentration above the MWQSOG-FAL, CWQG-FAL, or GW3 (Appendix A, Table 8A-5).

Groundwater Quality – Historical Mine Operational (potentially affected) Areas

Groundwater quality associated with historical mining activities is discussed in relation to the following:

- Areas of historical mine activities
- Historical MRSA
- Historical underground workings.

Areas of Historical Mine Activities

Groundwater from the area of historical mine activities (Map 8-4) flows toward the Keewatin River and its tributaries. The geometric mean concentrations in groundwater associated with the historical mine operational area (Appendix 8A, Table 8A-6) were calculated from groundwater samples collected from 20 monitoring wells over three years. The geometric mean concentrations of groundwater in overburden and/or bedrock within the area of historical mine activities exceeded the MWQSOG, GCDWQ, CWQG-FAL, and GW3 for the following parameters:

- GCDWQ: pH, iron, manganese.
- MWQSOG Drinking Water: iron, manganese.
- MWQSOG-FAL: pH, iron.
- CWQG-FAL: pH, iron.
- GW3: no parameters.

The GCDWQ, MWQSOG (drinking water), and the GW3 were used to identify indicator parameters for groundwater quality associated with the area of historical mine activities. Manganese and pH were not carried forward as indicator parameters for historical mining areas because they are noted to exceed in background (not affected) areas. Although the geometric mean of iron did not exceed the GCDWQ or MWQSOG for drinking water in background water quality, the background water quality statistics indicated that iron is highly variable in background monitoring wells. Elevated concentrations of iron are typical of groundwater in Manitoba because it is generally reflective of natural mineralization and geochemical processes in the area. Therefore, iron is considered an indicator parameter with discretion for the area of historical mine activities.

The difference in groundwater quality between the background and area of historical mining activities does not necessarily directly imply an effect of historical mine activities because the difference in water quality may be related to differences in mineralization between the two areas.

Historical MRSA

Groundwater from the area of the historical MRSAs (Map 8-16) flows toward the Keewatin River. Geometric mean concentrations in groundwater associated with the historical MRSA (Appendix 8A, Table 8A-7) was calculated from groundwater samples collected from a nested monitoring well (overburden and bedrock) installed at the downgradient toe of the historical MRSA. Geometric mean concentrations of groundwater associated with the historical MRSA exceeded the MWQSOG, GCDWQ, CWQG-FAL, and GW3 for the following parameters:

- GCDWQ: pH, sulphate, arsenic, manganese.
- MWQSOG Drinking Water: pH, sulphate, arsenic, manganese.
- MWQSOG-FAL: pH, cadmium.
- CWQG-FAL: pH, arsenic, cadmium, copper, zinc.
- GW3: no parameters.

Using the GCDWQ, MWQSOG (drinking water), and the GW3 as reference, sulphate and arsenic were identified as indicator parameters for the historical MRSA. Manganese and pH were not carried forward as indicator parameters for the historical MRSA because they are noted to exceed in background (not affected) areas.

Historical Underground Workings (Deep Bedrock)

The historical underground workings are flooded and therefore represent groundwater seepage and a portion of surface flow into the shafts and access ramp. A water quality profile of the MacLellan shaft was attempted but the shaft was obstructed at a depth of 39 m bgs. Details on the sampling effort for the MacLellan shaft are detailed in the Water Quality Baseline TDR (Volume 4, Appendix I). Deep bedrock was characterized by the sampling of two exploration boreholes, MG15-03 and MG15-04, located within the footprint of the open pit. The statistical water quality data that are representative of the exploration boreholes are presented in Appendix 8A, Table 8A-7.

Geometric mean concentrations of groundwater associated with the deep bedrock, interpreted to be reflective of potential water quality of the historical underground workings, exceeded the MWQSOG, GCDWQ, CWQG-FAL, and GW3 for the following parameters:

- GCDWQ: arsenic, iron, lead, manganese.
- MWQSOG Drinking Water: arsenic, iron, lead, manganese.
- MWQSOG-FAL: iron, lead.
- CWQG-FAL: arsenic, copper, iron, lead.
- GW3: no parameters.

As water from the historical underground workings has the potential to be pumped out during dewatering and discharged to surface water, via a collection pond, the MWQSOG-FAL and CWQG-FAL were used in addition to the GCDWQ, MWQSOG (drinking water) and the GW3 to identify indicator parameters associated with the underground workings water quality. Arsenic, iron, and lead were identified as the indicator parameters for deep bedrock. Manganese is not carried forward as an indicator parameter for deep bedrock water quality because it is noted to exceed in background (not affected) areas.

8.3 PROJECT INTERACTIONS WITH GROUNDWATER

Table 8-5 identifies, for each potential effect, the Project activities and components that might interact with the VC and result in the identified environmental effect. These interactions are indicated by check mark and are discussed in detail in Section 8.4, in the context of effects pathways, standard and Project-specific mitigation/enhancement, and residual effects. A justification for no interaction (and therefore no effect) is provided following Table 8-5.

Project activities for each phase are described in detail in Chapter 2, Section 2.3 and 2.4. Project related emissions and discharges are described in Chapter 2, Section 2.8.

The potential interactions between Project activities and the environment were considered for the construction, operation, and decommissioning/closure phases of the Project. The identification of Project activities and their potential interactions was based on engagement with interested parties, the professional judgment of technical specialists involved in the assessment, and a review of existing conditions. The selection of interactions is informed by the potential effects and effects pathways for each VC as described in Section 8.1.3.

Emissions, discharges, and wastes (e.g., air, waste, noise, light, liquid and solid effluents) are generated by many and varied Project activities. Rather than acknowledging this by placing a check mark against each of these activities, “Emissions, Discharges and Wastes” have been consolidated as integrated activity for efficiency of approach. This activity includes the emissions, discharges, and wastes generated by all other project activities under each Project phase.

Table 8-5 Potential Project-Environment Interactions with Groundwater

Project Activities and Components	Environmental Effects			
	Change in Groundwater Quantity and/or Flow		Change in Groundwater Quality	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Construction				
Site Preparation at Both Sites (removal of existing buildings; removal of contaminated materials; vegetation clearing and earthworks; development of temporary construction camp at the MacLellan site)	✓	✓	✓	✓
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA)	–	–	–	–
Mine Components at Both Sites (construction of: ore pads; ore, overburden and mine rock storage areas; mill feed storage area and crushing plant, ore milling and processing plant, and TMF at the MacLellan site; water management facilities [e.g., sumps, ponds and ditches])	✓	✓	✓	✓
Utilities, Infrastructure, and Other Facilities at Both Sites (construction of: buildings and yards; access roads [i.e., upgrades at the Gordon and MacLellan sites] and internal mine roads; site lighting and security; power supply and distribution system; potable water treatment plant at the MacLellan site; on-site pipelines at the MacLellan site; fuel storage and distribution systems; sewage treatment facilities; domestic solid waste handling facilities)	✓	✓	–	–
Water Development and Control at Both Sites (dewatering of existing pits at the Gordon site and underground workings at the MacLellan site; re-alignment of existing diversion channel at the Gordon site; interceptor wells at the Gordon site)	✓	✓	✓	✓
Emissions, Discharges, and Wastes[1]	✓	✓	✓	✓
Employment and Expenditure[2]	–	–	–	–
Operation				
Open Pit Mining at Both Sites (drilling; blasting; removal, loading and on-site hauling of mined material [i.e., ore, overburden, and mine rock])	✓	✓	✓	✓

Table 8-5 Potential Project-Environment Interactions with Groundwater

Project Activities and Components	Environmental Effects			
	Change in Groundwater Quantity and/or Flow		Change in Groundwater Quality	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA, including truck transportation of ore from the Gordon site to the MacLellan site)	–	–	–	–
Storage/Stockpiling of Ore, Overburden, and Mine Rock at both sites	✓	✓	✓	✓
Ore Milling and Processing at the MacLellan Site (ore crushing and conveyance; ore milling)	–	✓	–	✓
Water Management at Both Sites (mine water collection and storage; process water supply for the MacLellan site including water intake on Keewatin River at the MacLellan site; pumping fresh/fire water from Farley Lake at Gordon site; operation of interceptor wells at the Gordon site)	✓	✓	✓	✓
Tailings Management at the MacLellan Site	–	✓	–	✓
Utilities, Infrastructure, and Other Facilities at Both Sites (presence and operation of: buildings and yards; access roads and internal mine roads; site lighting and security; power supply and distribution system; potable water treatment plant at the MacLellan site; on-site pipelines at the MacLellan site; fuel storage and distribution systems; sewage treatment facilities; domestic solid waste handling facilities; explosives storage, maintenance of access roads and bridges)	✓	✓	✓	✓
Emissions, Discharges, and Wastes[1]	✓	✓	✓	✓
Employment and Expenditure[2]	–	–	–	–
Decommissioning/Closure				
Decommissioning at Both Sites	✓	✓	✓	✓
Reclamation at Both Sites	✓	✓	✓	✓
Post-Closure at Both Sites (long-term monitoring)	✓	✓	✓	✓
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA)	–	–	–	–

Table 8-5 Potential Project-Environment Interactions with Groundwater

Project Activities and Components	Environmental Effects			
	Change in Groundwater Quantity and/or Flow		Change in Groundwater Quality	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Emissions, Discharges, and Wastes[1]	✓	✓	✓	✓
Employment and Expenditure[2]	–	–	–	–

NOTES:
✓ = Potential interaction
– = No interaction
[1] Emissions, Discharges, and Wastes (e.g., air, waste, noise, light, liquid and solid effluents) are generated by many Project activities. Rather than acknowledging this by placing a check mark against each of these activities, “Emissions, Discharges and Wastes” have been introduced as an additional component under each Project phase.
[2] Project employment and expenditures are generated by most Project activities and components and are the main drivers of many socio-economic effects. Rather than acknowledging this by placing a check mark against each of these activities, “Employment and Expenditures” have been introduced as an additional component under each Project phase.

The following Project components and activities will not directly change the groundwater quantity/flow or quality:

- Project-related transportation (at both sites, for all Project phases) is not predicted to interact with groundwater quality or quantity during Project phases other than from an accidental fuel spill. Accidental events are assessed separately in Chapter 22.
- Ore milling and processing at the Gordon site; this activity will occur only at the MacLellan site.
- Tailings management at the Gordon site; this activity will occur only at the MacLellan site.
- The construction of utilities, infrastructure and other facilities at both sites are not expected to interact with a change in groundwater quality because there are no indicator parameter sources associated with such construction activities, except for an accidental spill. Accidental events are assessed separately in Chapter 22.
- Employment and expenditure will not directly result in changes to the physical environment, including groundwater, during any of the Project phases.

8.4 ASSESSMENT OF RESIDUAL ENVIRONMENTAL EFFECTS ON GROUNDWATER

8.4.1 Analytical Assessment Techniques

The environmental effects analysis for groundwater quantity and flow, and groundwater quality, is carried out using a number of analytical methods and tools, and includes laboratory analytical data, three-dimensional numerical groundwater flow modelling, water quality modelling, and mass balance loading calculations. The techniques are described in detail in the Hydrogeology Assessment TMRs (Volume 5, Appendices F and G) and the Hydrogeology Baseline TDR and the associated Validation Report (Volume 4, Appendix H).

The numerical, three-dimensional finite element groundwater flow model developed for each LAA to simulate baseline conditions, described in Section 8.2.1.2, was modified to assist in the evaluation of the potential effects of the Project on groundwater. The model provides quantitative predictions about changes in groundwater levels and flow under each Project phase.

The Gordon site groundwater flow model is specifically used to provide estimates of:

- Dewatering rates from staged development of the open pit and dewatering of the historical Wendy and East pits and associated changes to groundwater levels (drawdown) and baseflow to surrounding waterbodies.
- Evaluation of mitigation options to control groundwater inflow to the open pit.
- Groundwater inflow rates to the open pit at progressive stages during filling with water to form a pit lake.
- Interactions of the pit lake at the final lake level of 315 m amsl with groundwater levels and baseflow to surrounding waterbodies.
- Groundwater recharge originating from overburden storage area, MRSA, and historical MRSAs. Collection of groundwater recharge originating from the MRSA in the contact water collection system was not assessed and not considered in the effects assessment. For the assessment, groundwater recharge originating from the MRSA is assumed to discharge to the receiving environment to provide a conservative assessment of groundwater loading to the receiving environment.
- Groundwater recharge originating from the MRSA and historical MRSAs and discharging to surface water receivers did not consider physical flow processes, such as dispersion and diffusion, and chemical processes, such as adsorption and precipitation or dissolution.

The MacLellan site groundwater flow model is specifically used to provide estimates of:

- Dewatering rates from the staged development of the open pit and dewatering of the historical underground workings and associated changes to groundwater levels (drawdown) and baseflow to surrounding waterbodies.

- Groundwater inflow rates to the open pit at progressive stages during filling with water to form a pit lake.
- Interactions of the pit lake at the final lake level of 330 m amsl with groundwater levels and baseflow to surrounding waterbodies.
- Groundwater recharge originating from the TMF, MRSA, and historical MRSA. Collection of groundwater recharge originating from the MRSA and TMF in the contact water collection system was assessed. The seepage collection is an integral component of the MRSA and TMF design and is therefore included in the effects assessment as mitigation. For the assessment, groundwater recharge originating from the TMF and MRSA is assumed to discharge to the receiving environment to provide a conservative assessment of groundwater loading to the receiving environment.
- Groundwater recharge originating from the MRSA, TMF, and historical MRSA and discharging to surface water receivers did not consider physical flow processes, such as dispersion and diffusion, and chemical processes, such as adsorption and precipitation or dissolution.

Water balance and water quality models for each site were built using GoldSim™, coupling water quantity and mass transfer of selected parameters from different Project components (Volume 5, Appendices D and E). The results of the models were used to predict the water quality and recharge associated with the overburden storage areas (both sites), TMF (at the MacLellan site), MRSAs (both sites), and historical MRSAs (both sites) during construction, operation, and decommissioning/closure. The predicted water quality at each site was then used, together with the groundwater discharge rates predicted with the groundwater flow model, to estimate potential effects of Project activities on groundwater quality and loading to surface water receivers.

8.4.2 Assessment of Change in Groundwater Quantity and/or Flow

8.4.2.1 Project Pathways for Change in Groundwater Quantity and/or Flow

Gordon Site

Construction

During construction, in the absence of mitigation, groundwater quantity and/or flow could be affected by: construction of Project mine components including the MRSA; temporary dewatering for the installation of foundations for buildings and utilities; the alteration of the historical south MRSA; re-alignment of the existing diversion channel; changes to infiltration rates resulting from the construction of roads; and dewatering of the historical Wendy and East pits.

Of these Project components and activities, groundwater quantity and/or flow are anticipated to be primarily affected by the lowering of groundwater levels through initial dewatering of the historical Wendy and East pits. The initial development of the Gordon site ore stockpile, overburden stockpile, and MRSA; and the alteration of the historical south MRSA, also have the potential to affect groundwater recharge and consequently groundwater quantity and/or flow.

Operation

During Gordon site operation, in the absence of mitigation, dewatering of the open pit, overburden and ore stockpiling, MRSA continued development, and water management have the potential to affect groundwater quantity and/or flow.

Groundwater quantity and/or flow during Project operation are anticipated to be primarily affected by the lowering of water levels through dewatering of the open pit. Drawdown resulting from open pit dewatering may affect local groundwater users if users are located within the predicted zone of influence.

Groundwater flow patterns will be altered by open pit dewatering and continued development of the MRSA. The resulting change in groundwater flow pattern and recharge rates may affect groundwater discharge to surface water features (Gordon Lake and Farley Lake in particular) and wetlands. Potential effects to surface water features and wetlands from the lowering of groundwater levels and changes to baseflow are further assessed in Chapters 9 and 11, respectively.

Decommissioning/Closure

During decommissioning/closure, as surface water runoff from the Project is directed to the open pit and as the open pit fills, groundwater levels will slowly rise, and changes to groundwater flow direction and discharge locations are expected. Closure of water management facilities will result in the removal of contact water collection systems that may result in changes to the fate and flow of groundwater originating from the MRSA, overburden stockpile, and historical MRSAs. These changes will extend into post-closure and reach a steady-state condition once the open pit is filled.

At closure, the removal and rehabilitation of the ore stockpile and changes in moisture content and rehabilitation for the MRSA (Appendix 23B) have the potential to change groundwater recharge rates. These changes will affect groundwater flow patterns and discharge to surface water features and wetlands. Potential effects to surface water features and wetlands are further assessed in Chapters 9 and 11, respectively.

MacLellan Site

Construction

During construction, in the absence of mitigation, groundwater quantity and/or flow could be affected by: construction of mine components including the MRSA and TMF; temporary dewatering for the installation of foundations for buildings and utilities; dewatering of the historical underground workings; changes to infiltration rates resulting from the construction of roads; and initial dewatering of the open pit. Construction activities at the MacLellan site are anticipated to begin with the construction of the initial phases of the TMF and the MRSA as well as the construction of the starter open pit.

Of these Project components and activities, groundwater quantity and/or flow is anticipated to be primarily affected by the lowering of groundwater levels through initial dewatering of the starter open pit and historical underground workings. The initial development of the MRSA and TMF also have the potential to affect groundwater recharge and consequently groundwater quantity and/or flow.

Operation

During MacLellan site operation, in the absence of mitigation, dewatering of the open pit and historical underground workings, overburden and ore stockpiling, continued development of the MRSA and TMF, ore milling and processing, and water management have the potential to affect groundwater quantity and/or flow.

Groundwater quantity and/or flow during Project operation is anticipated to be primarily affected by the lowering of water levels through dewatering of the open pit and historical underground workings. Drawdown resulting from open pit dewatering may affect local groundwater users if users are located within the predicted zone of influence.

Groundwater flow patterns are expected to be altered by open pit dewatering and the ongoing development of the MRSA and TMF. The resulting change in groundwater flow pattern and recharge rates may affect groundwater discharge to surface water features and wetlands. Potential effects to surface water features and wetlands from the lowering of groundwater levels and changes to baseflow are further assessed in Chapters 9 and 11, respectively.

Decommissioning/Closure

During decommissioning/closure, as surface water runoff from the Project is directed to the open pit and as the open pit fills, groundwater levels will slowly rise and changes to groundwater flow direction and discharge locations are expected. Closure of water management facilities will result in the removal of contact water collection systems that may result in groundwater originating from the MRSA and TMF discharging to the natural environment. These changes will extend into post-closure and reach a steady-state condition as the open pit is filled.

At closure, the removal and rehabilitation of the ore stockpile, changes in moisture content and rehabilitation of the MRSA and TMF (Appendix 23B) have the potential to change groundwater recharge rates, affecting groundwater flow patterns and discharge to surface water features and wetlands. Potential effects to surface water features and wetlands are assessed in Chapters 9 and 11, respectively.

8.4.2.2 Mitigation

The implementation of the mitigation measures and other commitments described in this section will be the responsibility of Alamos and or contractors. The mechanisms used to require contractors and subcontractors to comply with these measures will include environmental protection plans and contract documents.

Mitigation measures proposed are generally considered to be industry standards and are effective for use in similar applications and environmental conditions. This assessment is based on professional judgment of engineers and scientists in consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited in the text below where applicable to justify the selection.

Detailed design of the Project and mitigation strategies is currently ongoing. Mitigation measures will be refined in consideration of environmental assessment approval conditions and permit stipulations which will be incorporated into final environmental management planning. The effectiveness of these mitigation measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs including adaptive management procedures will be reviewed by applicable regulatory agencies prior to their implementation.

Gordon Site

The following mitigation measures are proposed to avoid or reduce Project-related effects on groundwater quantity and flow:

- Limit construction footprint (i.e., PDA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the PDA.
- Use standard management practices throughout the Project, including drainage control and excavation and open pit dewatering.
- Intercept groundwater flowing into the open pit prior to discharge at the pit wall and return water generated from pumping groundwater interceptor wells to Gordon and Farley lakes to offset a reduction in groundwater discharge. The groundwater interceptor wells are an integral part of the open pit dewatering strategy and are therefore included in the effects assessment as mitigation.
- Install contact water and seepage collection ditches around the perimeter of the MRSA to mitigate the migration of seepage.

A high permeability zone in the shallow bedrock associated with the East and Wendy faults was identified through baseline studies (Volume 4, Appendix H) and the groundwater flow model calibration (Volume 5, Appendix F). To control inflow to the open pit and effects to surface water levels of Gordon and Farley lakes as a result of open pit dewatering, 13 interceptor wells were simulated in the groundwater flow model. At this time, the interceptor wells were simulated approximately 40 m from the boundary of the ultimate open pit towards Gordon and Farley lakes (Map 8-5) extending from the top of rock to the base of the shallow bedrock layer (top 50 m of bedrock). The water pumped from the interceptor wells will be pumped to Gordon and/or Farley lakes. If necessary, the water will be treated to meet applicable federal and provincial regulatory requirements prior to discharge to the environment, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER. Each of the 13 interceptor wells were simulated to pump at a rate of 1,209 m^3/d, year-round, which is a conservative assumption as required pumping from the interceptor wells in the winter may decrease due to the open pit walls freezing. The interceptor wells were carried through the groundwater effects assessment for construction, operation, and decommissioning/closure as indicated throughout Section 8.4.2.3.

MacLellan Site

The following mitigation measures are proposed to avoid or reduce Project-related effects on groundwater quantity and flow:

- Limit construction footprint (i.e., PDA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the PDA.
- Use standard management practices throughout the Project, including drainage control and excavation and open pit dewatering.
- Use standard construction methods, such as seepage cutoff collars, where trenches extend below the water table to mitigate preferential flow paths.
- Install contact water and seepage collection ditches around the perimeter of the MRSA and TMF to mitigate the migration of seepage from this mine infrastructure. The seepage collection is an integral component of the MRSA and TMF design and is therefore included in the effects assessment as mitigation.

In addition to the mitigation measures to reduce potential environmental effects, Alamos is also committed to follow-up and monitoring for both the Gordon and MacLellan sites, and adaptive management as outlined in Chapter 23.

8.4.2.3 Project Residual Effects

Gordon Site

Construction

During construction, the Project activities and components that might interact with groundwater quantity and result in an environmental effect (Table 8-5) include: site preparation, construction of mine components, utilities, and infrastructure, as described in temporary dewatering for foundations and installation of infrastructure, as well as water development and control at both sites as described under dewatering of the historical East and Wendy pits.

Temporary Dewatering for Foundations and Installation of Infrastructure

Local changes in infiltration rates through compaction of ground surfaces or construction of infrastructure such as buildings and overburden or topsoil storage areas may result in reduced infiltration within the PDA. Stripping of topsoil, timber harvesting, and removal of vegetation in the PDA will result in changes in evapotranspiration rates and runoff and may result in decreased infiltration rates where impervious surfaces will remain or increased infiltration rates where vegetation is removed. These changes in infiltration rate are considered to have a limited effect on groundwater resources.

Due to seasonally shallow groundwater levels present within the PDA, construction earthworks have the potential to encounter groundwater and require water management such as temporary dewatering (i.e., to maintain dry working conditions) and/or contact water collection. Temporary dewatering and/or contact water collection could result in limited local changes to groundwater flow direction, and/or lowering of groundwater levels and a potential decrease in discharge to surface water features. Dewatering for foundations and installation of infrastructure will be completed with permission from the Government of Manitoba Water Use Licensing Section under *The Water Rights Act* if pumping in excess of 25 m^3/d is required. The pumping will be short-term on an as-needed basis and may be required for minor supporting infrastructure for equipment storage and maintenance, and preparation of foundations for the overburden stockpile, ore stockpile, and MRSA.

With the construction mitigation measures presented in Section 8.4.2.2 (in particular limiting construction footprint and use of standard management practices including drainage control and excavation), changes to groundwater quantity and/or flow due to temporary construction dewatering are characterized as adverse, continuous, short-term (e.g., limited to the construction phase and on an as-needed basis), reversible and will be confined to the PDA. The magnitude is expected to be low as dewatering for typical foundations is expected to be less than 1 m below ground surface. Timing (i.e., natural seasonal variations in precipitation) may affect dewatering rates, particularly during the spring when higher groundwater levels are expected; however, these variations would not be considered a Project-related effect. The groundwater quantity in the LAA/RAA is disturbed with respect to ecological context, and dewatering is not expected to change that context.

Dewatering of the Historical Wendy and East Pits

The primary activities that are anticipated to potentially influence groundwater levels and flow during construction include the initial dewatering of the historical Wendy and East pits. While development of the historical Wendy and East pits into a larger open pit will continue into the initial operating years, they have been simulated separately in the construction phase to document the potential changes to groundwater levels and flow in the early phases of the Project.

Dewatering of the historical Wendy and East pits will take place prior to the start of pre-production mining and will include the use of interceptor wells (Section 8.4.2.2) to mitigate groundwater inflow to the open pit and the reduction in groundwater discharge to Gordon and Farley lakes as a result of dewatering the historical Wendy and East pits. Water from the historical pits and the interceptor wells will be pumped to a water management pond(s) and discharged to Gordon and/or Farley lakes.

The combined groundwater inflow rate to the historical Wendy and East pits was estimated using the groundwater flow model (Volume 5, Appendix F). The combined groundwater inflow rate to the historical pits is predicted to be initially high (12,528 m^3/d (145 L/s) for the first month), with decreasing to negligible flows into the historical pits during the winter months, followed by peak flows associated with the spring freshet. The average annual groundwater inflow rate to the historical pits is predicted to be 1,987 m^3/d (23 L/s) at the end of the construction period.

The predicted change in groundwater table and resulting drawdown at the end of construction period is presented on Map 8-17. In the area of the Wendy and East pits, groundwater levels are lowered by approximately 1.0 m or more within 800 m of the pits, including the drawdown effect from the interceptor wells. The drawdown extends predominantly north and south of the Wendy and East pits due to the constraints of Gordon and Farley lakes.

The corresponding changes to groundwater discharge to surface water features at the end of the construction period are presented in Table 8-6. These changes relative to baseline conditions are conservative estimates based on the results of the groundwater flow model (Volume 5, Appendix F). As shown in Table 8-6, the groundwater flow system responds to the dewatering of the existing pits at the end of the construction period.

The direction of groundwater flow into (discharge) or out of (recharge) each watercourse and lake are predicted to remain consistent between baseline and construction except for Gordon, Farley, and Marie lakes, and the diversion channel (FAR 6). Gordon, Farley, and Marie lakes shift from gaining groundwater under baseline conditions to surface water recharging groundwater at the end of construction. The water pumped from the interceptor wells will be returned to Gordon and Farley lakes during construction to offset a reduction in groundwater discharge. Groundwater discharge to Marie Lake is predicted to be reduced by 227 m^3/day at the end of construction compared to baseline conditions. The diversion channel is a groundwater recharge feature under baseline conditions with recharge from the ditch to groundwater increasing from 25 m^3/d in baseline to 472 m^3/d at the end of construction.

The reduction in groundwater discharge predicted by the model was included in the effects assessment for surface water (Chapter 9). The changes to the groundwater flow rates for remaining lakes and watercourses are relatively small (generally less than 86 m^3/d) compared to baseline conditions and the overall anticipated flow rates in the surface water features, the effect of which is evaluated in the effects assessment for surface water (Chapter 9).

Table 8-6 Comparison of Estimated Groundwater Discharge to Watercourses and Lakes near the Open Pit under Dewatered and Baseline Conditions (m^3/d) – Construction, Gordon Site

Surface Water Feature	Baseline	End of Construction
Lakes		
Susan Lake	32	52
Pump Lake	-24	-16
Marnie Lake	-23	5.2
Gordon Lake	50	-463
Farley Lake	208	-636
Marie Lake	70	-157
Unnamed South Lake (FAR4-A2)	-3.5	-1
Rivers and Creeks		
Watercourse connecting Susan and Marrow Lakes (SUS3)	30	45
Tributary of Simpson Lake (FAR3-SIM2)	20	41

Table 8-6 Comparison of Estimated Groundwater Discharge to Watercourses and Lakes near the Open Pit under Dewatered and Baseline Conditions (m^3/d) – Construction, Gordon Site

Surface Water Feature	Baseline	End of Construction
Tributary of Swede Lake (FAR3-A1)	72	91
Watercourse connecting Unnamed South Lake and Farley Lake (FAR5-MAN1)	-20	-6.0
Tributary of Farley Lake (FAR5-A1)	-10	-14
Southern Tributary of Gordon Lake (FAR7-A1)	-35	-26
Diversion Channel (FAR6)	-25	-472
Watercourse connecting Marie and Farley Lakes (FAR5-MAR1)	-6.9	-3.5
Watercourse connecting Marie and Farley Lakes (FAR5-MAR3)	3.5	-0.9
Northern Tributary of Gordon Lake (FAR7-B1)	-45	-59
Notes: Positive value represents flow from groundwater to surface water Negative value represents flow from surface water to groundwater		

During construction, residual environmental effects related to dewatering the historical Wendy and East pits will occur through construction phase and extend into operation. The changes to groundwater quantity and flow are characterized as adverse, medium-term, continuous, and reversible. The magnitude is high within the PDA and LAA/RAA, as the change in groundwater level is anticipated to be greater than 5 m. Timing (i.e., natural seasonal variations in precipitation) may affect dewatering rates, particularly during the spring period when higher groundwater levels are expected; however, these variations would not be considered a Project-related effect. The groundwater quantity in the LAA/RAA is disturbed with respect to ecological context.

Operation

During operation, the Project activities and components that might interact with groundwater quantity and result in an environmental effect (Table 8-5) include: open pit mining, storage/stockpiling of mine rock, water management. The magnitude of the effect of water management associated with open pit mining is greater than that associated with minor changes to groundwater quantity associated with reduced groundwater recharge from the presence of the MRSA.

Dewatering of the Open Pit

The primary Project effect on groundwater quantity and/or flow during operation is the lowering of water levels through continued dewatering of the historical Wendy and East pits as they are developed into the ultimate open pit. The groundwater interceptor wells (Section 8.4.2.2) installed during construction will remain in place during operation to control inflows to the open pit due to a high permeability zone in the shallow bedrock associated with the Wendy and East faults (Map 8-3).

As dewatering progresses with development of the open pit, the average annual groundwater inflow rate to the open pit is predicted to increase from 1,987 m^3/d (23 L/s) at the end of the construction period to 3,197 m^3/d (37 L/s) at end of operation. The drawdown or change in water table elevation due to dewatering of the open pit at end of the life of mine (LOM), in comparison to baseline conditions, is shown on Map 8-18. Dewatering of the open pit is predicted to lower the water table by up to 1 m and extend approximately 1,200 m from the open pit, increasing to more than 10 m within 600 m of the open pit. The induced infiltration of surface water to the shallow overburden and bedrock limits the extent of the drawdown.

Based on a review of the GWDrill database (MCC 2015) and as discussed in Section 8.2.2.2, there are no known groundwater well users located within the LAA/RAA and therefore, no water supply wells or groundwater withdrawals that supply potable water within the extent of drawdown of the open pit (Map 8-18). As a result, no environmental effect to groundwater quantity and/or flow is predicted from the Project on the surrounding water supply wells.

Groundwater drawdowns of greater than 10 m are predicted to occur beneath a small portion of wetlands located north to northwest of the open pit and PDA (Map 8-18). To the south of the PDA, groundwater drawdowns of 1 to 5 m are predicted. A discussion of the effects of lowering the water table on wetlands is provided in Chapter 11.

Changes in groundwater flow and discharge to surface water features due to dewatering of the open pit and the progressive development of the MRSA at the end of the operation period (i.e., Mine Year 6) are presented in Table 8-7. The largest changes in groundwater discharge are associated with Gordon, Farley, and Marie lakes where the lakes are predicted to shift from gaining groundwater under baseline conditions to surface water recharging groundwater at the end of operation. The reduction in groundwater discharge to Gordon and Farley lakes will be mitigated by returning at least a portion of the water pumped from the interceptor wells to the lakes. For Marie Lake, a reduction in groundwater levels of up to 1 m to the north of the lake compared to baseline condition was predicted with the groundwater flow model. The predicted reduction in groundwater level decreases the vertical hydraulic gradient resulting in a reduction in groundwater discharge to the lake by 246 m^3/d compared to baseline conditions.

For the remaining watercourses and lakes, the changes to groundwater discharge are relatively small (generally less than 84 m^3/d) compared to the baseline conditions and overall anticipated flow rates in the surface water features. The effect of changes in groundwater discharge on surface water levels and flow is evaluated in the effects assessment for surface water (Chapter 9).

Table 8-7 Comparison of Estimated Groundwater Discharge to Watercourses and Lakes near the Open Pit under Dewatered and Baseline Conditions (m^3/d) – Operation, Gordon Site

Surface Water Feature	Baseline	End of Operation
Lakes		
Susan Lake	32	44
Pump Lake	-24	-25
Marnie Lake	-23	-16
Gordon Lake	50	-906
Farley Lake	208	-1,248
Marie Lake	70	-176
Unnamed South Lake (FAR4-A2)	-4	-7
Rivers and Creeks		
Watercourse connecting Susan and Marrow Lakes (SUS3)	30	41
Tributary of Simpson Lake (FAR3-SIM2)	20	32
Tributary of Swede Lake (FAR3-A1)	72	81
Watercourse connecting Unnamed South Lake and Farley Lake (FAR5-MAN1)	-20	-19
Tributary of Farley Lake (FAR5-A1)	-10	-34
Southern Tributary of Gordon Lake (FAR7-A1)	-35	-65
Diversion Channel (FAR6)	-25	-402
Watercourse connecting Unnamed North Lake and Farley Lake (FAR5-MAR1)	-7	-8
Watercourse connecting Marie and Farley Lakes (FAR5-MAR3)	3	1
Northern Tributary of Gordon Lake (FAR7-B1)	-45	-100
Notes: Positive value represents flow from groundwater to surface water Negative value represents flow from surface water to groundwater		

The lowering of water levels through continued dewatering of the historical Wendy and East pits and the development and dewatering of the open pit will result in a change in groundwater quantity and flow at the Gordon site. This change is characterized as adverse, medium-term, continuous, irreversible, and will be confined to the LAA/RAA. The magnitude is high within the PDA and LAA/RAA as the change in groundwater level will be greater than 5 m. The magnitude will be reduced during decommissioning/closure as the open pit fills to form a pit lake; however, some local drawdown will remain on the southeast side of the open pit as discussed under decommissioning/closure. Timing (i.e., natural seasonal variations in precipitation) may affect dewatering rates due to natural seasonal variations, particularly during the spring period when higher groundwater levels are expected; however, these variations would not be considered a Project-related effect. The groundwater quantity in the LAA/RAA is disturbed with respect to ecological context.

Decommissioning/Closure

Following completion of operation, dewatering of the open pit will cease, and water levels will begin to rise within the open pit to a maximum water elevation of 315 m amsl, which reflects the local groundwater table at closure. The groundwater interceptor wells were assumed to continue to operate during the first stages of decommissioning/closure and decrease with time as the pit lake stage increases, so that pumping the interceptor wells does not interfere with the filling of the open pit (expected to take 11 years under average conditions; Chapter 9, Section 9.4.1).

Map 8-19 provides the simulated drawdown in comparison to baseline conditions with the open pit at the design elevation of 315 m amsl and recharge rates for the MRSA increased to steady-state infiltration rates. The water table is predicted to return to near baseline conditions, except for a small area between the pit lake and Farley Lake where groundwater levels are predicted to be about 0.5 m lower than baseline.

Table 8-8 presents the comparison of baseline groundwater discharge rates with effects of the pit lake on the rate of groundwater discharge to watercourses and lakes at closure (i.e., after the pit lake is full). As shown in Table 8-8, the groundwater flows to the receptors are predicted to return to near baseline conditions (within 86 m^3/day of baseline groundwater discharge) once the pit is full.

Table 8-8 Comparison of Estimated Groundwater Discharge to Watercourses and Lakes near the Open Pit Under Baseline and Closure (Pit Full) Conditions (m^3/d) – Gordon Site

Surface Water Feature	Baseline	Closure
Lakes		
Susan Lake	32	32
Pump Lake	-24	-24
Marnie Lake	-23	-23
Gordon Lake	50	37
Farley Lake	208	238
Marie Lake	70	8.6
Unnamed South Lake (FAR4-A2)	-3.5	-3.5
Rivers and Creeks		
Watercourse connecting Susan and Marrow Lakes (SUS3)	30	30
Tributary of Simpson Lake (FAR3-SIM2)	20	20
Tributary of Swede Lake (FAR3-A1)	72	72
Watercourse connecting Unnamed South Lake and Farley Lake (FAR5-MAN1)	-20	-20
Tributary of Farley Lake (FAR5-A1)	-10	-10
Southern Tributary of Gordon Lake (FAR7-A1)	-35	-36
Diversion Channel (FAR6)	-25	-16

Table 8-8 Comparison of Estimated Groundwater Discharge to Watercourses and Lakes near the Open Pit Under Baseline and Closure (Pit Full) Conditions (m^3/d) – Gordon Site

Surface Water Feature	Baseline	Closure
Watercourse connecting Marie and Farley Lakes (FAR5-MAR1)	-6.9	-6.9
Watercourse connecting Marie and Farley Lakes (FAR5-MAR3)	3.5	3.5
Northern Tributary of Gordon Lake (FAR7-B1)	-45	-46
Notes: Positive value represents flow from groundwater to surface water Negative value represents flow from surface water to groundwater		

The changes in groundwater levels in the area of the open pit are characterized as adverse, long-term, continuous, irreversible, and will be confined to the LAA/RAA. The magnitude will be low within the PDA and decrease to negligible in the LAA/RAA as the change in groundwater level is less than 1 m. Timing may affect water levels (i.e., natural seasonal variations), particularly during the spring period when higher groundwater levels are expected, but this is not considered a Project-related effect. From an ecological context, the areas where the water level changes occur are disturbed for groundwater availability.

MacLellan Site

Construction

During construction, the Project activities and components that might interact with groundwater quantity and result in an environmental effect (Table 8-5) include: site preparation, construction of mine components, utilities, and infrastructure as described in temporary dewatering for foundations and installation of infrastructure, as well as water development and control at both sites as described under dewatering of the starter open pit.

Temporary Dewatering for Foundations and Installation of Infrastructure

Local changes in infiltration rates through compaction of ground surfaces or construction of infrastructure such as buildings and overburden or topsoil storage areas may result in reduced infiltration within the PDA. Stripping of topsoil, timber harvesting, and removal of vegetation in the PDA will result in changes in evapotranspiration rates and runoff and may result in decreased infiltration rates where impervious surfaces will remain or increased infiltration rates where vegetation is removed. These changes are considered to have a limited effect on groundwater resources due to their limited extent during construction.

Construction earthworks have the potential to encounter groundwater and require water management (i.e., localized dewatering to maintain dry working conditions and/or contact water collection). This could result in limited local changes to groundwater flow direction, and/or lowering of groundwater levels and a potential decrease in discharge to surface water features. Dewatering for foundations and installation of infrastructure will be completed with permission from the Government of Manitoba Water Use Licensing

Section under *The Water Rights Act* if pumping in excess of 25 m^3/d is required. The pumping will be short-term on an as-needed basis and may be required for minor supporting infrastructure for equipment storage and maintenance, and preparation of foundations for the overburden stockpile, ore stockpile, MRSA, and TMF.

With the implementation of mitigation measures presented in Section 8.4.2.2, in particular limiting construction footprint and use of standard management practices including drainage control and excavation, changes to groundwater quantity and flow due to temporary construction dewatering are characterized as adverse, continuous, short-term (e.g., limited to the construction phase and on an as-needed basis), irreversible and will be confined to the PDA. The magnitude is expected to be low because dewatering for typical foundations is expected to be less than 1 m below ground surface. Timing (i.e., natural seasonal variations in precipitation) may affect dewatering rates, particularly during the spring period when higher groundwater levels are expected; however, these variations would not be considered a Project-related effect. The groundwater quantity in the LAA/RAA is disturbed with respect to ecological context.

Dewatering of the Starter Open Pit and Historical Underground Workings, and Operation of TMF

The primary activities that are anticipated to potentially influence groundwater levels and flow during construction include dewatering of the starter open pit and historical underground workings and, to a lesser degree, the initial operation of the TMF. While TMF operation and open pit development will continue during operation, they have been simulated separately in the construction phase to document the potential changes to groundwater levels and flow in the early phase of the Project. Water pumped from the open pit and historical underground workings will be sent to a collection pond and/or the TMF. A portion of the water may be sent to the process plant where it will be used in mill processing prior to being sent to the TMF.

The groundwater inflow rate to the starter open pit during construction was estimated using the groundwater flow model (Volume 5, Appendix G).The groundwater inflow rates are predicted to be initially high (1,063 m^3/d or 12 L/s for the first month), with decreasing flows during the winter months, followed by peak flows associated with the spring freshet. The average annual groundwater inflow rate to the open pit is predicted to be 544 m^3/d (6 L/s) at the end of the construction period.

The predicted drawdown contours at the end of construction period are presented on Map 8-20. In the area of the starter open pit, groundwater levels will be lowered by approximately 1 m or more within 200 m of the pits. The drawdown will extend predominantly south of the open pit due to the constraints of Keewatin River. Map 8-20 also presents the predicted zone of influence of the TMF on groundwater levels compared to baseline conditions. As identified by the -1 m drawdown contour, mounding of the water table (where the water table is higher than baseline conditions) within the area of the TMF is predicted to extend up to 900 m from the limits of the TMF.

Table 8-9 presents the comparison of baseline and construction groundwater discharge to surface water features as a result of starter open pit dewatering and TMF operation at the end of the construction period. These changes relative to baseline conditions are conservative estimates based on the results of the groundwater flow model (Volume 5, Appendix G). As shown in Table 8-9, there is a negligible change in the groundwater discharge to surface water receivers (i.e. less than 86 m^3/d) at the end of construction except for Keewatin River and the Lynn River.

Groundwater discharge to the Keewatin River increases from baseline conditions to the end of construction as a result of the increased horizontal hydraulic gradient to the river due to mounding associated with the TMF. The portion of the Lynn River within the LAA/RAA is predicted to change from receiving groundwater discharge under baseline conditions to being a source of groundwater recharge (i.e., surface water will flow to groundwater) at the end of construction as a result of open pit dewatering. The Lynn River is a boundary condition on the limits of the groundwater flow model, and the change in groundwater discharge to the Lynn River is likely a model artifact since the changes in the groundwater table (Map 8-20) due to open pit dewatering does not extend to the Lynn River, and the predicted change during construction does not extend to operation.

Table 8-9 Comparison of Estimated Groundwater Discharge to Watercourses and Lakes near the Open Pit under Dewatered and Baseline Conditions (m^3/d) – Construction, MacLellan Site

Surface Water Feature	Baseline	End of Construction
Lakes		
Dot Lake	518	518
Minton Lake	259	346
Payne Lake	60	121
Lake 2	95	95
Lake 3	78	78
Rivers and Creeks		
Keewatin River	778	1,296
Lynn River	371	-60
Tributary of Keewatin River connecting with East Pond (Kee3-A1)	-78	-78
Tributary of Keewatin River (Kee3-B1)	<5	<5
Watercourse from East Pond to Tributary of Keewatin River (Kee3-B2-A1)	-86	-86
Watercourse connecting Payne Lake and Keewatin River (Kee3-Pay1)	-69	-60
Notes: Positive value represents flow from groundwater to surface water Negative value represents flow from surface water to groundwater		

During construction, residual environmental effects related to dewatering the historical underground workings and the open pit, as well as operation of the TMF are predicted to occur through the construction phase and extend into the operation and decommissioning/closure phases. The changes to groundwater quantity and flow are characterized as adverse, medium-term, continuous, and irreversible. The magnitude is high within the PDA, and moderate within the LAA/RAA as the change in groundwater level is anticipated to be greater than 5 m. Timing (i.e., natural seasonal variations) may affect dewatering rates, particularly during the spring period when higher groundwater levels are expected; however, these variations would not be considered a Project-related effect. The groundwater quantity in the LAA/RAA is disturbed with respect to ecological context.

Operation

During operation, the Project activities and components that might interact with groundwater quantity and result in an environmental effect (Table 8-5) include: open pit mining, ore processing and the management of tailings, storage/stockpiling of mine rock, and water management. The magnitude of the effect of water management associated with open pit mining and tailings management is greater than that associated with minor changes to groundwater quantity associated with reduced groundwater recharge from the presence of the MRSA.

Dewatering of the Open Pit and Operation of the TMF

The primary Project effect on groundwater quantity and/or flow during operation is the lowering of water levels through continued dewatering of the open pit and mounding of the water table through continued operation of the TMF.

As dewatering progresses with development of the open pit, the average annual groundwater inflow rate to the open pit increases from 518 m^3/d (6 L/s) at the end of the construction period to 3,542 m^3/d (41 L/s) at end of operation. The drawdown or change in water table elevation due to dewatering of the open pit, at end of LOM in comparison to baseline conditions is shown on Map 8-21. Dewatering of the open pit will lower the water table by up to 1 m that extends over an area of approximately 800 m south of the open pit, increasing to more than 10 m within 600 m of the open pit. The induced infiltration of surface water to the shallow overburden and bedrock limits the extent of the drawdown. Map 8-21 also presents the predicted zone of influence of the TMF on groundwater levels compared to baseline conditions. As identified by the -0.5 m drawdown contour, mounding of the water table within the area of the TMF is predicted to extend up to 1,000 m from the limits of the TMF. Drawdown due to the operation of the seepage collection ditches around the perimeter of the TMF and MRSA are predicted to lower the water table up to 1 m in the immediate vicinity of the collection ditches, particularly along the eastern and southern portions of the MRSA. East Pond is anticipated to be dewatered during operation due to the lowering of the water table by up to 5 m and the loss of catchment due to open pit development.

Based on a review of the GWDrill database (Manitoba Conservation and Climate 2015) and discussed in Section 8.2.2.2 there are no known groundwater well users located within the LAA/RAA and therefore, no water supply wells or groundwater withdrawals that supply potable water within the extent of drawdown of the open pit (Map 8-21). As a result, no environmental effect to groundwater quantity and/or flow is predicted from the Project on water supply wells.

Groundwater drawdowns of up to 1 m are predicted to occur beneath wetlands located south of the PDA (Map 8-21) due to the effect of the contact water collection ditches. Mounding of the water table is predicted in the fen located east of the TMF. A discussion of the effects of lowering the water table on wetlands is provided in Chapter 11.

The comparison of groundwater discharge rates with effects of the dewatering the open pit and operation of the TMF at the end of the operation period (i.e., end of mining, mine year 13) are shown on Appendix 8A, Table 8A-10. The operation of seepage collection ditches around the perimeter of the TMF and MRSA were also simulated in the model. The effects of these features on the groundwater discharge to surface water features is included in the groundwater discharge rates presented in Table 8-10 for operation. The seepage collection ditches are predicted to collect 847 m^3/d (10 L/s) of groundwater and will have relatively minor changes to lake baseflows compared to operation without ditches.

The direction of groundwater discharge/recharge for each surface water feature from baseline conditions to end of operation remains consistent except for watercourse Kee3-Pay1, which changes from groundwater discharging into the stream to surface water recharging groundwater. Groundwater discharge to Kee3-Pay1 is the result of mounding of the water table in the area of the TMF, which increases the horizontal hydraulic gradient to Kee3-Pay1.

The rate of groundwater discharge to Payne Lake, Minton Lake, Lake 2, and Lake 3 increases from baseline conditions to the end of operation due to further development of the TMF and 50% saturation of the MRSA, which results in further mounding of the water table in the vicinity of the TMF compared to construction. The mounding of the water table increases the horizontal hydraulic gradient toward these lakes. The rate of groundwater recharge from watercourse Kee3-B2-A1 increases at the end of operation compared to baseline conditions due to dewatering of the open pit. For the remaining watercourses and lakes, the changes to the groundwater discharge rates are relatively small (less than 86 m^3/d) compared to the baseline conditions and the overall anticipated flow rates in the surface water features. The effect of changes in groundwater discharge on surface water levels and flow is evaluated in the effects assessment for surface water (Chapter 9).

Table 8-10 Comparison of Estimated Groundwater Discharge to Watercourses and Lakes near the Open Pit and TMF under Dewatered and Baseline Conditions (m^3/d) – Operation, MacLellan Site (with 2 m deep seepage collection ditches)

Surface Water Feature	Baseline	Operation
Lakes		
Dot Lake	518	518
Minton Lake	259	518
Payne Lake	60	328
Lake 2	95	190
Lake 3	78	225
Rivers and Creeks		
Keewatin River	778	691
Lynn River	372	518
Tributary of Keewatin River connecting with East Pond (Kee3-A1)	-78	-52
Tributary of Keewatin River (Kee3-B1)	<5	<5

Table 8-10 Comparison of Estimated Groundwater Discharge to Watercourses and Lakes near the Open Pit and TMF under Dewatered and Baseline Conditions (m^3/d) – Operation, MacLellan Site (with 2 m deep seepage collection ditches)

Surface Water Feature	Baseline	Operation
Watercourse from East Pond to Tributary of Keewatin River (Kee3-B2-A1)	-86	-354
Watercourse connecting Payne Lake and Keewatin River (Kee3-Pay1)	-69	190
Seepage Collection Ditches	n/a	847
Notes: Positive value represents flow from groundwater to surface water Negative value represents flow from surface water to groundwater n/a: not applicable		

The lowering of water levels through continued dewatering of the open pit, and the operation of the TMF (including seepage collection ditches) will result in a change in groundwater quantity and flow at the site. This change is characterized as adverse, medium-term, continuous, irreversible, and will be confined to the LAA. The magnitude is high within the PDA, and low within the LAA/RAA as the change in groundwater level is less than 5 m and 1 m, respectively. The magnitude will be reduced during decommissioning/closure as the open pit and historical underground workings fill to form a pit lake; however, some local drawdown will remain in the vicinity of the open pit as discussed under decommissioning/closure. Timing (i.e., natural seasonal variations in precipitation) may affect dewatering rates due to natural seasonal variations, particularly during the spring period when higher groundwater levels are expected; however, these variations would not be considered a Project-related effect. The groundwater quantity in the LAA/RAA is disturbed with respect to ecological context.

Decommissioning/Closure

Following completion of operation, dewatering of the open pit will cease, and water levels will begin to rise within the open pit to a maximum water elevation of 330 m amsl, which reflects the local groundwater table at closure.

The simulated drawdown in comparison to baseline conditions with the pit lake stage of 330 m amsl, recharge rates for the MRSA increased to steady state infiltration rates, and operation of the seepage collection ditches are presented on Map 8-22. As shown, at the end of closure, the water table is predicted to return to near baseline conditions in the vicinity of the open pit. The mounding of the water table is limited by the seepage collection ditches around the perimeter of the TMF and MRSA. Mounding of the water table is confined to the footprint of the TMF and MRSA as well as the fen located east of the MRSA. Drawdown due to the presence of the seepage collection ditches around the perimeter of the TMF and MRSA is predicted in the direct vicinity of the collection ditches, specifically located along the eastern and southern portions of the MRSA. Map 8-23 presents the simulated drawdown in comparison to baseline conditions with the decommissioning of the seepage collection ditches around the MRSA and TMF for comparison.

Without the seepage collection ditches, the mounding of the water table extends up to 2,400 m from the limits of the TMF. As the groundwater level returns to near baseline conditions, it is anticipated that at least a portion of East Pond may refill. A discussion of the effects of the change in water table on wetlands is provided in Chapter 11.

Table 8-11 presents the comparison of baseline groundwater discharge rates with effects of the pit lake and closure of the TMF on the baseflow of watercourses and lakes at closure (i.e., after the pit lake is full). The operation and decommissioning/closure of the seepage collection ditches around the perimeter of the TMF and MRSA were simulated in the model because the seepage collection ditches will not be decommissioned until the water quality meets applicable regulatory discharge criteria. The seepage collection ditches are predicted to collect 899 m^3/d (10 L/s) of groundwater while operating during decommissioning/closure and will have relatively minor changes to lake baseflows compared to the closure simulation without ditches.

The groundwater flows to the receptors are predicted to return to near baseline rates once the pit is full except for Payne Lake, Lake 3, Kee3-B2-A1, and Kee3-Pay1. Watercourse Kee3-Pay1 will continue to receive groundwater (groundwater discharge) through decommissioning/closure in comparison to baseline conditions where surface water recharged groundwater (groundwater recharge). The change of Kee3-Pay1 from a groundwater recharge feature in baseline conditions to a groundwater discharge feature during operation and closure is the result of mounding of the water table in the area of the TMF, which increases the horizontal hydraulic gradient to Kee3-Pay1. The rate of groundwater discharge to Payne Lake and Lake 3 also increases during closure relative to baseline as a result of mounding of the water table in the area of the TMF. The increase in the rate of groundwater recharge from watercourse Kee3-B2-A1 remains through closure in comparison to baseline conditions. For the remaining watercourses and lakes, the predicted changes to the groundwater flow rates are relatively small (less than 86 m^3/d) compared to the overall anticipated flow rates in the surface water features. The effect of changes in groundwater discharge on surface water levels and flow is evaluated in the effects assessment for surface water (Chapter 9).

The changes in groundwater levels during decommissioning/closure are characterized as adverse, long-term, continuous, irreversible, and will be confined to the LAA/RAA. The magnitude will be low within the PDA and decrease to negligible in the LAA/RAA as the change in groundwater level is less than 1 m. Timing may affect water levels (i.e., natural seasonal variations), particularly during the spring period when higher groundwater levels are expected, but this is not considered a Project-related effect. From an ecological context, the areas where the water level changes occur are disturbed for groundwater availability.

Table 8-11 Comparison of Estimated Groundwater Discharge to Watercourses and Lakes near the Open Pit under Baseline and Closure (Pit Full) Conditions (m^3/d) – MacLellan Site (with 2 m deep seepage collection ditches)

Surface Water Feature	Baseline	End of Closure (with 2 m deep seepage collection ditches)	End of Closure (without ditches)
Lakes			
Dot Lake	518	518	518
Minton Lake	259	259	518
Payne Lake	60	242	328
Lake 2	95	138	190
Lake 3	78	199	225
Rivers and Creeks			
Keewatin River	778	769	691
Lynn River	372	492	518
Tributary of Keewatin River connecting with East Pond (Kee3-A1)	-78	-26	-52
Tributary of Keewatin River (Kee3-B1)	<5	<5	<5
Watercourse from East Pond to Tributary of Keewatin River (Kee3-B2-A1)	-86	-354	-354
Watercourse connecting Payne Lake and Keewatin River (Kee3-Pay1)	-69	216	190
Seepage Collection Ditches	n/a	899	0

Notes:
Positive value represents flow from groundwater to surface water
Negative value represents flow from surface water to groundwater
n/a: not applicable

8.4.3 Assessment of Change in Groundwater Quality

8.4.3.1 Project Pathways for Change in Groundwater Quality

Gordon Site

Construction

During construction, in the absence of mitigation, dewatering of the historical Wendy and East pits and local dewatering for the installation of foundations has the potential to change groundwater flow patterns and discharge and subsequently the mass loading of parameters from groundwater to surface water. Groundwater recharge from the historical MRSAs may be redirected to the open pit where it will be pumped to a settling pond prior to discharge to the environment. Treatment will be implemented, if required, to meet regulatory discharge criteria prior to discharge to the environment. Potential effects to surface water features and wetlands from the change in quality of groundwater discharge are assessed in Chapters 9 and 11, respectively.

Operation

During operation, in the absence of mitigation, groundwater recharge from the MRSA and historical MRSAs have the potential to affect groundwater and surface water quality where groundwater discharges to surface water receivers. During operation, dewatering of the open pit will result in a change in groundwater flow patterns and will redirect groundwater recharge originating from the MRSA and historical MRSAs to the open pit, where it will be collected and pumped to a settling pond prior to discharge to the environment. Treatment will be implemented, if required, to meet regulatory discharge criteria prior to discharge to the environment. The changing groundwater flow patterns as a result of pumping, may affect the quality of groundwater discharging to surface water features and wetlands from the MRSA and historical MRSAs. Potential effects to surface water features and wetlands from the change in quality of groundwater discharge are assessed in Chapters 9 and 11, respectively.

Changes to groundwater quality resulting from groundwater recharge from the MRSA and historical MRSAs, and changing groundwater flow patterns, may affect local groundwater users, if users are located within the predicted zone of influence.

Decommissioning/Closure

During decommissioning/closure, as the open pit fills, groundwater levels are predicted to slowly recover, and the groundwater flow patterns will return to near baseline conditions once the open pit is filled. The change in groundwater flow patterns as a result of filling the open pit has the potential to affect surface water quality where groundwater recharge originating from the MRSA and historical MRSAs discharges to surface water features and wetlands. Potential effects to surface water features and wetlands from the change in quality of groundwater discharge are assessed in Chapters 9 and 11, respectively.

MacLellan Site

Construction

During construction, in the absence of mitigation, dewatering of the historical underground working and starter open pit and local dewatering for the installation of utilities and buildings and dam foundations for the TMF have the potential to change groundwater flow patterns and discharge and subsequently the mass loading of parameters from groundwater to surface water. Groundwater recharge from the MRSA and TMF has the potential to affect groundwater and surface water quality where groundwater discharges to surface water. Potential effects to surface water features and wetlands from the change in quality of groundwater discharge are assessed in Chapters 9 and 11, respectively.

Operation

During operation, in the absence of mitigation, groundwater recharge from the MRSA and TMF have the potential to affect groundwater quality and surface water quality where groundwater discharges to surface water receivers. During operation, dewatering of the open pit and historical underground workings will result in a change in groundwater flow patterns and will redirect groundwater recharge originating from the MRSA and the TMF to the open pit, where it will be collected and pumped to a collection pond and/or the TMF. Pumped water may be sent to the process plant and used for mill processing prior to being sent to the TMF with tailings. Treatment will be implemented, if required, to meet regulatory discharge criteria prior to discharge to the environment. These changes may affect the quality of groundwater discharging to surface water features and wetlands from the MRSA and TMF. Potential effects to surface water features and wetlands from the change in quality of groundwater discharge are assessed in Chapters 9 and 11, respectively.

Changes to groundwater quality resulting from groundwater recharge from the MRSA and TMF, and changing groundwater flow patterns, may affect local groundwater users if users are located within the predicted zone of influence.

Decommissioning/Closure

During decommissioning/closure, as the open pit fills, groundwater levels are predicted to slowly recover and the effect of the open pit on groundwater flow and discharge will be less than during operation. With the filling of the open pit, groundwater flow will return to near baseline conditions in areas away from the open pit and TMF; changes to groundwater flow patterns has the potential to affect surface water quality where groundwater recharge originating from the TMF and MRSA discharges to surface water. Potential effects to surface water features and wetlands from the change in quality of groundwater discharge are assessed in Chapters 9 and 11, respectively.

8.4.3.2 Mitigation

The implementation of the mitigation measures and other commitments described in this section will be the responsibility of Alamos and or contractors. The mechanisms used to require contractors and subcontractors to comply with these measures will include environmental protection plans and contract documents.

Mitigation measures proposed are generally considered to be industry standards and are effective for use in similar applications and environmental conditions. This assessment is based on professional judgment of engineers and scientists in consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited in the text below where applicable to justify the selection.

Detailed design of the Project and mitigation strategies is currently ongoing. Mitigation measures will be refined in consideration of environmental assessment approval conditions and permit stipulations which will be incorporated into final environmental management planning. The effectiveness of these mitigation measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs including adaptive management procedures will be reviewed by applicable regulatory agencies prior to their implementation.

Gordon Site

The following mitigation measures are proposed to avoid or reduce Project-related effects on groundwater quality:

- Limit construction footprint (i.e., PDA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the PDA.
- Intercept groundwater flowing into the open pit prior to discharge at the pit wall and return the water generated from pumping groundwater interceptor wells to Gordon and Farley lakes to offset a reduction in groundwater discharge.
- Design of the MRSA to increase the amount of runoff and reduce the amount of infiltration through the MRSA, thereby reducing the recharge and loading to groundwater.
- Installation of contact water collection ditches around the overburden storage area, ore stockpile, and MRSA to collect toe seepage and groundwater recharge from these Project components.

The groundwater interceptor wells are considered an integral part of the open pit dewatering strategy and are therefore included in the effects assessment as mitigation. For the purposes of this effects assessment, and to maintain a conservative approach, the collection of groundwater within the contact water collection ditches around the overburden storage area, ore stockpile, and MRSA was not considered as a mitigation measure in the modelling and water quality predictions. As well, no reduction in recharge through the MRSA was assumed as a result of rehabilitation. In addition to the mitigation measures to reduce potential environmental effects, Alamos is also committed to follow-up and monitoring, and adaptive management as outlined in Chapter 23.

MacLellan Site

The following mitigation measures are proposed to avoid or reduce Project-related effects on groundwater quality:

- Limit construction footprint (i.e., PDA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the PDA.
- Design of the MRSA to increase the amount of runoff and reduce the amount of infiltration through the MRSA, thereby reducing the recharge and loading to groundwater.
- Installation of contact water collection ditches around the overburden storage area, ore stockpile, MRSA, and TMF to collect toe seepage and groundwater recharge from these Project components.

Seepage collection is an integral component of the MRSA and TMF design and are therefore included in the effects assessment as mitigation. For the purposes of the effects assessment, and to maintain a conservative approach, no reduction in recharge through the MRSA was assumed as a result of rehabilitation. In addition to the mitigation measures to reduce potential environmental effects, Alamos is also committed to follow-up and monitoring, and adaptive management as outlined in Chapter 23.

8.4.3.3 Project Residual Effects

Gordon Site

Construction

During construction, the Project activities that might interact with groundwater quality and result in an environmental effect (Table 8-5) are related to site preparation, construction of mine components (e.g. removal of a portion of historical south MRSA), and water management and control activities.

Recharge through the remaining historical north and south MRSAs has the potential to affect groundwater quality during construction. As the starter open pit develops, a portion of the historical south MRSA that is located within the footprint of the open pit (Map 8-3) will be removed and placed in a controlled manner within the new MRSA. In total, the waste rock occupying 37% of the footprint of the historical south MRSA will be removed and placed within the new MRSA during construction. The relocation of the historical south MRSA to the new MRSA will increase the travel time of seepage from relocated waste rock due to being placed further from the open pit. The relocation of the waste rock material will result in a reduction in the potential mass loading from the historical south MRSA to surface water features where groundwater discharge is predicted (e.g., historical East and Wendy pits, Farley Lake). The duration of time for the new MRSA to reach a steady-state saturation condition, where the volume of water infiltrating into the MRSA from precipitation will result in an equal amount of seepage or recharge out the base of the MRSA, is expected to be longer than the duration of the construction phase of the Project (Volume 5, Appendix F). Therefore, seepage from the new MRSA and subsequently effects to groundwater quality resulting from recharge through the new MRSA, is not predicted during the construction phase of the Project.

The dewatering of the historical East and Wendy pits and the mitigation of pit inflows through the use of groundwater interceptor wells will influence groundwater flow patterns and redirect groundwater recharge originating from the historical MRSAs to the historical pits and interceptor wells, where it will be pumped to a settling pond prior to discharge to the environment. Treatment will be implemented, if required, to meet regulatory discharge criteria prior to discharge to the environment. These changes in groundwater flow patterns may affect the mass loading of groundwater discharging to surface water features and wetlands from the historical MRSAs compared to baseline conditions.

Groundwater recharge from the historical north and south MRSAs during construction is assumed to be the same quality as under baseline conditions, as estimated from monitoring data collected between 2015 and 2019 (Section 8.2.2.6 and Appendix 8A, Table 8A-3). Appendix 8A, Table 8A-8 provides a summary of mean concentrations for groundwater originating from the historical MRSAs at the end of construction. Indicator parameters for groundwater quality associated with the mine components were determined by comparing the groundwater quality of the component to groundwater thresholds for drinking water, GCDWQ and MWQSOG (drinking water) and groundwater thresholds for the discharge of groundwater to surface water (GW3). The CWQG-FAL and MWQSOG-FAL are surface water criteria provided for reference and evaluated in Chapter 9. As summarized in Section 8.2.2.6, pH, sulphate, and iron were identified as indicator parameters for the historical MRSAs. Concentrations of pH, sulphate, and iron exceeded the GCDWQ and MWQSOG (drinking water). Although the concentration of manganese exceeded the GCDWQ and MWQSOG (drinking water), it was not carried forward as a water quality indicator parameter for the historical MRSAs because it was noted to exceed in background (not affected) areas. No other parameters exceeded the GCDWQ and MWQSOG (drinking water) and no parameters exceeded the GW3 criteria.

The fate of groundwater that recharges beneath the historical MRSAs was determined with the groundwater flow model (Volume 5, Appendix F) by conducting particle tracking. The particle traces at the end of construction are presented on Map 8-24 (including the effect of operating the groundwater interceptor wells) and show the predicted flow pathway of groundwater seepage, with potentially elevated concentrations of indicator parameters above the drinking water guidelines, from the MRSAs. The predicted flow pathway of seepage from the historical MRSAs at the end of construction is confined to similar flow paths with similar groundwater quality as in baseline conditions (Map 8-15).

The particle traces were also used to quantify the inflow rates and advective travel times to the dewatered historical open pits and discharge to surface water features from each historical MRSA and are presented in Appendix 8A Table 8A-9. No reductions in groundwater discharge rates were included for the contact water collection system at the MRSA, ore stockpile, and overburden storage area, which is a conservative approach to predicting groundwater quality. The groundwater recharge from beneath the historical north MRSA is consistent in baseline and operation at about 1 m^3/d but is redirected from Gordon Lake and captured by the interceptor wells during construction, with a mean advective travel time of less than 1 year. The groundwater recharge from beneath the historical south MRSA is redirected from Farley Lake and discharges to the historical East and Wendy pits during construction, with a mean advective travel time of 1 year or less. Groundwater recharge from the historical south MRSA is reduced from 12 m^3/d in baseline to 2.6 m^3/d at the end of construction, a 79% reduction, as a result of relocation of a portion of the historical south MRSA. Overall, recharge through the historical MRSAs is small in both baseline and construction phases of the Project and represents only a fraction of the total flow of the given receivers as highlighted in Chapter 9.

No groundwater supply wells are known to be located in the PDA and groundwater originating from the historical MRSAs is predicted to discharge to surface water and not to areas where groundwater supply users are known to be located. The effect of the changes in mass loading to surface water receivers on surface water quality, is assessed in Chapter 9.

The residual effect on groundwater quality during construction is characterized as positive, as no new source of groundwater mass loading is introduced during construction, a portion of the historical south MRSA is relocated, and the seepage from the historical MRSAs is redirected from Gordon and Farley Lake to the open pit. The residual effect will be short-term, continuous, irreversible, and will be confined to the LAA/RAA, and mainly to the PDA. The magnitude is moderate because water quality and loading for most parameters are predicted to result in temporary improvements to groundwater quality within the LAA/RAA relative to baseline conditions. No existing or foreseeable groundwater users are located in the areas with groundwater quality that exceeds the GCDWQ or MWQSOG (drinking water). The ecological context of the LAA/RAA is disturbed based on existing parameter loadings from historical mining activities.

Operation

During operation, the Project activities and components that might interact with groundwater quality and result in an environmental effect (Table 8-5) include: open pit mining, stockpiling of mine rock, and water development and control activities (dewatering of the open pit and operation of the interceptor wells, which change seepage pathways from mine components).

During operation, the MRSAs (historical and new) have the potential to affect groundwater quality. Appendix 8A, Table 8A-8 provides a summary of mean concentrations for groundwater recharge originating from these sources at the end of operation. It is estimated to take 17 to 28 years for the new MRSA to reach a steady-state saturation condition, where the volume of water infiltrating into the MRSA from precipitation will result in an equal amount of seepage or recharge out the base of the MRSA (Volume 5, Appendix F). To account for the 17 to 28-year wetting time, the recharge rate from the new MRSA was set at 50% of the infiltration rate during operation.

The groundwater concentrations for the historical north and south MRSAs are assumed to be the same quality as under baseline conditions (Section 8.2.2.6 and Appendix 8A, Table 8A-3) and the concentrations for the new MRSA were estimated from the Gordon site water balance and water quality model (Volume 5, Appendix D). Groundwater concentrations of seepage from the new MRSA were simulated under two scenarios: expected and sensitivity. The expected scenario was simulated using concentration data from field bin testing of waste rock scaled up assuming that a normal climate year controls pore water volume and flows through the new MRSA. The sensitivity scenario was simulated with concentration data from field bin testing of waste rock, scaled up assuming that a 25-year dry climate year controls pore water volume and flows through the MRSA. The 25-year dry climate year condition is predicted to be worst case for seepage quality as less porewater would result in higher concentrations of parameters in seepage from the MRSA compared to a wet year with more porewater that would result in faster flow through the MRSA. The expected simulation of groundwater recharge quality from Project components is evaluated as part of the groundwater quality effects assessment with the results of the sensitivity simulation presented for reference.

As summarized in Section 8.2.2.6, sulphate and iron were selected as water quality indicator parameters for the historical MRSAs, meaning elevated concentrations of sulphate and iron above the drinking water criteria may be observed along the flow groundwater path of seepage from the historical MRSAs.

Groundwater recharge from the MRSA during operation is predicted to be below the MDMER (Appendix 8A, Table 8A-3). Expected mean concentrations in groundwater recharge from the MRSA are predicted to exceed the GCDWQ, MWQSOG, CWQG-FAL, and/or GW3 for the following parameters (Appendix 8A, Table 8A-3):

- GCDWQ: sulphate, antimony, arsenic, sodium, uranium.
- MWQSOG Drinking Water: sulphate, antimony, arsenic, sodium, uranium.

- MWQSOG-FAL: fluoride, selenium, uranium.
- CWQG-FAL: fluoride, arsenic, copper, selenium, uranium.
- GW3: no parameters.

The GCDWQ, MWQSOG (drinking water), and GW3 were used to identify indicator parameters of groundwater seepage from the Gordon site MRSA, although groundwater originating from the MRSA is predicted to discharge to either the open pit or surface water. No parameters evaluated are predicted to exceed the GW3 criteria. The indicator parameters for the MRSA during operation are identified as sulphate, antimony, arsenic, sodium, and uranium, meaning elevated concentrations of these parameters above the drinking water guidelines may be introduced along the flow path from the MRSA to the ultimate receiver compared to baseline conditions. Exceedances of the MWQSOG-FAL and CWQG-FAL are addressed in Chapter 9, as they are not directly applicable to groundwater, but have been provided for reference.

No additional parameters are predicted to exceed the GCDWQ and/or MWQSOG (drinking water) in seepage from the MRSA simulated under the sensitivity scenario except for nitrate+nitrite. No additional parameters are predicted to exceed the CWQG-FAL and/or MWQSOG-FAL in seepage from the MRSA simulated under the sensitivity scenario except for copper. The concentrations generated from the sensitivity scenario are based on conditions representative of limited duration; the predicted concentrations for the sensitivity scenario are provided for reference as elevated concentrations of these parameters in seepage originating from the MRSA may be predicted under particular climatic conditions. The effect of the groundwater discharge on surface water quality for the sensitivity scenario, including the parameters predicted to exceed the CWQG-FAL and/or MWQSOG-FAL, is presented in Chapter 9.

The groundwater flow model (Volume 5, Appendix F) was used to determine the flow pathway, discharge location, and flux of water recharging the groundwater flow system from beneath the MRSAs, similar to during construction. Map 8-25 presents the particle traces from the MRSA and historical MRSAs at the end of operation, at the ultimate extent of the open pit under fully dewatered conditions (Year 6). The predicted groundwater flow pathway of seepage from the historical MRSA at the end of operation is confined to similar flow paths with similar groundwater quality as in baseline conditions (Map 8-15). The predicted groundwater flow pathway of seepage from the MRSA at the end of operation is toward the open pit and Susan Lake, where elevated concentrations of indicator parameters, sulphate, antimony, arsenic, sodium, and uranium, above the drinking water guidelines, may be introduced relative to baseline conditions.

Table 8-A9 (Appendix 8A) provides a summary of the discharge fluxes and advective travel times of recharge originating from the historical MRSAs and MRSA once the ultimate extent of the open pit has been fully dewatered. No reductions in groundwater discharge rates were included for the contact water collection system at the MRSA, ore stockpile, and overburden storage area, which is a conservative approach to predicting groundwater quality. Continuing from construction and through to the end of operation, groundwater recharge originating from the historical MRSAs that discharged to Gordon Lake and Farley Lake is redirected to the open pit and interceptor wells. Groundwater recharge from beneath the historical north MRSA discharges to the interceptor wells at a rate of 0.95 m^3/d, with a mean advective travel time of less than 19 years. The groundwater recharge rate from the historical north MRSA is

consistent through baseline, construction, and operation. Groundwater recharge from beneath the historical south MRSA discharges to the open pit at a rate of 7.9 m^3/d with a mean advective travel time of less than 4 years. The total recharge from the historical south MRSA is slightly greater than construction as the groundwater level in the area of the open pit is lowered and the hydraulic gradient is increased as a result of dewatering the open pit. The total recharge from the historical south MRSA is less than predicted during baseline because a portion of the historical south MRSA is relocated to the new MRSA during construction to facilitate development of the open pit. The majority (i.e., 97%) of the recharge from the new MRSA, which is located farther from the open pit than the historical MRSAs, discharges to the open pit at a rate of 53 m^3/d, with a mean advective travel time of approximately 300 years. The balance of recharge (3%) from the new MRSA discharges to Susan Lake at a rate of 1.6 m^3/d with a mean advective travel time of approximately 900 years. The new MRSA is located south of the East and Wendy faults (Map 8-12) where the hydraulic conductivity of bedrock is characterized as an order of magnitude lower. The long advective travel times from the new MRSA to the point of discharge relative to the historical MRSAs is reflective of the hydraulic conductivity of the bedrock and the longer flow paths to the point of discharge.

Groundwater pumped from the interceptor wells will be returned to Gordon and/or Farley lakes to mitigate effects of pit dewatering on lake levels. Groundwater from the open pit will be pumped to a settling pond prior to discharge to the environment. Treatment will be implemented, if required, to meet regulatory discharge criteria prior to discharge to the environment.

No groundwater supply wells are known to be located in the PDA and groundwater originating from the MRSAs (historical and new) is predicted to discharge to the open pit and/or surface water and not to areas where groundwater supply users are known to be located. The effect of the changes in mass loading to surface water receivers on surface water quality, is assessed in Chapter 9.

The effects on groundwater quality during operation are characterized as adverse, long-term, continuous, irreversible, are confined to the LAA/RAA, and mainly to the PDA. The magnitude is moderate because water quality and loading for some parameters are predicted to increase but will not impact groundwater supply users beyond the PDA. For parameters predicted to increase in concentrations relative to baseline conditions, they are expected to remain below the GW3 at the point of discharge as the parameters undergo precipitation and adsorption reactions along the groundwater flow path. No existing or foreseeable groundwater users are located in the areas with groundwater quality that exceeds the GCDWQ or MWQSOG (drinking water). The ecological context of the LAA/RAA is currently disturbed based on existing parameter loadings from historical mining activities.

Decommissioning/Closure

During decommissioning/closure, as the open pit fills, groundwater levels will slowly recover, and the groundwater flow patterns will return to near baseline conditions once the open pit is filled. The groundwater interceptor wells are assumed to continue to operate during the initial stages of decommissioning/closure, followed by a decrease in the pumping rate over time as the pit level stage is increased so that the pumping does not interfere with the water level of the open pit. Rehabilitation of the MRSA by installation of a soil cover (Appendix 23B) may reduce infiltration and improve water quality over time. In the effects assessment, limited reductions in recharge due to the installation of the soil cover has been included for the MRSA (Volume 5, Appendix F). For the MRSA, the amount of groundwater recharge was increased in closure by 50%, as the MRSA is assumed to reach fully saturated conditions with all infiltration, resulting in either toe seepage or groundwater recharge (Volume 5, Appendix F). Appendix 8A, Table 8A-8 provides a summary of mean concentrations of groundwater recharge originating from the MRSAs (historical and new) at the end of closure, after the pit lake has formed. The groundwater concentrations for the historical north and south MRSAs are assumed to be the same quality as under baseline conditions (Section 8.2.2.6 and Appendix 8A, Table 8A-3) and the concentrations for the new MRSA were estimated from the Gordon site water balance and water quality model (Volume 5, Appendix D).

As summarized in Section 8.2.2.6, pH, sulphate, and iron were selected as water quality indicator parameters associated with the historical MRSAs, meaning elevated pH and concentrations of sulphate and iron above the drinking water criteria may be introduced along the groundwater flow path of seepage from the historical MRSAs to the ultimate receiver compared to baseline conditions.

Groundwater recharge from the MRSA during operation is predicted to be below the MDMER (Appendix 8A, Table 8A-3). Expected mean concentrations in groundwater recharge from the MRSA are predicted to exceed the GCDWQ, MWQSOG (drinking water and FAL), CWQG-FAL, and/or GW3 for the following parameters (Appendix 8A, Table 8A-3):

- GCDWQ: sulphate, antimony, arsenic, sodium, uranium.
- MWQSOG Drinking Water: sulphate, antimony, arsenic, sodium, uranium.
- MWQSOG-FAL: fluoride, copper, selenium, silver, thallium, uranium.
- CWQG-FAL: fluoride, arsenic, copper, selenium, thallium, uranium.
- GW3: no parameters.

The indicator parameters for the MRSA remain similar to operation, which are sulphate, antimony, arsenic, sodium, and uranium.

In addition to the above parameters, mean concentrations in groundwater recharge from the MRSA simulated under the sensitivity scenario are predicted to also exceed the GCDWQ and/or MWQSOG (drinking water) for manganese and selenium. Mean concentrations in groundwater recharge from the MRSA simulated under the sensitivity scenario are predicted to exceed the CWQG-FAL and/or MWQSOG-FAL for the same parameters as the expected case that is listed above. The concentrations generated from the sensitivity scenario are based on conditions representative of limited duration; the predicted concentrations for the sensitivity scenario are provided for reference as elevated concentrations of these parameters in seepage originating from the MRSA may be predicted under particular climatic conditions. The effect of the groundwater discharge on surface water quality for the sensitivity scenario is presented in Chapter 9.

The groundwater model (Volume 5, Appendix F) was used to simulate the effects of the Project during decommissioning/closure on groundwater levels and flow and the fate of groundwater originating from the MRSAs (historical and new). Map 8-26 presents the particle traces from the MRSA and historical MRSAs at the end of closure when the pit lake is full. The predicted groundwater flow path of seepage from the historical MRSA at the end of closure is confined to similar flow paths with similar groundwater quality as in baseline conditions (Map 8-15). The predicted groundwater flow pathway of seepage from the MRSA at the end of closure is toward the pit lake and Susan, Gordon and Farley lakes where elevated concentrations of indicator parameters, sulphate, antimony, arsenic, sodium, uranium, above the drinking water guidelines, may be introduced relative to baseline conditions. The groundwater flow pathway from the MRSA in decommissioning/closure captures a larger area of the PDA compared to the end of operation.

Table 8A-9, Appendix 8A provides a summary of the discharge fluxes and advective travel times of recharge originating from the MRSAs once the pit lake has formed and groundwater levels have recovered to near baseline conditions. No reductions in groundwater discharge rates were included for the contact water collection system at the MRSA, ore stockpile, and overburden storage area which is a conservative approach to predicting groundwater quality.

As the open pit fills, the inflow rates will slowly decline reaching steady state conditions, at which point the stage of the open pit will generally reflect the local water table given that there is no discharge outlet for the pit lake. Once the pit lake has filled, the groundwater recharge from the historical north MRSA will return to baseline conditions and discharge to Gordon Lake. Fifty-two percent (52%) of the groundwater recharge from the historical south MRSA will continue to discharge to the pit lake, with the balance discharging predominantly to Farley Lake (47%). Groundwater discharge from the MRSA will continue to discharge to the pit lake (40%) and Susan Lake (33%) in addition to Gordon Lake (7%) and Farley Lake (20%). The minimum and mean advective travel times from the MRSAs (historical and new) to the point of discharge are all greater than 100 years except for the historical south MRSA. The minimum advective travel time from the historical south MRSA to the pit lake and Farley Lake is less than 1 year with the mean advective travel time increasing to greater than 800 years.

No groundwater supply wells are known to be located in the PDA and groundwater originating from the MRSAs (historical and new) is predicted to discharge to surface water and/or the pit lake, and not to areas where groundwater supply users are known to be located. The effect of the changes in mass loading to surface water receivers on surface water quality, is assessed in Chapter 9.

The effects on groundwater quality during closure are characterized as adverse, long-term, continuous, irreversible, are confined to the LAA/RAA, and mainly to the PDA. The magnitude is moderate as water quality and loading for some parameters are predicted to increase above the GCDWQ or MWQSOG (drinking water) but will not impact groundwater supply users beyond the PDA. For parameters predicted to increase in concentrations relative to baseline conditions, they are expected to remain below the GW3 at the point of discharge as the parameters undergo precipitation and adsorption reactions along the groundwater flow path. No existing or foreseeable groundwater users are located in the areas with groundwater quality that exceeds the GCDWQ or MWQSOG (drinking water). The ecological context of the LAA/RAA is currently disturbed based on existing parameter loadings from historical mining activities.

MacLellan Site

Construction

During construction, the Project activities that might interact with groundwater quality and result in an environmental effect (Table 8-5) are related to site preparation, construction of mine components (e.g. removal of the historical MRSA), and water management and control activities.

Construction activities at the MacLellan site are anticipated to begin Mine Year -2 with the construction of the initial phases of the TMF and new MRSA. Recharge through the TMF and MRSA have the potential to affect groundwater quality during construction. As the starter open pit develops through construction, the historical MRSA will be removed and placed within the new MRSA. Therefore, the effect of the historical MRSA on groundwater quality throughout the life of the Project is not assessed.

Dewatering of the historical underground workings and starter open pit and local dewatering for the installation of buildings, utilities and foundations for the TMF have the potential to change groundwater flow patterns and redirect groundwater recharge originating from the initial development of the MRSA and TMF to the starter open pit and contact water collection ditches where it will be pumped back to the TMF and/or to a settling pond prior to discharge to the environment. Treatment will be implemented, if required, to meet regulatory discharge criteria prior to discharge to the environment.

The duration of time for the MRSA to reach steady-state saturation condition, where the volume of water infiltrating into the MRSA from precipitation will result in an equal amount of seepage or recharge out the base of the MRSA, is expected to be longer than the duration of the construction phase of the Project (Volume 5, Appendix G). Therefore, seepage from the MRSA and subsequently effects to groundwater quality resulting from recharge through the MRSA, is not predicted during the construction phase of the Project.

The fate of groundwater that recharges beneath the TMF was determined with the groundwater flow model (Volume 5, Appendix G) by conducting particle tracking. The particle traces at the end of construction are presented on Map 8-27 assuming no contact water collection system operating.

As shown in Appendix 8A, Table 8A-10, none of the particles that originate in the TMF are predicted to arrive at receptors during the two-year construction period, except for Payne Lake. As the particle traces are used to quantify the inflow rates to the open pit and discharge to surface water features from the TMF, but no particles arrived within the construction period, the predicted groundwater discharge and subsequent mass loading to the receptors originating from these areas during the construction period are estimated to be negligible, except for Payne Lake. Given that the majority of particle traces from the TMF to Payne Lake arrive after the construction period, the predicted mass loading to Payne Lake originating from the TMF during construction period are estimated to be negligible.

As described in Section 8.2.2.6, sulphate and arsenic were identified as indicator parameters for the historical MRSA. As the historical MRSA will be removed during construction of the starter open pit and relocated to the new MRSA, the mass loading of these indicator parameters from the historical MRSA (refer to Section 8.2.2.7) will be removed during the construction phase of the Project.

No groundwater supply wells are known to be located in the PDA and groundwater originating from the TMF is not predicted for areas where groundwater supply users are known to be located. The effect of the changes in mass loading to surface water receivers on surface water quality, is assessed in Chapter 9 and is essentially negligible because recharge from the TMF to groundwater is not predicted to discharge to surface water receivers during the construction phase of the Project.

The residual effects on groundwater quality during construction are characterized as positive as no new source of groundwater mass loading is introduced during construction and the historical MRSA is relocated during construction. The residual effect will be short-term, continuous, irreversible, and will be confined to the LAA/RAA, and mainly to the PDA. The magnitude is moderate because water quality and loading from the relocation of the historical MRSA are predicted to result in temporary improvements to groundwater quality within the LAA/RAA relative to baseline conditions. No existing or foreseeable groundwater users are located in the areas with groundwater quality that exceeds the GCDWQ or MWQSOG (drinking water). The ecological context of the LAA/RAA is disturbed based on existing parameter loadings from historical mining activities.

Operation

During operation, the Project activities and components that might interact with groundwater quality and result in an environmental effect (Table 8-5) include: open pit mining, stockpiling of mine rock, ore milling processing, and tailings management, and water development and control activities (dewatering of the open pit, which change seepage pathways from mine components).

During operation, recharge from the MRSA and the TMF have the potential to affect groundwater quality. It is estimated to take 17 to 28 years for the MRSA to reach a steady-state saturation condition, where the volume of water infiltrating into the MRSA from precipitation will result in an equal amount of seepage or recharge out the base of the MRSA (Hydrogeology TMR – Gordon Site; Volume 5, Appendix C). To account for the 17 to 28-year wetting time, the recharge rate from the MRSA was set at 50% of the infiltration rate during operation.

Appendix 8A, Table 8A-11 provides a summary of mean concentrations for groundwater recharge originating from these sources at the end of operation. The groundwater concentrations for the MRSA and the TMF were estimated from the MacLellan site water balance and water quality model (Volume 5, Appendix E). Groundwater concentrations of seepage from the MRSA and TMF were simulated under two scenarios: expected and sensitivity. The expected scenario was simulated using concentration data from field bin testing of waste rock and subaqueous columns for the TMF scaled up assuming that a normal climate year controls pore water volume and flows through the MRSA and TMF. The sensitivity scenario was simulated using concentration data from field bin testing of waste rock and subaqueous columns for the TMF scaled up assuming that a 25-year dry climate year controls pore water volume and flows through the MRSA and TMF. The 25-year dry climate year condition is predicted to be the worst-case scenario for seepage quality as less pore water would result in higher concentrations of parameters in seepage from the MRSA and TMF compared to a wet year with more pore water that would result in faster flow through the MRSA and TMF. The expected simulation of groundwater recharge quality from Project components is evaluated as part of the groundwater quality effects assessment with the results of the sensitivity simulation presented for reference.

Groundwater recharge from the MRSA during operation is predicted to be below the MDMER (Appendix 8A, Table 8A-11). Expected mean concentrations in groundwater recharge from the MRSA simulated under the expected scenario are predicted to exceed the GCDWQ, MWQSOG, CWQG-FAL and/or GW3 for the following parameters (Appendix 8A, Table 8A-11):

- GCDWQ: sulphate, antimony, arsenic, manganese.
- MWQSOG Drinking Water: nitrate+nitrite, sulphate, antimony, arsenic, manganese.
- MWQSOG-FAL: fluoride.
- CWQG-FAL: fluoride, arsenic, and copper.
- GW3: no parameters.

The GCDWQ, MWQSOG (drinking water), and GW3 were used to identify indicator parameters for the MRSA, although groundwater originating from the MRSA is predicted to discharge to either the open pit or surface water. No parameters evaluated are predicted to exceed the GW3 criteria. The indicator parameters for the MRSA during operation are identified as nitrate+nitrite, sulphate, antimony, and arsenic, meaning elevated concentrations of these parameters above the drinking water guidelines may be introduced along the flow path from the MRSA to the ultimate receiver compared to baseline conditions. Manganese was not carried forward as an indicator parameter for the MRSA because it is noted to exceed in background (not affected) areas. Exceedances of the MWQSOG-FAL and CWQG-FAL are addressed in Chapter 9, as they are not directly applicable to groundwater but have been provided for reference.

No additional parameters are predicted to exceed the GCDWQ and/or MWQSOG (drinking water) in seepage from the MRSA simulated under the sensitivity scenario except for nitrate+nitrite and aluminum. The following additional parameters are predicted to exceed the CWQG-FAL and/or MWQSOG-FAL in seepage from the MRSA simulated under the sensitivity scenario aluminum, arsenic, cadmium, copper, nickel, selenium, uranium, and zinc. Under the sensitivity scenario no parameters evaluated are predicted to exceed the GW3. The concentrations generated from the sensitivity scenario are based on conditions representative of limited duration; the predicted concentrations for the sensitivity scenario are provided for reference as elevated concentrations of these parameters in seepage originating from the MRSA may be predicted under particular climatic conditions. The effect of groundwater discharge on surface water quality for the sensitivity scenario, including the parameters predicted to exceed the CWQG-FAL and/or MWQSOG-FAL, is presented in Chapter 9.

The expected mean concentrations in groundwater recharge from the TMF during operation are predicted to be below the MDMER discharge limits for the parameters evaluated with the exception of total cyanide (Appendix 8A, Table 8A-11). Mean concentrations in groundwater recharge from the TMF simulated under the expected scenario are predicted to exceed the GCDWQ, MWQSOG, CWQG-FAL, and/or GW3 for the following parameters (Appendix 8A, Table 8A-11):

- GCDWQ: total cyanide, sulphate, antimony, arsenic, iron, manganese, sodium.
- MWQSOG Drinking Water: total cyanide, sulphate, antimony, arsenic, iron, manganese, sodium.
- MWQSOG-FAL: free cyanide, fluoride, copper, iron, selenium.
- CWQG-FAL: ammonia, free cyanide, fluoride, arsenic, copper, iron, selenium.
- GW3: total cyanide, cobalt.

The GCDWQ, MWQSOG (drinking water), and GW3 were used to identify indicator parameters for the TMF, although groundwater originating from the TMF is predicted to discharge to either the open pit or surface water. The indicator parameters for the TMF during operation are identified as total cyanide, sulphate, antimony, arsenic, cobalt, iron, and sodium meaning elevated concentrations of these parameters above the drinking water guidelines and/or GW3 may be introduced along the flow path from the TMF to the ultimate receiver compared to baseline conditions. Manganese was not carried forward as an indicator parameter for the TMF because it is noted to exceed in background (not affected) areas. Exceedances of the MWQSOG-FAL and CWQG-FAL are addressed in Chapter 9, as they are not directly applicable to groundwater but have been provided for reference.

No additional parameters are predicted to exceed the GCDWQ and/or MWQSOG (drinking water) in seepage from the TMF simulated under the sensitivity scenario. No additional parameters are predicted to exceed the CWQG-FAL and/or MWQSOG-FAL in seepage from the TMF simulated under the sensitivity scenario. The effect of groundwater discharge on surface water quality for the sensitivity scenario, including the parameters predicted to exceed the CWQG-FAL and/or MWQSOG-FAL, is presented in Chapter 9.

The fate of groundwater that recharges beneath the MRSA and TMF was determined with the groundwater flow model (Volume 5, Appendix G) by conducting particle tracking. The particle traces at the end of operation are presented on Map 8-28 and include the effect of the contact water collection system for the MRSA and TMF because it is an integral part of the design of these Project components. The predicted groundwater flow pathway of seepage from the MRSA and TMF encompasses a large portion of the PDA and extends into the LAA/RAA toward the Keewatin River and associated tributaries, Minton Lake, and Cockeram Lake. Elevated concentrations of MRSA and TMF indicator parameters above the drinking water guidelines and/or GW3 criteria may be introduced relative to baseline conditions along the groundwater flow path from the TMF and MRSA to the ultimate receivers.

The particle traces were used to quantify the inflow rates and advective travel times to the open pit and discharge to surface water features from the MRSA and TMF and are presented in Table 8A-10, Appendix 8A. Groundwater recharge from beneath the MRSA discharges primarily to Minton Lake (42% or 130 m^3/d) or Keewatin River Tributary (42% or 130 m^3/d), with the remainder discharging to the open pit (15% or 43 m^3/d), or Keewatin River (1% or 3 m^3/d). The mean advective travel times vary from 20 years to Keewatin River Tributary to excess of 100 years to the open pit and Keewatin River. The minimum advective travel times from the MRSA to Minton Lake and the Keewatin River Tributary is 1 to 3 years, respectively, compared to greater than 14 years, and beyond the life of mine, to the remaining surface water features. As shown on Table 8A-10, Appendix 8A the groundwater recharge from beneath the TMF discharges primarily to a tributary of the Keewatin River Tributary (55% or 216 m^3/d) or Minton Lake (33% or 130 m^3/d) with smaller contributions to Payne Lake Tributary (less than 1%), Keewatin River (2%), the open pit (6%), or Cockeram Lake (3%). The mean advective travel times from the TMF vary from 229 years to the Keewatin River, to more than 130,000 years to Cockeram Lake. The minimum advective travel times from the TMF are 2 years and 5 years to the Keewatin River Tributary and Minton Lake, respectively, compared to greater than 90 years to the remaining surface water features suggesting at least 10% of the groundwater recharge from the TMF will not discharge to surface water during the life of mine (13 years). Some advective travel times of seepage from the TMF were predicted in excess of 500 years (e.g. open pit, Payne Lake Tributary, Cockeram Lake), which suggests that recharge from the TMF becomes part of the deeper groundwater flow system and is unlikely to discharge to surface water.

No groundwater supply wells are known to be located in the PDA and groundwater originating from the MRSA and TMF is predicted to discharge to the open pit and surface water and not to areas where groundwater supply users are known to be located. The effect of the changes in mass loading to surface water receivers on surface water quality, is assessed in Chapter 9.

The effects on groundwater quality during operation are characterized as adverse, long-term, continuous, irreversible, are confined to the LAA/RAA, and mainly to the PDA. The magnitude is moderate because water quality and loading for some parameters are predicted to increase but will not affect existing groundwater supply users. For parameters predicted to increase in concentrations relative to baseline conditions, they are expected to remain below the GW3 at the point of discharge as the parameters undergo precipitation and adsorption reactions along the groundwater flow path. No existing or foreseeable groundwater users are located in the areas with groundwater quality that exceeds the GCDWQ or MWQSOG (drinking water). The ecological context of the LAA/RAA is disturbed based on existing parameter loadings from historical mining activities.

Decommissioning/Closure

During decommissioning/closure, as the open pit fills, groundwater levels are predicted to slowly recover and the effect of the open pit on groundwater flow and discharge will be less than operation. Rehabilitation of the MRSA and TMF by installation of a soil cover (Appendix 23B) may reduce infiltration and improve water quality over time. In the effects assessment, limited reductions in recharge due to the installation of the soil cover has been included for the MRSA and TMF (Volume 5, Appendix G). For the MRSA, the amount of groundwater recharge was increased in closure by 50%, because the MRSA is assumed to reach fully saturated conditions with all infiltration resulting in either toe seepage or groundwater recharge. Five-six years of active reclamation/closure will occur followed by post-closure monitoring. The open pit is predicted to take 21 years to fill under average conditions (Chapter 9, Section 9.4.1). The seepage collection ditches around the MRSA, TMF, ore stockpile, and overburden stockpile will continue to operate until such time that the water quality meets the regulatory criteria for discharge to the natural environment. Table 8A-11, Appendix 8A provides a summary of mean concentrations for groundwater originating from the MRSA and TMF at closure, after the pit lake has formed. The groundwater quality of seepage from the

MRSA and TMF was estimated from the MacLellan site water balance and water quality model (Volume 5, Appendix E).

Groundwater recharge from the MRSA during closure is predicted to be below the MDMER (Appendix 8A, Table 8A-11). Mean concentrations in groundwater recharge from the MRSA simulated under the expected scenario are predicted to exceed the GCDWQ, MWQSOG, CWQG-FAL, and/or GW3 for the following parameters (Appendix 8A, Table 8A-11):

- GCDWQ: sulphate, aluminum, antimony, arsenic, manganese.
- MWQSOG Drinking Water: sulphate, antimony, arsenic, manganese.
- MWQSOG-FAL: aluminum, cadmium, nickel, selenium.
- CWQG-FAL: aluminum, arsenic, cadmium, copper, nickel, selenium, zinc.
- GW3: no parameters.

Using the GCDWQ, MWQSOG (drinking water), and GW3, the indicator parameters for the MRSA in closure were identified as sulphate, aluminum, antimony, and arsenic. Manganese was not carried forward as an indicator parameter for the MRSA because it is noted to exceed in background (not affected) areas. Exceedances of the MWQSOG-FAL and CWQG-FAL are addressed in Chapter 9, as they are not directly applicable to groundwater but have been provided for reference.

No additional parameters are predicted to exceed the GCDWQ and/or MWQSOG (drinking water) in seepage from the MRSA simulated under the sensitivity scenario with the exception of fluoride, barium, cadmium, nickel, selenium, and uranium. Mean concentrations in groundwater recharge from the MRSA simulated under the sensitivity scenario are predicted to exceed the GW3 for cadmium and nickel. The following additional parameters are predicted to exceed the CWQG-FAL and/or MWQSOG-FAL in groundwater recharge from the MRSA simulated under the sensitivity scenario: thallium and uranium. The concentrations generated from the sensitivity scenario are based on conditions representative of limited duration, the predicted concentrations for the sensitivity scenario are provided for reference as elevated concentrations of these parameters in seepage originating from the MRSA may be predicted under particular climatic conditions. The effect groundwater discharge on surface water quality for the sensitivity scenario, including the parameters predicted to exceed the CWQG-FAL and/or MWQSOG-FAL, is presented in Chapter 9.

The expected mean concentrations in groundwater recharge from the TMF during closure are predicted to be below the MDMER discharge limits for the parameters evaluated with the exception of total cyanide (Appendix 8A, Table 8A-11). Mean concentrations in groundwater recharge from the MRSA simulated under the expected scenario are predicted to exceed the GCDWQ, MWQSOG, CWQG-FAL and/or GW3 (Table 8A-11, Appendix 8A) for the following parameters:

- GCDWQ: total cyanide, sulphate, aluminum, antimony, arsenic, manganese, sodium.
- MWQSOG Drinking Water: total cyanide, sulphate, antimony, arsenic, manganese, sodium.

- MWQSOG-FAL: free cyanide, fluoride, copper, iron, selenium.
- CWQG-FAL: free cyanide, fluoride, aluminum, arsenic, copper, iron, selenium.
- GW3: total cyanide.

Using the GCDWQ, MWQSOG (drinking water), and GW3, indicator parameters for the TMF in closure, were identified as total cyanide, sulphate, aluminum, antimony, arsenic, and sodium. Meaning elevated concentrations of these parameters above the drinking water guidelines and GW3 may be introduced along the groundwater flow path from the TMF to the ultimate receiver compared to baseline conditions. Manganese was not carried forward as an indicator parameter for the TMF because it is noted to exceed in background (not affected) areas. Exceedances of the MWQSOG-FAL and CWQG-FAL are addressed in Chapter 9, as they are not directly applicable to groundwater but have been provided for reference.

No additional parameters are predicted to exceed the GCDWQ and/or MWQSOG (drinking water) in seepage from the TMF simulated under the sensitivity scenario and the concentration of total cyanide and sodium is predicted to be less than the GCDWQ and MWQSOG (drinking water) for the sensitivity scenario compared to the expected scenario. The following additional parameters are predicted to exceed the CWQG-FAL and/or MWQSOG-FAL in groundwater recharge from the TMF simulated under the sensitivity scenario: aluminum, nickel, and zinc whereas the concentration of free cyanide and iron are predicted to be less than the CWQG-FAL and/or MWQSOG-FAL in the sensitivity scenario compared to the expected scenario. The effect of groundwater discharge on surface water quality for the sensitivity scenario, including the parameters predicted to exceed the CWQG-FAL and/or MWQSOG-FAL, is presented in Chapter 9.

The fate of groundwater that recharges beneath the MRSA and TMF was determined by conducting particle tracking. The particle traces at closure are presented on Map 8-29 and Map 8-30, with and without the effect of the seepage collection ditches around the MRSA and TMF, respectively. The seepage collection ditches are assumed to be operated until such time that the water quality meets the regulatory discharge criteria for discharge to the environment at which time the ditches would be decommissioned. The predicted groundwater flow pathway of seepage from the MRSA and TMF at the end of closure, with and without the seepage collection ditches, is similar to operation, encompassing a large portion of the PDA and extending out into the LAA/RAA toward the Keewatin River and associated tributaries, Minton Lake, and Cockeram Lake. Elevated concentrations of MRSA and TMF indicator parameters, above the drinking water guidelines and/or GW3 may be introduced along the groundwater flow path from the MRSA and TMF to the ultimate receiver relative to baseline conditions.

The particle traces were used to quantify the inflow rates and travel times to the open pit and discharge to surface water features from the MRSA and TMF and are presented in Appendix 8A, Table 8A-10. With similar magnitude to operation, groundwater recharge from beneath the MRSA discharges primarily to Minton Lake (46%) and the Keewatin River Tributary (37%), with the remainder discharging to the open pit (16%), Keewatin River (1%) or Cockeram Lake (1%). The mean advective travel times vary from 15 years to Keewatin River Tributary to in excess of 270 years to Cockeram Lake.

The magnitude of surface water discharge originating from the TMF was similar to a slight decrease in closure compared to operation, except for Minton Lake. Groundwater recharge from the TMF to Minton

Lake decreased by more than half, from 130 m^3/d to 52 m^3/d as a result of the TMF pond being lowered compared to operation, which will reduce the infiltration of water from the TMF to the underlying aquifer by reducing the hydraulic gradient. Groundwater recharge from beneath the TMF discharges primarily to a tributary to Keewatin River (71%) or Minton Lake (18%) with smaller contributions to Payne Lake Tributary (less than 1%), Keewatin River (3%), the open pit (6%), or Cockeram Lake (less than 1%). The mean advective travel times vary from 217 years to the Keewatin River to more than 6,000 years to Cockeram Lake and the open pit. The extremely long advective travel times, such as for the point of discharge at the Cockeram Lake, suggests that recharge from the TMF becomes part of the deeper groundwater flow system and is unlikely to discharge to surface water.

The seepage collection ditches around the MRSA and TMF will be decommissioned once groundwater quality meets regulatory criteria for discharge to the environment. Once decommissioned, the groundwater discharge to surface water from the MRSA and TMF will generally double. Groundwater recharge originating from the MRSA and TMF and discharging to Minton Lake will increase from 156 m^3/d to 475 m^3/day with the majority of discharge originating from the MRSA (80%). The predicted inflow rates and travel times to the open pit and discharge to surface water features from the MRSA and TMF without the effect of the seepage collection ditches is presented in Table 8A-10, Appendix 8A for comparison to the effect on discharge to surface water including the seepage collection ditches.

No groundwater supply wells are known to be located in the PDA and groundwater originating from the MRSA and TMF is predicted to discharge to surface water and/or the pit lake and not to areas where groundwater supply users are known to be located. The effect of the changes in mass loading to surface water receivers on surface water quality, is assessed in Chapter 9.

The effects on groundwater quality during construction is characterized as adverse, long-term, continuous, irreversible, are confined to the LAA/RAA, and mainly to the PDA. The magnitude is moderate because water quality and loading for some parameters are predicted to increase but will not impact groundwater supply users beyond the PDA. For parameters predicted to increase in concentrations relative to baseline conditions, they are expected to remain below the GW3 at the point of discharge as the parameters undergo precipitation and adsorption reactions along the groundwater flow path. No existing or foreseeable groundwater users are located in the areas with groundwater quality that exceeds the GCDWQ or MWQSOG for drinking water. The ecological context of the LAA/RAA is disturbed based on existing parameter loadings from historical mining activities.

8.4.4 Summary of Project Residual Environmental Effects on Groundwater

A summary of residual environmental effects on groundwater that are likely to occur as a result of the Project is provided in Table 8-12.

Table 8-12 Project Residual Effects on Groundwater

Residual Effect	Residual Effects Characterization								
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context
Gordon Site									
Change in Groundwater Quantity and/or Flow	C	A	H	PDA and LAA/RAA	MT	A	C	R	D
	O	A	H	PDA and LAA/RAA	MT	A	C	I	D
	D	A	L	LAA/RAA	LT	A	C	I	D
Change in Groundwater Quality	C	P	M	PDA and LAA/RAA	ST	A	C	I	D
	O	A	M	PDA and LAA/RAA	LT	A	C	I	D
	D	A	M	PDA and LAA/RAA	LT	A	C	I	D
MacLellan Site									
Change in Groundwater Quantity and/or Flow	C	A	H	PDA and LAA/RAA	MT	A	C	R	D
	O	A	L	PDA and LAA/RAA	MT	A	C	I	D
	D	A	L	LAA/RAA	LT	A	C	I	D
Change in Groundwater Quality	C	P	M	PDA and LAA/RAA	ST	A	C	I	D
	O	A	M	PDA and LAA/RAA	LT	A	C	I	D
	D	A	M	PDA and LAA/RAA	LT	A	C	I	D

Table 8-12 Project Residual Effects on Groundwater

Residual Effect	Residual Effects Characterization								
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context

KEY
See Table 8-2 for detailed definitions

Project Phase
C: Construction
O: Operation
D: Decommissioning

Direction:
P: Positive
A: Adverse

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PDA: Project Development Area
LAA: Local Assessment Area
RAA: Regional Assessment Area

Duration:
ST: Short-term;
MT: Medium-term
LT: Long-term

N/A: Not applicable

Timing:
N/A: Not Applicable
A: Applicable

Frequency:
S: Single event
IR: Multiple irregular event
R: Multiple regular event
C: Continuous

Reversibility:
R: Reversible
I: Irreversible

Ecological/Socio-Economic Context:
D: Disturbed
U: Undisturbed

8.5 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS ON GROUNDWATER

The Project residual effects described in Section 8.4 are likely to interact cumulatively with residual environmental effects from other physical activities (past, present, and reasonably foreseeable).

The effects of past and current projects relative to conditions prior to historical mining activities contribute to baseline conditions upon which Project effects are assessed. Conditions prior to historical mining activities are generally considered to be similar to currently undisturbed areas of the RAA.

The resulting cumulative environmental effects (future scenario with the Project) are assessed. Cumulative environmental effects (the future scenario without the Project) are also described. This is followed by an analysis of the Project contribution to cumulative effects. Future projects and activities that are reasonably foreseeable are defined as those that (a) have been publicly announced with a defined project execution period and with sufficient project details that allow for a meaningful assessment, (b) are currently undergoing an environmental assessment or (c) are in a permitting process.

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- The Project has residual environmental effects on the VC and

- The residual effects could act cumulatively (spatial and temporal overlap) with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either is not met, the assessment of cumulative effects concludes because the Project does not interact cumulatively with other projects or activities.

8.5.1 Project Residual Effects Likely to Interact Cumulatively

Table 4C-1 in Chapter 4, Environmental Effects Assessment Scope and Methods, presents the project and physical activities inclusion list, which identifies other projects and physical activities that might act cumulatively with the Project. Where residual environmental effects from the Project act cumulatively with residual effects from other projects and physical activities (Table 8-13), a cumulative effects assessment is undertaken.

Table 8-13 Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Environmental Effects	Environmental Effects	
	Change in Groundwater Quantity and/or Flow	Change in Groundwater Quality
Mineral Development		
• “A” Mine	–	–
• EL Mine	–	–
• Fox Mine	–	–
• Farley Mine	✓	✓
• Ruttan Mine	–	–
• MacLellan Mine (Historical)	✓	✓
• Burnt Timber Mine	–	–
• Farley Lake Mine	–	–
• Keystone Gold Mine	–	–
• East/West Tailings Management Areas	–	–
Mineral Exploration	–	–
Water and Waste Projects (sewage plants, waste disposal grounds)	✓	–
Residential and Community Development (including cottage subdivisions)	✓	–
Infrastructure Development (transmission line, airport, highways, roads, rail)	✓	–
Other Resource Activities (hunting, fishing, berry picking)	–	–
Future Physical Activities		
Mineral Development	✓	✓

Table 8-13 Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Environmental Effects	Environmental Effects	
	Change in Groundwater Quantity and/or Flow	Change in Groundwater Quality
Mineral Exploration	–	–
Traditional Land Use	–	–
Resource Use Activities	–	–
Recreation	–	–

NOTES:
✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with Project residual environmental effects.
– = Interactions between the residual effects of other projects and residual effects of the Project are not expected.
For a detailed description and mapped locations of Projects and Physical Activities, where applicable, see Chapter 4, Table 4D-2 and Maps 4-3 and 4-4.

Environmental effects identified in Table 8-13 as not likely to interact cumulatively with residual effects of other projects and physical activities (no check mark) are not discussed further. The assessment of the cumulative environmental effects that are likely to result from the Project in combination with other projects and physical activities are discussed in subsequent sections.

Because the Project involves the redevelopment of at least a portion of the Farley Mine (historical) and MacLellan Mine (historical), the cumulative effect of the Project with the Farley Mine (historical) and MacLellan Mine (historical) is included in the assessment of change in groundwater quantity and quality (Sections 8.3 and 8.4), the summary of residual environmental effects (Section 8.4.4), and determination of significance (Section 8.6.1) for the Project and are not discussed further as a cumulative effect.

Groundwater effects from future activities located in different sub-watersheds than the Project and that occur at a distance of more than 2 km from the boundaries of the LAA/RAA are not expected to have measurable cumulative effects on groundwater quantity or quality and are not considered further.

Those future activities listed but not checked off in Table 8-13 represent activities that are unlikely to interact cumulatively with the Project (i.e., are either one or a combination of the following: 1) substantially geographically removed from the Project; 2) by definition their operations do not represent a potential cumulative effect pathway to the VC; 3) would be considered to have a potential spatial or temporal overlap however due to the known success of current best management and design mitigation for such projects residual effects are unlikely.

Four potential categories of future projects, Water and Waste Projects, Residential and Community Development, and Infrastructure Development, and Mineral Development have a potential spatial and temporal overlap with the Project. However, as noted under condition 3 above, with the implementation of current best management and design mitigation measures that are typically required as part of approval conditions, neither project is anticipated to result in residual effects on groundwater quantity beyond the immediate vicinity of the given Project and therefore cumulative effects with the Project are not anticipated. Effects on groundwater quantity from Water and Waste Projects, Residential and Community Development, and Infrastructure Development would be restricted to possible temporary dewatering during construction only. The magnitude of drawdown is anticipated to be low due to the limited depths at which these types of infrastructure are typically installed. The short-term effect of drawdown would be confined to the area directly around the infrastructure and would not overlap spatially with the residual effects of the Project. Given this, no cumulative effects with future projects and/or activities is anticipated.

8.6 EFFECTS TO FEDERAL LANDS

There are no Federal lands located within the groundwater LAA or RAA and therefore no effects of the environment on Federal Lands as a result of a change in groundwater quantity or quality are anticipated.

8.7 DETERMINATION OF SIGNIFICANCE

8.7.1 Significance of Project Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on groundwater quantity and quality are predicted to be not significant.

The main adverse residual environmental effect on groundwater quantity and flow identified in this assessment is the lowering of the water table as a consequence of dewatering the open pit. This effect will be most notable during the construction phase and during operation, and to a lesser extent during closure as the open pit fills and groundwater levels recover.

The threshold for significance as defined in Section 8.1.6 relates to a reduction in the groundwater level of an existing water supply well located beyond the PDA but within the LAA/RAA such that, following the application of mitigation, the water supply well no longer meets the needs of the current users. At the Gordon and MacLellan sites, there are no known groundwater users located within the LAA/RAA. Groundwater discharge to surface water features will be affected by the dewatering of the open pit and the mounding of the water table in and around the TMF. Potential effects to surface water features and wetlands as a result of a reduction in groundwater discharge and/or levels are further assessed in Chapters 9 and 11, respectively.

The adverse residual environmental effects of the Project on a change in groundwater quantity and/or flow during each Project phase are predicted to be not significant. This determination is supported by the fact that there are no known groundwater users within the area of drawdown in the LAA/RAA, and no new groundwater users will be permitted within the PDA, or within lands leased by Alamos within the LAA/RAA.

The main residual environmental effect on groundwater quality identified in this assessment is the increase in concentration of indicator parameters above the drinking water guidelines and/or GW3 along the groundwater flow path from the MRSAs and TMF to the ultimate receiver relative to baseline conditions. This effect will be most notable later in mine life and into closure because the predicted mean advective travel times of seepage from the Project components through the aquifer are generally decades to centuries. The effect is confined mainly to the PDA, with a portion of the groundwater flow paths from the MRSAs and TMF extending into the LAA/RAA.

The threshold for significance as defined in Section 8.1.6 relates to a change in groundwater quality resulting in a Project-caused degradation of the quality of groundwater by exceeding one or more of the health-based standards specified in the GCDWQ or MWQSOG for drinking water to the extent that a water supply well no longer meets the needs of current users or land owners beyond the PDA. Typical in northern Manitoba, groundwater naturally exceeds a number of water quality objectives (e.g., hardness). For parameters with baseline concentrations that exceed the health-based standards specified in the GCDWQ or MWQSOG (drinking water), the determination of significance will be such that the quality of those parameters for an existing water supply well will not be further impaired by the Project. No groundwater users are known within the area of influence of Project components with the groundwater recharge from the MRSAs and TMF discharging to surface water. Therefore, the adverse residual environmental effects of the Project on a change in groundwater quality during each Project phase are not significant. The effect of the groundwater quality discharging to surface water features is evaluated in Chapter 9.

8.8 PREDICTION CONFIDENCE

The assessment of baseline conditions and the inferred conceptualization of groundwater processes are based on applying industry standards and practices under quality assurance and quality control programs which are applied to both field and laboratory procedures.

The effects to groundwater levels and baseflow as a result of the Project are based on a steady-state groundwater flow model, which predicts the long-term average annual effects on flow, and conservatively overestimates the drawdown effects on water levels. Prediction confidence is high because the groundwater flow model was calibrated to within an acceptable range of error for groundwater levels and groundwater discharge to surface water features. Predictions made using the model are based on several conservative assumptions to reduce the influence of uncertainty in the predictions as follows:

- For the Gordon site, groundwater recharge rates at the MRSA and historical MRSAs to the receiving environment are conservatively “over predicted” in two ways. First, the results from modelling conducted without the presence of the seepage collection ditches are used to predict groundwater flows to the receiving environment and to inform the environmental effects assessment. Second, recharge applied within the MRSAs over the life of the mine is assumed to be carried through to the final receptors.

- For the MacLellan site, groundwater recharge rates at the MRSA, TMF, and historical MRSA to the receiving environment are conservatively “over predicted” in two ways. First, the prediction of recharge rates and seepage from the TMF is based on the final (i.e., maximum) elevation of the TMF dams and TMF reclaim pond at the end of operation. This model approach imposes the highest vertical hydraulic gradient from the TMF reclaim pond and results in a conservative prediction of seepage rates from the TMF during operation of the Project. Second, recharge applied within the MRSA, TMF, and historical MRSA are assumed to be carried through to the final receptors.

The effects to groundwater quality as a result of the Project are based on a water balance and water quality model that was developed based on field data and geochemical characterization of overburden, ore, waste rock, and tailings. Prediction confidence in groundwater quality effects is high because reductions in groundwater discharge to the natural environment did not consider the attenuation of groundwater quality along the groundwater flow path from the source to the receptor. Furthermore, conservative estimates of groundwater recharge beneath the MRSAs and TMF are applied in the groundwater modelling, which overestimate the loadings to groundwater. Groundwater quality predictions made are based on several conservative assumptions to reduce the influence of uncertainty in the predictions as follows:

- The water quality infiltrating to groundwater from beneath the MRSAs and TMF was assumed to be representative of the water quality at the predicted discharge location to the receiving environment. This approach provides a conservative estimate of groundwater quality discharging to surface water and does not consider physical or chemical attenuation processes along the groundwater flow path.
- Particle tracking was used in the groundwater flow model to provide a conservative estimate of groundwater discharge rates and travel times to surface water components based on advective flow processes. The effects of other physical flow processes, such as dispersion and diffusion, and chemical processes, such as adsorption and precipitation or dissolution, was not considered. These other processes will reduce parameter concentrations and arrival times.
- It is estimated to take 17 to 28 years for the MRSAs to reach a steady-state saturation condition where the volume of water infiltrating into the MRSA from precipitation will result in an equal amount of seepage or recharge out of the base of the MRSA. This is referred to as the wetting time, where infiltrating precipitation is retained within the MRSA as the moisture content and saturation increases. To account for this wetting time, the recharge rates from the MRSAs were set at 50% of the infiltration rates during operation and increased to 100% at the end of operation. This increase results in higher recharge rates and loading to the groundwater table.
- Loading predictions to downstream receptors do not consider groundwater travel times and are based on discharge rates at the end of operation and closure once the open pits are filled to their final water elevation. As a result, the loadings represent a conservative estimate under steady-state conditions during operation.

Using the conservative discharge rates from the groundwater flow model, the loading to the natural environment is estimated by multiplying the discharge rate by the source water quality from the water quality model. The prediction of concentrations and mass loading did not consider physical flow processes, such as dispersion and diffusion, and chemical processes, such as adsorption, precipitation, and dissolution along the groundwater flow path of the travel time to reach the ultimate receptor. These processes will result in reductions in groundwater concentrations along the groundwater flow path, and therefore represents a conservative approach to estimating loading to the natural environment. Furthermore, the loading assessment did not consider the effect of timing for infrastructure development (i.e., gradual development of a MRSA over the LOM) or the groundwater travel time in calculating the mass loading to the environment. This results in a conservative prediction of the mass loading in early phases of the Project (i.e., operation) and provides a better representation of long-term water quality through closure, although still a conservative prediction.

8.9 FOLLOW-UP AND MONITORING

Management and Monitoring Program Basis and Objectives

At both the Gordon and MacLellan sites, the effect on groundwater quantity and flow is a lowering of the water table as a result of dewatering the open pit during construction and operation and to a lesser extent during closure when the open pit refills. The effect on groundwater quality is the increase in concentrations of parameters in seepage (as noted in Section 8.4.3.3) from the MRSAs and TMF to groundwater, although the effect is likely limited given the decades to centuries advective groundwater travel time and potential for natural attenuation of the parameters along the groundwater flow paths.

Although there are no groundwater well users within the LAA/RAA at either the Gordon or MacLellan sites where effects on groundwater are anticipated, Alamos will develop a follow-up and monitoring program to monitor groundwater levels and groundwater quality at key Project locations. Monitoring data from these locations will be used to verify and confirm the anticipated effects identified in the groundwater flow model and to meet regulatory requirements related to specific permits or conditions of approval.

In the event that an unexpected deterioration of the environment is observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process described in Chapter 23, Section 23.2. This may include an investigation of the cause of the deterioration and identification of existing and/or new mitigation measures to be implemented to address it.

Monitoring Methods

During operation, a detailed groundwater monitoring program will be implemented for each site, building on the baseline monitoring program, to confirm potential changes in groundwater associated with mine operation. The EIS follow-up and monitoring program for groundwater will be developed based on regulatory requirements for both quantity and quality. During closure, the groundwater monitoring program for each site will be continued to document the recovery in groundwater levels as the open pit fills.

The type of monitoring equipment, selection of monitoring stations, frequency of sample collection, and duration of the program will be based on MCC guidelines and consultation with government agencies. However, it is expected that the monitoring program for each site will be comprised of the following key elements:

- Monitoring wells at select locations around the open pit to monitor groundwater levels during construction, operation, and closure as the open pit is dewatered during construction and operation and subsequently recovers during closure.
- Monitoring wells/drive point piezometers in the vicinity of, but not limited to, Susan Lake, Gordon Lake, and Farley Lake at the Gordon site and the Keewatin River, Keewatin River Tributary, Minton Lake, and the Payne Lake Tributary at the MacLellan site. The monitoring wells/drive point piezometers will be used to collect groundwater levels during construction, operation, and closure to monitor the effects on groundwater levels due to open pit dewatering and recovery during closure.

- Monitoring wells upgradient, cross gradient, and downgradient of the TMF (at the MacLellan site only) and MRSAs will be established to collect groundwater levels and water quality during construction, operation, and closure to document changes to groundwater levels and flow and groundwater quality.
- Groundwater quality samples from monitoring wells will be monitored in spring, summer, and fall during construction, operation and decommissioning/closure with the frequency progressively reduced based on monitoring results and Project phase. Winter groundwater sampling is not feasible as, based on the baseline data, the monitoring wells are generally frozen and not possible to sample. Groundwater quality samples will be analyzed for general chemistry and select dissolved metals.
- Follow-up monitoring results will be compared with applicable regulatory standards set out in GCDWQ, MWQSOG, CWQG-FAL, and the Ontario Ministry of the Environment GW3 criteria and Project-specific regulatory approvals.

Monitoring Locations and Frequencies

Groundwater monitoring locations will be reviewed at regular intervals. Monitoring locations/stations may be added or removed from the monitoring program in accordance with their utility in monitoring the effects of the Project on the environment.

Monitoring locations will be maintained until the location is no longer required. If a monitoring location/station is no longer required but is identified as part of a regulatory approval, it will only be removed from the monitoring program once the required amendments are approved. Chapter 23 provides additional information on Environmental Management and Monitoring Programs.

8.10 SUMMARY OF COMMITMENTS

- Limit construction footprint (i.e., PDA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the PDA.
- Use standard management practices throughout the Project, including drainage control and excavation and open pit dewatering.
- Use standard construction methods, such as seepage cutoff collars, where trenches extend below the water table to mitigate preferential flow paths.
- Return water generated from the Gordon site groundwater interceptor wells (with treatment as required) to Gordon and Farley lakes during operation and a portion of decommissioning/closure to offset a reduction in groundwater discharge.
- Design MRSAs to increase the amount of runoff and reduce the amount of infiltration through the MRSAs, thereby reducing the recharge and loading to groundwater.
- Install contact water collection ditches around the overburden storage area, ore stockpile and MRSAs to collect toe seepage and groundwater recharge from these Project components.

- Install seepage collection ditches around the TMF to collect seepage from the TMF dam and groundwater recharge originating from the TMF.
- Monitor groundwater levels in monitoring wells to document changes in water levels and flow in response to dewatering of the open pits and changes in recharge due to Project components. Monitor using a combination of manual and automated monitoring methods with the frequency and approach modified throughout the life of the Project. During initial periods of monitoring, automated monitoring will be implemented to confirm initial water level responses to dewatering. As effects on levels are confirmed, monitoring may be transitioned to manual methods or discontinued at locations where no effects are observed.
- Monitor groundwater quality to document the effects of changes in groundwater quality associated with the Project components. Select monitoring locations near the immediate source area to confirm the quality of water infiltrating to the groundwater system and down gradient of the seepage collection ditches. The monitoring locations immediately down gradient of the Project component and seepage collection ditches will be used as trigger monitoring location to identify the need for adaptive management.
- Monitoring locations will be maintained until the location is no longer required. If a monitoring location/station is no longer required but is identified as part of a regulatory approval, it will only be removed from the monitoring program once the required amendments are approved.
- Monitor groundwater levels (monthly or continuous depending on location) and water quality (annually) in monitoring wells upgradient, cross gradient, and downgradient of the MRSAs and TMF to monitor for changes in groundwater quality and flow regime due to Project development.
- Monitor groundwater levels (monthly or continuous depending on location) and water quality (annually) in background monitoring wells.

8.11 REFERENCES

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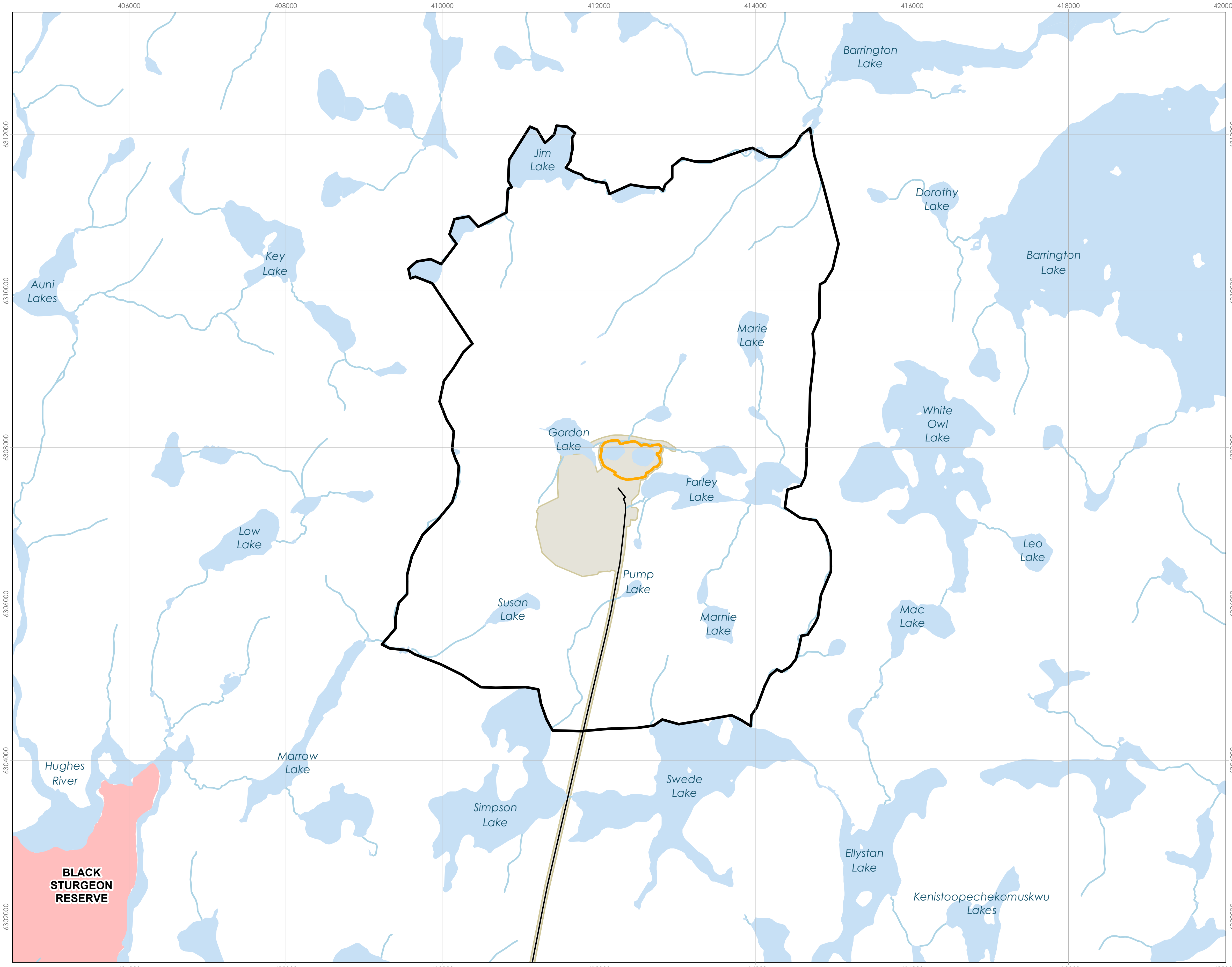


Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Landbase

- Existing Access
- Watercourse
- Waterbody
- First Nation Reserve

N

0 1 2 Kilometres

(At original document size of 11x17)
1:50,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

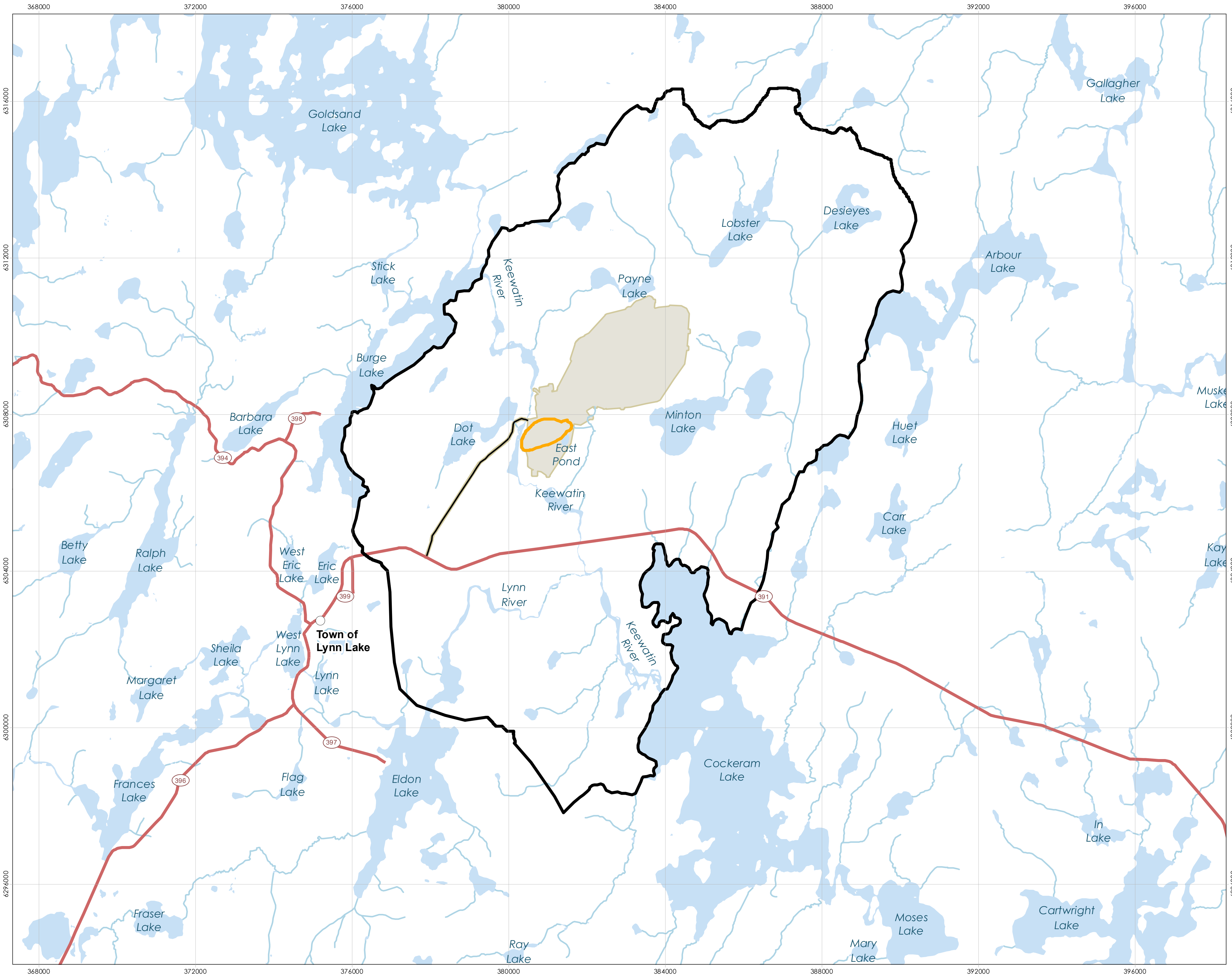
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-03-25
Technical Review by MFraser on 2020-03-25
Senior GIS Review by GKroupa on 2020-03-25

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-1

Title
Gordon Spatial Boundaries for Groundwater



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 1.5 3 Kilometres

(At original document size of 11x17)
1:100,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

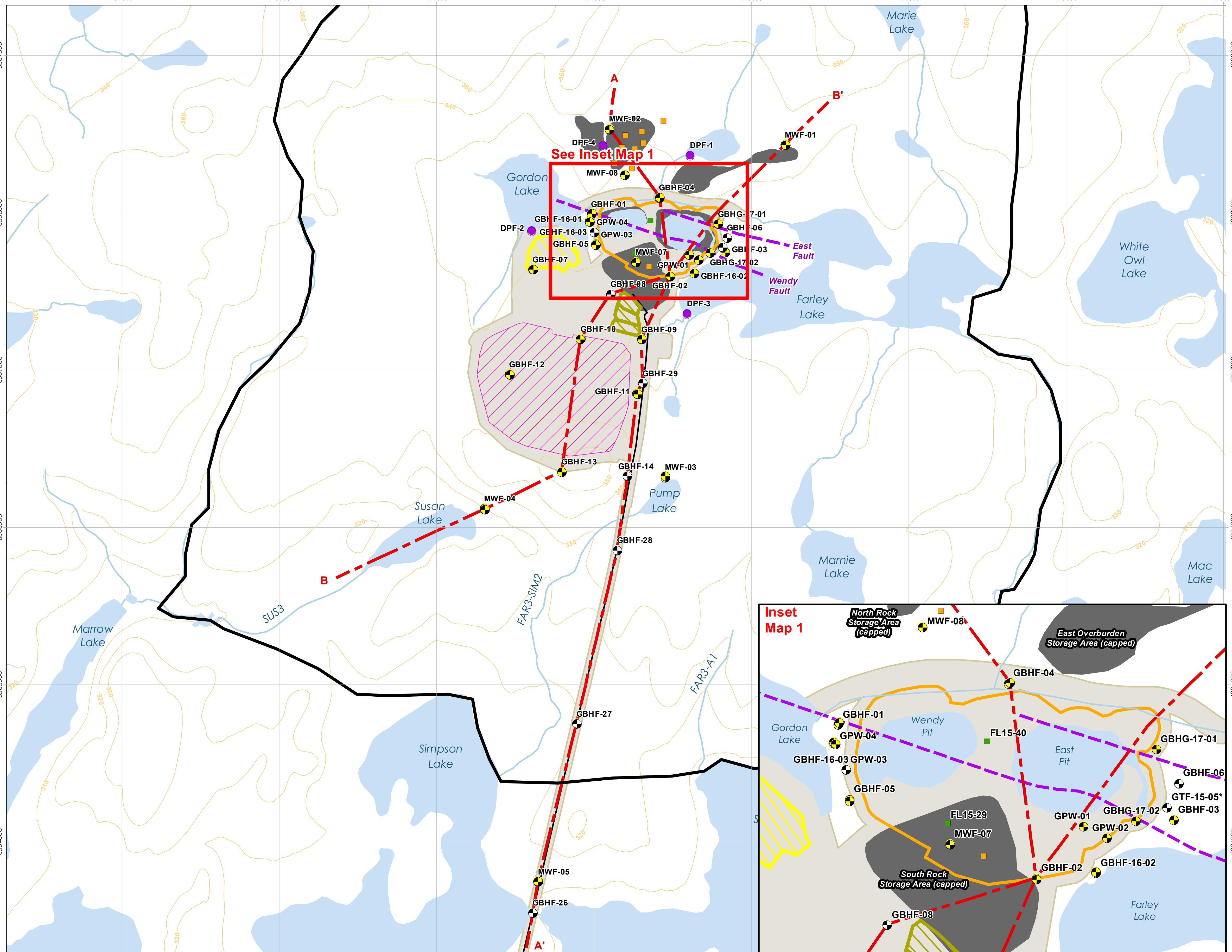
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-08
Technical Review by MFraser on 2020-05-08
Senior GIS Review by GKroupa on 2020-05-08

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-2

Title
MacLellan Spatial Boundaries for Groundwater



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage
- Potential Overburden Stockpile
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Survey Locations

- Borehole
- Drive-Point Piezometers
- Monitoring Well
- Exploration Borehole
- Test Pit
- Cross Section Locations

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Landbase

- Existing Access Road
- Fault Zone
- Elevation Contours (m)
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:25,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

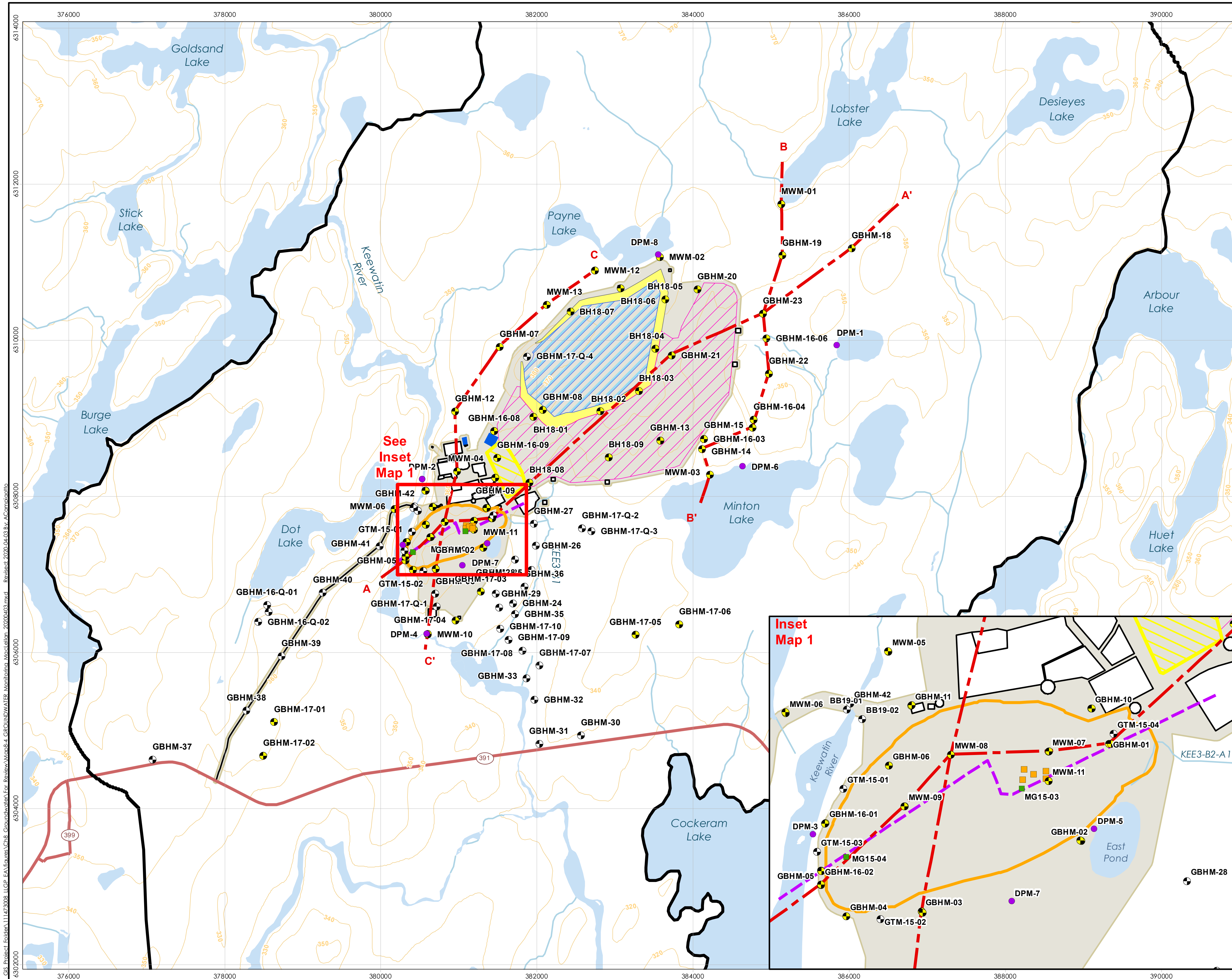
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-03
Technical Review by MFraser on 2020-04-03
Senior GIS Review by GKroupa on 2020-04-03

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-3

Title
Gordon Baseline Monitoring Locations



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Survey Locations

- Borehole
- Drive-Point Piezometers
- Monitoring Well
- Exploration Borehole
- Test Pit
- Cross Section Locations

Landbase

- Existing Access Road
- Highway
- Approximate Location of NSZ
- Elevation Contours (m)
- Watercourse
- Waterbody

N

0 0.55 1.1 Kilometres

(At original document size of 11x17)
1:50,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

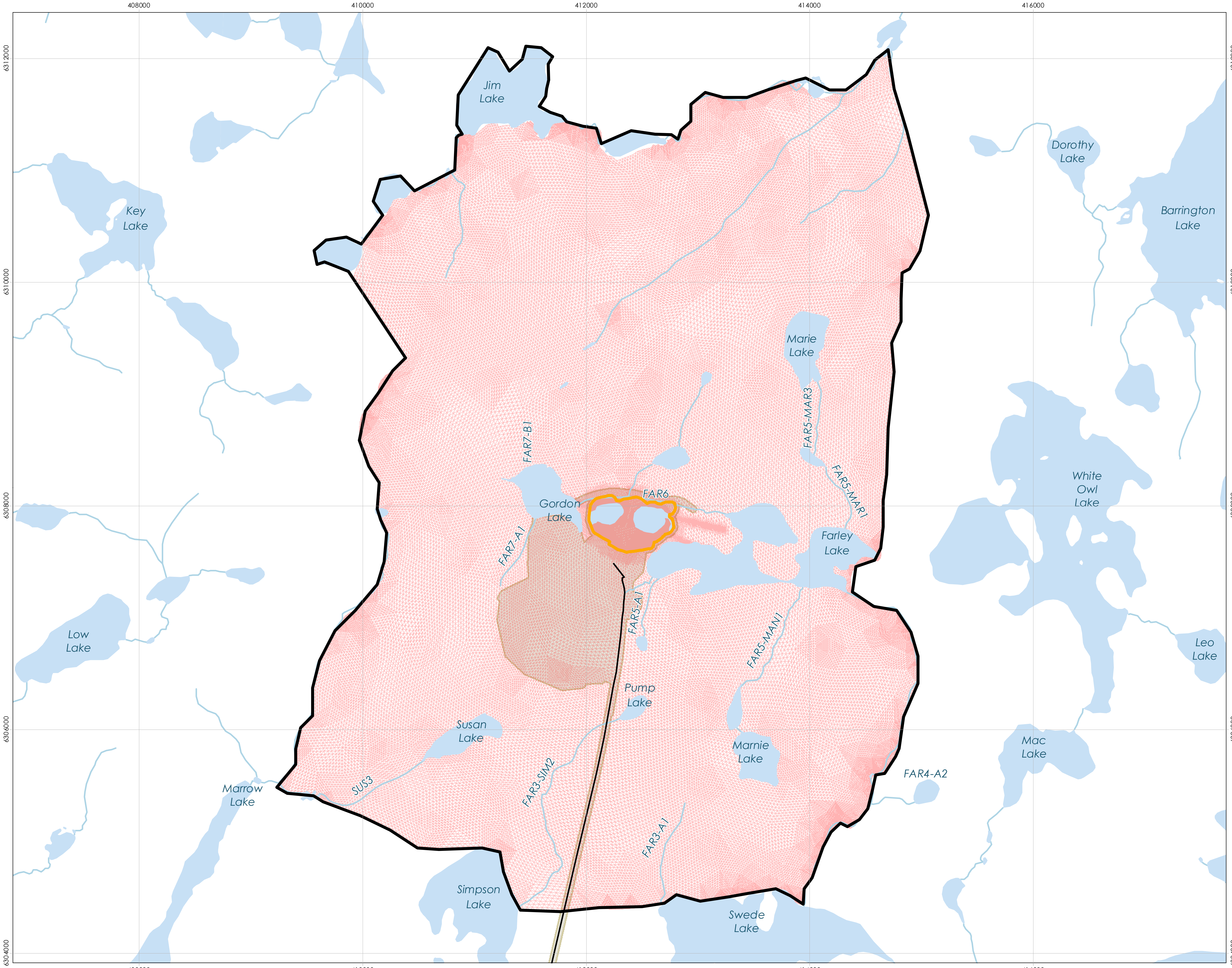
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-03
Technical Review by MFraser on 2020-04-03
Senior GIS Review by GKroupa on 2020-04-03

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-4

Title
MacLellan Baseline Monitoirng Location



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)
- Model Mesh

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 0.5 1 Kilometre

(At original document size of 11x17)
1:35,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

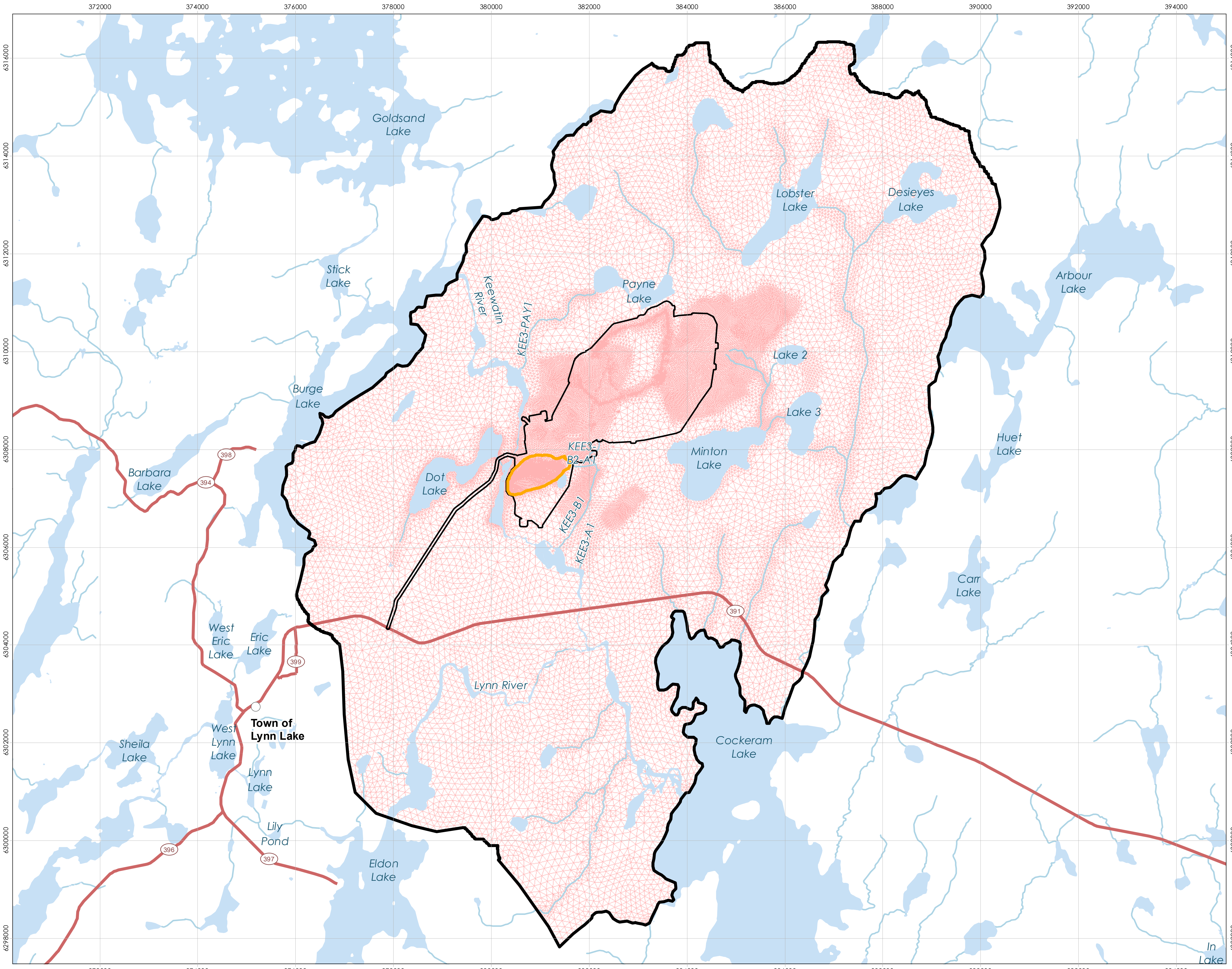
Prepared by ACampigotto on 2020-05-14
Technical Review by JMule on 2020-05-14
Senior GIS Review by GKroupa on 2020-03-25

Client/Project 111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-5

Title
Gordon Groundwater Flow Model Domain and Boundary Conditions



Stantec

ALAMOS GOLD INC.

Project Infrastructure
- Proposed Open Pit
- Project Development Area

Study Area
- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)
- Model Mesh

Landbase
- Highway
- Watercourse
- Waterbody

N

0 1 2 Kilometres
(At original document size of 11x17)
1:80,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

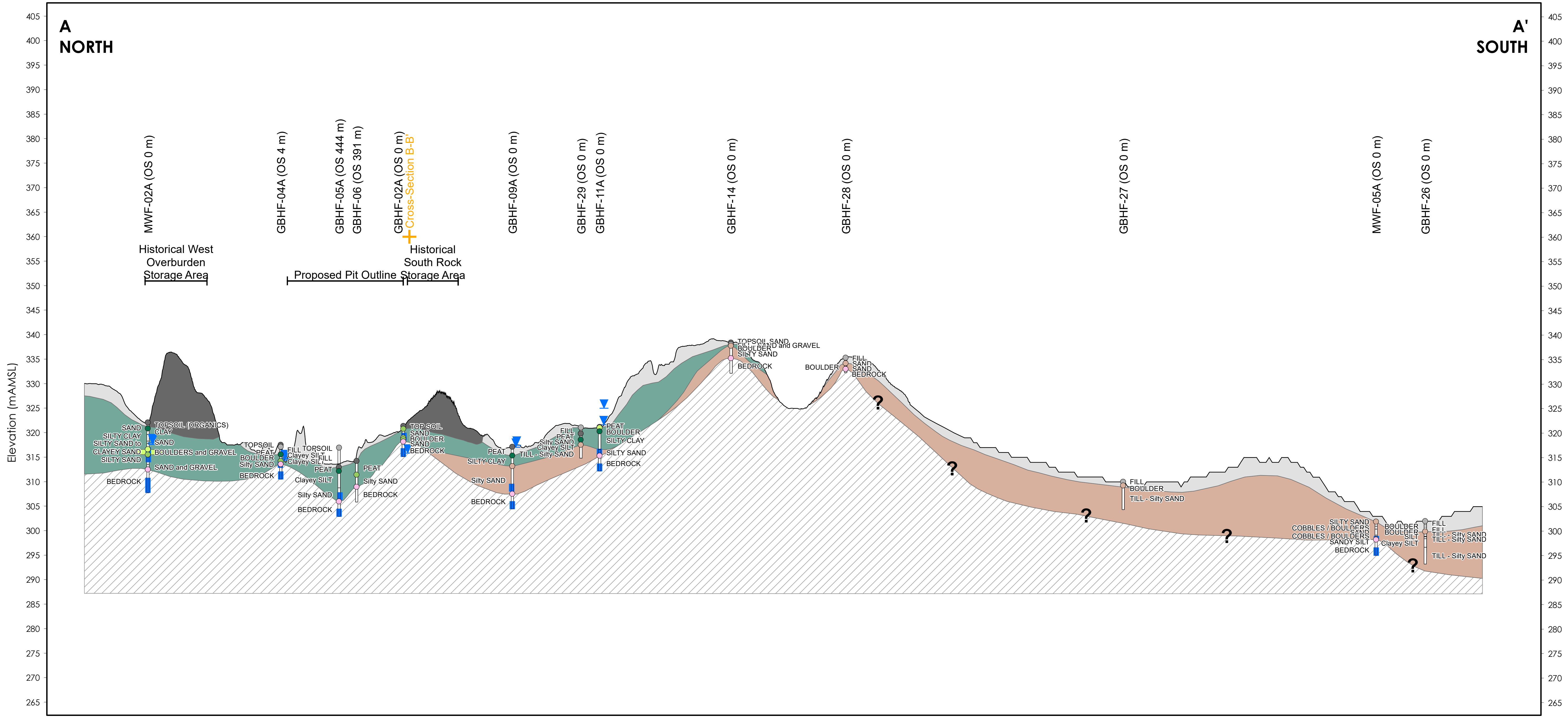
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-03-25

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-6

Title
MacLellan Groundwater Flow Model Domain and Boundary Conditions



MW1-15 (OS m)	Well ID (Offset)
Sand	Stratigraphy
	Water Level (June 25 to July 4, 2018)
	Well Screen

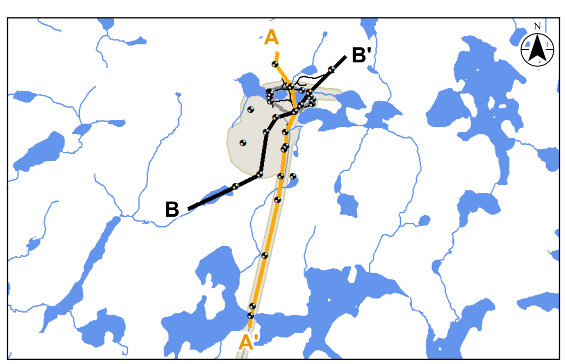
- Fill
- Organics
- Glaciofluvial
- Glaciolacustrine Nearshore
- Glaciolacustrine Offshore
- Diamicton
- Bedrock

- Ground Surface
- Rock Dump
- Fill/Organics
- Glaciolacustrine
- Glaciofluvial
- Diamicton
- Bedrock

20x Vertical Exaggeration

0 0.5 1 km

1:17,500 (At original document size of 11x17)



Notes

1. Manual water level measurements from September 25 to 29, 2015.

Stantec

Alamos Gold Inc.

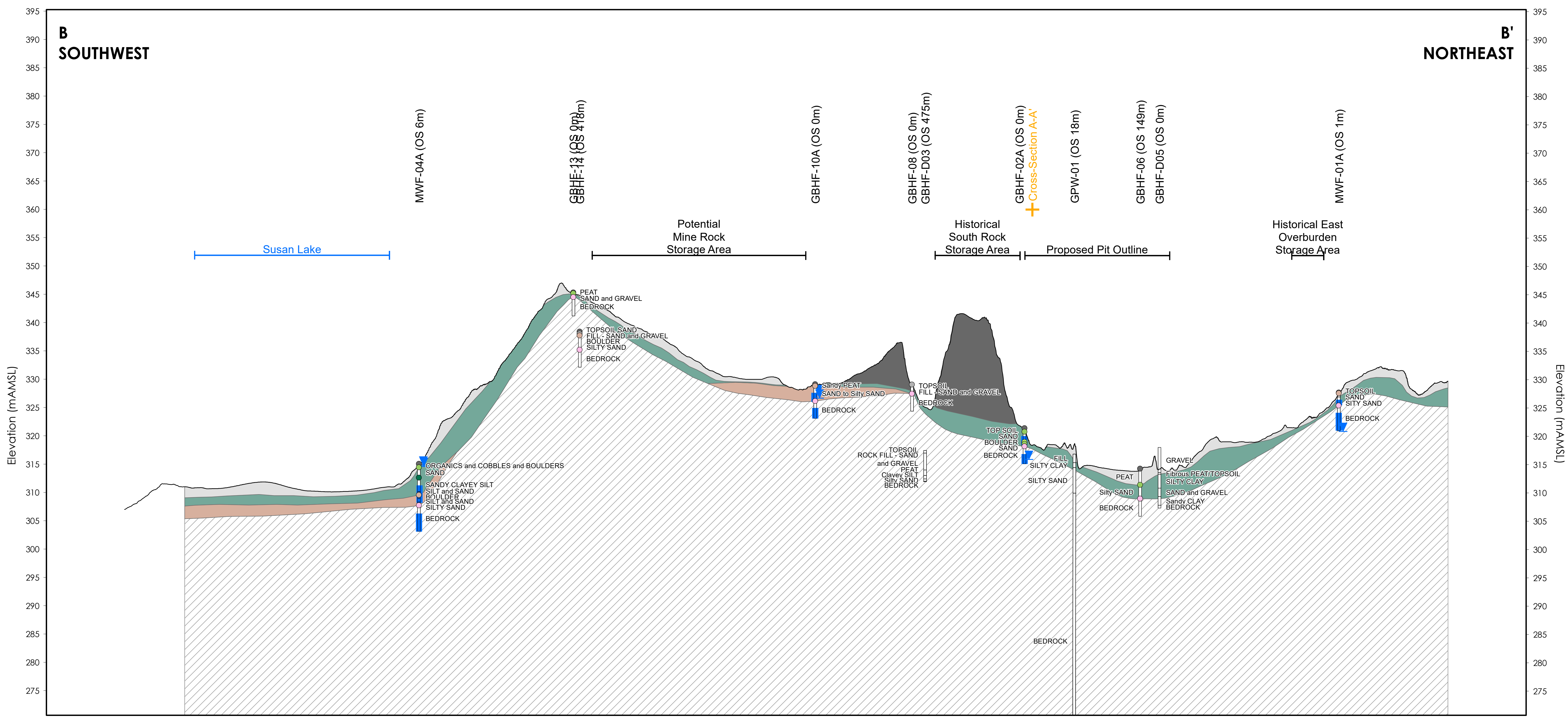
Project Location
Lynn Lake,
Manitoba

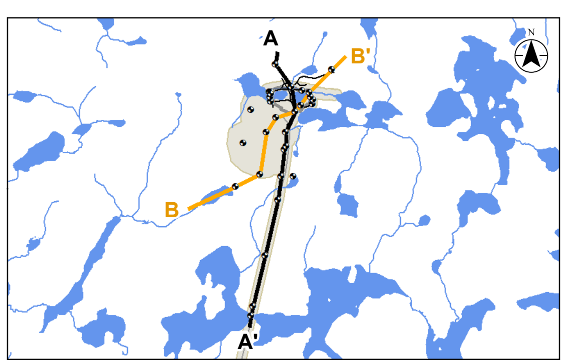
111473008
Prepared by PRM on 2019-11-18
Technical Review by JM on 2019-11-18

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT

Map No.
8-7

Title
Gordon Site
Cross-Section A-A'





Notes
1. Manual water level measurements from September 25 to 29, 2015.

MW1-15 (OS m) Well ID (Offset)
Stratigraphy
Water Level (June 25 to July 4, 2018)
Well Screen

- Fill
- Organics
- Glaciofluvial
- Glaciolacustrine Nearshore
- Glaciolacustrine Offshore
- Diamicton
- Bedrock

- Ground Surface
- Rock Dump
- Fill/Organics
- Glaciolacustrine
- Glaciofluvial
- Diamicton
- Bedrock

20x Vertical Exaggeration
0 250 500 metres
1:15,000 (At original document size of 11x17)

Stantec
ALAMOS GOLD INC.

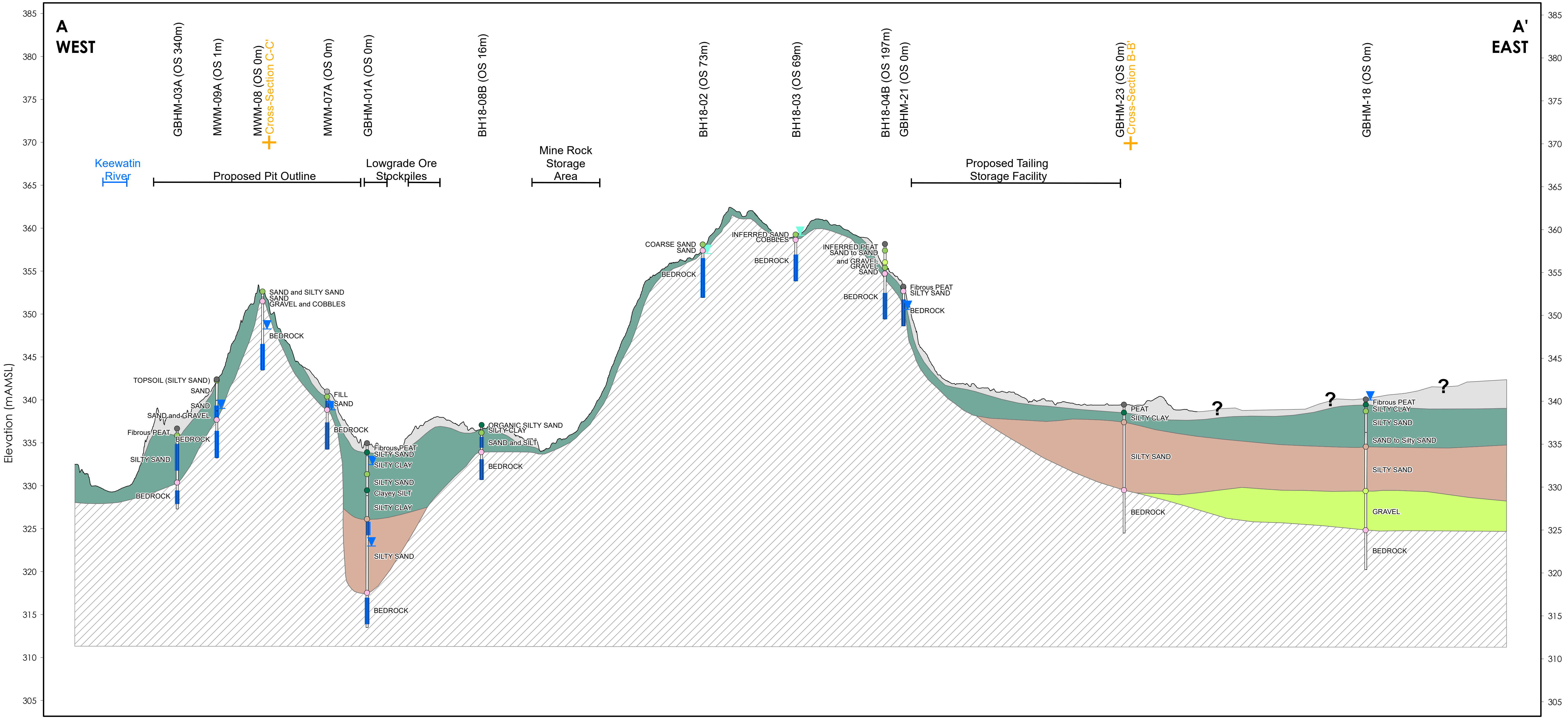
Project Location
Lynn Lake, Manitoba

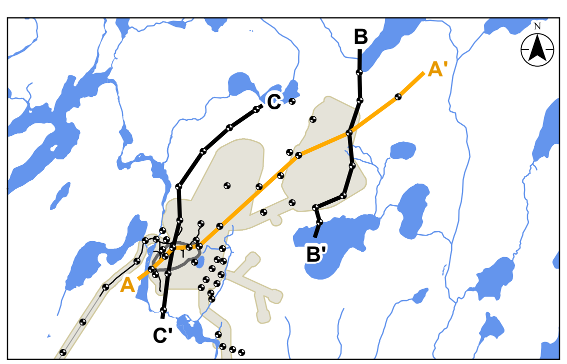
111473008
Prepared by PRM on 2019-11-18
Technical Review by JM on 2019-11-18

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT

Map No.
8-8

Title
Gordon Site
Cross-Section B-B'





Notes
1. Manual water level measurements from September 25 to 29, 2015.

MW1-15 (OS m)
Well ID (Offset)
Sand
Stratigraphy
Water Level
(June 22-26, 2018)
(July 4-5, 2019)
Well Screen

- Fill
- Organics
- Glaciofluvial
- Glaciolacustrine Nearshore
- Glaciolacustrine Offshore
- Diamicton
- Bedrock

- Ground Surface
- Rock Dump
- Fill/Organics
- Glaciolacustrine
- Glaciofluvial
- Diamicton
- Bedrock

50x Vertical Exaggeration
0 500 1,000 metres
1:25,000 (At original document size of 11x17)

Stantec
Alamos Gold Inc.

Project Location
Lynn Lake, Manitoba

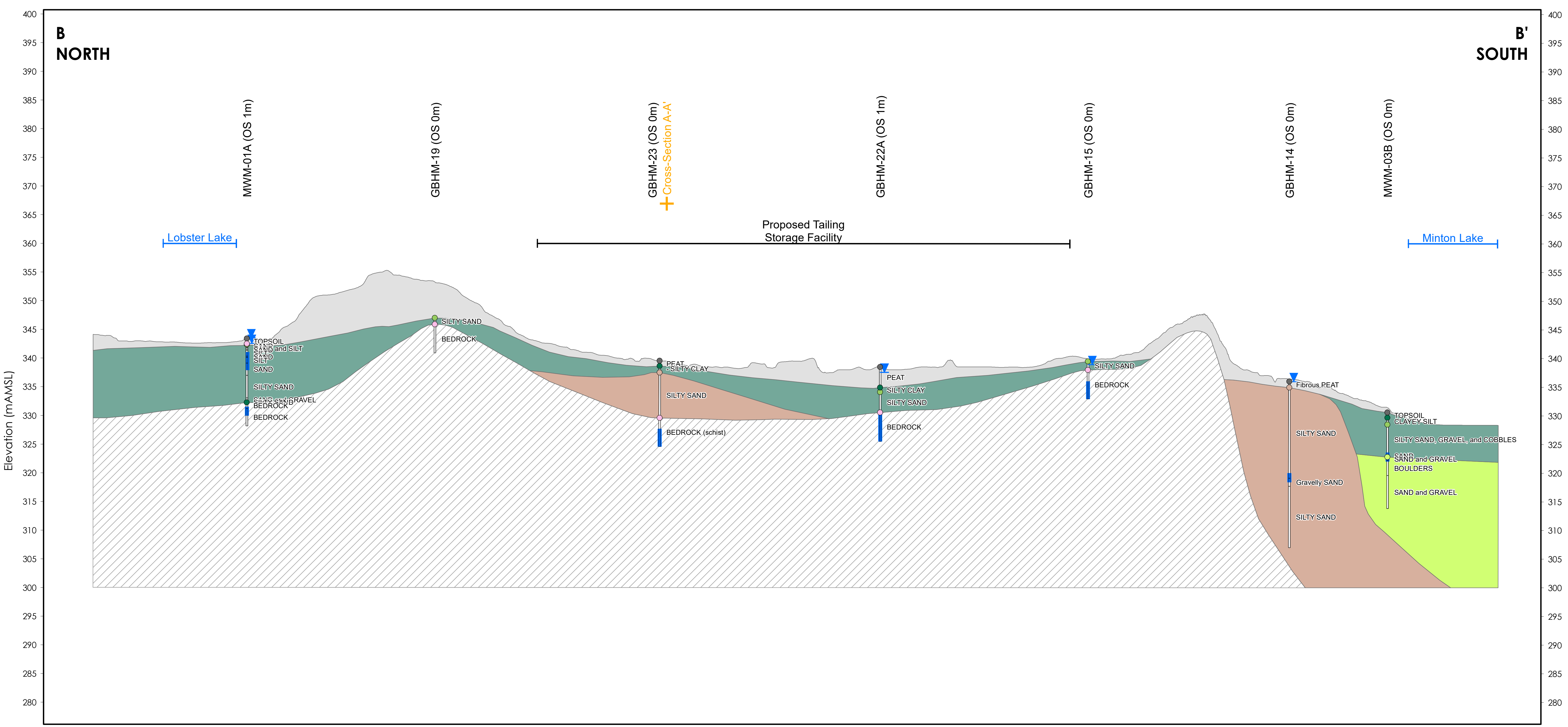
111473008
Prepared by PRM on 2019-11-18
Technical Review by JM on 2019-11-18

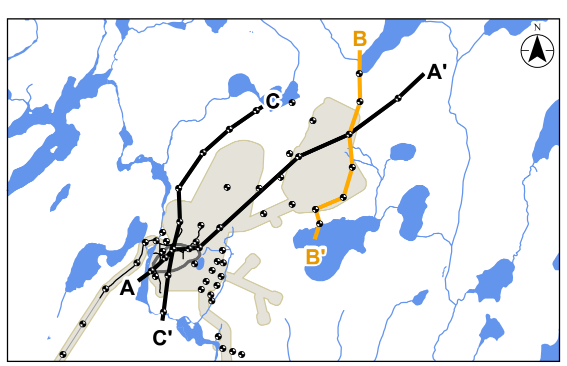
Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT

Map No.
8-9

Title
MacLellan Site
Cross-Section A-A'

\\cd1004-f01\work_group\01609\active\111440293_Alamos\MXD\Hydrogeology\TDR\111473008_HG_TDR_Map8-9_MacLellanSectionAA.mxd Revised: 2019-11-18 By: pmoser





Notes
1. Manual water level measurements from September 25 to 29, 2015.

MW1-15 (OS m)

Well ID (Offset)

Sand

Stratigraphy

Water Level
(June 22-26, 2018)

Well Screen

- Fill
- Organics
- Glaciofluvial
- Glaciolacustrine Nearshore
- Glaciolacustrine Offshore
- Diamicton
- Bedrock

- Ground Surface
- Rock Dump
- Fill/Organics
- Glaciolacustrine
- Glaciofluvial
- Diamicton
- Bedrock

20x Vertical Exaggeration
0 250 500 metres
1:15,000 (At original document size of 11x17)

Stantec

Alamos Gold Inc.

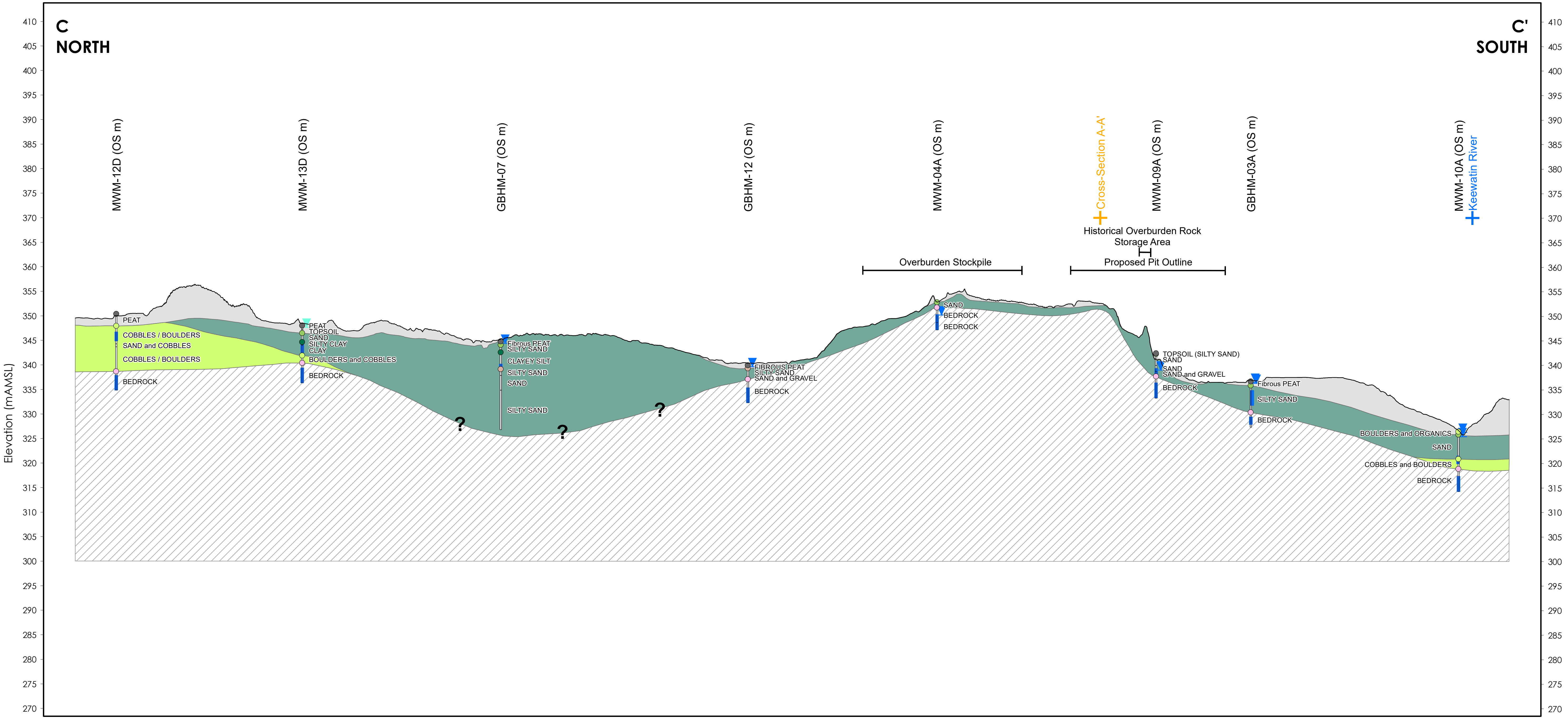
Project Location
Lynn Lake,
Manitoba

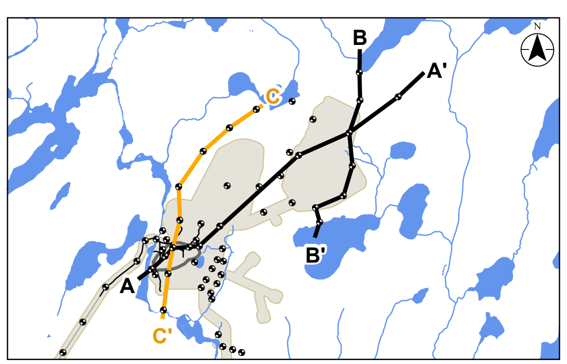
111473008
Prepared by PRM on 2019-11-18
Technical Review by JM on 2019-11-18

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT

Map No.
8-10

Title
MacLellan Site
Cross-Section B-B'





Notes
1. Manual water level measurements from September 25 to 29, 2015.

MW1-15 (OS m) Well ID (Offset)
Sand Stratigraphy
Water Level
(June 22-26, 2018)
(July 4-5, 2019)
Well Screen

- Fill
- Organics
- Glaciofluvial
- Glaciolacustrine Nearshore
- Glaciolacustrine Offshore
- Diamicton
- Bedrock

- Ground Surface
- Rock Dump
- Fill/Organics
- Glaciolacustrine
- Glaciofluvial
- Diamicton
- Bedrock

20x Vertical Exaggeration
0 250 500 metres
1:17,500 (At original document size of 11x17)

Stantec
Alamos Gold Inc.

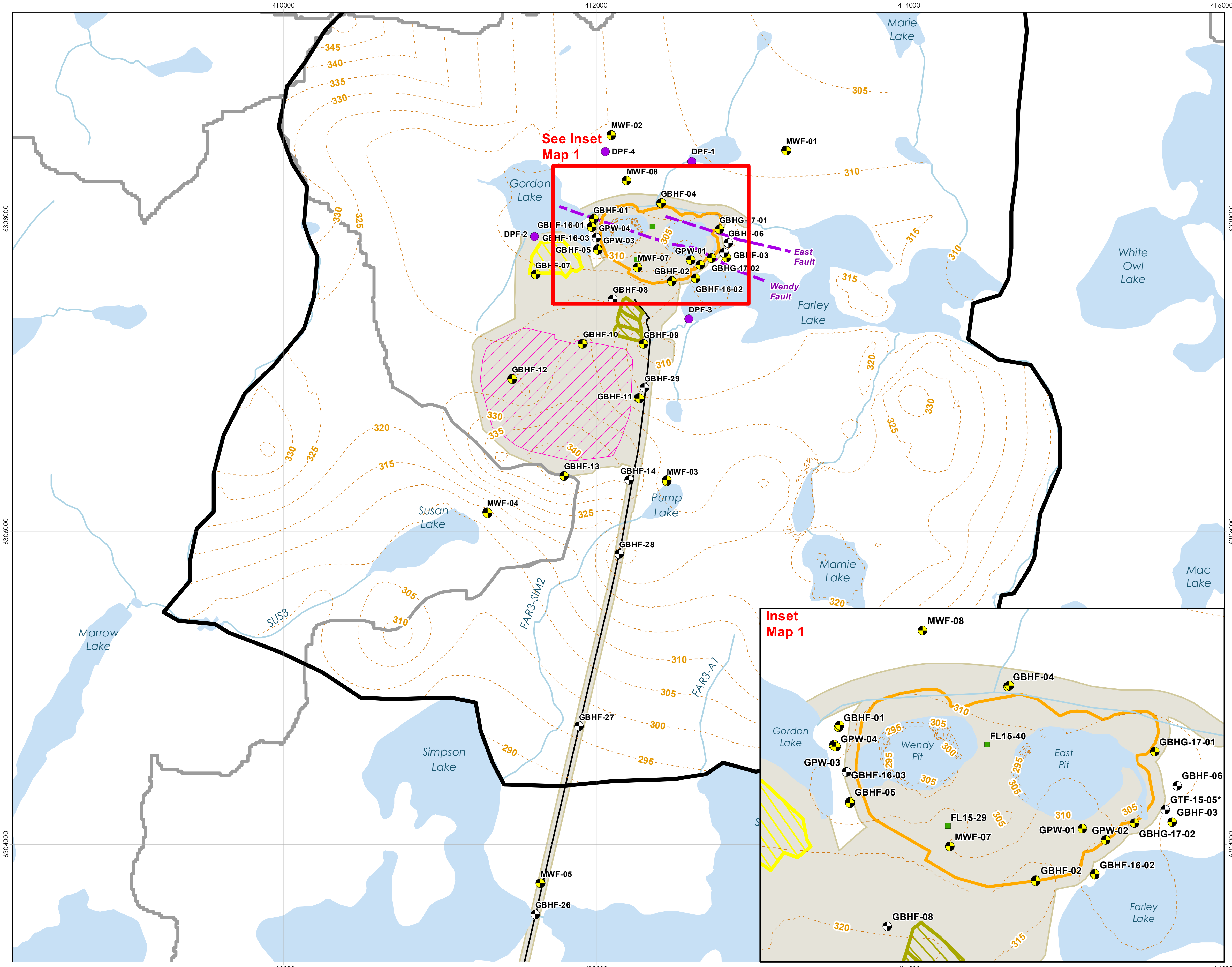
Project Location
Lynn Lake,
Manitoba

111473000
Prepared by PRM on 2019-11-18
Technical Review by JM on 2019-11-18

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT

Map No.
8-11

Title
MacLellan Site
Cross-Section C-C'



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)
- Subwatersheds

Survey Locations

- Borehole
- Drive-Point Piezometers
- Monitoring Well
- Exploration Borehole
- Top of Bedrock Contour (m)

Landbase

- Existing Access Road
- Fault Zone
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:25,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

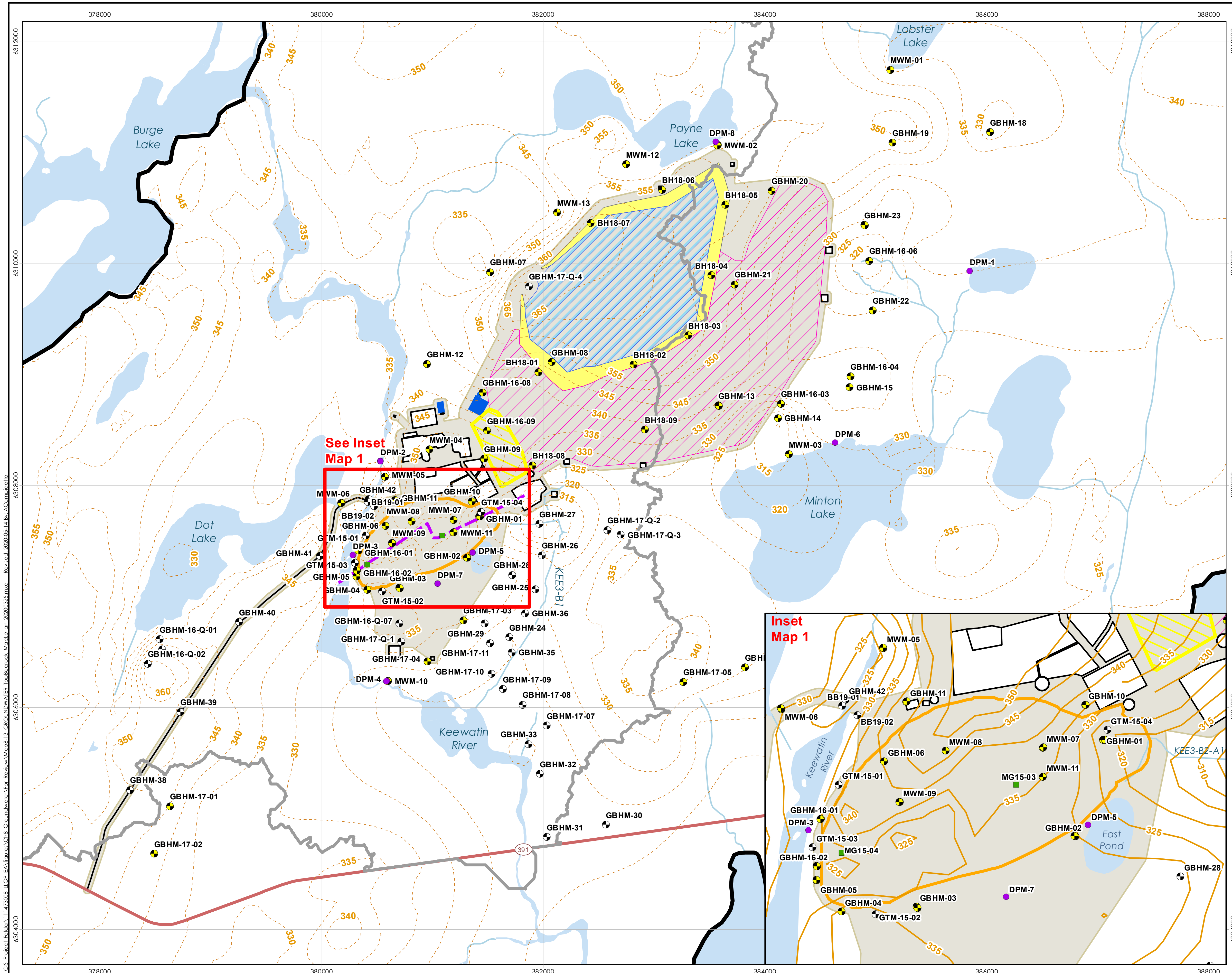
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-12

Title
Interpreted Top of Bedrock - Gordon



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)
- Subwatersheds

Survey Locations

- Borehole
- Drive-Point Piezometers
- Monitoring Well
- Exploration Borehole
- Top of Bedrock Contour (m)

Landbase

- Existing Access Road
- Highway
- Approximate Location of NSZ
- Watercourse
- Waterbody

N

0 0.5 1 Kilometres

(At original document size of 11x17)
1:35,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location: Lynn Lake, Manitoba

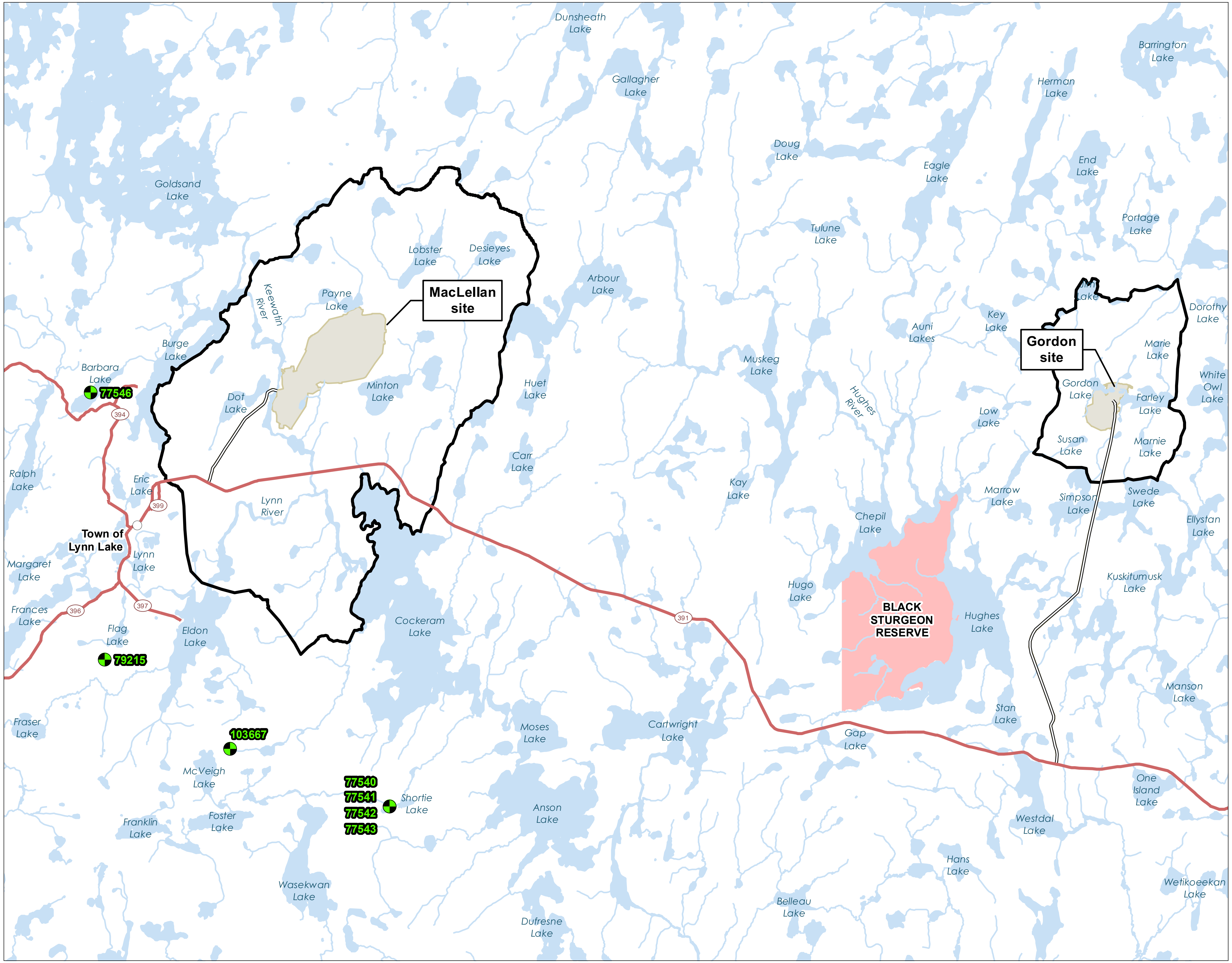
Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project: 111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-13

Title
Interpreted Top of Bedrock - MacLellan



Stantec

Alamos Gold Inc.

Project Infrastructure

Project Development Area

Study Area

Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Well Locations

Groundwater Well

Landbase

Existing Access Road

Highway

Watercourse

Waterbody

First Nation Reserve

0 2.5 5 Kilometres

(At original document size of 11x17)
1:150,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada
3. Groundwater wells identified from the GWDrill database

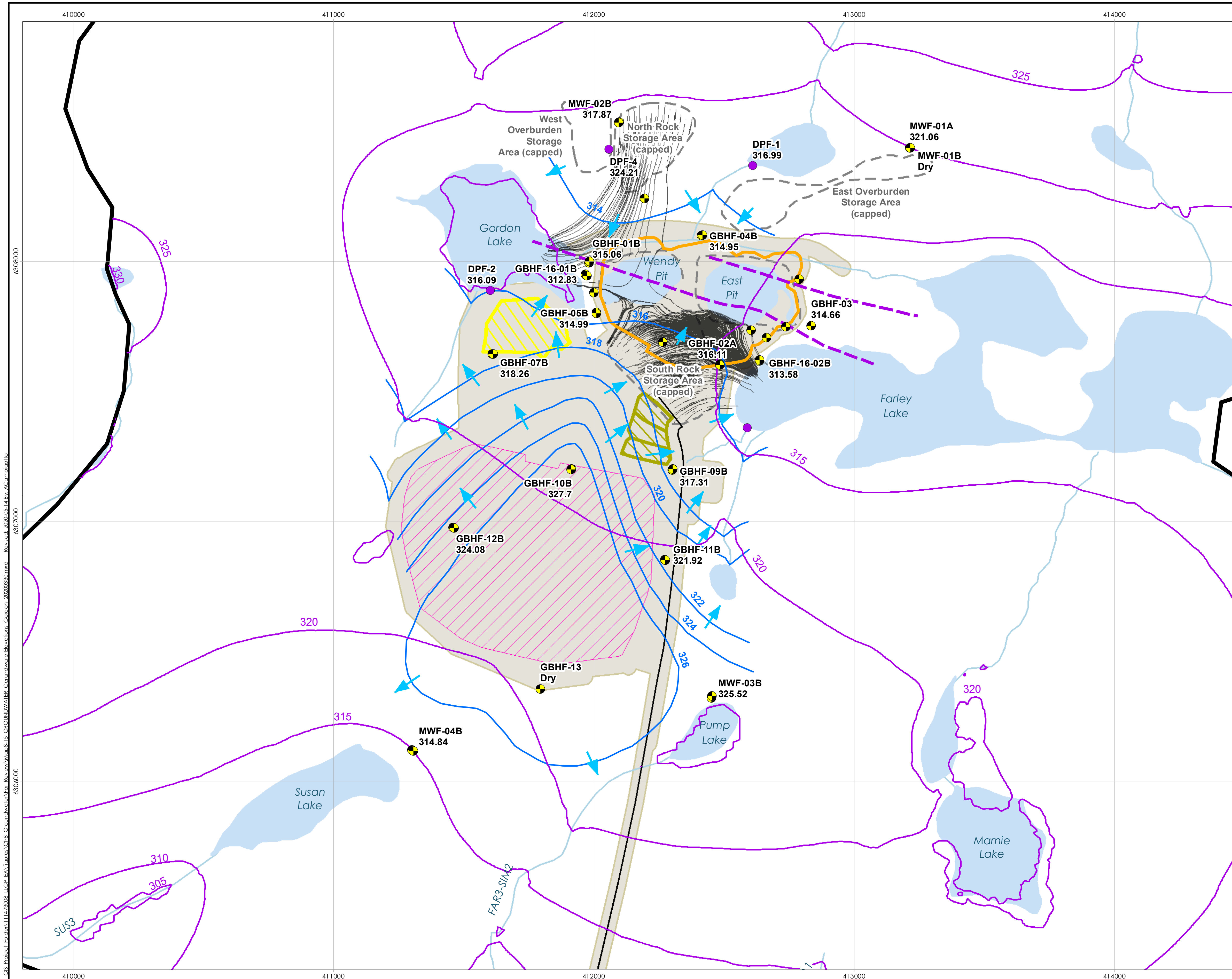
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-03-25
Technical Review by MFraser on 2020-03-25
Senior GIS Review by GKroupa on 2020-03-25

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-14

Title
Groundwater Well Users



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Survey Locations

- Monitoring Well with Groundwater Elevation (mAMSL) June 25 to July 4, 2018
- Drive-Point Piezometers with Groundwater Elevation (mAMSL) June 25 to July 4, 2018
- Groundwater Flow Direction
- Interpreted/Inferred Groundwater Contour (m AMSL)
- Simulated Baseline Water Table Elevations (5 m interval)
- Baseline Particle Tracks

Landbase

- Existing Access Road
- Watercourse
- Fault Zone
- Waterbody

N

0 150 300 Metres

(At original document size of 11x17)
1:15,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

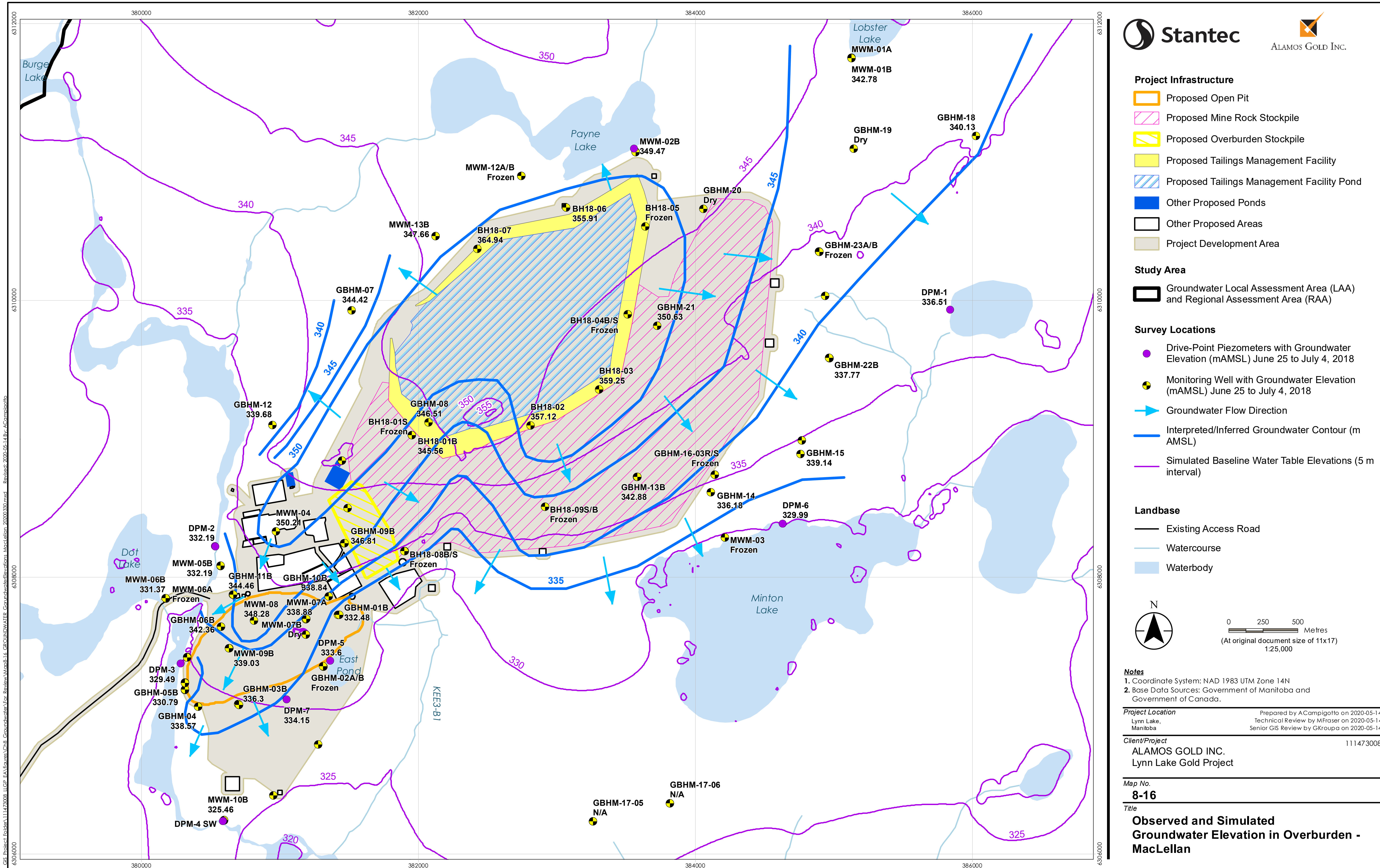
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-15

Title
Observed and Simulated Groundwater Elevation in Overburden - Gordon


Stantec
Alamos Gold Inc.
Project Infrastructure
Proposed Open Pit
Proposed Mine Rock Stockpile
Proposed Overburden Stockpile
Proposed Tailings Management Facility
Proposed Tailings Management Facility Pond
Other Proposed Ponds
Other Proposed Areas
Project Development Area
Study Area
Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)
Survey Locations
Drive-Point Piezometers with Groundwater Elevation (mAMSL) June 25 to July 4, 2018
Monitoring Well with Groundwater Elevation (mAMSL) June 25 to July 4, 2018
Groundwater Flow Direction
Interpreted/Inferred Groundwater Contour (m AMSL)
Simulated Baseline Water Table Elevations (5 m interval)
Landbase
Existing Access Road
Watercourse
Waterbody
N
0 250 500
Metres
(At original document size of 11x17)
1:25,000
Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
Project Location
Lynn Lake, Manitoba
Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14
Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project
Map No.
8-16
Title
Observed and Simulated Groundwater Elevation in Overburden - MacLellan
Burge Lake
Lobster Lake
Payne Lake
Dot Lake
Minton Lake
East Pond
KEE3-B1
MWM-01A
MWM-01B 342.78
GBHM-18 340.13
GBHM-19 Dry
MWM-02B 349.47
MWM-12A/B Frozen
GBHM-20 Dry
BH18-06 355.91
BH18-05 Frozen
MWM-13B 347.66
BH18-07 364.94
GBHM-23A/B Frozen
GBHM-07 344.42
DPM-1 336.51
GBHM-21 350.63
BH18-04B/S Frozen
GBHM-22B 337.77
BH18-03 359.25
GBHM-12 339.68
GBHM-08 346.51
BH18-02 357.12
BH18-01S Frozen
BH18-01B 345.56
GBHM-16-03R/S Frozen
GBHM-15 339.14
GBHM-13B 342.88
GBHM-14 336.18
MWM-04 350.21
BH18-09S/B Frozen
DPM-6 329.99
DPM-2 332.19
GBHM-09B 346.81
BH18-08B/S Frozen
MWM-03 Frozen
MWM-05B 332.19
MWM-06B 331.37
MWM-06A Frozen
GBHM-11B 344.46
GBHM-10B 338.84
MWM-08 348.28
MWM-07A 338.88
GBHM-01B 332.48
GBHM-06B 342.36
MWM-07B Dry
DPM-5 333.6
MWM-09B 339.03
DPM-3 329.49
GBHM-02A/B Frozen
GBHM-05B 330.79
GBHM-03B 336.3
DPM-7 334.15
GBHM-04 338.57
MWM-10B 325.46
DPM-4 SW
GBHM-17-06 N/A
GBHM-17-05 N/A
350
345
340
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330
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320
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380000
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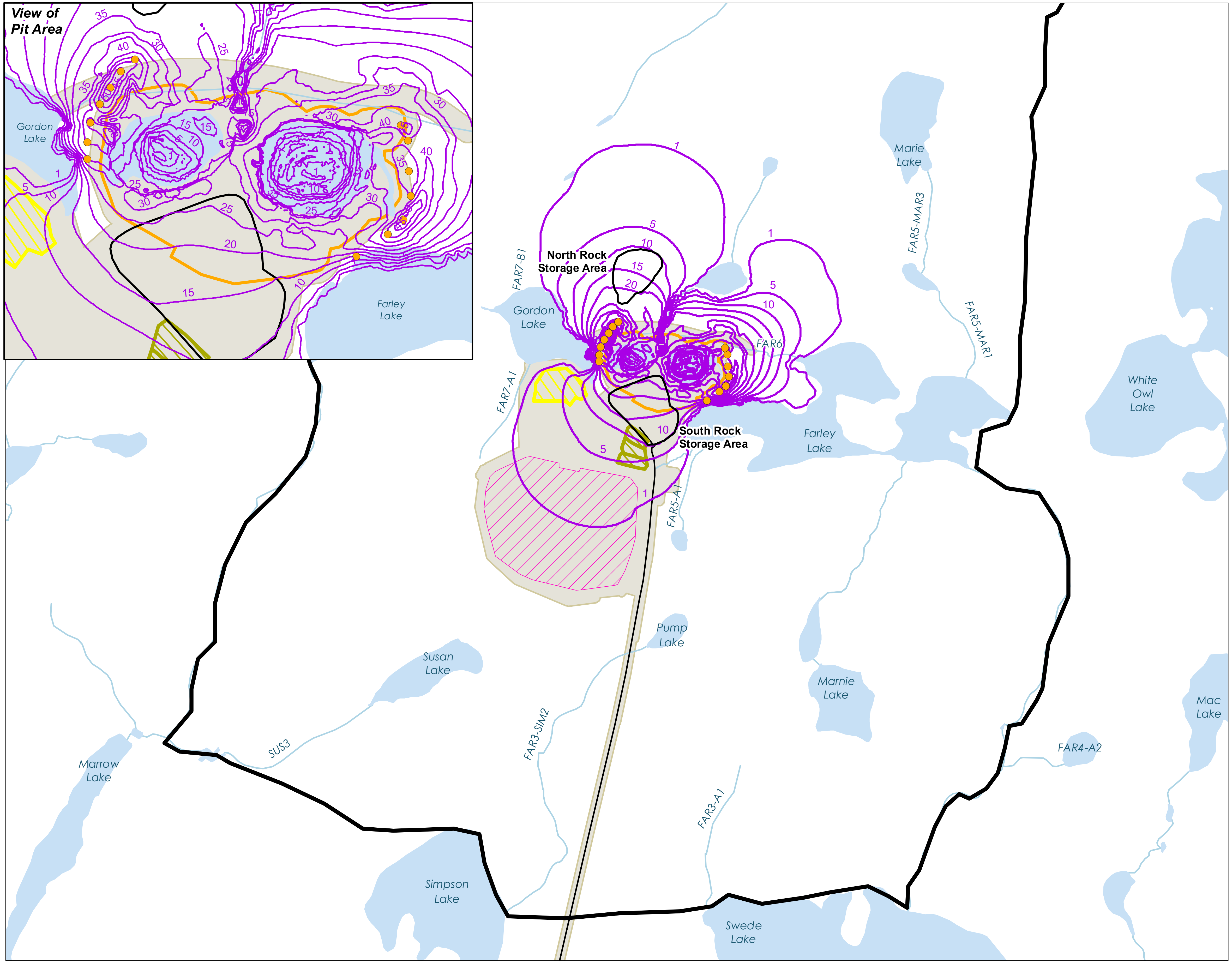
6310000
6308000
6306000



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Survey Locations

- Groundwater Interceptor Wells
- Simulated Water Table Drawdown

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:25,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake,
Manitoba

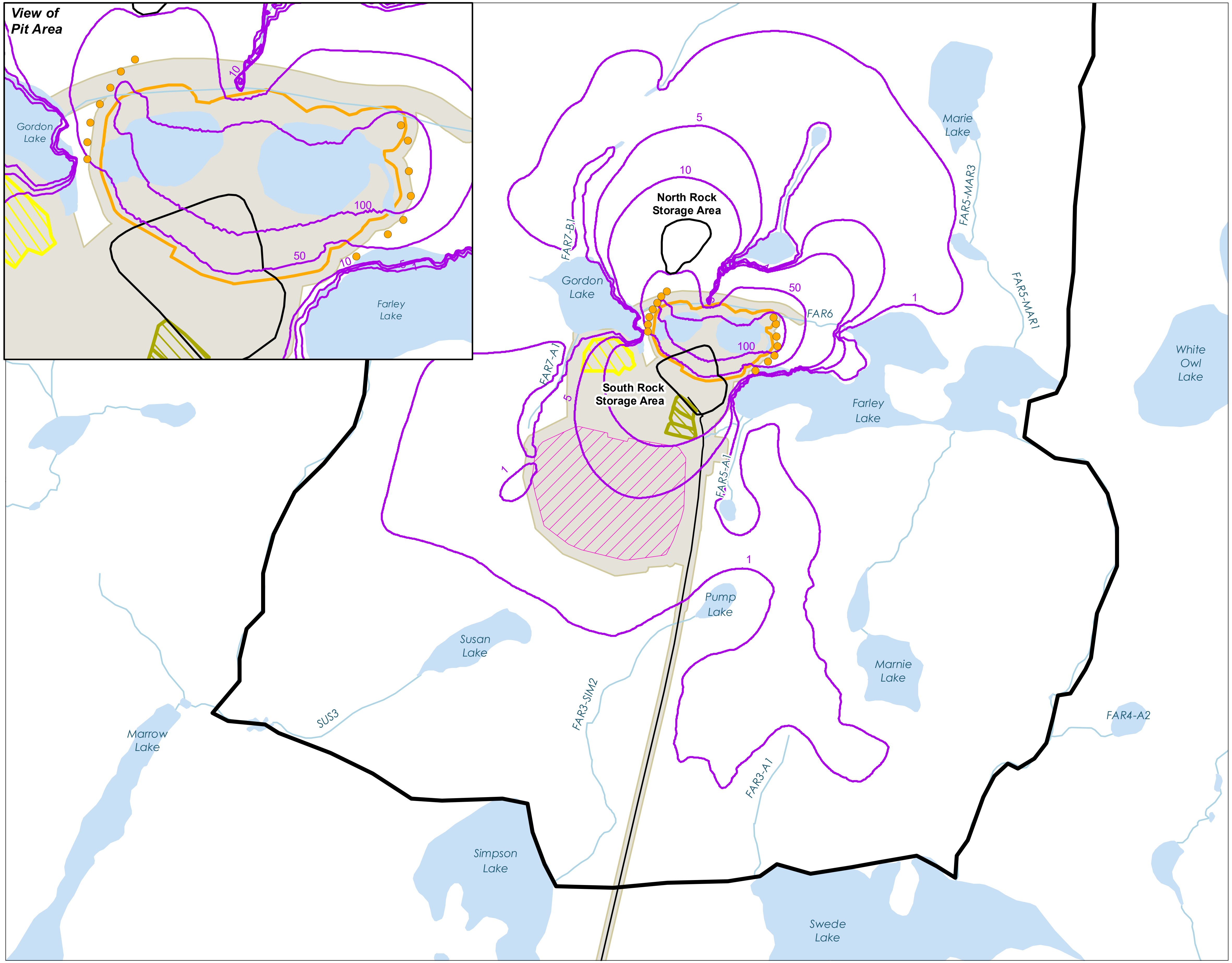
Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project
111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-17

Title
Simulated Water Table Drawdown at End of Construction - Gordon Site



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Survey Locations

- Groundwater Interceptor Wells
- Simulated Water Table Drawdown

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

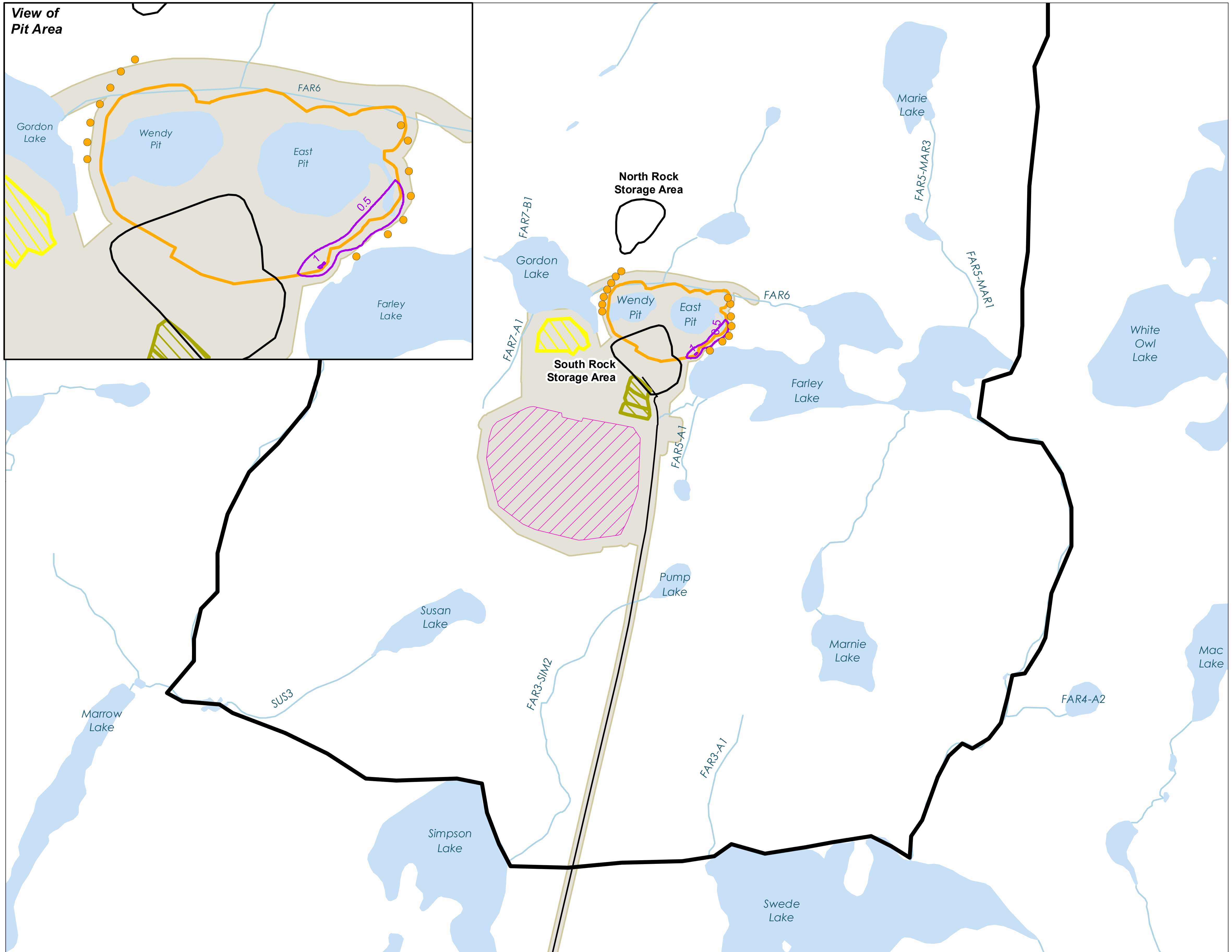
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-18

Title
Simulated Water Table Drawdown at End of Operation - Gordon Site



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Survey Locations

- Groundwater Interceptor Wells
- Simulated Water Table Drawdown

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

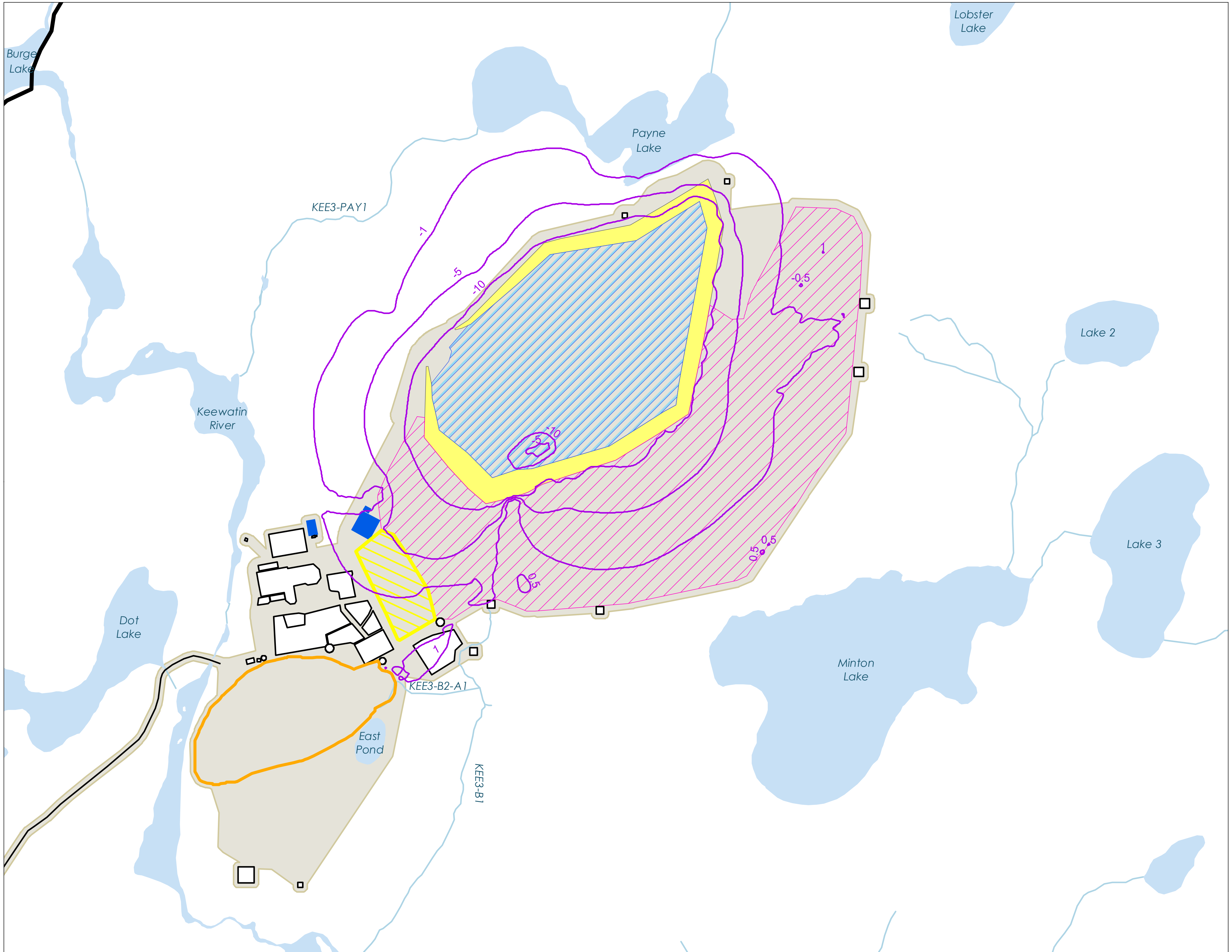
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-19

Title
Simulated Water Table Drawdown at Closure - Gordon Site



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Survey Locations

- Water Table Drawdown Contours

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:25,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008

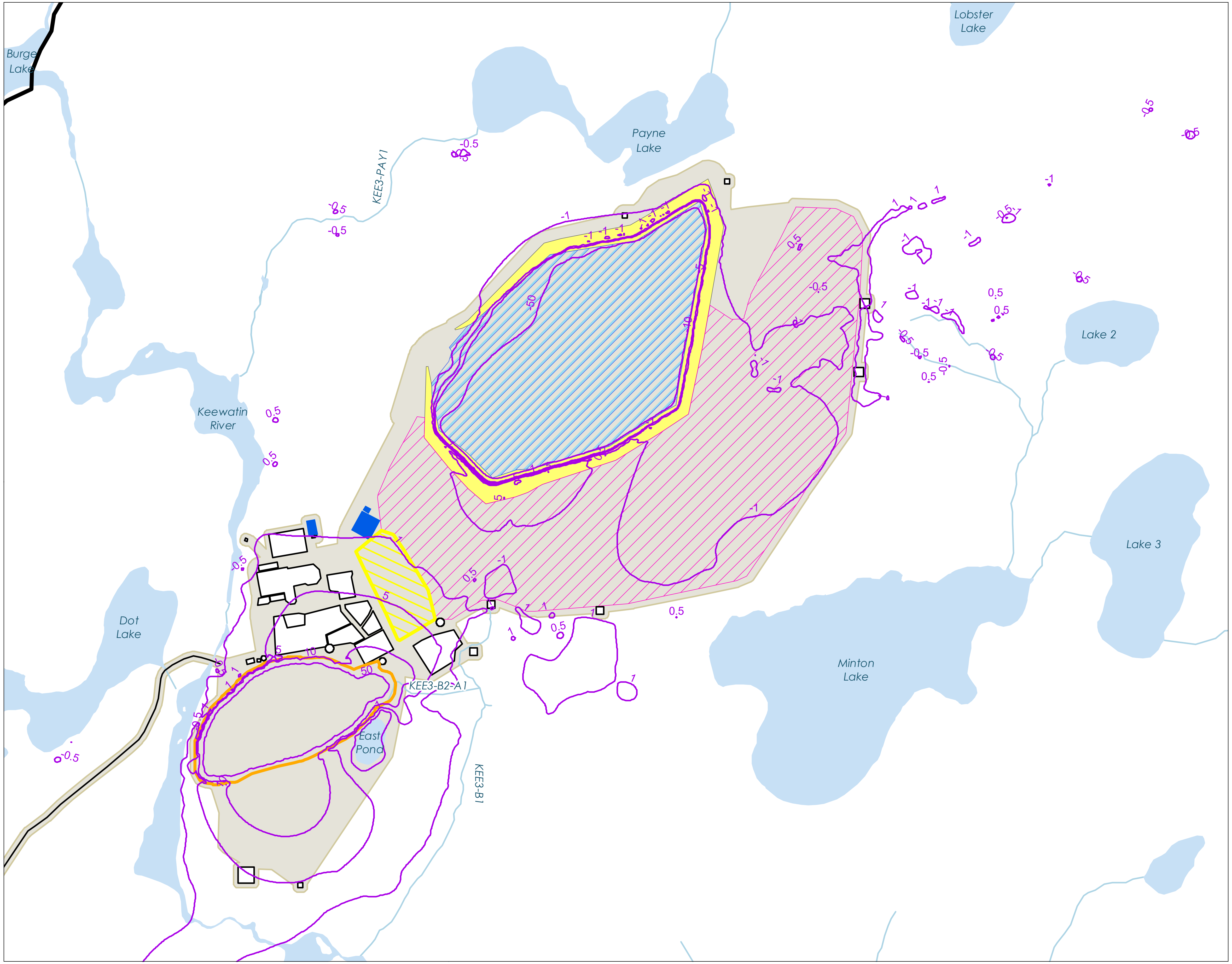
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.

8-20

Title

Simulated Water Table Drawdown at End of Construction - MacLellan Site



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Survey Locations

- Water Table Drawdown Contours

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:25,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

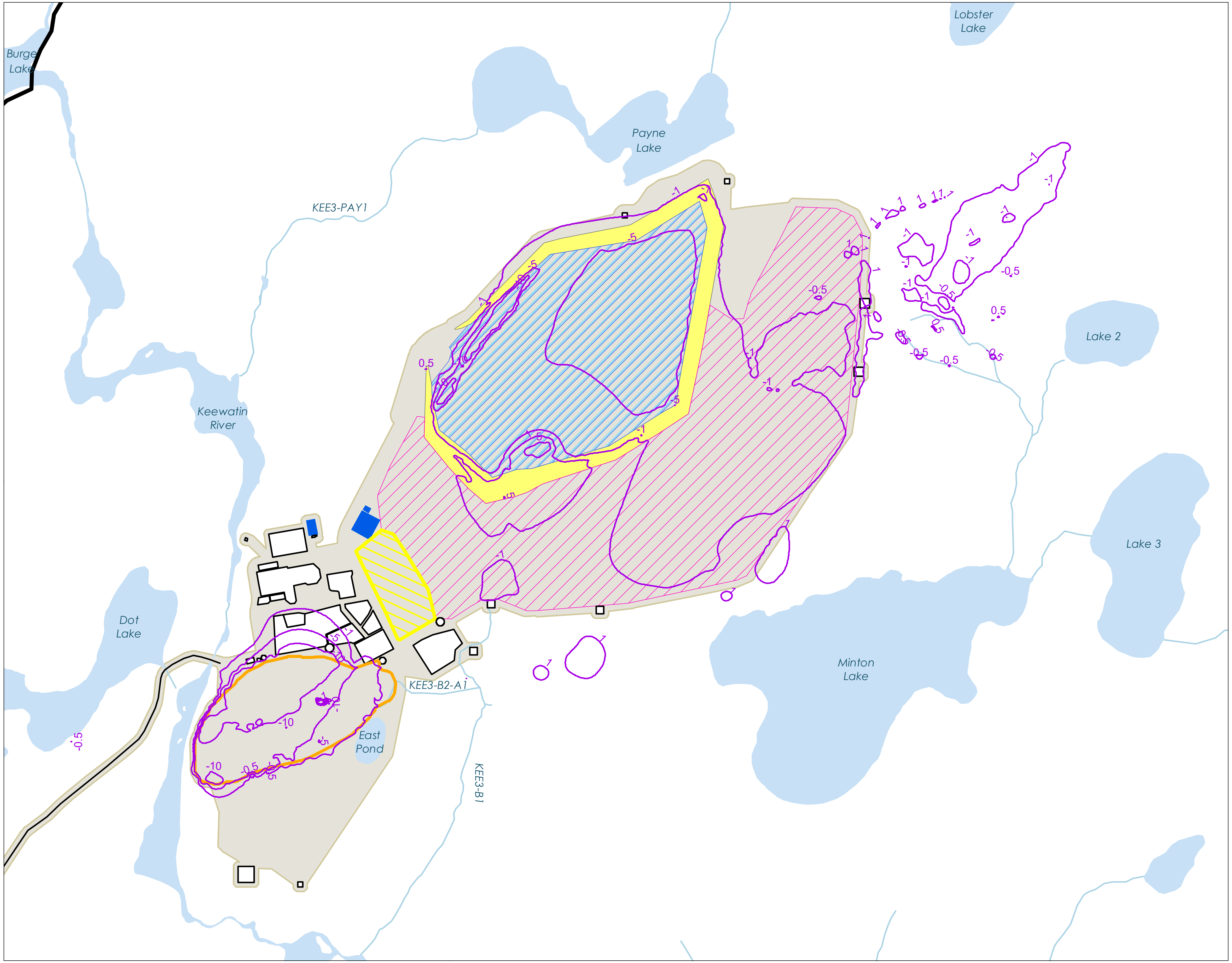
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-21

Title
Simulated Water Table Drawdown at End of Operation - MacLellan Site (including contact water collection ditches)



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Survey Locations

- Water Table Drawdown Contours

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:25,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008

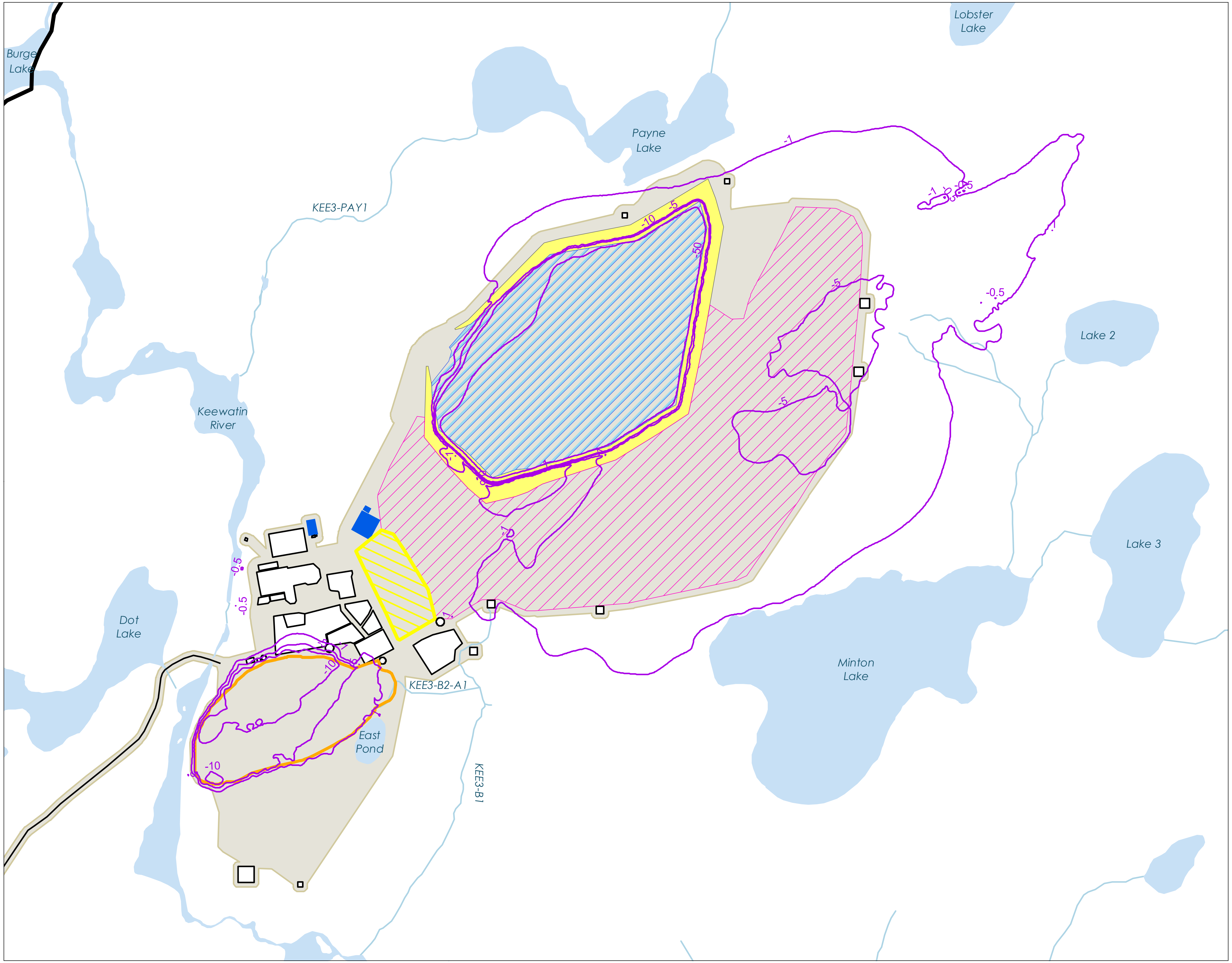
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.

8-22

Title

Simulated Water Table Drawdown at End of Closure - MacLellan Site (including contact water collection ditches)



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Survey Locations

- Water Table Drawdown Contours

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:25,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

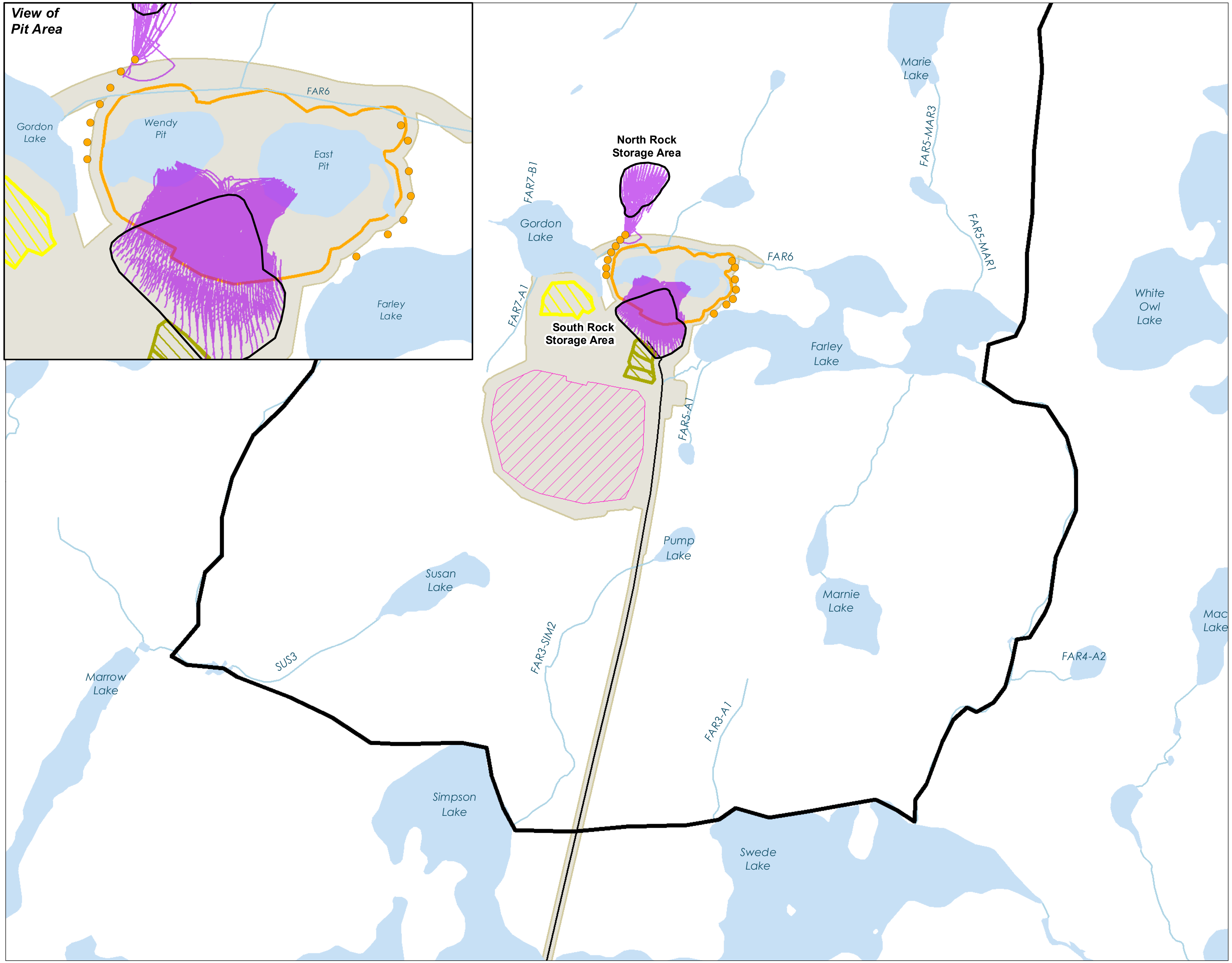
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-23

Title
Simulated Water Table Drawdown at End of Closure - MacLellan Site (no contact water collection ditches)



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Survey Locations

- Groundwater Interceptor Wells
- Simulated Water Table Drawdown

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

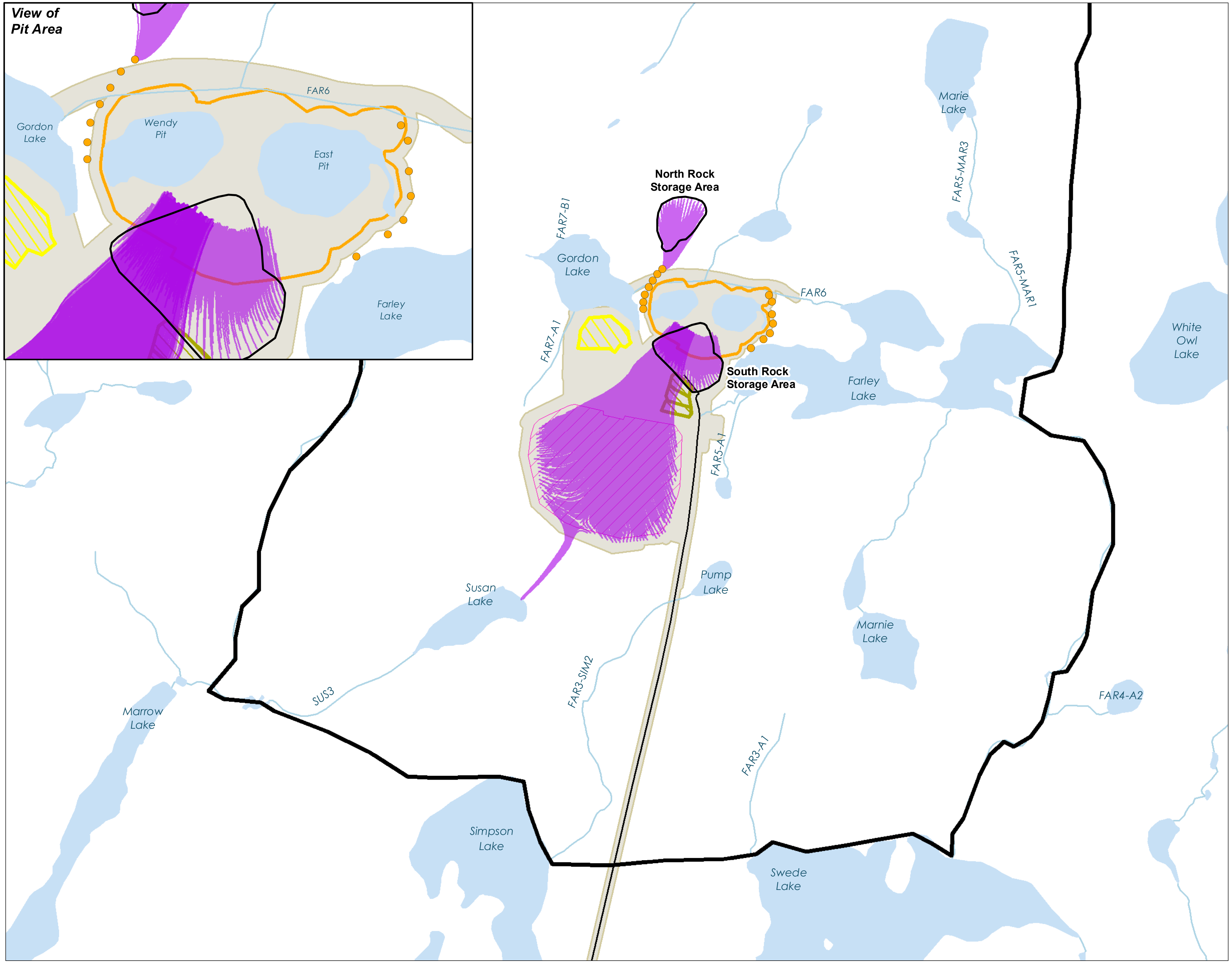
Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-24

Title
Particle Traces from Historical MRSAs to Historical Pits and Receiving Environment - End of Construction, Gordon Site



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Survey Locations

- Groundwater Interceptor Wells
- Simulated Water Table Drawdown

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:25,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

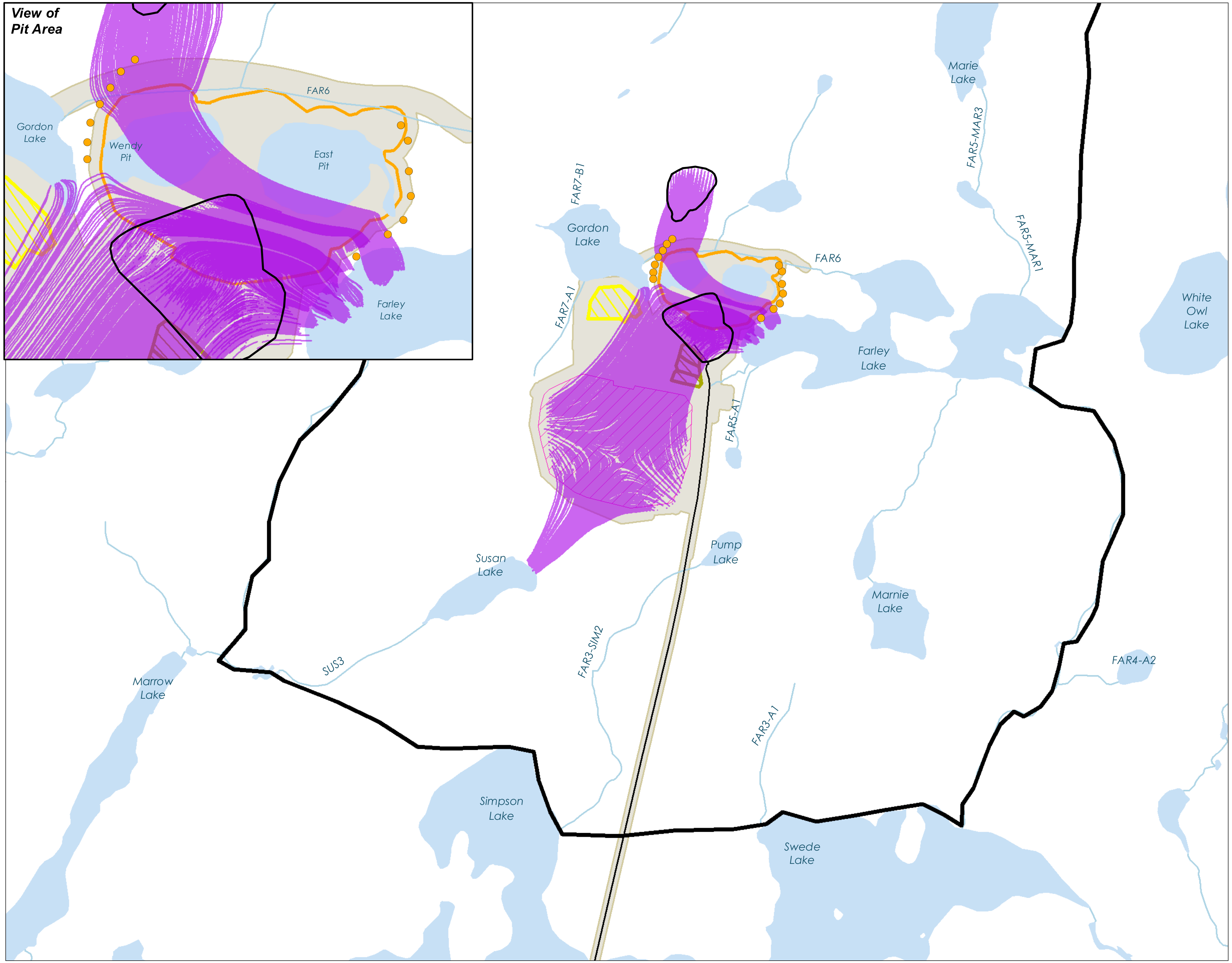
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-25

Title
Particle Traces from MRSAs to Open Pit and Receiving Environment under Dewatering Conditions (Year 6) - Gordon Site



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Survey Locations

- Groundwater Interceptor Wells
- Simulated Water Table Drawdown

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:25,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

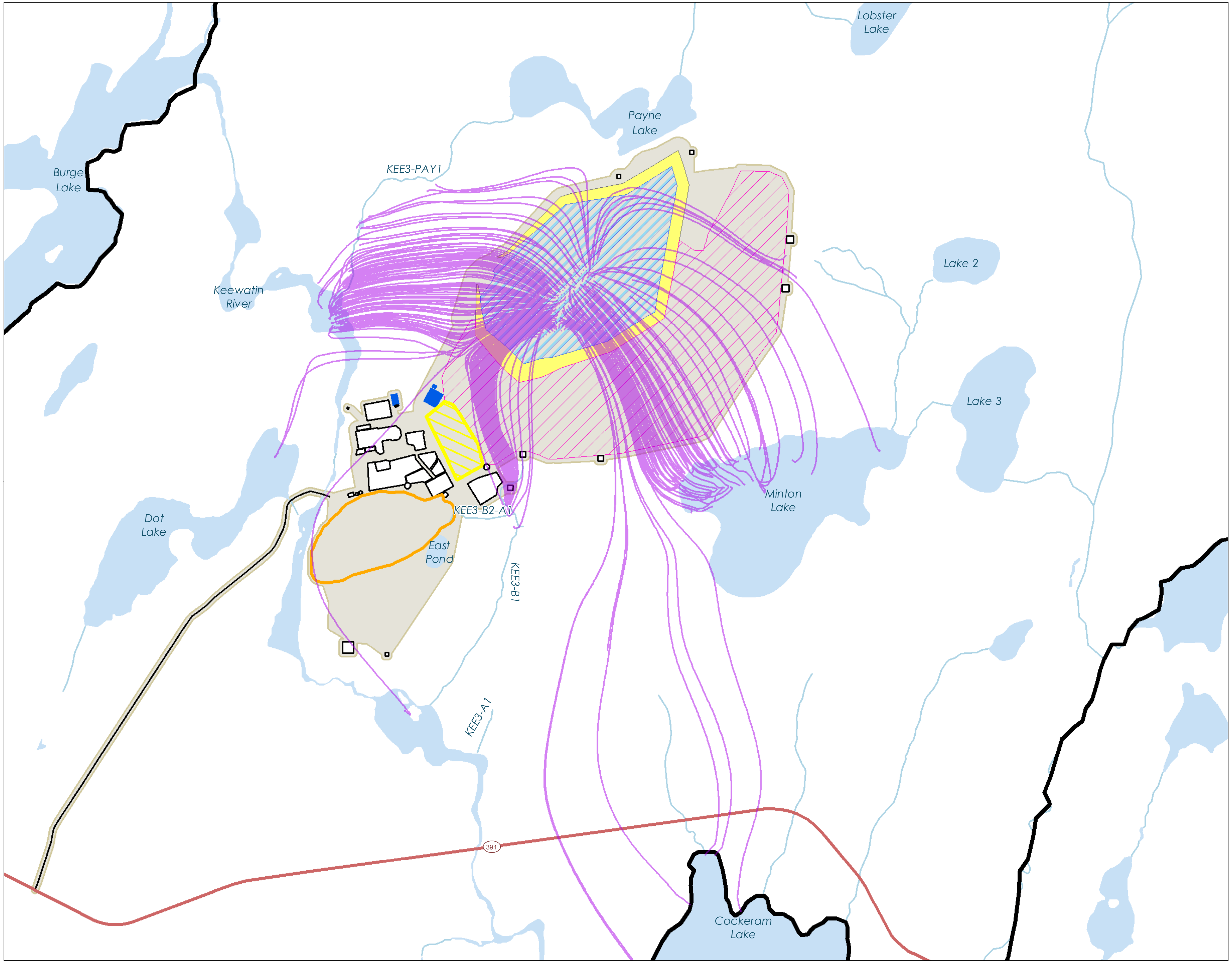
Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-26

Title
Particle Traces from MRSAs at End of Closure (Pit Lake) - Gordon Site



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Survey Locations

- Water Table Drawdown Contours

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 400 800 Metres

(At original document size of 11x17)
1:35,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

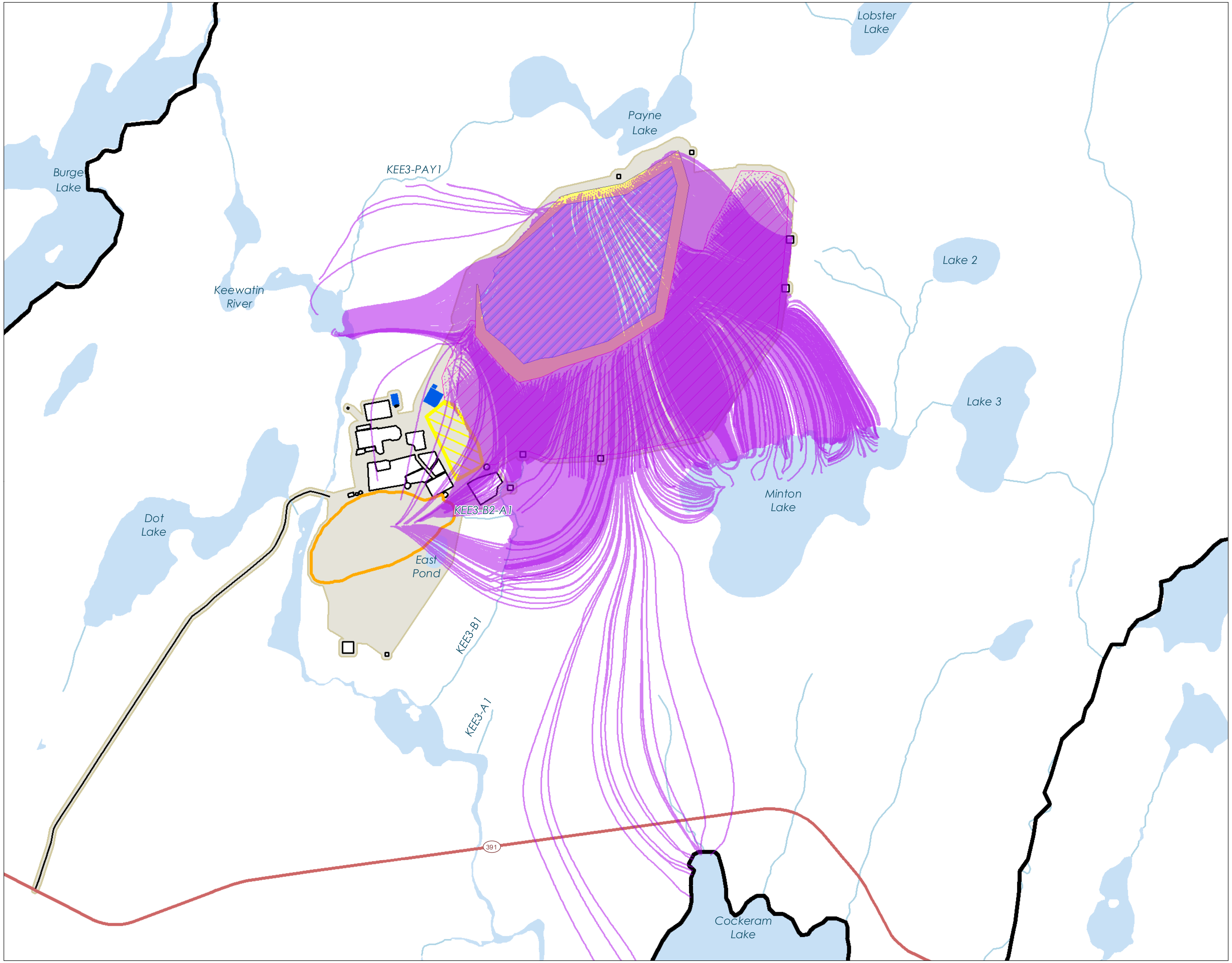
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-27

Title
Particle Traces from TMF to the Receiving Environment, End of Construction - MacLellan Site (no contact water collection ditches)



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Survey Locations

- Water Table Drawdown Contours

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 400 800 Metres

(At original document size of 11x17)
1:35,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

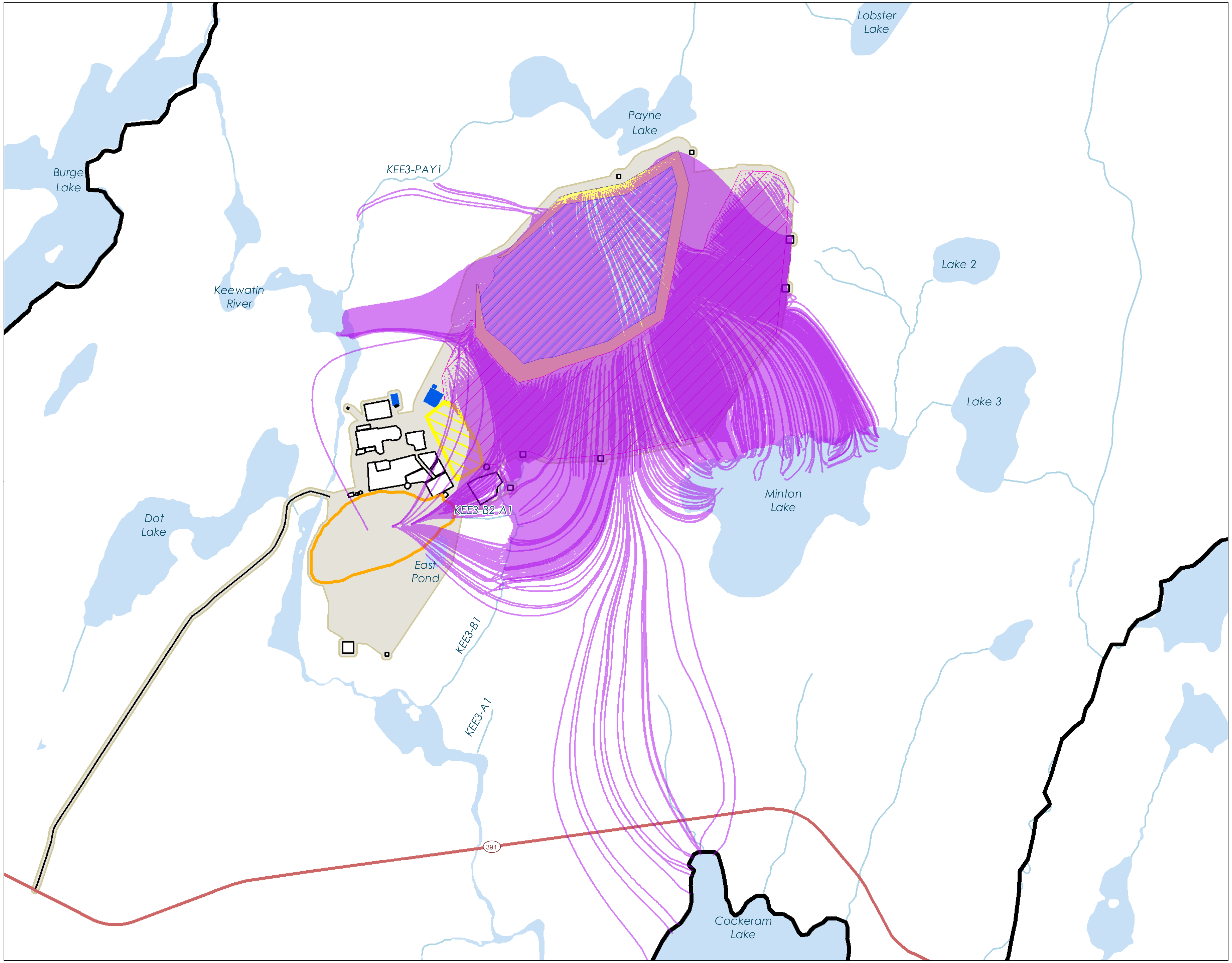
Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-28

Title
Particle Traces from MRSA and TMF to Open Pit and Receiving Environment under Dewatering Conditions (Year 13) - MacLellan Site



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Project Development Area

Study Area

- Groundwater Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Survey Locations

- Water Table Drawdown Contours

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 400 800 Metres
(At original document size of 11x17)
1:35,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-14
Technical Review by MFraser on 2020-05-14
Senior GIS Review by GKroupa on 2020-05-14

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
8-29

Title
Particle Traces from MRSA and TMF at End of Closure (Pit Lake) - MacLellan Site (including contact water collection ditches)

Appendix 8A TABLES

Table 8A-1 Gordon Baseline Groundwater Quality Statistics - Background (not affected) Areas

Parameters	Units	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Gordon Background Bedrock Monitoring Locations									Gordon Background Overburden Monitoring Locations								
											Number of wells with mean exceeding:									Number of wells with mean exceeding:		
					Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3
General Chemistry																						
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	0.93	1.6	2.0	10	2.9	9	-	-	-	1.1	2.7	2.8	12	3.5	8	-	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.0036	0.021	0.024	0.42	0.14	9	-	5	-	0.0065	<0.01	0.011	0.090	0.029	8	-	0	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	0.019	0.11	0.085	0.51	0.16	9	-	0	-	0.074	0.17	0.19	0.44	0.14	8	-	0	-
Chloride	mg/L	250	120	1,800	<0.5	<0.5	0.57	4.2	1.4	9	0	0	0	<0.5	1.0	0.94	7.2	2.5	8	0	0	0
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	<0.001	<0.001	0.0010	0.00017	9	0	-	0	<0.001	<0.001	<0.001	0.0010	0.00018	8	0	-	0
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	<0.001	<0.001	0.0013	0.00027	9	0	0	-	0.0010	<0.001	<0.001	0.0011	0.00027	8	0	0	-
Fluoride	mg/L	1.5	0.12	n/v	0.073	0.14	0.14	0.28	0.067	9	0	5	-	0.072	0.12	0.14	0.33	0.087	8	0	0	-
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	76	148	164	534	140	9	-	-	-	71	185	161	362	97	8	-	-	-
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	<0.05	0.059	0.067	0.21	0.075	9	0	-	-	<0.05	0.066	0.082	1.2	0.39	8	0	-	-
pH, Field	mg/L	7.0*-8.5**	6.5-9.0	n/v	7.2	7.5	7.5	8.0	0.25	9	0	0	-	**6.5**	7.6	7.6	**9.7**	0.95	8	3	3	-
Sulfate	mg/L	500	n/v	n/v	4.8	8.8	16	390	126	9	0	-	-	3.4	30	28	257	92	8	0	-	-
Dissolved Metals																						
Aluminum	mg/L	0.1 *	0.1	n/v	0.0013	0.0027	0.0040	**0.21**	0.069	9	1	1	-	0.0023	0.0064	0.0070	0.022	0.0066	8	0	0	-
Antimony	mg/L	0.006	n/v	16	<0.0001	<0.0001	<0.0001	<0.0002	0.000017	9	0	-	0	<0.0001	<0.0001	<0.0001	<0.0002	0.000023	8	0	-	0
Arsenic	mg/L	0.01	0.005 *	1.5	0.00015	0.00074	0.00057	0.0019	0.00056	9	0	0	0	<0.0001	0.00052	0.00042	0.0017	0.00061	8	0	0	0
Barium	mg/L	1	n/v	23	0.0049	0.036	0.021	0.055	0.019	9	0	-	0	0.021	0.040	0.040	0.11	0.029	8	0	-	0
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	<0.0001	<0.0001	0.00034	0.000096	9	-	-	0	<0.0001	<0.0001	<0.0001	<0.0002	0.000018	8	-	-	0
Boron	mg/L	5	1.5	36	<0.01	<0.01	<0.01	0.046	0.014	9	0	0	0	<0.01	<0.01	<0.01	0.041	0.013	8	0	0	0
Cadmium	mg/L	0.005	BR 0.0035 */*** OB 0.0034 */***	0.0021	<0.000005	<0.000005	0.0000072	0.00021	0.000069	9	0	6	0	<0.000005	0.0000071	0.0000069	0.000021	0.0000063	8	0	0	0
Chromium	mg/L	0.05	0.011 **	0.64	<0.0001	0.00016	0.00019	0.0011	0.00038	9	0	0	0	0.00010	0.00011	0.00011	0.00050	0.00015	8	0	0	0
Cobalt	mg/L	n/v	n/v	0.052	<0.0001	<0.0001	<0.0001	0.00043	0.00012	9	-	-	0	<0.0001	<0.0001	0.00012	0.00084	0.00027	8	-	-	0
Copper	mg/L	1	BR 0.0031 */*** OB 0.0032 */***	0.069	<0.0002	<0.0002	0.00036	0.0074	0.0024	9	0	6	0	0.00023	0.00063	0.00084	0.0078	0.0027	8	0	0	0
Iron	mg/L	0.3	0.3	n/v	<0.01	**0.39**	0.16	**7.1**	2.4	9	6	6	-	<0.01	0.013	0.034	**2.4**	0.84	8	1	1	-
Lead	mg/L	0.005 *	BR 0.0043 **/*** OB 0.0042 **/***	0.02	<0.00005	<0.00005	<0.00005	**0.0054**	0.0018	9	1	9	0	<0.00005	<0.00005	<0.00005	0.00019	0.000058	8	0	0	0
Manganese	mg/L	0.02 *	n/v	n/v	0.0027	**0.11**	**0.058**	**0.49**	0.19	9	6	-	-	0.0077	**0.11**	**0.084**	**0.46**	0.18	8	6	-	-
Mercury	ng/L	1,000	26	7,700	<0.5	1.4	1.2	<20	3.2	9	0	0	0	<0.5	1.2	1.0	2.1	0.64	8	0	0	0
Molybdenum	mg/L	n/v	0.073	7.3	0.00046	0.0026	0.0022	0.0076	0.0027	9	-	0	0	0.00052	0.0028	0.0027	0.011	0.0032	8	-	0	0
Nickel	mg/L	n/v	BR 0.079 **/*** OB 0.078 **/***	0.39	<0.0004	<0.0004	<0.0004	0.0010	0.00027	9	-	7	0	<0.0004	0.00064	0.00073	0.0057	0.0018	8	-	0	0
Selenium	mg/L	0.01 **	0.001	0.05	<0.00005	0.000050	0.000069	0.00024	0.000095	9	0	0	0	<0.00005	0.000069	0.000078	0.00052	0.00016	8	0	0	0
Silver	mg/L	n/v	0.0001 **	0.0012	<0.00001	<0.00001	<0.00001	0.000075	0.000023	9	-	0	0	<0.00001	<0.00001	<0.00001	<0.00001	0.0000	8	-	0	0
Sodium	mg/L	200	n/v	1,800	3.1	7.2	7.1	23	6.4	9	0	-	0	3.6	9.1	10	35	13	8	0	-	0
Thallium	mg/L	n/v	0.0008	0.4	0.000014	<0.0001	<0.0001	<0.0001	0.000012	9	-	0	0	<0.00001	0.000029	0.000022	<0.0001	0.000013	8	-	0	0
Tungsten	mg/L	n/v	n/v	n/v	0.00020	0.00081	0.0014	0.036	0.012	9	-	-	-	0.00013	0.016	0.0090	0.48	0.17	8	-	-	-
Uranium	mg/L	0.02	0.015	0.33	<0.0001	0.0013	0.0012	0.013	0.0045	9	0	0	0	<0.0001	0.00061	0.00078	0.0064	0.0023	8	0	0	0
Vanadium	mg/L	n/v	n/v	0.2	<0.0002	0.00025	0.00027	0.00094	0.00033	9	-	-	0	<0.0002	0.00025	0.00036	0.0018	0.00055	8	-	-	0
Zinc	mg/L	5	0.03 *	0.89	<0.001	0.0022	0.0025	0.024	0.0079	9	0	0	0	<0.001	0.0034	0.0031	0.023	0.0090	8	0	0	0
Zirconium	mg/L	n/v	n/v	n/v	0.000081	<0.0004	<0.0004	0.0011	0.00033	9	-	-	-	0.000067	<0.0004	<0.0004	<0.0004	0.000045	8	-	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not applicable
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations
OB	Overburden
BR	Bedrock

GCDWQ	Guidelines for Canadian Drinking Water
MWQSOG-DW	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL	Manitoba Water QualityStandards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3	Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)

Table 8A-2 Gordon Baseline Groundwater Quality Statstics - Area of Historical Mining Activities (potentially affected)

Parameters	Units	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Gordon Historical Operational Area Bedrock Monitoring Locations: Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	Number of wells with mean exceeding: GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Gordon Historical Operational Area Overburden Monitoring Locations: Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	Number of wells with mean exceeding: GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3
General Chemistry																						
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	1.3	5.1	3.7	14	4.5	7	-	-	-	1.4	7.1	5.8	14	5.6	5	-	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.012	0.021	0.028	0.084	0.027	7	-	4	-	0.023	0.030	0.035	0.066	0.019	5	-	5	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	0.014	0.098	0.062	0.28	0.10	7	-	0	-	0.064	0.28	0.23	0.53	0.17	5	-	0	-
Chloride	mg/L	250	120	1,800	<0.5	<0.5	<0.5	1.5	0.45	7	0	0	0	<0.5	0.65	0.69	2.4	0.95	5	0	0	0
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	<0.001	<0.001	<0.001	0.00000	7	0	-	0	<0.001	<0.001	<0.001	0.0014	0.00039	5	0	-	0
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	<0.001	<0.001	<0.001	0.00000	7	0	0	-	<0.001	<0.001	<0.001	0.0016	0.00049	5	0	0	-
Fluoride	mg/L	1.5	0.12	n/v	0.067	0.14	0.12	0.19	0.057	7	0	4	-	0.073	0.16	0.16	0.31	0.097	5	0	3	-
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	76	157	163	332	95	7	-	-	-	176	321	283	363	80	5	-	-	-
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	<0.05	0.054	0.056	0.20	0.070	7	0	-	-	<0.05	0.056	0.074	0.25	0.091	5	0	-	-
pH, Field	mg/L	7.0*-8.5**	6.5-9.0	n/v	**6.8**	7.2	7.3	8.0	0.42	7	1	0	-	**6.7**	7.3	7.3	7.9	0.54	5	2	0	-
Sulfate	mg/L	500	n/v	n/v	2.6	18	12	27	8.3	7	0	-	-	9.4	16	19	50	16	5	0	-	-
Dissolved Metals																						
Aluminum	mg/L	0.1 *	0.1	n/v	0.0014	0.0036	0.0046	0.032	0.011	7	0	0	-	0.0023	0.013	0.011	0.050	0.021	5	0	0	-
Antimony	mg/L	0.006	n/v	16	<0.0001	<0.0001	<0.0001	0.00010	0.000019	7	0	-	0	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	5	0	-	0
Arsenic	mg/L	0.01	0.005 *	1.5	0.00017	0.0010	0.0011	**0.011**	0.0040	7	1	2	0	0.00032	0.0023	0.0015	0.0054	0.0020	5	0	1	0
Barium	mg/L	1	n/v	23	0.0053	0.013	0.011	0.028	0.0074	7	0	-	0	0.021	0.035	0.039	0.074	0.026	5	0	-	0
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	<0.0001	<0.0001	<0.0002	0.000019	7	-	-	0	<0.0001	<0.0001	<0.0001	0.00011	0.000025	5	-	-	0
Boron	mg/L	5	1.5	36	<0.01	<0.01	<0.01	0.031	0.011	7	0	0	0	<0.01	0.013	0.011	0.029	0.010	5	0	0	0
Cadmium	mg/L	0.005	BR 0.0004 *** OB 0.0005 ***	0.0021	<0.000005	<0.000005	<0.000005	<0.00001	0.00000095	7	0	7	0	<0.000005	<0.000005	<0.000005	0.000026	0.000010	5	0	4	0
Chromium	mg/L	0.05	0.011 **	0.64	<0.0001	0.00013	0.00015	0.0011	0.00038	7	0	0	0	<0.0001	0.00015	0.00015	0.00069	0.00027	5	0	0	0
Cobalt	mg/L	n/v	n/v	0.052	<0.0001	<0.0001	<0.0001	<0.0002	0.000019	7	-	-	0	<0.0001	<0.0001	0.00014	0.00091	0.00038	5	-	-	0
Copper	mg/L	1	BR 0.0032 */*** OB 0.0040 */***	0.069	<0.0002	<0.0002	0.00027	0.0032	0.0011	7	0	5	0	<0.0002	0.00034	0.00030	0.00082	0.00027	5	0	1	0
Iron	mg/L	0.3	0.3	n/v	<0.01	**3.5**	0.26	**7.9**	3.1	7	4	4	-	0.071	**3.5**	**1.2**	**7.6**	3.6	5	3	3	-
Lead	mg/L	0.005 *	BR 0.0042 **/*** OB 0.0069 */***	0.02	<0.00005	<0.00005	<0.00005	0.000054	0.000011	7	0	6	0	<0.00005	<0.00005	<0.00005	0.000080	0.000025	5	0	3	0
Manganese	mg/L	0.02 *	n/v	n/v	0.0011	**0.40**	**0.10**	**0.88**	0.32	7	5	-	-	0.012	**0.42**	**0.24**	**1.5**	0.57	5	4	-	-
Mercury	ng/L	1,000	26	7,700	<0.5	1.6	1.2	<5	0.75	7	0	0	0	1.6	2.0	2.0	2.3	0.30	5	0	0	0
Molybdenum	mg/L	n/v	0.073	7.3	0.00023	0.00046	0.00065	0.0052	0.0018	7	-	0	0	0.00018	0.00086	0.00084	0.0037	0.0018	5	-	0	0
Nickel	mg/L	n/v	BR 0.078 **/*** OB 0.125 **/***	0.39	<0.0004	<0.0004	<0.0004	0.00059	0.00015	7	-	6	0	<0.0004	0.00050	0.00046	0.0013	0.00046	5	-	2	0
Selenium	mg/L	0.01 **	0.001	0.05	<0.00005	0.00011	0.000073	0.00020	0.000063	7	0	0	0	0.000057	0.00012	0.00011	0.00019	0.000052	5	0	0	0
Silver	mg/L	n/v	0.0001 **	0.0012	<0.00001	<0.00001	<0.00001	<0.00001	0.00000	7	-	0	0	<0.00001	<0.00001	<0.00001	<0.00001	0.00000	5	-	0	0
Sodium	mg/L	200	n/v	1,800	2.3	5.4	5.0	11	3.3	7	0	-	0	5.4	10	10	23	7.2	5	0	-	0
Thallium	mg/L	n/v	0.0008	0.4	0.000016	0.000028	0.000027	0.000035	0.0000059	7	-	0	0	0.000028	0.000030	0.000031	0.000035	0.0000034	5	-	0	0
Tungsten	mg/L	n/v	n/v	n/v	0.00014	0.00041	0.00066	0.0038	0.0014	7	-	-	-	<0.0001	0.0018	0.0018	0.085	0.037	5	-	-	-
Uranium	mg/L	0.02	0.015	0.33	<0.0001	0.00045	0.00026	0.0010	0.00031	7	0	0	0	0.00029	0.00056	0.0010	0.0039	0.0018	5	0	0	0
Vanadium	mg/L	n/v	n/v	0.2	<0.0002	0.00025	0.00040	0.0011	0.00043	7	-	-	0	0.00022	0.00064	0.00053	0.00087	0.00026	5	-	-	0
Zinc	mg/L	5	0.03 *	0.89	<0.001	0.0014	0.0018	0.010	0.0032	7	0	0	0	<0.001	0.0013	0.0010	0.0021	0.00071	5	0	0	0
Zirconium	mg/L	n/v	n/v	n/v	0.000081	0.00059	0.00040	0.0017	0.00069	7	-	-	-	0.00012	0.00057	0.00040	0.0012	0.00046	5	-	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not applicable
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations
OB	Overburden
BR	Bedrock

GCDWQ	Guidelines for Canadian Drinking Water
MWQSOG-DW	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL	Manitoba Water QualityStandards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3	Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)

Table 8A-3 Gordon Baseline Groundwater Quality Statistics - Historical Mine Rock Storage Areas

Parameters	Units	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	South MRSA Monitoring Locations									North MRSA Monitoring Locations								
											Number of wells with mean exceeding:									Number of wells with mean exceeding:		
					Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3
General Chemistry																						
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	3.7	5.0	4.9	6.4	1.9	2	-	-	-	8.1	11	11	14	4.1	2	-	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.010	0.018	0.016	0.026	0.011	2	-	1	-	0.067	0.11	0.10	0.16	0.067	2	-	2	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	0.066	0.22	0.16	0.38	0.22	2	-	0	-	0.21	0.60	0.46	0.99	0.55	2	-	0	-
Chloride	mg/L	250	120	1,800	5.6	10	9.1	15	6.6	2	0	0	0	3.3	6.2	5.5	9.1	4.1	2	0	0	0
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	-	0	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	-	0
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	0	-	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	0	-
Fluoride	mg/L	1.5	0.12	n/v	0.13	<0.2	<0.2	<0.2	0.018	2	0	0	-	0.094	<0.1	<0.1	<0.1	0.031	2	0	0	-
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	547	1,210	1,010	1,880	940	2	-	-	-	311	509	469	707	279	2	-	-	-
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	<0.05	4.0	0.44	7.9	5.6	2	0	-	-	<0.05	0.24	0.11	0.46	0.30	2	0	-	-
pH, Field	mg/L	7.0*-8.5**	6.5-9.0	n/v	7.1	7.2	7.2	7.3	0.12	2	0	0	-	**6.4**	**6.8**	**6.8**	7.1	0.46	2	1	1	-
Sulfate	mg/L	500	n/v	n/v	214	**1,010**	**624**	**1,810**	1,130	2	1	-	-	193	309	287	425	164	2	0	-	-
Dissolved Metals																						
Aluminum	mg/L	0.1 *	0.1	n/v	0.0022	0.0030	0.0029	0.0037	0.0011	2	0	0	-	0.012	0.015	0.015	0.018	0.0039	2	0	0	-
Antimony	mg/L	0.006	n/v	16	<0.0001	0.00047	0.00021	0.00090	0.00060	2	0	-	0	<0.0001	0.00014	0.00011	0.00023	0.00013	2	0	-	0
Arsenic	mg/L	0.01	0.005 *	1.5	0.00031	0.00063	0.00054	0.00094	0.00044	2	0	0	0	0.00079	0.0013	0.0012	0.0019	0.00077	2	0	0	0
Barium	mg/L	1	n/v	23	0.030	0.080	0.063	0.13	0.070	2	0	-	0	0.039	0.14	0.095	0.23	0.14	2	0	-	0
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	2	-	-	0	<0.0001	<0.0001	<0.0001	<0.0001	0.000000	2	-	-	0
Boron	mg/L	5	1.5	36	0.021	0.049	0.040	0.076	0.039	2	0	0	0	0.016	0.024	0.023	0.033	0.012	2	0	0	0
Cadmium	mg/L	0.005	South 0.0012 *** North 0.0007 ***	0.0021	0.000012	0.000068	0.000039	0.00012	0.000079	2	0	0	0	<0.000005	0.0000077	0.0000057	0.000013	0.0000074	2	0	0	0
Chromium	mg/L	0.05	0.011 **	0.64	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	2	0	0	0	0.00010	0.00046	0.00029	0.00082	0.00051	2	0	0	0
Cobalt	mg/L	n/v	n/v	0.052	0.00043	0.00049	0.00049	0.00055	0.000084	2	-	-	0	0.00011	0.00012	0.00012	0.00014	0.000024	2	-	-	0
Copper	mg/L	1	0.004 */***	0.069	<0.0002	0.00046	0.00029	0.00082	0.00051	2	0	0	0	<0.0002	0.0012	0.00049	0.0024	0.0016	2	0	0	0
Iron	mg/L	0.3	0.3	n/v	0.16	0.19	0.19	0.23	0.049	2	0	0	-	0.10	**23**	**2.2**	**45**	32	2	1	1	-
Lead	mg/L	0.005 *	0.007 */***	0.02	<0.00005	<0.00005	<0.00005	<0.00005	0.00000	2	0	0	0	<0.00005	<0.00005	<0.00005	<0.00005	0.000000	2	0	0	0
Manganese	mg/L	0.02 *	n/v	n/v	**0.38**	**0.43**	**0.43**	**0.48**	0.071	2	2	-	-	**0.035**	**0.99**	**0.26**	**1.9**	1.4	2	2	-	-
Mercury	ng/L	1,000	26	7,700	<0.5	<0.5	<0.5	0.61	0.25	2	0	0	0	<0.5	0.77	0.57	1.3	0.73	2	0	0	0
Molybdenum	mg/L	n/v	0.073	7.3	0.00092	0.0032	0.0023	0.0056	0.0033	2	-	0	0	0.00029	0.0014	0.00084	0.0025	0.0015	2	-	0	0
Nickel	mg/L	n/v	0.15 */***	0.39	0.0011	0.0019	0.0017	0.0027	0.0012	2	-	0	0	<0.0004	0.00083	0.00054	0.0015	0.00089	2	-	0	0
Selenium	mg/L	0.01 **	0.001	0.05	0.00011	0.00011	0.00011	0.00012	0.0000052	2	0	0	0	0.000070	0.00016	0.00013	0.00024	0.00012	2	0	0	0
Silver	mg/L	n/v	0.0001 **	0.0012	<0.00001	<0.00001	<0.00001	<0.00001	0.00000	2	-	0	0	<0.00001	<0.00001	<0.00001	<0.00001	0.00000	2	-	0	0
Sodium	mg/L	200	n/v	1,800	11	69	37	127	82	2	0	-	0	43	45	45	47	2.4	2	0	-	0
Thallium	mg/L	n/v	0.0008	0.4	0.000011	0.000013	0.000013	0.000015	0.0000025	2	-	0	0	0.000011	<0.0001	<0.0001	<0.0001	0.000027	2	-	0	0
Tungsten	mg/L	n/v	n/v	n/v	<0.0001	0.00013	0.00010	0.00022	0.00012	2	-	-	-	0.00016	0.00017	0.00017	0.00018	0.000013	2	-	-	-
Uranium	mg/L	0.02	0.015	0.33	0.0010	**0.030**	0.0075	**0.059**	0.041	2	1	1	0	0.00048	0.0020	0.0013	0.0036	0.0022	2	0	0	0
Vanadium	mg/L	n/v	n/v	0.2	0.00023	<0.0005	<0.0005	<0.0005	0.000015	2	-	-	0	<0.0005	0.0018	0.00092	0.0034	0.0022	2	-	-	0
Zinc	mg/L	5	0.03 *	0.89	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	0	0	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	0	0
Zirconium	mg/L	n/v	n/v	n/v	0.000091	0.00034	0.00023	0.00058	0.00035	2	-	-	-	0.00051	0.0017	0.0012	0.0028	0.0016	2	-	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not applicable
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations

GCDWQ	Guidelines for Canadian Drinking Water
MWQSOG-DW	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL	Manitoba Water QualityStandards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3	Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)

Table 8A-4 Gordon Baseline Groundwater Quality Statistics - Historical Pits and Deep Bedrock

Parameters	Units	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Historical East and Wendy Pits Monitoring Locations						Number of wells with mean exceeding:			Deep Bedrock Monitoring Locations						Number of wells with mean exceeding:		
					Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3
General Chemistry																						
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	6.3	6.8	6.8	7.3	0.65	2	-	-	-	-	-	-	-	-	2	-	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	-	-	-	-	-	2	-	-	-	-	-	-	-	-	2	-	-	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	0.089	0.091	0.091	0.094	0.0030	2	-	0	-	-	-	-	-	-	2	-	-	-
Chloride	mg/L	250	120	1,800	1.6	2.8	2.5	4.0	1.7	2	0	0	0	1.9	6.8	4.7	12	7.0	2	0	0	0
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	-	0	-	-	-	-	-	2	-	-	-
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	0	-	-	-	-	-	-	2	-	-	-
Fluoride	mg/L	1.5	0.12	n/v	0.11	0.11	0.11	0.11	0.0038	2	0	0	-	-	-	-	-	-	2	-	-	-
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	227	251	250	275	34	2	-	-	-	250	685	529	1,120	615	2	-	-	-
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	<0.05	<0.05	<0.05	0.073	0.034	2	0	-	-	0.13	<0.25	<0.25	<0.25	0.0035	2	0	-	-
pH, Field	mg/L	7.0*-8.5**	6.5-9.0	n/v	7.5	7.5	7.5	7.5	0.021	2	0	0	-	8.0	8.0	8.0	8.0	0.021	2	0	0	-
Sulfate	mg/L	500	n/v	n/v	89	111	109	134	31	2	0	-	-	34	388	159	**742**	500	2	1	-	-
Dissolved Metals																						
Aluminum	mg/L	0.1 *	0.1	n/v	0.0034	0.0044	0.0043	0.0054	0.0014	2	0	0	-	<0.004	<0.004	<0.004	<0.004	0.00000	2	0	0	-
Antimony	mg/L	0.006	n/v	16	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	2	0	-	0	<0.003	0.0043	0.0032	**0.0070**	0.0039	2	1	-	0
Arsenic	mg/L	0.01	0.005 *	1.5	0.0036	0.0037	0.0037	0.0038	0.00017	2	0	0	0	<0.003	<u>0.0053</u>	0.0037	<u>0.0090</u>	0.0053	2	0	0	0
Barium	mg/L	1	n/v	23	0.026	0.027	0.027	0.027	0.00089	2	0	-	0	0.013	0.041	0.030	0.069	0.040	2	0	-	0
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	2	-	-	0	<0.001	<0.001	<0.001	<0.001	0.00000	2	-	-	0
Boron	mg/L	5	1.5	36	0.045	0.047	0.047	0.048	0.0022	2	0	0	0	0.030	0.035	0.035	0.040	0.0071	2	0	0	0
Cadmium	mg/L	0.005	Pits 0.00047 *** Deep BR 0.00078 ***	0.0021	<0.000005	<0.000005	<0.000005	0.0000051	0.0000018	2	0	0	0	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	2	0	0	0
Chromium	mg/L	0.05	0.011 **	0.64	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	2	0	0	0	<0.003	<0.003	<0.003	<0.003	0.00000	2	0	0	0
Cobalt	mg/L	n/v	n/v	0.052	0.00017	0.00017	0.00017	0.00018	0.0000030	2	-	-	0	<0.0005	<0.0005	<0.0005	0.00070	0.00032	2	-	-	0
Copper	mg/L	1	0.004 */***	0.069	0.00060	0.00063	0.00063	0.00066	0.000043	2	0	0	0	<0.002	<0.002	<0.002	<0.002	0.00000	2	0	0	0
Iron	mg/L	0.3	0.3	n/v	**<u>0.43</u>**	**<u>0.47</u>**	**<u>0.47</u>**	**<u>0.52</u>**	0.062	2	2	2	-	**<u>2.6</u>**	**<u>5.4</u>**	**<u>4.6</u>**	**<u>8.1</u>**	3.9	2	2	2	-
Lead	mg/L	0.005 *	0.007 */***	0.02	<0.00005	<0.00005	<0.00005	<0.00005	0.00000	2	0	0	0	0.0010	<0.001	<0.001	0.0010	0.00035	2	0	0	0
Manganese	mg/L	0.02 *	n/v	n/v	**0.50**	**0.51**	**0.51**	**0.51**	0.0055	2	2	-	-	**0.28**	**0.64**	**0.53**	**1.0**	0.50	2	2	-	-
Mercury	ng/L	1,000	26	7,700	0.00073	0.00079	0.00079	0.00085	0.000082	2	0	0	0	-	-	-	-	-	2	-	-	-
Molybdenum	mg/L	n/v	0.073	7.3	0.00063	0.00072	0.00071	0.00081	0.00012	2	-	0	0	0.0040	0.0045	0.0045	0.0050	0.00071	2	-	0	0
Nickel	mg/L	n/v	Pits 0.11 */*** Deep BR 0.15 */***	0.39	0.00061	0.00070	0.00070	0.00079	0.00013	2	-	0	0	<0.003	0.0033	<0.003	0.0050	0.0025	2	-	0	0
Selenium	mg/L	0.01 **	0.001	0.05	0.000062	0.000084	0.000081	0.00011	0.000031	2	0	0	0	<0.004	<0.004	<0.004	<u>0.0040</u>	0.0014	2	0	1	0
Silver	mg/L	n/v	0.0001 **	0.0012	<0.00001	<0.00001	<0.00001	<0.00001	0.00000	2	-	0	0	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	2	-	0	0
Sodium	mg/L	200	n/v	1,800	12	15	15	17	3.4	2	0	-	0	-	-	-	-	-	2	0	-	0
Thallium	mg/L	n/v	0.0008	0.4	0.000028	0.000029	0.000029	0.000030	0.0000017	2	-	0	0	<0.0003	<0.0003	<0.0003	<0.0003	0.00000	2	-	0	0
Tungsten	mg/L	n/v	n/v	n/v	0.00010	0.00011	0.00011	0.00012	0.0000094	2	-	-	-	<0.01	<0.01	<0.01	<0.01	0.00000	2	-	-	-
Uranium	mg/L	0.02	0.015	0.33	0.0015	0.0023	0.0022	0.0031	0.0012	2	0	0	0	<0.002	0.0075	0.0037	0.014	0.0092	2	0	0	0
Vanadium	mg/L	n/v	n/v	0.2	<0.0002	<0.0002	<0.0002	<0.0002	0.00000	2	-	-	0	<0.002	<0.002	<0.002	<0.002	0.00000	2	-	-	0
Zinc	mg/L	5	0.03 *	0.89	0.0012	0.0014	0.0013	0.0015	0.00015	2	0	0	0	<0.005	<u>0.032</u>	0.012	<u>0.061</u>	0.041	2	0	0	0
Zirconium	mg/L	n/v	n/v	n/v	0.00016	0.00016	0.00016	0.00016	0.00000	2	-	-	-	<0.004	<0.004	<0.004	<0.004	0.00000	2	-	-	-

NOTES:

999 (shaded)	Parameter exceeds GW3
<u>999</u>	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not applicable
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations
BR	Bedrock

GCDWQ	Guidelines for Canadian Drinking Water
MWQSOG-DW	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL	Manitoba Water QualityStandards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3	Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)

Table 8A-5 MacLellan Baseline Groundwater Quality Statistics - Background (not affected) Areas

Parameters	Units	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	MacLellan Background Bedrock Monitoring Locations									MacLellan Background Overburden Monitoring Locations								
											Number of wells with mean exceeding:									Number of wells with mean exceeding:		
					Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3
General Chemistry																						
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	1.0	5.3	4.9	18	4.6	13	-	-	-	1.9	6.9	6.8	19	7.6	8	-	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.0031	0.011	0.013	0.25	0.062	15	-	5	-	0.0035	0.0086	0.012	0.14	0.046	8	-	2	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	<0.01	0.040	0.048	2.0	0.52	13	-	0	-	0.017	0.073	0.10	2.2	0.75	8	-	0	-
Chloride	mg/L	250	120	1,800	<0.5	<0.5	0.51	13	3.3	13	0	0	0	<0.5	<0.5	<0.5	0.68	0.19	8	0	0	0
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	<0.001	<0.001	0.0010	0.00013	13	0	-	0	<0.001	<0.001	<0.001	<0.002	0.00025	8	0	-	0
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	<0.001	<0.001	0.0013	0.00026	13	0	0	-	<0.001	0.0011	<0.001	<0.005	0.00068	8	0	0	-
Fluoride	mg/L	1.5	0.12	n/v	0.047	0.064	0.082	0.29	0.072	13	0	4	-	0.030	0.072	0.080	0.41	0.12	8	0	2	-
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	29	97	99	1,670	411	13	-	-	-	11	65	58	397	147	8	-	-	-
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	<0.05	0.057	0.09	**25**	6.9	13	1	-	-	<0.05	0.067	0.061	0.29	0.093	7	0	-	-
pH, Field	mg/L	7.0*-8.5**	6.5-9.0	n/v	**5.3**	7.2	7.1	8.2	0.76	13	7	2	-	**5.6**	**6.6**	**6.9**	**9.4**	1.2	8	6	4	-
Sulfate	mg/L	500	n/v	n/v	0.82	6.2	9.3	**2,410**	619	13	1	-	-	0.72	3.2	3.5	8.6	2.9	8	0	-	-
Dissolved Metals																						
Aluminum	mg/L	0.1 *	0.1	n/v	0.0036	0.0091	0.017	**0.42**	0.11	13	3	3	-	0.0037	0.022	0.029	**0.24**	0.098	8	3	3	-
Antimony	mg/L	0.006	n/v	16	<0.0001	<0.0001	<0.0001	0.00021	0.000048	13	0	-	0	<0.0001	<0.0001	<0.0001	<0.0002	0.000031	8	0	-	0
Arsenic	mg/L	0.01	0.005 *	1.5	<0.0001	0.00042	0.00044	**0.014**	0.0035	13	1	1	0	<0.0001	0.00032	0.00030	0.0013	0.00043	8	0	0	0
Barium	mg/L	1	n/v	23	0.0039	0.012	0.016	0.10	0.025	13	0	-	0	0.0035	0.019	0.023	0.17	0.054	8	0	-	0
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	<0.0001	<0.0001	<0.0002	0.000022	13	-	-	0	<0.0001	<0.0001	<0.0001	<0.0002	0.000023	8	-	-	0
Boron	mg/L	5	1.5	36	<0.01	<0.01	<0.01	0.026	0.0073	13	0	0	0	<0.01	<0.01	<0.01	0.026	0.0075	8	0	0	0
Cadmium	mg/L	0.005	BR 0.00024 *** OB 0.00017 ***	0.0021	<0.000005	0.0000061	0.0000067	0.000064	0.000019	13	0	0	0	<0.000005	0.000011	0.000011	0.000058	0.000019	8	0	2	0
Chromium	mg/L	0.05	0.011 *	0.64	<0.0001	0.00021	0.00015	0.00082	0.00021	13	0	0	0	<0.0001	0.00020	0.00021	0.00064	0.00026	8	0	0	0
Cobalt	mg/L	n/v	n/v	0.052	<0.0001	0.00010	0.00015	0.0030	0.00078	13	-	-	0	<0.0001	0.00039	0.00050	0.0099	0.0035	8	-	-	0
Copper	mg/L	1	0.0024 */***	0.069	<0.0002	0.0040	0.0017	0.016	0.0046	13	0	8	0	<0.0002	0.00082	0.0011	0.082	0.029	8	0	5	1
Iron	mg/L	0.3	0.3	n/v	<0.01	0.048	0.078	**11**	2.8	13	4	4	-	<0.01	**0.43**	0.24	**11.4**	3.9	8	5	5	-
Lead	mg/L	0.005 *	BR 0.0024 */*** OB 0.0014 **/***	0.02	<0.00005	0.000080	0.000080	0.00094	0.00023	13	0	0	0	<0.00005	0.000092	0.000084	0.00041	0.00013	8	0	3	0
Manganese	mg/L	0.02 *	n/v	n/v	0.0050	**0.055**	**0.063**	**0.69**	0.23	13	11	-	-	0.0042	**0.22**	**0.15**	**0.79**	0.29	8	7	-	-
Mercury	ng/L	1,000	26	7,700	<0.5	1.6	1.6	<20	3.1	13	0	0	0	0.84	1.5	1.8	<20	3.4	8	0	0	0
Molybdenum	mg/L	n/v	0.073	7.3	0.00011	0.00070	0.00081	0.019	0.0046	13	-	0	0	0.00021	0.00052	0.00095	0.015	0.0052	8	-	0	0
Nickel	mg/L	n/v	BR 0.052 **/*** OB 0.033 **/***	0.39	<0.0004	0.00056	0.00058	0.0041	0.0011	13	-	0	0	<0.0004	0.0012	0.0012	0.0096	0.0036	8	-	3	0
Selenium	mg/L	0.01 **	0.001	0.05	<0.00005	0.000059	0.000090	**0.029**	0.0076	13	0	1	0	<0.00005	<0.00005	<0.00005	<0.0001	0.000020	8	0	0	0
Silver	mg/L	n/v	0.0001 **	0.0012	<0.00001	<0.00001	<0.00001	0.000027	0.0000070	13	-	0	0	<0.00001	<0.00001	<0.00001	0.000012	0.0000026	8	-	0	0
Sodium	mg/L	200	n/v	1,800	2.0	4.7	6.2	**556**	142	13	1	-	0	1.7	3.6	3.9	12	3.3	8	0	-	0
Thallium	mg/L	n/v	0.0008	0.4	<0.00001	0.000030	0.000024	<0.0001	0.000014	13	-	0	0	<0.00001	0.000030	0.000026	<0.0001	0.000015	8	-	0	0
Tungsten	mg/L	n/v	n/v	n/v	0.00031	0.0018	0.0021	0.032	0.0088	13	-	-	-	<0.0001	0.00068	0.00086	0.035	0.013	8	-	-	-
Uranium	mg/L	0.02	0.015	0.33	<0.0001	0.00040	0.00054	**0.048**	0.012	13	1	1	0	0.000024	0.00023	0.00018	0.0048	0.0017	8	0	0	0
Vanadium	mg/L	n/v	n/v	0.2	<0.0002	0.00036	0.00035	0.0012	0.00028	13	-	-	0	0.00023	<0.0005	<0.0005	0.0018	0.00056	8	-	-	0
Zinc	mg/L	5	0.03 *	0.89	<0.001	0.0029	0.0037	0.052	0.014	13	0	1	0	<0.001	0.0028	0.0036	0.24	0.083	8	0	1	0
Zirconium	mg/L	n/v	n/v	n/v	<0.00006	0.00020	0.00018	0.0025	0.00060	13	-	-	-	0.000080	0.00020	0.00029	0.0010	0.00038	8	-	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not applicable
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations
OB	Overburden
BR	Bedrock

GCDWQ	Guidelines for Canadian Drinking Water
MWQSOG-DW	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL	Manitoba Water Quality Standards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3	Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)

Table 8A-6 MacLellan Baseline Groundwater Quality Statistics - Area of Historical Mining Activities (potentially affected)

Parameters	Units	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	MacLellan Historical Operational Area Bedrock Monitoring Locations									MacLellan Historical Operational Area Overburden Monitoring Locations								
											Number of wells with mean exceeding:									Number of wells with mean exceeding:		
					Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3
General Chemistry																						
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	0.81	5.2	4.1	14	4.2	13	-	-	-	0.57	9.5	8	92	32	7	-	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.0015	<0.005	0.0058	0.070	0.019	13	-	2	-	0.0087	0.014	0.018	0.072	0.027	7	-	3	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	<0.01	0.020	0.043	2.2	0.67	13	-	0	-	0.024	0.14	0.12	1.0	0.35	7	-	0	-
Chloride	mg/L	250	120	1,800	<0.5	<0.5	0.64	7.0	2.0	13	0	0	0	<0.5	<0.5	0.87	56	21	7	0	0	0
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	<0.001	<0.001	<0.005	0.00066	13	0	-	0	<0.001	<0.001	<0.001	<0.005	0.00074	7	0	-	0
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	<0.001	<0.001	<0.005	0.00060	13	0	0	-	<0.001	<0.001	<0.001	<0.005	0.00075	7	0	0	-
Fluoride	mg/L	1.5	0.12	n/v	0.036	<0.1	<0.1	0.20	0.055	13	0	3	-	0.029	0.058	0.074	0.24	0.090	7	0	2	-
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	39	144	146	671	189	13	-	-	-	24	49	68	293	102	7	-	-	-
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	<0.05	0.11	0.12	0.67	0.20	13	0	-	-	<0.05	0.18	0.18	1.7	0.61	7	0	-	-
pH, Field	mg/L	7.0*-8.5**	6.5-9.0	n/v	**5.8**	**6.9**	**6.9**	8.2	0.62	13	7	3	-	**5.7**	**6.4**	**6.4**	7.4	0.52	7	6	4	-
Sulfate	mg/L	500	n/v	n/v	3.9	22	35	446	154	13	0	-	-	3.8	17	21	424	155	7	0	-	-
Dissolved Metals																						
Aluminum	mg/L	0.1 *	0.1	n/v	0.0011	0.012	0.013	**0.13**	0.044	13	1	1	-	0.0053	0.046	0.067	**2.5**	0.92	7	3	3	-
Antimony	mg/L	0.006	n/v	16	<0.0001	<0.0001	<0.0001	<0.0002	0.000032	13	0	-	0	<0.0001	<0.0001	<0.0001	0.00027	0.000082	7	0	-	0
Arsenic	mg/L	0.01	0.005 *	1.5	<0.0001	0.00028	0.00046	**0.041**	0.011	13	1	1	0	<0.0001	0.0010	0.00057	0.0093	0.0033	7	0	1	0
Barium	mg/L	1	n/v	23	0.0023	0.034	0.026	0.18	0.049	13	0	-	0	0.013	0.050	0.049	0.22	0.076	7	0	-	0
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	<0.0001	<0.0001	<0.0002	0.000019	13	-	-	0	<0.0001	<0.0001	<0.0001	<0.0002	0.000024	7	-	-	0
Boron	mg/L	5	1.5	36	<0.01	<0.01	<0.01	0.034	0.0096	13	0	0	0	<0.01	<0.01	<0.01	0.039	0.012	7	0	0	0
Cadmium	mg/L	0.005	BR 0.00032 *** OB 0.00019 ***	0.0021	<0.000005	0.0000050	0.0000086	0.000058	0.000019	13	0	0	0	0.0000094	0.000011	0.000011	0.000025	0.0000073	7	0	2	0
Chromium	mg/L	0.05	0.011 *	0.64	<0.0001	0.00012	0.00013	0.0018	0.00047	13	0	0	0	<0.0001	0.00044	0.00036	0.0025	0.00087	7	0	0	0
Cobalt	mg/L	n/v	n/v	0.052	<0.0001	0.00013	0.00020	0.0019	0.00062	13	-	-	0	0.00013	0.00057	0.00064	0.0026	0.00092	7	-	-	0
Copper	mg/L	1	BR 0.0030 */*** OB 0.0025 */***	0.069	<0.0002	0.0024	0.0014	0.017	0.0053	13	0	6	0	0.0017	0.0020	0.0027	0.012	0.0036	7	0	3	0
Iron	mg/L	0.3	0.3	n/v	<0.01	0.083	0.15	**21**	6.3	13	4	4	-	<0.01	0.26	**0.31**	**25**	9.3	7	3	3	-
Lead	mg/L	0.005 *	BR 0.004 */*** OB 0.002 **/***	0.02	0.000052	0.00021	0.00021	0.00097	0.00025	13	0	0	0	<0.00005	0.00013	0.00014	0.0012	0.00041	7	0	3	0
Manganese	mg/L	0.02 *	n/v	n/v	0.0014	0.011	**0.034**	**1.2**	0.47	13	5	-	-	0.0073	**0.042**	**0.068**	**0.65**	0.23	7	6	-	-
Mercury	ng/L	1,000	26	7,700	<0.5	1.6	2.1	<20	3.8	13	0	0	0	1.2	<20	<20	<20	3.8	7	0	0	0
Molybdenum	mg/L	n/v	0.073	7.3	0.00011	0.00061	0.00051	0.0019	0.00064	13	-	0	0	<0.00005	0.00066	0.00045	0.014	0.0050	7	-	0	0
Nickel	mg/L	n/v	BR 0.07 OB 0.05 **/***	0.39	<0.0004	0.00052	0.00056	0.0068	0.0018	13	-	0	0	0.00090	0.0022	0.0024	0.0063	0.0018	7	-	0	0
Selenium	mg/L	0.01 **	0.001	0.05	<0.00005	0.00017	0.00010	0.00027	0.000091	13	0	0	0	<0.00005	0.000064	0.000084	0.0011	0.00037	7	0	1	0
Silver	mg/L	n/v	0.0001 **	0.0012	<0.00001	<0.00001	<0.00001	0.000026	0.0000057	13	-	0	0	<0.00001	<0.00001	<0.00001	0.000062	0.000021	7	-	0	0
Sodium	mg/L	200	n/v	1,800	1.3	3.0	4.3	69	18	13	0	-	0	1.6	3.5	6.4	194	72	7	0	-	0
Thallium	mg/L	n/v	0.0008	0.4	0.000028	<0.0001	<0.0001	<0.0001	0.000010	13	-	0	0	0.000028	<0.0001	<0.0001	<0.0001	0.0000092	7	-	0	0
Tungsten	mg/L	n/v	n/v	n/v	0.00037	0.0015	0.0021	0.050	0.014	13	-	-	-	<0.0001	0.0037	0.0038	0.25	0.091	7	-	-	-
Uranium	mg/L	0.02	0.015	0.33	<0.0001	0.00013	0.00021	0.0039	0.0012	13	0	0	0	0.000032	0.00023	0.00023	0.017	0.0062	7	0	1	0
Vanadium	mg/L	n/v	n/v	0.2	<0.0002	0.00025	0.00039	0.0031	0.00083	13	-	-	0	<0.0002	0.00088	0.00067	0.0064	0.0022	7	-	-	0
Zinc	mg/L	5	0.03 *	0.89	0.0013	0.0053	0.0054	0.030	0.0078	13	0	1	0	0.0053	0.0069	0.0075	0.012	0.0027	7	0	0	0
Zirconium	mg/L	n/v	n/v	n/v	0.000093	<0.0002	0.00024	0.0038	0.0010	13	-	-	-	0.00012	0.00061	0.00059	0.0048	0.0017	7	-	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not applicable
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations
OB	Overburden
BR	Bedrock

GCDWQ	Guidelines for Canadian Drinking Water
MWQSOG-DW	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL	Manitoba Water Quality Standards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3	Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)

Table 8A-7 MacLellan Baseline Groundwater Quality Statistics - Historical Mine Rock Strage Areas and Deep Bedrock

Parameters	Units	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	MacLellan Historical MRSA Monitoring Locations						Number of wells with mean exceeding:			MacLellan Deep Bedrock Monitoring Locations						Number of wells with mean exceeding:		
					Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3	Minimum	Median	Geometric Mean	Maximum	Standard Deviation	Number of Wells	GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3
General Chemistry																						
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	5.5	8.2	7.8	11	3.8	2	-	-	-	-	-	-	-	-	2	-	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.0030	0.016	0.0091	0.028	0.018	2	-	1	-	-	-	-	-	-	2	-	-	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	0.034	0.079	0.065	0.12	0.064	2	-	0	-	-	-	-	-	-	2	-	-	-
Chloride	mg/L	250	120	1,800	<1	<1	<1	1.2	0.46	2	0	0	0	<1	<1	0.83	1.39	0.63	2	0	0	0
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	-	0	-	-	-	-	-	2	-	-	-
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	<0.001	<0.001	<0.001	0.00000	2	0	0	-	-	-	-	-	-	2	-	-	-
Fluoride	mg/L	1.5	0.12	n/v	<0.04	<0.04	<0.04	0.046	0.019	2	0	0	-	-	-	-	-	-	2	-	-	-
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	791	871	868	951	113	2	-	-	-	30	254	119	479	318	2	-	-	-
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	0.10	0.32	0.24	0.55	0.32	2	0	-	-	0.12	<0.5	0.17	<0.5	0.092	2	0	-	-
pH, Field	mg/L	7.0*-8.5**	6.5-9.0	n/v	**6.3**	**6.4**	**6.4**	**6.5**	0.14	2	2	1	-	7.4	7.6	7.6	7.8	0.25	2	0	0	-
Sulfate	mg/L	500	n/v	n/v	**730**	**826**	**820**	**922**	135	2	2	-	-	7.9	193	55	378	262	2	0	-	-
Dissolved Metals																						
Aluminum	mg/L	0.1 *	0.1	n/v	0.025	**0.12**	0.073	**0.21**	0.13	2	1	1	-	0.0290	<0.04	0.024	<0.04	0.0064	2	0	0	-
Antimony	mg/L	0.006	n/v	16	0.00038	0.00047	0.00046	0.00055	0.00012	2	0	-	0	<0.003	<0.003	0.0015	<0.003	0.00000	2	0	-	0
Arsenic	mg/L	0.01	0.005 *	1.5	0.0074	**0.013**	**0.012**	**0.018**	0.0075	2	1	2	0	0.0030	**0.012**	0.0078	**0.020**	0.012	2	1	1	0
Barium	mg/L	1	n/v	23	0.027	0.027	0.027	0.027	0.00027	2	0	-	0	0.054	0.082	0.077	0.11	0.039	2	0	-	0
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	2	-	-	0	<0.001	<0.001	0.00050	<0.001	0.00000	2	-	-	0
Boron	mg/L	5	1.5	36	0.027	0.030	0.030	0.032	0.0036	2	0	0	0	<0.01	<0.01	0.0050	<0.01	0.00000	2	0	0	0
Cadmium	mg/L	0.005	MRSA 0.0011 *** Deep BR 0.0028 ***	0.0021	0.0016	0.0021	0.0020	0.0026	0.00067	2	0	2	1	<0.0001	0.00028	0.00016	0.00050	0.00032	2	0	1	0
Chromium	mg/L	0.05	0.011 *	0.64	0.00020	0.0012	0.00067	0.0022	0.0014	2	0	0	0	0.0030	0.011	0.0074	0.018	0.011	2	0	0	0
Cobalt	mg/L	n/v	n/v	0.052	0.021	0.026	0.026	0.031	0.0066	2	-	-	0	<0.0005	0.0020	0.0010	0.0037	0.0024	2	-	-	0
Copper	mg/L	1	MRSA 0.004 */*** Deep BR 0.003 */***	0.069	0.0059	0.0081	0.0078	0.010	0.0031	2	0	2	0	0.0040	0.0095	0.0078	0.015	0.0078	2	0	2	0
Iron	mg/L	0.3	0.3	n/v	0.21	0.27	0.26	**0.33**	0.088	2	1	1	-	**2.9**	**5.9**	**5.1**	**8.9**	4.3	2	2	2	-
Lead	mg/L	0.005 *	MRSA 0.007 */*** Deep BR 0.003 */***	0.02	0.00042	0.0011	0.00088	0.0019	0.0010	2	0	0	0	0.0040	**0.028**	**0.014**	**0.051**	0.033	2	1	2	1
Manganese	mg/L	0.02 *	n/v	n/v	**0.83**	**0.87**	**0.86**	**0.90**	0.056	2	2	-	-	**0.093**	**0.23**	**0.19**	**0.37**	0.20	2	2	-	-
Mercury	ng/L	1,000	26	7,700	<0.5	0.91	0.62	1.6	0.93	2	0	0	0	-	-	-	-	-	2	0	0	0
Molybdenum	mg/L	n/v	0.073	7.3	0.00027	0.00046	0.00042	0.00065	0.00027	2	-	0	0	<0.002	0.0030	0.0022	0.0050	0.0028	2	-	0	0
Nickel	mg/L	n/v	MRSA 0.15 */*** Deep BR 0.060 **/***	0.39	0.067	0.092	0.089	0.12	0.035	2	-	0	0	<0.003	0.093	0.017	0.19	0.13	2	-	1	0
Selenium	mg/L	0.01 **	0.001	0.05	0.00011	0.00014	0.00014	0.00018	0.000055	2	0	0	0	<0.004	<0.004	0.0020	<0.004	0.00000	2	0	0	0
Silver	mg/L	n/v	0.0001 **	0.0012	<0.00001	0.000038	0.000019	0.000071	0.000047	2	-	0	0	<0.0001	<0.0001	0.000071	0.00010	0.000035	2	-	0	0
Sodium	mg/L	200	n/v	1,800	8.5	9.9	10	11	1.9	2	0	-	0	-	-	-	-	-	2	0	-	0
Thallium	mg/L	n/v	0.0008	0.4	<0.0001	<0.0001	<0.0001	<0.0001	0.00000	2	-	0	0	<0.0003	<0.0003	0.00015	<0.0003	0.00000	2	-	0	0
Tungsten	mg/L	n/v	n/v	n/v	<0.0001	0.019	0.0014	0.038	0.027	2	-	-	-	<0.01	0.018	0.012	0.031	0.018	2	-	-	-
Uranium	mg/L	0.02	0.015	0.33	0.00077	0.00080	0.00080	0.00084	0.000050	2	0	0	0	<0.002	<0.002	0.0010	<0.002	0.00000	2	0	0	0
Vanadium	mg/L	n/v	n/v	0.2	0.00028	0.00057	0.00049	0.00086	0.00041	2	-	-	0	<0.002	0.0080	0.0039	0.015	0.0099	2	-	-	0
Zinc	mg/L	5	0.03 *	0.89	0.050	0.060	0.059	0.070	0.014	2	0	2	0	0.011	0.037	0.026	0.062	0.036	2	0	1	0
Zirconium	mg/L	n/v	n/v	n/v	0.00013	0.00019	0.00018	0.00024	0.000076	2	-	-	-	<0.004	<0.004	0.0020	<0.004	0.00000	2	-	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not applicable
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations

GCDWQ	Guidelines for Canadian Drinking Water
MWQSOG-DW	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL	Manitoba Water Quality Standards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3	Groundwater values protective of aquatic receptors (Ground Water and

Table 8A-8 Predicted Concentrations of Groundwater Recharge from Project Components - Gordon Site

Parameter	Units	Regulatory Criteria			End of Construction		End of Operation				Closure (Pit Lake)			
		Drinking Water Criteria	Surface Water Criteria for the Protection of Aquatic Life	Groundwater Discharging to Surface Water	Historical North MRSA	Historical South MRSA	Historical North MRSA	Historical South MRSA	New MRSA (expected)	New MRSA (sensitivity)	Historical North MRSA	Historical South MRSA	New MRSA (expected)	New MRSA (sensitivity)
		GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3										
General Chemistry														
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	11	4.9	11	4.9	-	-	11	4.9	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.10	0.016	0.10	0.016	-	-	0.10	0.016	-	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	0.46	0.16	0.46	0.16	0.99	1.8	0.46	0.16	0.0000046	0.0000084
Calculated Un-ionized Ammonia (as N)	mg/L	n/v	0.19 *	n/v	0.00040	0.00014	0.00040	0.00014	0.00087	0.0016	0.00040	0.00014	0.0000000041	0.0000000074
Chloride	mg/L	250	120	1,800	5.5	9.1	5.5	9.1	-	-	5.5	9.1	-	-
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Fluoride	mg/L	1.5	0.12	n/v	0.069	0.11	0.069	0.11	0.43	0.48	0.069	0.11	0.61	0.61
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	469	1,010	469	1,010	-	-	469	1,010	-	-
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	0.11	0.44	0.11	0.44	7.8	**43**	0.11	0.44	0.000036	0.00020
pH, Field	S.U.	7.0*-8.5**	6.5-9.0	n/v	**6.8**	7.2	**6.8**	7.2	-	-	**6.8**	7.2	-	-
Sulfate	mg/L	500	n/v	n/v	287	**624**	287	**624**	**706**	**1,091**	287	**624**	**1,814**	**3,320**
Dissolved Metals														
Aluminum	mg/L	0.1 *	0.1	n/v	0.015	0.0029	0.015	0.0029	0.079	0.083	0.015	0.0029	0.086	0.086
Antimony	mg/L	0.006	n/v	16	0.00011	0.00021	0.00011	0.00021	**0.0087**	**0.013**	0.00011	0.00021	**0.012**	**0.021**
Arsenic	mg/L	0.010	0.005 *	1.5	0.0012	0.00054	0.0012	0.00054	**0.071**	**0.079**	0.0012	0.00054	**0.10**	**0.10**
Barium	mg/L	1	n/v	23	0.095	0.063	0.095	0.063	0.13	0.20	0.095	0.063	0.31	0.56
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	<0.0001	<0.0001	<0.0001	-	-	<0.0001	<0.0001	-	-
Boron	mg/L	5	1.5	36	0.023	0.040	0.023	0.040	0.38	0.59	0.023	0.040	0.70	1.3
Cadmium	mg/L	0.005	0.00036 ***	0.0021	0.0000057	0.000039	0.0000057	0.000039	0.000043	0.000067	0.0000057	0.000039	0.00012	0.00021
Chromium	mg/L	0.05	0.011 **	0.64	0.00029	<0.0001	0.00029	<0.0001	0.00039	0.00061	0.00029	<0.0001	0.0019	0.0035
Cobalt	mg/L	n/v	n/v	0.052	0.00012	0.00049	0.00012	0.00049	0.00079	0.0012	0.00012	0.00049	0.0019	0.0035
Copper	mg/L	1	0.0031 */***	0.069	0.00049	0.00029	0.00049	0.00029	0.0094	0.015	0.00049	0.00029	0.022	0.041
Iron	mg/L	0.3	0.3	n/v	**2.2**	0.19	**2.2**	0.19	0.058	0.090	**2.2**	0.19	0.13	0.23
Lead	mg/L	0.005 *	0.0049 **/***	0.02	<0.00005	<0.00005	<0.00005	<0.00005	0.00039	0.00061	<0.00005	<0.00005	0.00096	0.0018
Manganese	mg/L	0.02 *	n/v	n/v	**0.26**	**0.43**	**0.26**	**0.43**	0.0087	0.013	**0.26**	**0.43**	0.015	**0.027**
Mercury	mg/L	0.001	0.000026	0.0077	0.00000057	0.00000039	0.00000057	0.00000039	0.0000043	0.0000067	0.00000057	0.00000039	0.000011	0.000019
Molybdenum	mg/L	n/v	0.073	7.3	0.00084	0.0023	0.00084	0.0023	0.035	0.054	0.00084	0.0023	0.072	0.13
Nickel	mg/L	n/v	0.085 **/***	0.39	0.00054	0.0017	0.00054	0.0017	0.0055	0.0085	0.00054	0.0017	0.011	0.019
Phosphorus	mg/L	n/v	n/v	n/v	0.0521	0.0222	0.0521	0.0222	-	-	0.0521	0.0222	-	-
Selenium	mg/L	0.01 **	0.001	0.05	0.00013	0.00011	0.00013	0.00011	0.0035	0.0055	0.00013	0.00011	0.0058	**0.011**
Silver	mg/L	n/v	0.0001 **	0.0012	<0.00001	<0.00001	<0.00001	<0.00001	0.000043	0.000067	<0.00001	<0.00001	0.00012	0.00021
Sodium	mg/L	200	n/v	1,800	45	37	45	37	**241**	**372**	45	37	**396**	**725**
Thallium	mg/L	n/v	0.0008	0.4	0.000024	0.000013	0.000024	0.000013	0.00043	0.00067	0.000024	0.000013	0.0011	0.0019
Tungsten	mg/L	n/v	n/v	n/v	0.00017	0.00010	0.00017	0.00010	-	-	0.00017	0.00010	-	-
Uranium	mg/L	0.02	0.015	0.33	0.0013	0.0075	0.0013	0.0075	**0.030**	**0.046**	0.0013	0.0075	**0.051**	**0.094**
Vanadium	mg/L	n/v	n/v	0.2	0.00092	0.00024	0.00092	0.00024	-	-	0.00092	0.00024	-	-
Zinc	mg/L	5	0.03 *	0.89	<0.001	<0.001	<0.001	<0.001	0.0067	0.010	<0.001	<0.001	0.014	0.025
Zirconium	mg/L	n/v	n/v	n/v	0.0012	0.00023	0.0012	0.00023	-	-	0.0012	0.00023	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not estimated
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations of background groundwater quality
(expected)	Concentration data from Field Bin FLB-FL S5J, representing 55% of banded iron formation (BIF) waste rock, scaled up assuming normal climate year controls pore water volume and flows through MRSA.
(sensitivity)	Concentration data from Field Bin FLB-FL S5fi, representing 55% of banded iron formation (BIF) waste rock, scaled up assuming 25 year dry climate year controls pore water volume and flows through MRSA.

GCDWQ: Guidelines for Canadian Drinking Water
MWQSOG-DW: Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL: Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL: Manitoba Water QualityStandards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3: Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)

Table 8A-9 Predicted Groundwater Discharge Rates and Travel Times from MRSAs to the Receiving Environment at Baseline, End of Construction, End of Operation, and Closure (Pit Lake) - Gordon Site

Facility	Predicted Groundwater Discharge Rates and Travel Times																
	Interceptor Wells		East Pit		Wendy Pit		Open Pit		Susan Lake		Pit Lake		Gordon Lake		Farley Lake		Total Discharge Rate m^3/d
	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	
Baseline																	
Historical North MRSA	-	-	-	-	0.57	176 / 303	-	-	-	-	-	-	0.55	83 / 156	-	-	**1.1**
Historical South MRSA	-	-	0.74	62 / 259	0.19	1.5 / 424	-	-	-	-	-	-	-	-	11.2	0.1 / 246	**12**
Total	**-**	**-**	**0.74**	**-**	**0.76**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.55**	**-**	**11.2**	**-**	**13**
End of Construction																	
Historical North MRSA	0.95	0.06 / 0.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.95**
Historical South MRSA	-	-	1.6	0.01 / 1.09	1.0	0.02 / 0.73	-	-	-	-	-	-	-	-	-	-	**2.6**
New MRSA	-	-	-	-	-	-	n/a[1]	n/a[1]	n/a[1]	n/a[1]	-	-	-	-	-	-	**-**
Total	**0.95**	**-**	**1.6**	**-**	**1.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.6**
End of Operations																	
Historical North MRSA	0.95	12.3 / 18.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.95**
Historical South MRSA	-	-	-	-	-	-	7.9	<0.1 / 3.4	-	-	-	-	-	-	-	-	**7.9**
New MRSA	-	-	-	-	-	-	52.7	29.7 / 321	1.6	545 / 954	-	-	-	-	-	-	**54**
Total	**0.95**	**-**	**-**	**-**	**-**	**-**	**60.6**	**-**	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**63**
Closure (Pit Lake)																	
Historical North MRSA	-	-	-	-	-	-	-	-	-	-	-	-	1.0	133 / 252	-	-	**1.0**
Historical South MRSA	-	-	-	-	-	-	-	-	-	-	3.5	0 / 1,578	0.020	214 / 214	3.2	1.2 / 829	**6.7**
New MRSA	-	-	-	-	-	-	-	-	18.1	193 / 827	22.5	1,153 / 6,010	4.0	821 / 1,048	11.2	374 / 2,894	**56**
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**18.1**	**-**	**26.0**	**-**	**5.0**	**-**	**14.4**	**-**	**64**

Notes:

n/a[1] The MRSA will not become saturated during the construction period and therefore, no seepage out the base of the MRSA is predicted during this mine phase.

Table 8A-10 Predicted Groundwater Discharge Rates and Travel Times from MRSAs and TMF to the Receiving Environment at Baseline, End of Construction, End of Operation, and Closure (Pit Lake) - MacLellan Site

Facility	Predicted Groundwater Discharge Rates and Travel Times												
	Keewatin River		Keewatin River Tributary (Kee3-B1)		Open Pit		Minton Lake		Cockeram Lake		Payne Lake Tributary (Kee3-Pay1)		Total Discharge Rate m^3/d
	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	Dischrage Rate (m^3/d)	Minimum / Mean Travel Time (yr)	
Baseline													
Historical MRSA	0.95	2,085,000 / 2,477,000	-	-	-	-	-	-	-	-	-	-	0.95
Total	**0.95**	-	-	-	-	-	-	-	-	-	-	-	**0.95**
End of Construction													
MRSA	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	-	-	-	-	-
TMF	n/a[2]	2 / 7	n/a[2]	4 / 18	-	-	n/a[2]	2 / 16	n/a[2]	42 / 65	0.26	1 / 5	0.26
Total	-	-	-	-	-	-	-	-	-	-	**0.26**	-	-
End of Operations (With Seepage Collection Ditches)													
MRSA	2.7	87.2 / 117	130	1.0 / 20	43	14.1 / 168	130	3.0 / 70.0	-	-	-	-	305
TMF	10	90.0 / 229	216	2.0 / 248	26	807 / 5,071	130	5.0 / 437	11	32,796 / 130,146	0.30	134 / 1,533	393
Total	**13**	-	**346**	-	**69**	-	**259**	-	**11**	-	**0.30**	-	**698**
Closure (Pit Lake, With Seepage Collection Ditches)													
MRSA	2.7	86.7 / 106	130	1.5 / 15.1	43	43.1 / 271	104	4.4 / 77.3	-	-	-	-	279
TMF	8.6	89.4 / 217	207	2.0 / 244	17	941 / 6,520	52	5.5 / 872	8.6	29,130 / 87,622	0.26	163 / 937	294
Total	**11**	-	**337**	-	**60**	-	**156**	-	**8.6**	-	**0.26**	-	**573**
Closure (Pit Lake, Without Seepage Collection Ditches)													
MRSA	8.6	95.1 / 343	164	3.2 / 67	104	47.8 / 637	380	19.7 / 830	<<8.6	80,882 / 230,855	-	-	657
TMF	17	103 / 1,428	268	1.0 / 240	17	2,363 / 11,875	95	4.2 / 4,860	<<8.6	140,017 / 249,217	8.6	141 / 212	406
Total	**26**	-	**432**	-	**121**	-	**475**	-	-	-	**8.6**	-	**1,063**

Notes:

n/a[1]: The MRSA will not become saturated during the construction period and therefore, no seepage out the base of the MRSA is predicted during this mine phase.

n/a[2]: not applicable, travel time from source to receptor is greater than the time period of the given mine phase, therefore no discharge from source to receptor is anticipated during the given mine phase.

Table 8A-11 Predicted Concentrations of Groundwater Recharge from Project Components - MacLellan Site

Parameter	Units	Regulatory Criteria			Baseline	End of Operation				Closure (Pit Lake)			
		Drinking Water Criteria	Surface Water Criteria for the Protection of Aquatic Life	Groundwater Discharging to Surface Water	Historical MRSA	MRSA (expected)	MRSA (sensitivity)	TMF (expected)	TMF (sensitivity)	MRSA (expected)	MRSA (sensitivity)	TMF (expected)	TMF (sensitivity)
		GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3									
General Chemistry													
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	7.8	-	-	-	-	-	-	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.0091	-	-	-	-	-	-	-	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	0.065	1.7	1.5	7.1	7.1	0.061	0.055	3.9	0.061
Calculated Un-ionized Ammonia (as N)	mg/L	n/v	0.19 *	n/v	0.000017	0.00045	0.00041	0.0019	0.0019	0.000016	0.000015	0.0010	0.000016
Chloride	mg/L	250	120	1,800	<1	-	-	42	44	0.58	0.52	23	0.58
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	-	-	**4.8**	**4.8**	0.00051	0.00046	**1.6**	0.00051
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	-	-	0.014	0.014	0.00051	0.00046	0.015	0.00051
Fluoride	mg/L	1.5	0.12	n/v	<0.04	0.16	0.89	0.68	0.95	0.36	**2.4**	0.45	0.36
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	868	-	-	39	39	485	433	37	485
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	0.24	**13**	**36**	1.0	1.0	0.27	0.24	0.55	0.27
pH, Field	S.U.	7.0*-8.5**	6.5-9.0	n/v	**6.4**	-	-	-	-	-	-	-	-
Sulfate	mg/L	500	n/v	n/v	**820**	**977**	**5,596**	**3,254**	**3,947**	**1,797**	**18,124**	**1,903**	**1,797**
Dissolved Metals													
Aluminum	mg/L	0.1 *	0.1	n/v	0.073	0.072	**0.17**	0.093	0.093	**0.18**	**0.20**	**0.10**	**0.18**
Antimony	mg/L	0.006	n/v	16	0.00046	**0.0092**	**0.050**	**0.049**	**0.049**	**0.0081**	**0.044**	**0.028**	**0.0081**
Arsenic	mg/L	0.01	0.005 *	1.5	**0.012**	**0.071**	**0.13**	**0.035**	**0.035**	**0.044**	**0.088**	**0.055**	**0.044**
Barium	mg/L	1	n/v	23	0.027	0.10	0.53	0.066	0.066	0.15	**1.2**	0.051	0.15
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	-	-	-	-	-	-	-	-
Boron	mg/L	5	1.5	36	0.030	0.083	0.26	0.033	0.033	0.070	0.24	0.026	0.07
Cadmium	mg/L	0.005	0.00036 ***	0.0021	0.0020	0.000033	0.0021	0.000055	0.000055	0.0011	**0.0066**	0.000053	0.0011
Chromium	mg/L	0.05	0.011 **	0.64	0.00067	0.00018	0.0019	0.00012	0.00012	0.0014	0.0097	0.00010	0.0014
Cobalt	mg/L	n/v	n/v	0.052	0.026	0.0020	0.012	0.058	0.058	0.017	0.038	0.033	0.017
Copper	mg/L	1	0.0031 */***	0.069	0.0078	0.0033	0.017	0.028	0.028	0.011	0.028	0.021	0.011
Iron	mg/L	0.3	0.3	n/v	0.26	0.013	0.082	**0.65**	**0.65**	0.18	0.18	**0.62**	0.18
Lead	mg/L	0.005 *	0.0049 **/***	0.02	0.00088	0.00018	0.00083	0.00037	0.00037	0.0012	0.0025	0.00031	0.0012
Manganese	mg/L	0.02 *	n/v	n/v	**0.86**	**0.074**	**0.91**	**0.10**	**0.10**	**0.53**	**2.7**	**0.16**	**0.53**
Mercury	mg/L	0.001	0.000026	0.0077	0.00000062	0.0000010	0.0000055	0.0000094	0.0000094	0.0000018	0.000012	0.000017	0.0000018
Molybdenum	mg/L	n/v	0.073	7.3	0.00042	0.035	0.069	0.034	0.034	0.011	0.042	0.022	0.011
Nickel	mg/L	n/v	0.085 **/***	0.39	0.089	0.038	0.16	0.010	0.010	0.092	0.42	0.012	0.092
Selenium	mg/L	0.01 **	0.001	0.05	0.00014	0.00092	0.0091	0.0042	0.0042	0.0012	**0.020**	0.0025	0.0012
Silver	mg/L	n/v	0.0001 **	0.0012	0.000019	0.000014	0.000082	0.000025	0.000025	0.000055	0.00024	0.000023	0.000055
Sodium	mg/L	200	n/v	1,800	9.8	17	57	**1,207**	**1,207**	14	78	**661**	14
Thallium	mg/L	n/v	0.0008	0.4	<0.0001	0.000074	0.00050	0.000013	0.000013	0.00015	0.0011	0.000017	0.00015
Tungsten	mg/L	n/v	n/v	n/v	0.0014	-	-	-	-	-	-	-	-
Uranium	mg/L	0.02	0.015	0.33	0.00080	0.0064	0.016	0.0016	0.0016	0.0064	**0.024**	0.0011	0.0064
Vanadium	mg/L	n/v	n/v	0.2	0.00049	-	-	-	-	-	-	-	-
Zinc	mg/L	5	0.03 *	0.89	0.059	0.0022	0.052	0.0054	0.0054	0.037	0.16	0.0056	0.037
Zirconium	mg/L	n/v	n/v	n/v	0.00018	-	-	-	-	-	-	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not estimated
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations of background groundwater quality
(predicted)	MRSA concentration data from Field Bin FLB-ML WR Ave, representing 100% of waste rock and TMF concentration data based on average first (operation) or last (closure) month concentrations out of four subaqueous columns, scaled up assuming normal climate year controls pore water volume and flows through MRSA amd TMF.
(sensitivity)	MRSA concentration data from Field Bin FLB-ML WR>1%S, representing 100% of waste rock and TMF concentration data based on average first (operation) or last (closure) month concentrations out of four subaqueous columns, scaled up assuming 25 year dry climate year controls pore water volume and flows through MRSA and TMF

GCDWQ	Guidelines for Canadian Drinking Water
MWQSOG-DW	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL	Manitoba Water QualityStandards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3	Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)

ALAMOS GOLD INC.

Lynn Lake Gold Project
Environmental Impact Statement
Chapter 9 – Assessment of Potential Effects on Surface Water

Stantec

Prepared by:

Stantec Consulting Ltd.

May 25, 2020

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Acronyms and Abbreviations

ARD	acid rock drainage
Bq/L	becquerel per litre
$CaCO_3$	calcium carbonate
CCME	Canadian Council of Ministers of the Environment
GCDWQ	Guidelines for Canadian Drinking Water Quality
CRA	Commercial, Recreational, and Aboriginal
CWQG-FAL	Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life
DFO	Fisheries and Oceans Canada
DO	dissolved oxygen
DOC	dissolved organic carbon
EA	environmental assessment
ECCC	Environment and Climate Change Canada
EEM	environmental effects monitoring
EIS	environmental impact statement
EMMPs	environmental management and monitoring plans
ETMA	East Tailings Management Area
FAL	freshwater aquatic life
GCDWQ	Guidelines for Canadian Drinking Water Quality
GIS	geographic information system
ID	identification codes
L/day	liters per day
LAA	Local Assessment Area

LiDAR	light detection and ranging
LLGP/the Project	Lynn Lake Gold Project
LOM	life of mine
MAD	mean annual discharge
masl	meters above sea level
Mm^3	cubic megametre
MMER	Metal Mine Effluent Regulation
MDMER	Metal and Diamond Mining Effluent Regulations
mg/L	milligram per litre
ML	metal leaching
MMD	mean monthly discharge
MRMP	Mine Rock Management Plan
MRSA	Mine Rock Storage Area
m^3/s	cubic metres per second
MWQSOG	Manitoba Water Quality Standards, Objectives, and Guidelines
MWQSOG-FAL	Manitoba Water Quality Standards, Objectives, and Guidelines for the Protection of Freshwater Aquatic Life
NRCan	Natural Resources Canada
PAG	potentially acid generating
PDA	Project Development Area
POPC	parameters of potential concern
RAA	Regional Assessment Area
SO_2	sulphur dioxide
TDR	technical data report
TLRU	traditional land and resource use

TMF	tailings management facility
TMR	technical modelling report
TSS	total suspended solids
VC	valued component
WSC	Water Survey of Canada

9.0 ASSESSMENT OF POTENTIAL EFFECTS ON SURFACE WATER

Surface Water includes surface water quantity and surface water quality in freshwater waterbodies and watercourses. Surface Water was selected as a valued component (VC) for assessment because of its importance as a source of potable water for humans, importance to wildlife and freshwater aquatic biota as habitat, and importance for supporting commercial, recreational, traditional, and industrial activities.

Surface Water is an integral component of the hydrologic cycle and is linked to the following VCs:

- Groundwater (Chapter 8) – changes in surface water quality and/or quantity can affect, and can be affected by, groundwater.
- Fish and Fish Habitat (Chapter 10) – changes in surface water quality and/or quantity may affect the availability and suitability of fish habitat and affect the health, growth and survival of fish and the algae, plankton, and benthic invertebrate communities that support fish.
- Vegetation and Wetlands (Chapter 11) – changes in surface water quality and/or quantity can affect upland and riparian vegetation and wetland communities that are formed by, or reliant upon, surface water.
- Wildlife and Wildlife Habitat (Chapter 12) – changes in surface water quality and/or quantity can affect the availability and suitability of wildlife habitat, particularly for semi-aquatic mammals (e.g., beavers) and waterfowl, and affect wildlife health that rely on surface water as a source of drinking water.
- Land and Resource Use (Chapter 15) – changes in surface water quantity can affect the navigability of streams and rivers while changes in surface water quality can affect the ability or desire of people wishing to participate in water-based recreational activities (e.g., boating, swimming, fishing).
- Current Use of Lands for Traditional Purposes (Chapter 17) – changes in surface water quality and/or quantity can affect the ability or desire of Indigenous peoples to participate in traditional water-based activities (e.g., hunting, trapping, fishing).
- Human Health (Chapter 18) – changes in surface water quality can increase the exposure of Indigenous and non-Indigenous peoples to naturally-occurring and human-made contaminants (e.g., metals, hydrocarbons), either directly through drinking water or indirectly through the wildlife and fish consumed by people, that can pose health risks to humans and ecological receptors.

9.1 SCOPE OF ASSESSMENT

The scope of the assessment of potential effects to the Surface Water VC was guided by the federal Environmental Impact Statement (EIS) Guidelines developed for the Project (Appendix 4A), Manitoba Sustainable Development's (MSD), now Manitoba Conservation and Climate's (MCC), Environment Act

Proposal Report Guidelines; as well as the various federal and provincial laws, regulations, policies, and guidelines protecting surface water quantity and quality in Canada and Manitoba.

In addition to regulations, policies, and guidelines, this section describes how engagement with the public and local Indigenous communities has influenced the scope of the assessment; the understanding of potential effects and pathways between the Project and surface water quantity and quality during construction, operation, and decommissioning/closure of the Project; measurable parameters to be used to quantify potential effects of the Project on surface water quantity and quality; spatial and temporal boundaries of the assessment; and the approach for characterizing and determining the significance of residual effects.

9.1.1 Regulatory and Policy Setting

Federal and provincial water quality guidelines are used to protect drinking water and freshwater aquatic biota. This assessment uses the guidelines to screen potential adverse effects to surface water quantity and quality during construction, operation, and decommissioning/closure of the Gordon and MacLellan sites. These guidelines are described below, along with other laws, policies, and guidelines that govern the management and protection of surface water in Canada and Manitoba.

9.1.1.1 Federal

Fisheries Act

Section 36 of the federal *Fisheries Act* prohibits the deposition of deleterious substances into waters frequented by fish in Canada unless authorized by regulation. The *Metal and Diamond Mining Effluent Regulation* (MDMER) under the *Fisheries Act* regulates the deposit of deleterious mine effluents, tailings, and waste rock into waters frequented by fish, as authorized by Environment and Climate Change Canada (ECCC). The MDMER came into effect on June 1, 2018 and amends the *Metal Mining Effluent Regulations* (MMER). The MDMER defines mine effluent as:

> *"(a) hydrometallurgical facility effluent, milling facility effluent, mine water effluent, tailings impoundment area effluent, treatment pond effluent or treatment facility effluent other than effluent from a sewage treatment facility; or (b) any seepage or surface runoff containing any deleterious substance that flows over, through or out of the site of a mine."*

The MDMER applies to metal and diamond mines with an effluent flow rate of greater than 50 m^3/d based on effluent deposited from all final discharge points of the mine. For these mines, the MDMER allows the discharge of mine effluent containing deleterious substances listed in Schedule 4 as long as the effluent is not acutely lethal, the pH is equal to or greater than 6.0, but not greater than 9.5, and concentrations of deleterious substances do not exceed concentration limits identified in Schedule 4 of the MDMER at the final discharge point(s).

The MDMER includes the phasing-in of more stringent effluent discharge limits than the previous MMER for deleterious substances for new and existing mines, a new effluent discharge limit for unionized ammonia, and the requirement that effluent be non-acutely lethal to *Daphnia magna*, all of which come into force on June 1, 2021. Existing mines are metal and diamond mines (not recognized closed mines) that were subject to MMER after June 6, 2002 and have continued commercial operations. New mines are metal and diamond mines that begin commercial operations within three years of the amended MDMER coming-into-force on June 1, 2021 (i.e., mines which begin operations on or after June 1, 2018) or, in the case of a recognized closed mine, that return to commercial operation on or after June 1, 2021.

The current and future MDMER effluent limits for new mines are shown in (Table 9-1). The more stringent future effluent limits for existing mines have been considered in this assessment based on the assumption that the Project will not be in commercial operation before June 1, 2021.

Deposition of acutely lethal mine effluent, tailings, and waste rock into waterbodies frequented by fish is prohibited by the *Fisheries Act* unless those waterbodies are designated as a Mine Waste Disposal Area by the Parliament of Canada and listed in Schedule 2 of the MDMER. Amendment of Schedule 2 of the MDMER is not anticipated for the Project. This is because the tailings management facility (TMF) and mine rock storage areas (MRSA) have been sited away from fish-bearing waterbodies and watercourses.

Table 9-1 Metal and Diamond Mining Effluent Regulation (MDMER) Authorized Effluent Limits for New Mines in Canada

Substance	Maximum Authorized Monthly Mean Concentration (mg/L)		Maximum Authorized Concentration in a Composite Sample (mg/L)		Maximum Authorized Concentration in a Grab Sample (mg/L)	
	Current	Future[1]	Current	Future[1]	Current	Future[1]
Arsenic	0.50	0.10	0.75	0.15	1.00	0.20
Copper	0.30	0.10	0.45	0.15	0.60	0.20
Cyanide	1.00	0.50	1.50	0.75	2.00	1.00
Lead	0.20	0.08	0.30	0.12	0.40	0.16
Nickel	0.50	0.25	0.75	0.38	1.00	0.50
Zinc	0.50	0.40	0.75	0.60	1.00	0.80
Unionized ammonia	-	0.50	-	NA	-	1.00
Total suspended solids	15.00	15.00	22.50	22.50	30.00	30.00
Radium 226	0.37	0.37	0.74	0.74	1.11	1.11

Notes:

All units in mg/L, except for Radium 226, which is expressed in Bq/L, and unionized ammonia which is expressed as mg/L nitrogen (N)

NA = not applicable

[1] effluent limits that will coming-into-force on June 1, 2021 for new mines (i.e., mines beginning operations after June 1, 2018)

The MDMER requires environmental effects monitoring (EEM) for mines that discharge mine effluent to the receiving environment. This monitoring requires effluent characterization, water quality monitoring, and biological studies. Some exemptions to conducting biological studies apply, such as when effluent is rapidly diluted to ≤1% within 100 m and 250 m from the final discharge point.

Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life

The *Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life* (CWQG-FAL) are established by the Canadian Council of Ministers of the Environment (CCME 2020) and are regularly updated to incorporate current guideline derivation approaches and toxicological data. The CWQG-FAL are intended to be protective of all forms of aquatic life and all aspects of the aquatic life cycle during acute and/or chronic exposure regimes (i.e., short-term or long-term exposure). These guidelines were used, in conjunction with the most stringent of the Tier I, II, and III *Manitoba Water Quality Standards, Objectives, and Guidelines* (MWQSOG) for the protection of aquatic life (MWQSOG-FAL; MWS 2011), to identify parameters of potential concern (POPCs) and to provide context for baseline conditions and predicted effects of the Project on surface water quality (Table 9-2).

Guidelines for Drinking Water Quality

The Guidelines for Canadian Drinking Water Quality (GCDWQ) are established by the Federal-Provincial-Territorial Committee on Drinking Water and published by Health Canada (Health Canada 2020). Guidelines are based on current, published research related to health effects, aesthetic effects, exposure levels, and operational considerations. The GCDWQ are considered when defining discharge criteria for Project effluents where potential effects on drinking water quality are anticipated. The MWQSOG also include water quality guidelines for the protection of surface water drinking sources (MWS 2011). The GCDWQ and MWQSOG used to assess changes in receiving environment drinking water quality are summarized with the guidelines for the protection of aquatic life in Table 9-2.

Table 9-2 Canadian and Manitoba Freshwater Aquatic Life and Drinking Water Quality Guidelines

Parameter[1]	Unit	Most Stringent CWQG-FAL	Most Stringent MWQSOG-FAL	Drinking Water Quality Guidelines (MWQSOG and GCDWQ)[2]
Field Parameters				
Dissolved oxygen	mg/L	6.5	6	-
Nitrate	mg/L	3	-	10
Nitrite	mg/L	0.06	0.06	1
Nitrate + Nitrite	mg/L	-	10	-
pH	S.U.	6.5-9.0	6.5-9.0	7 - 10.5
General Chemistry				
Ammonia (as N)	mg/L	Equation*	Equation*	-
Chloride	mg/L	120	-	-
Cyanide (Total)	mg/L	-	-	0.2
Cyanide (Free)	mg/L	0.005	0.0052	-
Fluoride	mg/L	0.12	0.12	1
Phosphorus, total	mg/L	Framework	0.025	-

Parameter[1]	Unit	Most Stringent CWQG-FAL	Most Stringent MWQSOG-FAL	Drinking Water Quality Guidelines (MWQSOG and GCDWQ)[2]
Metals, Dissolved[a]				
Antimony	mg/L	-	-	0.2
Arsenic	mg/L	-	0.15	-
Cadmium	mg/L	-	Equation*	-
Chromium (total dissolved)	mg/L	-	Equation*	-
Chromium (hexavalent)	mg/L	-	-	0.05
Copper	mg/L	-	Equation*	-
Lead	mg/L	-	Equation*	-
Manganese	mg/L	Equation*	-	-
Nickel	mg/L	-	Equation*	-
Zinc	mg/L	Equation*	Equation*	-
Metals, Total				
Aluminum	mg/L	0.005 at pH≤6.5 0.1 at pH≥6.5	0.005 at pH≤6.5 0.1 at pH≥6.5	9.5
Antimony	mg/L	-	-	0.006
Arsenic	mg/L	0.005	-	0.01
Barium	mg/L	-	-	1
Boron	mg/L	1.5	1.5	5
Cadmium	mg/L	Equation*	-	0.005
Chromium (trivalent)	mg/L	0.0089	-	-
Chromium (hexavalent)	mg/L	0.001	0.011	-
Copper	mg/L	Equation*	-	-
Iron	mg/L	0.3	0.3	-
Lead	mg/L	Equation*	-	0.005
Mercury	mg/L	0.000026	0.000026	0.001
Molybdenum	mg/L	0.073	0.073	0.25
Nickel	mg/L	Equation*	-	-
Selenium	mg/L	0.001	0.001	0.01
Silver	mg/L	0.00025	0.0001	-
Thallium	mg/L	0.0008	0.0008	-
Uranium	mg/L	0.015	0.015	0.02

Parameter[1]	Unit	Most Stringent CWQG-FAL	Most Stringent MWQSOG-FAL	Drinking Water Quality Guidelines (MWQSOG and GCDWQ)[2]
NOTES: 1 Dissolved oxygen and pH were not modelled and therefore not assessed for potential changes in water quality CWQG-FAL = Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life by Canadian Council of Ministers of the Environment (CCME 2020). MWQSOG-FAL = Manitoba Water Quality Standards Objectives and Guidelines for Freshwater Aquatic Life - Manitoba (MWS 2011). GCDWQ = Guidelines for Canadian Drinking Water Quality (Health Canada 2020) A Manitoba Tier II guidelines for dissolved metals are based on exceedance once in three years, but not more frequent, being acceptable during periods of infrequent and extreme low streamflows. * Equations were used to calculate hardness (as CaCO3), pH, DOC, and temperature-dependent guidelines for these parameters as per MWS (2011) and CCME (2020). • Ammonia MWQSOG-FAL: pH and temperature-dependent guideline. Values used for screening are based on Equation 1 values from Table 1 in MWS (2011) • Ammonia CWQG-FAL: pH and temperature-dependent guideline. Values used for screening are based on Table 1 in CCME (2010) and converted to ammonia (as N) by multiplying the unionized ammonia (NH3) guidelines by 0.8224. • Dissolved cadmium MWQSOG-FAL (mg/L): 0.001*[(exp(0.7409*(ln(Hardness))-4.719))*(1.101672-(ln(Hardness)*0.041838))] • Dissolved chromium MWQSOG-FAL (mg/L): 0.001*[(exp(0.819*(ln(Hardness)) + 0.6848))*(0.86)] • Dissolved copper MWQSOG-FAL (mg/L): 0.001*[exp(0.8545[ln(Hardness)]-1.702]*[0.960] • Dissolved lead MWQSOG-FAL (mg/L): 0.001*[(exp(1.273*(ln(Hardness)) - 4.705))*((1.46203-(ln(Hardness))*0.145712))] • Dissolved nickel MWQSOG-FAL (mg/L): 0.001*[(exp(0.846*(ln(Hardness))+0.0584))*(0.997)] • Dissolved manganese CWQG-FAL (mg/L): pH and hardness-dependent guideline. Values used for screening are based on Table 5 in CCME (2019). • Dissolved zinc MWQSOG-FAL (mg/L): 0.001*[(exp(0.8473*(ln(Hardness))+0.884))*(0.986)] • Dissolved zinc CWQG-FAL: exp(0.947[ln(Hardness)] - 0.815[pH] + 0.398[ln(DOC)] + 4.625). The value for DOC was set at 0.3 mg/L (i.e., the lowest and most conservative value to calculate the guideline) • Total cadmium CWQG-FAL: at hardness >280 mg/L the guideline is 0.00037 mg/L; at hardness between 17 and 280 mg/L the guideline (in mg/L) is 0.001*[10^(1.016*(log10(Hardness))-1.71)]; at hardness <17 mg/L the guideline is 0.00011 mg/L. • Total copper CWQG-FAL: at hardness >180 mg/L the guideline is 0.004 mg/L; at hardness between 82 and 180 mg/L the guideline (in mg/L) is 0.001*0.2*[exp(0.8545*(ln(Hardness]))-1.465)]; at hardness <82 mg/L the guideline is 0.002 mg/L. • Total lead CWQG-FAL: at hardness >180 mg/L the guideline is 0.007 mg/L; at hardness between 60 and 180 mg/L the guideline (in mg/L) is 0.001*[exp(1.273*(ln(Hardness]))-4.705)]; at hardness <60 mg/L the guideline is 0.001 mg/L. Total nickel CWQG-FAL: at hardness >180 mg/L the guideline is 0.15 mg/L; at hardness between 60 and 180 mg/L the guideline (in mg/L) is 0.001*[exp(0.76*(ln(Hardness]))+1.06))]; at hardness <60 mg/L the guideline is 0.025 mg/L. 2 The drinking water quality guideline shown is the most stringent MWQSOG or GCDWQ. Only health-based guidelines (i.e., not aesthetic guidelines) were used for screening water quality.				

Framework for Assessing Ecological Flow Requirements to Support Fisheries in Canada

The *Framework for Assessing Ecological Flow Requirements to Support Fisheries in Canada* (DFO 2013) provides guidance on the management of flows required to maintain the ecological functions that sustain fisheries in streams and rivers potentially affected by flow withdrawals. The guidance promotes the maintenance of natural flow regimes to sustain riverine ecosystems, with the understanding that the probability of degrading riverine ecosystems increases with increasing alteration of the natural flow regime. To manage this risk in Canadian rivers and streams, the Framework (DFO 2013) recommends that assessment of alterations to the natural flow regime should be considered in a cumulative sense, not just on a project-by-project basis, and that:

- Cumulative flow alterations less than 10% in amplitude of the actual “instantaneous” flow in the river relative to a “natural flow regime” have a low probability of detectable effects to ecosystems that support Commercial, Recreational, or Aboriginal (CRA) fisheries. Such projects can be assessed with “desk-top” methods.

- Cumulative flow alterations that result in instantaneous flows less than 30% of the mean annual discharge (MAD) have a heightened risk of impacts to fisheries.
- For cumulative flow alterations greater than 10% of instantaneous discharge or that results in flows less than 30% of MAD, a more rigorous level of assessment is recommended to evaluate potential impacts on ecosystem functions which support fisheries.
- If the "natural flow regime" must be calculated with hydrologic modelling, it is recommended that data with the finest available time scale be used.
- Floor value or "cut-off limit" should be part of the overall prescription to conserve and protect fisheries and should not simply be considered during low flow events.
- Given the inherent uncertainty in many ecological flow setting methods, the use of adaptive management based on long-term and follow-up monitoring with multiple control locations is recommended.

9.1.1.2 Provincial

The Drinking Water Safety Act

The Drinking Water Safety Act addresses construction, operation, and monitoring of drinking water systems in Manitoba. Regulations under the Act provide requirements for water system approval, monitoring, and reporting, as well as treatment and water quality standards. The potable water treatment plant constructed and operated at the MacLellan site will be required to operate in adherence with the Act.

The Environment Act

Alterations to stream channels that affect fish mobility and/or fish habitat and works resulting in modification to lake or river levels for a water surface area greater than 2 km^2 are considered Class 2 developments under section 3(9) of the Classes of Development Regulations pursuant to *The Environment Act* of Manitoba. Consequently, any proposed alteration to streams in Manitoba is subject to provincial assessment and licensing requirements.

The Water Protection Act

The Water Protection Act provides for the protection and stewardship of Manitoba's water resources and aquatic ecosystems. Part 2 of the Act allows for setting and adoption of MWQSOG (Manitoba Water Stewardship 2011) and requires consideration of relevant MWQSOG for approvals or decisions issued under *The Environment Act* of Manitoba or other relevant acts or regulations.

The MWQSOG identify the minimum standards for water quality. Tier I standards describe minimum standards for quality of industrial and municipal wastewaters and other effluents. Tier II water quality objectives for various parameters, including dissolved metals, apply to lakes, ponds, rivers, and streams. The Tier II objectives for metals typically are for one maximum four-day period every three years during periods of infrequent or extreme low streamflows to avoid aquatic communities being in continual recovery.

Tier III guidelines, including those for total metals, are used to evaluate ambient water quality data in relation to aquatic life and human uses, including drinking water, irrigation, and recreation.

The Water Rights Act

The Water Rights Act is the legislative mechanism governing allocation of water resources and construction of water control works within Manitoba. A license is required under section 3(1) of the Act for construction of any dyke, dam, surface or subsurface drain, drainage, improved natural waterway, canal, tunnel, bridge, culvert, borehole, or contrivance for carrying or conducting water that temporarily or permanently changes flow, level, or direction of flow of water in a waterbody (including a wetland or aquifer). The diversion and use of surface water or groundwater for industrial or other purposes also requires licensing under section 3(1) of the Act.

The Mines and Minerals Act

The Mines and Minerals Act requires that water removed from the workings under a mine lease be disposed of in a safe and secure manner. Regulation 67/99 of the Act stipulates requirements for restoration of watercourses during mine closure.

The Public Health Act

The Public Health Act is intended to enable the delivery of public health services to protect and promote the health and wellbeing of the people of Manitoba. Regulations can be enacted under the Act with regard to pollution of wells, groundwater, surface water, and springs, as well as construction, provision, maintenance, and operation of potable and waste-water systems. Regulation 326/88R contains prohibitions on discharge of mine waste, sewage, and other liquid waste into watercourses. Management and discharge of sewage and mine waste from the Project will be conducted in accordance with this Act.

The Water Resources Conservation Act

The Water Resources Conservation Act requires that any removal of water from Manitoba's water basins be conducted in quantities that would not, individually or collectively, have significant adverse effects on the ecological integrity of Manitoba's water resources or their associated ecosystems.

9.1.2 The Influence of Engagement on the Assessment

Engagement has been ongoing prior to and throughout the EIS process, and will continue with local Indigenous communities, stakeholders, the public, and government agencies through the life of the Project. More detail on the Engagement process can be found in Chapter 3.

Engagement feedback related to groundwater has been addressed through direct responses, updates to baseline information, and in the EIS, as appropriate. Key feedback that influenced the surface water effects assessment is provided below.

9.1.2.1 Indigenous Engagement

As part of the information sharing throughout the engagement process, Project-related information was provided by Indigenous communities in the form of traditional land and resource use (TLRU) studies and other forms of information sharing.

A Project-specific TLRU study was completed collaboratively with Marcel Colomb First Nation with a final report provided to the community on January 11, 2018 (Stantec 2018). The TLRU study included interviews with participants selected by Marcel Colomb First Nation regarding traditional land use in the Project area, including availability of traditional resources, access to traditional resources or areas, occupancy, cultural sites and areas, and experience of TLRU.

A Project-specific TLRU study was completed in collaboration with Peter Ballantyne Cree Nation but has not yet been released by community leadership for use in the environmental assessment. The TLRU study included interviews with community members in Kinoosao, Saskatchewan.

A TLRU study (Manitoba Métis Traditional Knowledge, Land Use, and Occupancy Study for the Lynn Lake Gold Mine Project) was completed by an independent consultant for the Manitoba Metis Federation (SVS 2020), the results of which were received in February 2020. The study documents harvesting and land use by the Manitoba Métis Community within a 100 km radius of the Project.

Comments were provided by Marcel Colomb First Nation regarding the potential effects of the Project on water quality with regard to human use. During the March 26, 2015 Winnipeg community meeting and in their TLRU study (Chapter 17), Marcel Colomb First Nation indicated a concern that the Project could result in depletion of waters for the exercise of Marcel Colomb First Nation rights or a decrease in fish and/or other aquatic species, and could potentially affect fish populations traditionally harvested by its members due to an increase in non-members using land and resources. These comments were considered when defining boundaries and significance thresholds of potential effects for this chapter and the human health assessment (Chapter 18).

During engagement with the Barren Lands First Nation, Manitoba Metis Federation, Mathias Colomb Cree Nation, Nisichawayasihk Cree Nation, O-Pipon-Na-Piwin Cree Nation, and Peter Ballantyne Cree Nation, potential Project effects on surface water quality were identified as a key concern and are outlined in Chapter 3. In addition, the Mathias Colomb Cree Nation, Nisichawayasihk Cree Nation, O-Pipon-Na-Piwin Cree Nation, Barren Lands First Nation, Northlands Denesuline First Nation, and Sayisi Dene First Nation raised concerns about potential effects of the Project on water quality affecting fish and fish habitat (Cote 2011, INAC 2005, Sinclair 1993). These effects are addressed in the Fish and Fish Habitat assessment (Chapter 10).

9.1.2.2 Public Engagement

Several respondents to questionnaires distributed as part of public open houses held in Lynn Lake between March 2015 and February 2020 indicated that impacts to surface water and groundwater are of high importance (Chapter 3). Other areas of importance noted included tailings and mine rock management, tailings containment, and effects on fish habitat (of which surface water quantity and quality comprises an essential component).

9.1.2.3 Regulatory Engagement

Several comments were provided by ECCC and Natural Resources Canada (NRCan) regarding water management at the Project sites. ECCC indicated that it requires details related to any wastewater treatment facility that may be required for the treatment of seepage/discharge of effluent that does not meet provincial/federal discharge criteria. Additional information was also requested regarding the management of water in the existing historical open pits at the Gordon site. ECCC indicated that the management plan for water pumped from these pits to allow mining to occur should clearly indicate whether this water will be discharged directly to the environment or will be managed through site infrastructure, noting that all water discharged to the environment must be non-deleterious (i.e., not lethal to aquatic biota as required by the MDMER). NRCan indicated that potential effects of groundwater quantity and quality and acid rock drainage (ARD) and metal leaching (ML) on surface water quality should be assessed.

With respect to the TMF at the MacLellan site, Fisheries and Oceans Canada (DFO) and ECCC indicated that the deposit of tailings, mine rock, drainage water, or other mine effluent into waterbodies frequented by finfish constitutes introduction of a deleterious substance and is prohibited under the MDMER pursuant to the *Fisheries Act*, unless authorized by ECCC. On July 24, 2019 in Edmonton, Alberta, these regulators advised that the preliminary TMF design presented during that meeting would be expected to trigger a Schedule 2 amendment under the then MMER, if not changed. In consideration of this regulatory guidance, Alamos Gold Inc. (Alamos) subsequently re-designed the TMF dam alignment to avoid encroaching on two fish-bearing headwater tributaries to Minton Lake. The currently proposed TMF design (including start-up and ultimate TMF infrastructure) does not overlap spatially with fish-bearing waters. As a result, no amendment(s) to Schedule 2 of the MDMER are anticipated to be required for the Project.

Comments were provided by Health Canada regarding potential effects of the Project on water quality and human use. Health Canada requested further information to understand the potential effects on human health related to drinking and recreational water, and to identify locations of sources (surface and groundwater) of drinking water, and waters used for recreational purposes. These comments were considered when defining boundaries and significance thresholds of potential effects in the Surface Water assessment (this chapter) and the Human Health assessment (Chapter 18).

9.1.3 Potential Effects, Pathways and Measurable Parameters

Table 9-3 summarizes the potential environmental effects of the Project on surface water, the pathways in which the effects may occur, and the measurable parameters used to monitor and assess the magnitude, geographic extent, and duration of potential effects. These potential environmental effects and measurable parameters were selected based on understanding of the project, recent environmental assessments for mining projects in Canada, and comments provided during engagement.

Table 9-3 Potential Effects, Effects Pathways and Measurable Parameters for Surface Water

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in surface water quantity	Change in lake levels and streamflows due to diversion, extraction, storage, or discharge of surface water during development, operation, and closure of the open pits, TMF, MRSAs, and associated mine infrastructure.	• Mean annual and monthly flows (m^3/s) • Lake levels (masl)
Change in surface water quality	Changes in surface water quality associated with mine effluent releases or surface runoff during construction, operation, and closure of the open pits, TMF, MRSAs, and associated mine infrastructure.	• Concentration of metals and metalloids (mg/L) • Concentration of phosphorus, nitrogen, and major ions (mg/L)

9.1.4 Boundaries

9.1.4.1 Spatial Boundaries

The following spatial boundaries are used to assess potential residual and cumulative environmental effects of the Project on surface water:

- The Project Development Area (PDA) encompasses the anticipated area of direct physical disturbance to streams, lakes, and wetlands due to Project activities and components, plus a 30-metre (m) buffer. The PDAs are:
  - Gordon site (Map 9-1): includes the two existing open pits (Wendy and East pits) and the diversion channel between Gordon and Farley lakes. Except for the access road, the Gordon site is located entirely within the Farley Lake watershed. The size of the Gordon site is approximately 5 km^2.
  - MacLellan site (Map 9-2): includes East Pond and its outlet stream, the Keewatin River at the mine access road bridge crossing, the Dot Lake outlet at the existing mine access road crossing, and the Keewatin River at the water intake and effluent discharge locations. The MacLellan site is located entirely within the Cockeram Lake watershed. The size of the MacLellan site is approximately 11.2 km^2.
- Local Assessment Area (LAA) includes the PDAs and watercourses and lakes downstream of the Project where measurable changes in surface water quantity (i.e., lake levels and streamflows) and surface water quality (i.e., metal, metalloid, or nutrient concentrations) are most likely to occur due to Project activities and components during the construction, operation, and closure phases. The LAAs are:
  - Gordon site (see Map 9-1): includes lakes and streams within the Ellystan Lake watershed, a sub-watershed in the Hughes River system. It also includes Susan Lake, a headwater lake in the Hughes Lake watershed that may be affected by changes in groundwater quantity or quality. The waterbodies and watercourses included in the LAA, and the rationale for their inclusion, are

provided in Table 9-4. The LAA extends to the outlet of Ellystan Lake and is approximately 47.5 km².

  - MacLellan site (see Map 9-2): includes portions of the Cockeram River watershed and the Keewatin River watershed. The waterbodies and watercourses included in the LAA, and the rationale for their inclusion, are provided in Table 9-4. The LAA extends downstream to the outlet of Cockeram Lake and is approximately 126.9 km².

- Regional Assessment Area (RAA): includes the drainage area that encompasses the PDAs, LAAs, and the streams and lakes that drain the LAAs to a common downstream location (i.e., Granville Lake). It also includes upstream lakes and streams in the Keewatin River watershed to provide regional context for the lakes and streams within the LAAs (Map 9-3) and has been defined to allow assessment of potential cumulative effects with past, present, and reasonably foreseeable future projects. The RAA is approximately 9,929 km². The rationale for the delineation of the RAA is:
  - It is necessary to extend the RAA downstream to the lake receiving run-off from the watersheds draining the two Project sites (i.e., Granville Lake).
  - The Lynn River is the main source of historical contaminants to the Keewatin River watershed and has the potential to interact cumulatively with residual effects of the Project.
  - The RAA extends north to the upstream limits of the Keewatin and Hughes river watersheds, providing regional context.
  - Opachuanau Lake and Southern Indian Lake are excluded from the RAA because potential effects of the Project are not expected to extend downstream beyond Granville Lake (i.e., the size of Granville Lake and the contribution of the Laurie River and Churchill River inflow to Granville Lake are expected to attenuate potential changes in surface water quality and quantity to levels that are too small to detect).

It is noted that the PDAs, LAAs, and RAA boundaries for the Gordon and MacLellan sites are the same as those established for the Fish and Fish Habitat assessment (Chapter 10).

Table 9-4 Waterbodies and Watercourses in the Local Assessment Areas at the Gordon Site and MacLellan Site

Site	Waterbody/Watercourse	Waterbody Identification Codes	Rationale for Inclusion in the LAAs
Gordon	Gordon Lake and its inlets	sws-FAR7 sws-FAR7-B1 sws-FAR7-C1 sws-FAR7-A1	• Lake located adjacent to open pit and downslope from overburden stockpile and MRSA
	Diversion Channel	sws-FAR6-A2 sws-FAR5-B2	• Human-made channel draining Gordon Lake to Farley Lake

Table 9-4 Waterbodies and Watercourses in the Local Assessment Areas at the Gordon Site and MacLellan Site

Site	Waterbody/Watercourse	Waterbody Identification Codes	Rationale for Inclusion in the LAAs
Gordon	Diversion Channel	sws-FAR6-A2 sws-FAR5-B2	• Will be dewatered and new diversion channel constructed further north to allow expansion of the new pit
	Farley Lake and its inlets	sws-FAR5-1 sws-FAR5-2 sws-FAR5-A1	• Lake located adjacent to open pit and downslope from overburden stockpile and MRSA • Lake most likely to receive contact water • Lake most likely to receive pit water during dewatering • Lake receiving mine outflow at post-closure
	Farley Creek	sws-FAR4	• Fish-bearing stream draining Farley Lake to Swede Lake • Potential changes in water quality and quantity due to mine construction, operation, and closure
	Marie Lake and its outlet	sws-FAR5-MAR4 sws-FAR5-MAR1	• No potential direct effects but part of the Farley Lake watershed
	Marnie Lake and its outlet	sws-FAR5-MAN2 sws-FAR5-MAN1	• No potential direct effects but part of the Farley Lake watershed
	Pump Lake and its outlet to Simpson Lake	ws-FAR3-SIM2 ws-FAR3-SIM3	• Lake located closest to MRSA • Potentially affected by changes in groundwater quality or quantity
	Simpson Lake	ws-FAR3-SIM1	• Lake downstream of Pump Lake • Potential changes in water quality due to changes to Pump Lake water quality
	Swede Lake and its outlet to Ellystan Lake	ws-FAR3	• Lake immediately downstream of Farley Lake • Potential changes in water quality and quantity due to mine construction, operation, and closure
	Ellystan Lake and its outlet to Manson Lake	ws-FAR1	• Lake downstream of Swede Lake • Potential changes in water quality and quantity due to mine construction, operation, and closure
	Susan Lake	ws-SUS4	• Located in watershed adjacent to MRSA • Potentially affected by changes in groundwater quality or quantity

Table 9-4 Waterbodies and Watercourses in the Local Assessment Areas at the Gordon Site and MacLellan Site

Site	Waterbody/Watercourse	Waterbody Identification Codes	Rationale for Inclusion in the LAAs
MacLellan	Keewatin River (from its confluence with the outlet of Payne Lake to its mouth at Cockeram Lake)	sws-KEE3 sws-KEE2	• The watercourse into which mine effluent or contact water would eventually drain • The most likely source of freshwater required for the mill
	Payne Lake and its outlet	sws-KEE3-PAY2 sws-KEE3-PAY1	• Located adjacent to the TMF • Potentially affected by TMF seepage or changes in groundwater quality or quantity
	Lobster Lake and its outlet	sws-COC2-LOB4 sws-COC2-LOB3	• Located adjacent to the TMF • Potentially affected by TMF seepage or changes in groundwater quality or quantity
	Minton Lake and its outlet	ws-COC2-LOB2-MIN4 sws-COC2-LOB2-MIN3	• Lake immediately down-gradient of the TMF • Potentially affected by TMF seepage or changes in groundwater quality or quantity • Potentially affected by reduction in run-off volume due to encroachment of the TMF into its watershed
	Unnamed lake downstream of Minton Lake and its outlet to the confluence with the Cockeram River	sws-COC2-LOB2-MIN2 sws-COC2-LOB2-MIN1	• Downstream of Minton Lake and the TMF • Potentially affected by TMF seepage or changes in groundwater quality or quantity • Potentially affected by reduction in run-off volume due to encroachment of the TMF into its watershed
	Unnamed lake upstream of Minton Lake and its outlet to Minton Lake	sws-COC2-LOB2-MIN5-A1 sws-COC2-LOB2-MIN5	• Located adjacent to the TMF • Potentially affected by TMF seepage or changes in groundwater quality or quantity
	Cockeram River (from Lobster Lake to its mouth at Cockeram Lake)	sws-COC2-LOB3 sws-COC2-LOB2 sws-COC2-LOB1 sws-COC1	• TMF is located in its headwaters • Potentially affected by TMF seepage and changes in flow due to loss of upstream watershed area
	Dot Lake and its outlet to the Keewatin River	sws-KEE3-DOT2 sws-KEE3-DOT1	• Lake located within the potential “cone of groundwater depression” created by the open pit

Table 9-4 Waterbodies and Watercourses in the Local Assessment Areas at the Gordon Site and MacLellan Site

Site	Waterbody/Watercourse	Waterbody Identification Codes	Rationale for Inclusion in the LAAs
MacLellan	East Pond and its outlet to the Keewatin River	sws-KEE3-B2-A2 sws-KEE3-B2-A1 sws-KEE3-B1	• Waterbody and watercourse located adjacent to the open pit and association mine infrastructure • Watercourse crossed by mine access road and transmission line
	Unnamed Keewatin River tributary	ws-KEE3-DOT1	• Watercourse crossed by mine access road and transmission line
	Unnamed Keewatin River tributary near MRSA	sws-KEE3-C1	• Watercourse located adjacent to MRSA
	Cockeram Lake	ws-KEE1	• First downstream waterbody of Keewatin River and Cockeram River • Waterbody where potential change in streamflow or water quality caused by mine effluents or TMF seepage may occur

9.1.4.2 Temporal Boundaries

The temporal boundaries for the Project consist of the following phases:

- Construction – two years (scheduled to be carried out concurrently from Year -2 to Year -1 at both sites).
- Operation – 13 years (scheduled to be carried out from Year 1 to Year 6 at the Gordon site and from Year 1 to Year 13 at the MacLellan site).
- Decommissioning/closure – five to six years of active closure (scheduled to begin in Year 6 at the Gordon site and in Year 14 at the MacLellan site). Active closure will be followed by post-closure, which is the time period during which active reclamation measures are complete, but monitoring is still required. The expected duration for post-closure is approximately 10 years. Pit filling is expected to take 11 years at the Gordon site and 21 years at the MacLellan site under average conditions (Section 9.4.1). Permanent closure will occur when the site is stable, and monitoring is no longer required. For surface water, this would occur when surface water quality is within the pertinent guidelines and discharge will be allowed. The duration and conditions for post-closure monitoring and permanent closure will be detailed in subsequent submissions of the Closure Plan to regulatory agencies as Project design and execution progresses.

9.1.5 Residual Effects Characterization

Potential residual effects of the Project on surface water quantity and quality are characterized in terms of direction, magnitude, geographic extent, timing, frequency, duration, reversibility, and ecological and socio-economic context. Quantitative measures or, where applicable, descriptions of qualitative measures, are provided in Table 9-5.

Table 9-5 Definition of Terms used to Characterize Residual Effects on Surface Water

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction[1]	The long-term trend of the residual effect	**Positive –** a residual effect that moves measurable parameters in a direction beneficial to surface water quality relative to baseline. **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to surface water quantity and quality relative to baseline. **Neutral –** a residual effect that moves measurable parameters in a direction neutral to surface water quantity relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Change in Surface Water Quantity** **Negligible –** no measurable (less than 5%) change from existing conditions. **Low** – a Project-caused change in hydrology (flow or levels) compared to baseline conditions, but change is <10% from existing conditions. **Moderate** – a Project-caused change in hydrology (flow or levels) that is between 10% and 30% relative change from existing conditions. Measurable effects on water levels and flow velocities may occur. **High** – a Project-caused change in hydrology (flow or levels) that is greater than 30% relative change from existing conditions.
		Change in Surface Water Quality **Negligible**—no measurable change from existing conditions **Low**—a measurable change that is within the variability of existing conditions **Moderate**—a measurable change that is not within the variability of existing conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives but is unlikely to have an adverse effect on aquatic biota in the LAA **High**— a measurable change that is not within the variability of existing conditions and not within applicable guidelines, legislated requirements and/or federal and provincial management objectives and is likely to have an adverse effect on aquatic biota in the LAA or RAA.
Geographic Extent	The geographic area in which a residual effect occurs	**PDA –** residual effects are restricted to the PDA. **LAA –** residual effects extend into the LAA. **RAA –** residual effects extend into the RAA.

Table 9-5 Definition of Terms used to Characterize Residual Effects on Surface Water

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Timing	Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant	**Not Applicable –** seasonal aspects are unlikely to affect surface water quantity or quality. **Applicable –** seasonal aspects may affect surface water quantity and/or quality.
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event –** the effect occurs only once. **Multiple irregular event –** the effect occurs more than once but at no set schedule. **Multiple regular event –** the effect occurs more than once and at regular intervals. **Continuous –** the effect occurs continuously.
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term** — the effect is restricted to the construction or active closure phase, or for periods of less than one year during operation. **Medium-term** — the effect extends throughout construction, operation, and active closure. **Long-term** — the effect extends beyond decommissioning/ closure.
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the effect is likely to be reversed after the activity ceases and active closure is completed. **Irreversible –** the effect is unlikely to be reversed.
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activity. **Disturbed –** area has been substantially previously disturbed by human development or human development is still present.

Note:

1 For surface water quantity, adverse is defined as a residual effect that causes a greater than 10% change relative to baseline. Changes less than 10% are considered neutral. A positive directional change for surface water quantity was also not considered.

9.1.6 Significance Definition

In consideration of the criteria for characterization of residual effects presented in Section 9.1.5, the following thresholds have been established to define significant residual adverse environmental effects on surface water quantity and surface water quality.

9.1.6.1 Change in Surface Water Quantity

A significant residual adverse environmental effect to surface water quantity is one that results in a high-magnitude change in streamflows or lake levels in the LAA (e.g., a Project-caused change in flow or lake levels greater than 30% relative change from existing conditions). The significance of residual adverse environmental effects to surface water quantity is determined based on the measurable parameters presented in Table 9-3 and using the terms defined in Table 9-5. The potential for Project-related changes in surface water quantity to cause adverse effects to Land and Resource Use VC (Chapter 15) and Fish and Fish Habitat VC (Chapter 10) are assessed separately.

9.1.6.2 Change in Surface Water Quality

A significant residual adverse effect to surface water quality is one that results in a measurable change in water quality parameters that exceed water quality guidelines to an extent that adverse toxicological effects to aquatic life are expected to occur at the community or population level. The potential for Project-related changes in water quality to cause adverse effects to aquatic life is assessed in Chapter 10. The potential for Project-related changes in water quality to cause adverse effects to human health and ecological receptors is assessed separately in Chapter 18 and in Volume 5, Appendix H.

9.2 EXISTING CONDITIONS FOR SURFACE WATER

Detailed descriptions of existing conditions for surface water quantity and for surface water quality are provided in the Hydrology Baseline Technical Data Report (TDR) and associated Validation Report (Volume 4, Appendix G) and the Water Quality Baseline TDR and associated Validation Report (Volume 4, Appendix I). Existing climate and meteorology (factors that affect surface water quantity and quality) are summarized in Section 6.2.1.1, Chapter 6, with a detailed description of existing conditions for climate and meteorology are provided in the Climate and Meteorology Baseline TDR and associated Validation Report (Volume 4, Appendix C). Characterization of existing sediment quality in the LAA is summarized in the Sediment Quality and Lower Trophic Community Baseline TDR and associated Validation Report (Volume 4, Appendix K).

The existing conditions and the methods used to characterize baseline conditions are summarized below. These descriptions of existing conditions for surface water quantity and quality in lakes and stream in the LAAs are provided so that potential interactions between the Project and surface water quantity and surface water quality can be identified and to provide context for assessing potential Project effects. It does so by allowing comparison of existing conditions to predicted conditions with the Project and to provincial and federal guidelines.

9.2.1 Methods

9.2.1.1 Surface Water Quantity

Physical Watershed Characteristics

A geographic information system (GIS) based analysis was used to delineate watersheds associated with the Gordon and MacLellan sites. Site-specific LiDAR data, at approximately 2 m x 2 m resolution, were used as the dominant topographic source data. For areas where LiDAR coverage was not available, digital elevation model data from GeoBase (Natural Resources Canada 2014), at approximately 20 m x 20 m resolution, were used. Through this analysis, watersheds, sub-watersheds, and drainage areas for hydrometric stations in the Gordon and MacLellan sites were delineated along with the physiographic characteristics of the watersheds.

A naming convention was designated for watersheds and sub-watersheds, where “ws” refers to a watershed and “sws” refers to a sub-watershed. Waterbody identification codes (IDs) were designated for waterbodies, watercourses, and existing pit lakes in the LAA as well as upstream and downstream of the Gordon and MacLellan sites (Maps 9-4 and 9-5).

Watersheds and sub-watersheds at the Gordon site are presented in Maps 9-6 and 9-7, respectively. Watersheds and sub-watersheds at the MacLellan site are presented in Maps 9-8 and 9-9, respectively.

Hydrology Monitoring Program

The baseline hydrology study included a detailed field program completed between spring 2015 and fall 2018. The following activities were completed during the baseline hydrology study:

- 11 hydrometric stations were installed within the LAA at the Gordon site (Map 9-10).
- 14 hydrometric stations were installed within the LAA at the MacLellan site (Map 9-11).
- Discharge measurements, levelling surveys, and datalogger downloads were completed seasonally at each station.
- Bathymetric surveys were completed for 15 lakes within the LAA at the Gordon and the MacLellan site and for a portion of the Keewatin River within the LAA at the MacLellan site.

Tables 9A-1 and 9A-2 in Appendix 9A list the hydrometric stations in the immediate vicinity as well as upstream and downstream of the Gordon and MacLellan sites, respectively, their drainage areas, period of record, rationale for site selection, details of station set-up, and frequency of field visits. Sites are listed in the order of hydraulic connectivity from upstream to downstream. Drainage areas for each station are shown in Maps 9-12 and 9-13 for the Gordon site and Maps 9-14 and 9-15 for the MacLellan site.

At each hydrometric station, current velocity measurements were taken throughout the year to obtain a range of discharges under varying flow conditions to develop stage-discharge relations. Eleven site visits were conducted under open water conditions during the baseline monitoring program, and in some cases multiple discharge measurements were taken during a site visit. Throughout the monitoring period, hydrometric levelling surveys were conducted during each site visit.

Stage-discharge relations, expressed as rating curves, were developed for hydrometric stations where data allowed, using Aquarius® Time Series Hydrologic Software (Aquatic Informatics Inc.). Rating curves were used to convert water level data (stage) recorded by the streamflow monitoring stations into a continuous discharge time series or hydrograph. Annual hydrographs, presented as mean daily discharge, and multiple hydrometric indices were generated for hydrometric stations where rating curves were established. Quality assurance and quality control information is available in Volume 4, Appendix G.

9.2.1.2 Surface Water Quality

Water Quality Monitoring Program

The baseline surface water quality program included field programs completed between spring 2015 and fall 2018. The following activities were conducted during the baseline field programs each year:

- 31 sites were sampled within the LAA at the Gordon site (Maps 9-16 and 9-17).
- 29 sites were sampled either within or downstream of the MacLellan LAA (Maps 9-18 and 9-19).
  - Four of these sites (AQM66, AQM67, AQM68, and AQM69B) were added to the sampling program to help characterize the influence of historical mining on water quality downstream of the PDA (described in Section 9.2.2.2).
- *In situ* water quality parameters (i.e., temperature, pH, conductivity, dissolved oxygen, turbidity, nitrite) were measured and samples were collected seasonally (i.e., spring, summer, fall, and winter) from just below the water surface at the established locations in each LAA.
- Additional *in situ* measurements and samples were collected from the top, middle, and bottom of lakes >2 m deep but <4 m deep
- Additional *in situ* measurements and samples were collected at 1 m intervals below the water surface in the open pits and in lakes >4 m deep.

Tables 9A-3 and 9A-4 in Appendix 9A list the sample sites at the Gordon and MacLellan sites, and the rationale for site selection. Sites are listed in order from upstream to downstream. Waterbody IDs were designated for the lakes, streams, and the existing pit lakes, in the immediate vicinity as well as upstream and downstream of the Gordon and MacLellan sites (Maps 9-4 and 9-5).

Field data collection for the surface water quality baseline program followed the Protocols Manual for Water Quality Sampling in Canada (CCME 2011). Baseline surface water quality was characterized using field and laboratory data collected for the Project. Results were compared with the CWQG-FAL and MWQSOG-FAL. Quality assurance and quality control information is available in Volume 4, Appendix I.

9.2.2 Overview

9.2.2.1 Surface Water Quantity

Physical Watershed Characteristics

Key physiographic characteristics of the main watersheds in the RAA at the Gordon and MacLellan sites are provided in Tables 9A-5 and 9A-6 in Appendix 9A, respectively. A detailed description of existing conditions for surface water quantity is provided in Volume 4, Appendix G.

The LAA at the Gordon site is characterized by small lakes and streams, many of which are intermittent and usually flow for short periods in the spring. Muskeg bogs and wetlands are common throughout the LAA at the Gordon site. Wetland coverage as a proportion of total watershed area ranges from 25% in the furthest downstream watershed (ws-FAR1) to 48% in the furthest upstream watershed (ws-FAR2-WHI1). General flow direction in the Gordon LAA is north to south from Gordon Lake towards Ellystan Lake. The PDA at the Gordon site is located in the headwaters of the Ellystan Lake watershed, which is itself a tributary watershed of the Hughes River. Within the LAA, water flows from Gordon Lake to Farley Lake through a constructed diversion channel, then from Farley Lake to Swede Lake through Farley Creek, an approximately 4 km long, beaver dam-impounded stream, and from Swede Lake to Ellystan Lake. Ellystan Lake is the largest lake by surface area in the LAA at the Gordon site with a surface area of approximately 2.5 km^2.

The LAA at the MacLellan site is characterized by larger lakes and rivers than at the Gordon site. Cockeram Lake is the largest lake by surface area in the LAA at the MacLellan site with a surface area of approximately 21 km^2. The MacLellan PDA is situated within the ws-KEE3 watershed (which flows into the Keewatin River) and the ws-COC2-LOB2-MIN4 watershed (which eventually flows into the Cockeram River). The Keewatin River flows north to south within the LAA and drains the western part of the PDA, Dot Lake, Payne Lake, and small tributaries. The Cockeram River flows north to south within the LAA and drains the eastern portion of the PDA, Lobster Lake, Minton Lake, several unnamed lakes. Water flows from the Keewatin River and the Cockeram River into Cockeram Lake.

Flooding within the region can be triggered by extreme precipitation, rapid snow melt, ice jams, and beaver activity, with peak flows generally occurring during the spring freshet. Catchments within the LAAs are generally small and therefore have low flood severity. Larger catchments such as the Keewatin River are populated by large lakes, which mitigate peak flows. An assessment of peak flows on the Keewatin River found that in the reach of the river adjacent to the Project, river stage (water surface elevation) is less sensitive to flood magnitudes due to the large channel capacity (Stantec 2016). The processing plant (MacLellan site) is located in an area that has not been known to have flooded during previous periods of regional flood conditions. A flood assessment on Farley Lake (Gordon site) also found that there are only small changes in water surface elevation associated with substantial changes to lake inflows.

Beaver activity is extensive within the Gordon and MacLellan LAAs and can produce high water levels in both streams and lakes. The influence of beaver activity, particularly at the Gordon site, was prevalent during the hydrology baseline program, when a large increase in water level related to the construction of a beaver dam was observed in Farley Lake (Volume 4, Appendix G). Smaller beaver dams were also observed at the Simpson Lake and Swede Lake outlets.

Hydrology Monitoring Program

Maximum recorded depth, surface areas, and volumes of waterbodies in the Gordon and MacLellan baseline study area from bathymetric surveys conducted are provided in Volume 4, Appendix G and are presented in Table 9-6 (Gordon site) and Table 9-7 (MacLellan site). These indices are a representation of the waterbodies at the time the bathymetric surveys were completed (2015-2016). Calculated maximum surface areas and volumes for lakes used in the hydrology model are provided in Volume 5, Appendices D and E.

Hydrometric gauging at some Project stations was challenging, with several factors adding uncertainty to the monitoring program. These include varying effects of vegetation and channel roughness when gauging low-gradient, shallow, low-velocity watercourses; abundance of beaver activity; and complex wetland hydrology. For example, many hydrometric stations at the Gordon site were directly affected by beaver activity, whether through construction of new dams or modification of existing dams at the gauging sites, or backwater effects caused by rising lake levels due to beaver dams constructed at the lake outlet. Overall, six stations had sufficient data to allow a stage-discharge relationship to be developed and to subsequently calculate annual discharge hydrographs and various hydrologic indices. The remaining stations are limited to stage data and point discharge measurements. A more thorough explanation of the data limitations can be found in Volume 4, Appendix G. Hydrologic indices for the six hydrometric stations with sufficient data are shown in Volume 4, Appendix G (Table 3-11). Streamflow in the immediate vicinity as well as upstream and downstream of the Gordon and MacLellan sites, is marked by considerable seasonal and yearly variability.

The open water season runs from late April to late October/early November on large watercourses such as the Keewatin and Lynn rivers. During the open water season, the distribution of flow appears to depend on the timing of the freshet and the balance between the volumes of water released during the freshet and water resulting from fall rains. Typically, the highest flows occur during the spring period, in response to seasonal freshet-related runoff conditions. However, peak flows were sometimes recorded later in the melt season in response to precipitation events. MAD and mean monthly discharge (MMD) were calculated for each hydrometric station at the Gordon (QF01 – QF10) and MacLellan (QM01 – QM11) sites. These calculated values were used as model inputs and are presented in Table 9-8 (Gordon site) and Table 9-9 (MacLellan site); the values represent flows anticipated during the long-term average climate conditions. The methods used to calculate MAD and MMD are outlined in Volume 5, Appendices D and E.

Table 9-6 Characteristics of Waterbodies in the Gordon Site LAA

Waterbody	Waterbody ID	Surface Area (m^2)	Volume (m^3)	Maximum Depth (m)	Average Depth (m)	Water Level Variation for 2016 Water Year (masl)	Littoral Substrates
Farley Lake	FAR5.2 and FAR5.1	773,944	724,960	10.8	0.9	313.349 – 313.877	Sand, silt, organics, detritus, boulder
Gordon Lake	FAR7	190,292	260,370	2.8	1.4	315.000 – 315.452	Organics, detritus
Marie Lake	FAR5-MAR4	187,620	849,000	14.2	4.5	-	-
Marnie Lake	FAR5-MAN3	152,000	297,000	4.3	2.0	-	-
Susan Lake	SUS4	118,592	401,000	5.5	3.4	-	Organics, detritus
Swede Lake	FAR3	2,305,700	7,376,000	9.0	3.2	297.160 – 297.531	Organics, detritus
East Pit	FAR5-B1	56,000	1,561,930	83.0	27.9	-	Bedrock, cobble, boulder
Wendy Pit	FAR5-B2	53,192	644,846	68.0	12.1	-	Silt, cobble, gravel, boulder
Simpson Lake	FAR3-SIM1	1,719,038	-	-	-	297.300 – 297.530	-
Ellystan Lake	FAR2	2,507,299	-	-	-	-	-

Notes:
“ - “ indicates data not available or not collected during Project field studies

Table 9-7 Characteristics of Waterbodies in the MacLellan Site LAA

Waterbody	Waterbody ID	Surface Area (m^2)	Volume (m^3)	Maximum Depth (m)	Average Depth (m)	Water Level Variation for 2016 Water Year (masl)	Littoral Substrates
Payne Lake	KEE3-PAY2	598,000	779,000	3.7	1.3	-	Organics, detritus
Dot Lake	KEE3-DOT2	980,000	1,218,200	2.0	1.2	331.520 – 332.326	Bedrock, sand, organics
Lobster Lake	COC2-LOB4	1,256,000	1,599,000	2.7	1.3	-	-
Minton Lake	COC2-LOB2-MIN4	1,666,000	2,525,880	2.2	1.5	329.730 – 330.102	Sand, organics
Unnamed Lake downstream of Minton Lake	COC2-LOB2-MIN2	648,000	1,269,800	3.7	2.0	-	Sand, cobble, boulder
Unnamed Lake upstream of Minton Lake	COC2-LOB2-MIN5-A1	204,000	137,407	4.6	0.7	-	-
Cockeram Lake	KEE1	21,051,000	63,153,000	4.0	3.0	312.026 – 312.310	Sand, silt, clay, cobble, gravel, boulder
East Pond	KEE3-B2-A2	370,000	407,000	1.6	1.1	-	None

Notes:
“ - “ indicates data not available or not collected during Project field studies

Table 9-8 Characteristics of Watercourses in the Gordon Site LAA

Month	Average Climate Scenario - Flow (m^3/s)								
	QF01	QF02	QF03	QF04	QF05	QF06	QF07	QF08	QF10
Jan	0.000	0.000	0.005	0.000	0.029	0.000	0.071	0.111	0.000
Feb	0.000	0.000	0.004	0.000	0.023	0.000	0.054	0.087	0.000
Mar	0.000	0.000	0.003	0.000	0.019	0.000	0.045	0.073	0.000
Apr	0.001	0.000	0.003	0.000	0.018	0.009	0.044	0.067	0.000
May	0.027	0.024	0.038	0.032	0.148	0.168	0.180	0.501	0.008
Jun	0.012	0.011	0.039	0.014	0.153	0.067	0.343	0.639	0.004
Jul	0.016	0.014	0.037	0.020	0.154	0.094	0.362	0.490	0.006
Aug	0.013	0.012	0.037	0.016	0.157	0.078	0.361	0.487	0.005
Sep	0.012	0.010	0.033	0.014	0.143	0.070	0.302	0.435	0.004
Oct	0.007	0.006	0.027	0.009	0.124	0.043	0.258	0.355	0.003
Nov	0.001	0.000	0.015	0.001	0.078	0.004	0.178	0.248	0.000
Dec	0.000	0.000	0.008	0.000	0.042	0.000	0.105	0.157	0.000
Annual	0.007	0.007	0.021	0.009	0.091	0.044	0.192	0.304	0.002

Table 9-9 Characteristics of Watercourses in the MacLellan Site LAA

Month	Average Climate Scenario - Flow (m^3/s)									
	QM01	QM02	QM03	QM04	QM05	QM06	QM07	QM08	QM09	QM11
Jan	7.044	7.044	7.050	0.000	2.391	7.050	0.024	10.425	0.000	0.694
Feb	6.397	6.397	6.402	0.000	2.009	6.402	0.018	9.273	0.000	0.586
Mar	5.825	5.825	5.830	0.000	1.654	5.830	0.014	8.261	0.000	0.498
Apr	5.308	5.329	5.356	0.010	1.367	5.374	0.013	7.458	0.013	0.424
May	6.896	7.173	7.455	0.127	3.502	7.684	0.057	13.007	0.168	1.086
Jun	11.718	11.835	11.956	0.053	7.780	12.052	0.068	26.509	0.070	2.640
Jul	12.863	13.028	13.198	0.075	5.846	13.334	0.036	25.101	0.100	1.686
Aug	9.561	9.704	9.852	0.065	3.747	9.970	0.038	18.374	0.086	1.300
Sep	6.908	7.032	7.161	0.057	2.980	7.263	0.063	13.633	0.075	1.413
Oct	6.012	6.090	6.173	0.036	2.708	6.237	0.072	10.789	0.047	1.236
Nov	6.910	6.917	6.929	0.003	2.668	6.935	0.054	10.733	0.004	1.001
Dec	7.526	7.526	7.532	0.000	2.633	7.532	0.036	11.166	0.000	0.831
Annual	7.747	7.825	7.908	0.035	3.274	7.972	0.041	13.727	0.047	1.116

The peak discharge at the outlet of Ellystan Lake, Gordon station QF08, occurred in spring (May/June) in all years monitored (2015 to 2018). However, peak discharges at the MacLellan site stations occurred in spring (May) in 2015 and 2017, summer (July) in 2016, and fall (September) in 2018. At most hydrometric stations, the quality of data collected during winter was unreliable due to ice encroachment and accumulation, which alters the stage-discharge relation in the channel.

The 2017 and 2018 annual runoff at stations studied was approximately two times higher than the 2015 and 2016 annual runoff. At all stations, the highest runoff and MAD occurred in 2017 and the lowest runoff and MAD occurred in 2015. However, the 2015 annual runoff and MAD results are low as it was only a partial year of record. The estimated mean annual runoff was highest at QF08 (Ellystan outlet) in 2015 (61 mm) and highest at station QM08 (Cockeram Lake outlet) in 2017 (222 mm). Figure 9-1 shows select hydrographs (2007, 2009, 2010) for a nearby WSC Station (06FA001 - Gauer River below Thorsteinson Lake). This figure demonstrates the variability in annual hydrographs in the region – one year with a spring freshet-dominated peak flow (2007), one year where a combination of effects (freshet, lake storage, precipitation) yielded a double peak in the summer (2009), and one year that experienced a late summer rainfall-driven peak flow (2010).

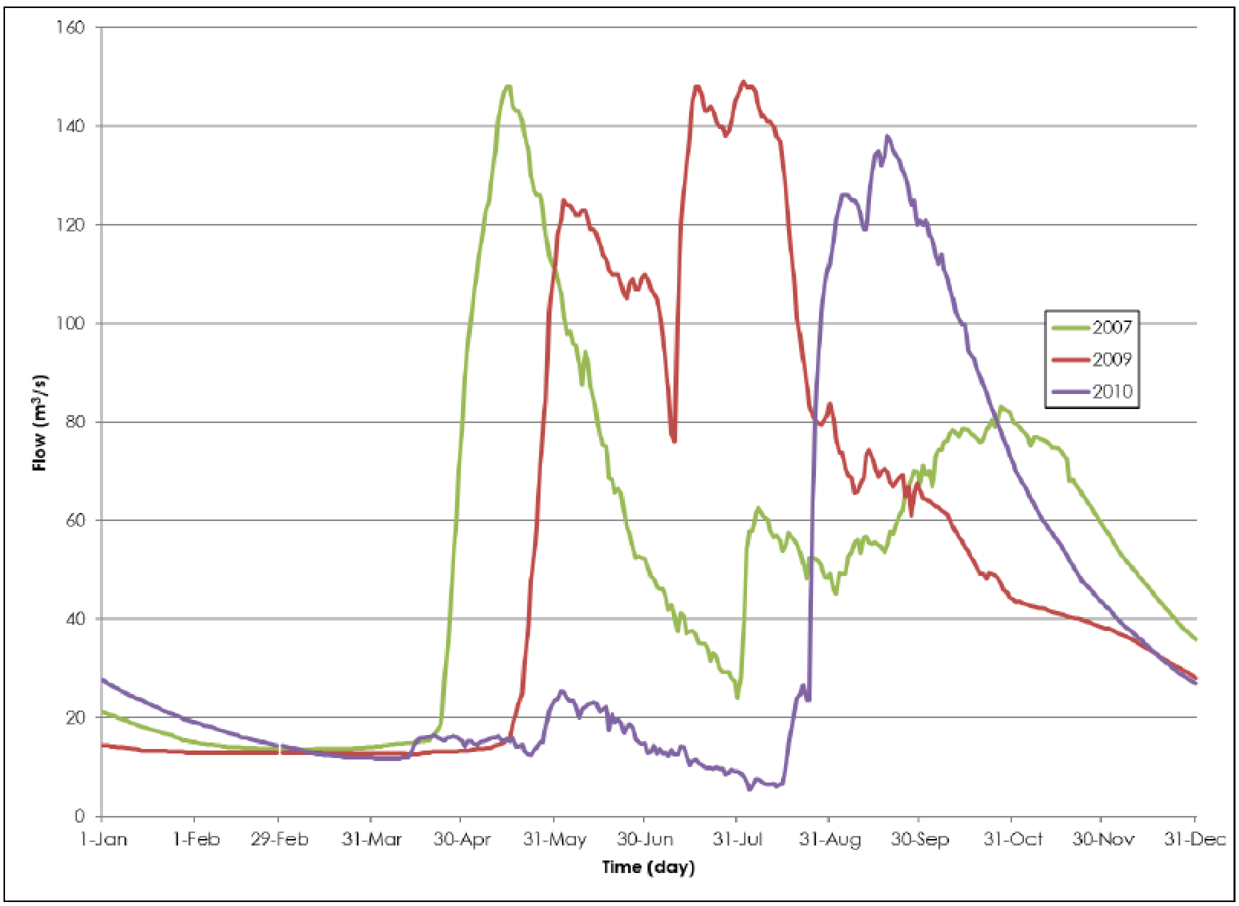

Figure 9-1 Select Hydrographs at WSC Station 06FA001 Gauer River Below Thorsteinson Lake

Annual low flows typically occurred in winter, when a large percentage of water inputs are stored as snow or ice. Streams in many of the smaller watersheds likely freeze in winter and experience zero flow conditions. As indicated, data collected during the winter is typically unreliable due to ice conditions affecting the stage-discharge relation in the channel. June to September low flows typically occurred towards the end of August and beginning of September in 2015, 2016, and 2017, with the exception of QF08, which had its lowest flow occur in the beginning of July in 2016. This was because flows were receding after a summer with minimal precipitation. In 2018, the largest annual rain event occurred in late August.

9.2.2.2 Surface Water Quality

Water Quality Monitoring Program

Most of the lakes within and near the two study areas are shallow (<4 m deep) and do not thermally stratify during the summer. Background water quality generally reflects the geochemistry of the Precambrian Shield. Lakes and streams are typically low in dissolved ions (<80 mg/L total dissolved solids), soft (hardness <75 mg/L as calcium carbonate [$CaCO_3$]), and neutral to slightly acidic. Parameters such as total phosphorus, aluminum, chromium, and iron are naturally elevated (or low in the case of pH) and occasionally do not meet CWQG-FAL and MWQSOG-FAL. Tabular and graphical summaries of water temperature, turbidity, pH, dissolved oxygen, metals, major ions, and nutrients are presented in Volume 4, Appendix I. The monitoring sites for existing conditions surface water quality are provided in Tables 9A-3 (Gordon site) and 9A-4 (MacLellan site) in Appendix 9A.

Gordon Site

Naturally occurring water quality guideline exceedances in the Gordon site LAA include nitrite, fluoride, total phosphorus, total aluminum, total arsenic, total hexavalent chromium, total copper, total iron, and total zinc. Also, dissolved oxygen and pH were below the CWQG-FAL and MWQSOG-FAL lower limits at several sites. These guideline exceedances were generally attributable to local geochemistry and watershed characteristics, including rock outcroppings, beaver impoundments, and muskeg bogs.

Water in the Wendy Pit (site AQF4) and East Pit (site AQF6) had elevated concentrations of some general parameters (i.e., alkalinity, hardness, specific conductivity), metals (i.e., arsenic, copper, and nickel), and other ions (i.e., calcium, chloride, fluoride, potassium, sodium, and sulphate) compared to surrounding lakes and streams. Both pits are deep (>70 m) and chemically stratified year-round (and thermally stratified in summer), with higher concentrations of metals and other ions in waters below 10 m depth than in surface waters <10 m deep. These data suggest that metal leaching from the exposed pit walls affected water quality in the existing pits, likely during the first few years after mining when water levels in these pits were lowest and the area of exposed rock in these pits was highest. Water quality guideline exceedances in the existing pits were noted for fluoride, total phosphorus, total aluminum, arsenic, copper, iron, and selenium. Most of the fluoride and total arsenic guideline exceedances at the Gordon site were in the existing pits.

Concentrations of most of the total metals followed the same seasonal and spatial trend as total suspended solids (TSS) and turbidity, with maximum values occurring during periods of high flow (i.e., spring freshet) and with higher concentrations occurring in streams rather than lakes. Peak concentrations observed during periods of high flow are likely related to inputs of decayed organic matter runoff and mobilization of sediment.

Total metal concentrations were generally highest in small watercourses in the immediate vicinity of the former Gordon Mine open pits and historical MRSAs. These included a Gordon Lake tributary (AQF10), a Simpson Lake tributary (AQF17), and Farley Lake tributaries (AQF22 and AQF23). One exception to the above was molybdenum, which was highest in Pump lake (AQF12) and Susan Lake (AQF11). Total arsenic concentrations were also elevated in the three basins of Farley Lake (AQF9, AQF33, and AQF34) immediately downstream of the open pits and reclaimed historical MRSAs. However, total arsenic concentrations decreased in Swede Lake and Ellystan Lake downstream of Farley Lake. Elevated arsenic concentrations in Farley Lake, while not exceeding CWQG-FAL, suggest the continuing effect of the former mine on water quality in the lake.

A small, headwater tributary of Simpson Lake (AQF17) had higher concentrations of several metals compared to other watercourses and lakes in the LAA at the Gordon site. It is possible this tributary receives more of its flow from groundwater than from surface run-off and, therefore, better reflects local surficial groundwater chemistry than local surface water runoff.

MacLellan Site

Run-off from the MacLellan site enters the Keewatin River via a stream that drains a small pond (East Pond) to the south and several smaller tributaries that drain to the west. East Pond was the main water collection area for the previous MacLellan Mine.

Alkalinity, total ammonia, hardness, calcium, chloride, arsenic, magnesium, potassium, sodium, and sulphate concentrations were higher in East Pond (AQM18) than in other lakes or streams in the LAA at the MacLellan site. However, arsenic concentrations did not exceed the CWQG-FAL. These data suggest that historical mining activities at the MacLellan site have affected, and continue to affect, water quality in the East Pond. Despite these elevated concentrations in the East Pond, drainage from the MacLellan site does not have a measurable effect on water quality in the Keewatin River; water quality parameter concentrations were similar upstream (AQM4) and downstream (AQM7 and AQM8) of the MacLellan site. This is likely due to the relatively small volume of water draining the MacLellan site in comparison to the volume of the Keewatin River.

The former East Tailings Management Area (ETMA) associated with three now-closed copper, gold, and nickel mines is located immediately east of the Town of Lynn Lake and adjacent to the Lynn River and Eldon Lake; the Lynn River drains into the Keewatin River downstream of the MacLellan site. The ETMA stored tailings for three mines that operated between 1953 and 1975. Prior to reclamation in 2013, run-off and seepage from the ETMA entered the Lynn River and Eldon Lake untreated. Despite reclamation efforts, some leaching from the ETMA continues to enter the Lynn River and potentially Eldon Lake.

The combined flows from the Keewatin and Lynn rivers drain into Cockeram Lake, the first lake downstream of the former mine at the MacLellan site and the former ETMA. The surface water quality monitoring sites for the MacLellan site LAA are shown in Map 9-19.

Based on water quality sampling completed (Volume 4; Appendix I), concentrations of aluminum, copper, nickel, cadmium, cobalt, and zinc were higher in Eldon Lake (AQM17), the Lynn River (AQM28), the Keewatin River downstream of the Lynn River confluence (AQM29 and AQM29B), and Cockeram Lake (AQM30 and AQM11) than in the Keewatin River upstream of the Lynn River confluence and in other lakes and streams in the LAA. Concentrations of aluminum, copper, nickel, iron, and zinc exceeded the CWQG-FAL in Eldon Lake, the Lynn River, and Cockeram Lake, indicating that water quality in these waterbodies and watercourses continues to be affected by run-off from the ETMA.

The metals that were identified as being elevated in waterbodies downstream of the ETMA (i.e., aluminum, copper, nickel, cadmium, cobalt, and zinc) also generally showed greater variability relative to concentrations observed at reference sites and at sites in the Keewatin River upstream of the Lynn River confluence. Furthermore, these metals showed a general downward concentration gradient as a function of distance from the ETMA (i.e., concentrations generally decreased with increasing distance downstream from the ETMA). This spatial concentration gradient between Eldon Lake (AQM17) and Sickle Lake (AQM68) suggests that the ETMA continues to influence water quality in Eldon Lake, Lynn River, the Keewatin River, Cockeram Lake, and potentially Sickle Lake (which is also downstream of the former Burnt Timber Mine near Shortie Lake).

Further downstream at Granville Lake, aluminum, copper, nickel, cadmium, cobalt, and zinc concentrations generally decrease to within the ranges observed at historically unimpacted reference sites in Goldsand Lake (AQM3), the Keewatin River upstream of the MacLellan site and the ETMA (AQM4), Lobster Lake (AQM13), and Arbour Lake (AQM15). One exception is total aluminum, which was observed to exceed the long-term CWQG-FAL and MWQSOG-FAL in Granville Lake (AQM69B). However, mean total aluminum concentrations in Granville Lake are greater than at all sites between the Lynn River confluence at Keewatin and Granville Lake (i.e., AQM29, AQM30, AQM11, AQM67, and AQM68), suggesting the main source of total aluminum in Granville Lake is not from the ETMA. Dissolved aluminum in Granville Lake is within the ranges observed at upstream reference sites and, therefore, was not investigated further. Based on the spatial analysis of aluminum, copper, nickel, cadmium, cobalt, and zinc concentrations, there is no apparent remaining influence of the ETMA on water quality as far downstream as Granville Lake (i.e., at sites AQM69 and AQM69B).

The potential influence of the historical Burnt Timber mine on water quality downstream of Shortie Lake may have contributed to marginally elevated mean total arsenic concentrations in Waban Creek (AQM66), a tributary to Keewatin River downstream of Cockeram Lake (upstream of Moses Lake) compared with unimpacted reference sites in the LAA (AQM3, AQM4, AQM13, AQM15). Based on data collected (Volume 4, Appendix I), total arsenic concentrations in Waban Creek (AQM66) and the other sites in the RAA downstream of Cockeram Lake are well below the long-term CWQG-FAL (0.005 mg/L). Furthermore, there is no clear spatial trend of total arsenic concentrations at sites between Cockeram Lake and Granville Lake. Together, the influence of the ETMA and former Burnt Timber mine on water quality, including total arsenic concentrations, was not evident as far downstream as Granville Lake.

Guideline exceedances in Waban Creek (AQM66) and in sites downstream of Cockeram Lake (i.e., AQM11 and AQM30) include pH, dissolved oxygen, total phosphorus, total aluminum, and total iron. These exceedances were generally attributable to local geochemistry and watershed characteristics. Concentrations of most of the total metals followed the same seasonal and spatial trend as TSS and turbidity, with maximum values during periods of high flow in watercourses rather than in lakes.

9.3 PROJECT INTERACTIONS WITH SURFACE WATER

Table 9-10 identifies, for each potential effect, the physical activities and components at the Gordon and MacLellan sites that have the potential to interact with surface water quantity and quality within the LAAs. These interactions are indicated by check marks and are discussed in detail in Section 9.4, in the context of effects pathways, standard and Project-specific mitigation, and residual effects. A justification for activities not expected to interact with surface water quantity and quality is provided following the table.

Project activities for each phase are described in detail in Chapter 2, Section 2.3 and 2.4. Project related emissions and discharges are described in Chapter 2, Section 2.8.

The potential interactions between Project activities and the environment were considered for the construction, operation, and decommissioning/closure phases of the Project. The identification of Project activities and their potential interactions was based on engagement with interested parties, the professional judgment of technical specialists involved in the assessment, and a review of existing conditions. The selection of interactions is also informed by the potential effects and effects pathways for each VC as described in Section 9.1.3.

Emissions, discharges, and wastes (e.g., air, waste, noise, light, liquid and solid effluents) are generated by many and varied Project activities. Rather than acknowledging this by placing a check mark against each of these activities, “Emissions, Discharges and Wastes” have been consolidated as integrated activity for efficiency of approach. This activity includes the emissions, discharges, and wastes generated by all other project activities under each Project phase.

As noted at the bottom of Table 9-10, with the exceptions of dewatering of the existing pits at the Gordon site and the existing underground works at the MacLellan site during construction and long-term monitoring during decommissioning, and closure at both sites, all Project activities and components with the potential to affect surface water quality have been combined into the “Emissions, Discharge, and Wastes” activity for efficiency.

Table 9-10 Project-Environment Interactions with Surface Water

Project Activities and Components	Environmental Effect			
	Change in Surface Water Quantity		Change in Surface Water Quality	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Construction				
Site Preparation at Both Sites (removal of existing buildings; removal of contaminated materials; vegetation clearing and earthworks; development of temporary construction camp at the MacLellan site)	✓	✓	–	–
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA)	–	–	–	–
Mine Components at Both Sites (construction of: ore pads; ore, overburden and mine rock storage areas; mill feed storage area and crushing plant, ore milling and processing plant, and TMF at the MacLellan site; water management facilities [e.g., sumps, ponds and ditches])	✓	✓	–	–
Utilities, Infrastructure, and Other Facilities at Both Sites (construction of: buildings and yards; access roads [i.e., upgrades at the Gordon and MacLellan sites] and internal mine roads; site lighting and security; power supply and distribution system; potable water treatment plant at the MacLellan site; on-site pipelines at the MacLellan site; fuel storage and distribution systems; sewage treatment facilities; domestic solid waste handling facilities)	✓	✓	–	–
Water Development and Control at Both Sites (dewatering of existing pits at the Gordon site and underground workings at the MacLellan site; pumping freshwater from the Keewatin River; re-alignment of existing diversion channel at the Gordon site; interceptor wells at the Gordon site; pumping fresh/fire water from Farley Lake at Gordon site)	✓	✓	✓	–
Emissions, Discharges, and Wastes[1]	–	–	✓	✓
Employment and Expenditure[2]	–	–	–	–
Operation				
Open Pit Mining at Both Sites (drilling; blasting; removal, loading and on-site hauling of mined material [i.e., ore, overburden, and mine rock])	–	–	–	–
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA, including truck transportation of ore from the Gordon site to the MacLellan site)	–	–	–	–
Storage/Stockpiling of Ore, Overburden, and Mine Rock at Both Sites	✓	✓	–	–
Ore Milling and Processing at the MacLellan Site (ore crushing and conveyance; ore milling)	–	✓	–	–

Table 9-10 Project-Environment Interactions with Surface Water

Project Activities and Components	Environmental Effect			
	Change in Surface Water Quantity		Change in Surface Water Quality	
	Gordon Site	MacLellan Site	Gordon Site	MacLellan Site
Water Management at Both Sites (mine water collection and storage; process water supply for the MacLellan site including water intake on Keewatin River at the MacLellan site; operation of interceptor wells at the Gordon site)	✓	✓	–	–
Tailings Management at the MacLellan Site	–	✓	–	–
Utilities, Infrastructure, and Other Facilities at Both Sites (presence and operation of: buildings and yards; access roads and internal mine roads; site lighting and security; power supply and distribution system; potable water treatment plant at the MacLellan site; on-site pipelines at the MacLellan site; fuel storage and distribution systems; sewage treatment facilities; domestic solid waste handling facilities; explosives storage, maintenance of access roads and bridges)	✓	✓	–	–
Emissions, Discharges, and Wastes[1]	–	–	✓	✓
Employment and Expenditure[2]	–	–	–	–
Decommissioning/Closure				
Decommissioning at Both Sites	✓	✓	–	–
Reclamation at Both Sites	✓	✓	–	–
Post-Closure at Both Sites (long-term monitoring)	✓	✓	✓	✓
Project-related Transportation within the LAA (movement of trucks, equipment, bulk materials, supplies, and personnel within the LAA)	–	–	–	–
Emissions, Discharges, and Wastes[1]	–	–	✓	✓
Employment and Expenditure[2]	–	–	–	–

NOTES:
✓ = Potential interaction
– = No interaction
[1] Emissions, Discharges, and Wastes (e.g., air, waste, noise, light, liquid and solid effluents) are generated by many Project activities. Rather than acknowledging this by placing a check mark against each of these activities, "Emissions, Discharges and Wastes" are included as a general component under each Project phase.
[2] Project employment and expenditures are generated by most Project activities and components and are the main drivers of many socio-economic effects. Rather than acknowledging this by placing a check mark against each of these activities, "Employment and Expenditures" have been introduced as an additional component under each Project phase.

The following Project components and activities are not expected to interact with surface water quantity or quality:

- Project-related transportation within the LAA is not expected to interact with surface water quantity or quality during any phase (for both sites) unless there is an accidental spill. Accidental events (i.e., accidental fuel spill) are assessed separately in Chapter 22.
- Emissions, discharges, and wastes, specific to surface water quality. Changes to surface water quantity, including the release of runoff and dewatering activities, are considered under water management. Changes to surface water quantity related to the TMF are considered under tailings management.
- Open pit mining during operation at both sites, as this is an activity contained within the open pits. Dewatering activities or collection of runoff is considered under water management.
- Employment and expenditure, as this activity will not directly result in changes to surface water quantity or quality during any phase.
- Ore milling and processing will occur only at the MacLellan site; therefore, there is no potential interaction with surface water quantity or quality for this activity at the Gordon site.
- Tailings management will occur only at the MacLellan site; therefore, there is no potential interaction with surface water quantity or quality for this activity at the Gordon site.

9.4 ASSESSMENT OF RESIDUAL ENVIRONMENTAL EFFECTS ON SURFACE WATER

Potential effects to surface water quantity and quality due to Project-related activities during construction, operation, and decommissioning/closure are assessed below and limited to lakes and streams within the LAAs at the Gordon and MacLellan sites. This is because, by definition, the LAAs encompass the lakes and streams for which measurable potential changes in surface water quantity and quality are most likely to occur due to Project activities and components.

Potential effects of Project activities and components on surface water quantity and quality have been predicted using quantitative models: water balance models for surface water quantity predictions and mass-balance water quality models for surface water quality. For each potential effect, the Project activities and components causing the potential effect (i.e., effect pathways) and mitigation measures to reduce the potential effect are discussed. This is followed by an assessment and characterization of residual effects after the application of mitigation and a significance determination of the residual effects associated with changes in surface water quantity and surface water quality.

9.4.1 Surface Water Quantity

9.4.1.1 Analytical Assessment Methods for Surface Water Quantity

The environmental effects analysis of change in surface water quantity was carried out using water balance models developed in GoldSim^{TM} for the Gordon and MacLellan sites. The model development, inputs, and results are described in Volume 5, Appendices D and E, and are summarized below.

Flows and drainage areas under existing conditions were used as the benchmark against Project-related changes during construction, operation, and decommissioning/closure. Changes in surface water quantity were assessed at the sub-watershed scale. The water balance models for the Gordon and MacLellan PDAs include the open pits and associated historical underground workings, overburden storage area, MRSAs, processing plant, ore stockpile, and TMF. Maps 9-6 to 9-9 present the sub-watersheds and major Project components modelled in the Gordon and MacLellan water balances.

The main inflows in the water balance models are:

- Meteorological elements including precipitation (snow and rain), temperature
- Groundwater discharge
- Keewatin River freshwater intake (potable water supply).

Outflow or losses are:

- Evaporation
- Stream discharge
- Groundwater seepage, groundwater recharge
- Water lost to void spaces within the MRSA and deposited tailings.

The Gordon and MacLellan site water balances were calibrated to daily discharge values and lake levels from the surface water quantity baseline monitoring program (Section 9.2.2.1).

The baseline water balances estimated lake levels and streamflows under average, 1:25-year dry, and 1:25-year wet climate scenarios. Results of the three climate scenarios were averaged over each Project phase, and are presented in Section 9.4.1.4.

9.4.1.2 Project Pathways

Without mitigation the activities identified in Table 9-10 have the potential to affect surface water quantity and drainage patterns through changes in runoff, evapotranspiration and infiltration characteristics, catchment areas, and watercourse alignment, and through surface water extraction for use in the Project activities. Potential changes to surface water quantity during each Project phase are discussed in the following sections.

Gordon Site

Construction

During construction, in the absence of mitigation measures, surface water quantity and/or flow could be affected by: site preparation; construction of mine components, including ore pads and ore processing facilities; construction of utilities, infrastructure and other facilities including buildings, access roads, utility lines, fuel storage, and interceptor wells; and construction of water development and control (constructing and operating water management features, including re-alignment of the existing Gordon Lake-Farley Lake diversion channel, dewatering of existing East and Wendy pits, and operation of interceptor wells). Interceptor wells will pump non-contact groundwater from the vicinity of the open pit to Gordon and Farley lakes, and will be located at the margins of the proposed Gordon pit (Chapter 8). Dewatering of the existing pits and flows from operation of the interceptor wells will likely be phased to mitigate the effects of this additional input to Gordon and Farley lakes; however, for the purpose of this assessment, the water balance model conservatively assumed that these flows will be concurrent. These activities will affect surface water runoff, evapotranspiration, and infiltration characteristics, change effective contributing catchment areas, and change natural groundwater levels, which will affect hydraulically connected lake levels and flows.

Site preparation and mine component construction will involve compaction of ground surfaces and construction of infrastructure (such as buildings and overburden and MRSA), which will result in reduced infiltration and increased runoff, as well as changes to local drainage areas within the PDA. Stripping of topsoil, timber harvesting, and removal of vegetation in the PDA will result in changes in runoff via decreased infiltration rates where impervious surfaces remain, or increased infiltration rates where vegetation is removed. The construction and initial development of water management facilities, utilities, infrastructure, and other facilities involves vegetation removal, topsoil stripping, ground compaction, building construction, diversion channel re-alignment, and contact water ditch construction, which are anticipated to result in some areas having reduced infiltration and increased runoff. Contact water (seepage and runoff) will be collected from the perimeter of the overburden stockpile area, MRSA, ore stockpiles, and open pit, and directed to the collection pond via a series of sumps and/or small ponds at topographic lows. Collectively, these changes will affect the catchment areas of natural inlets to Gordon Lake and Farley Lake, which are anticipated to experience reduced runoff and decreased natural surface inflows to these two waterbodies. These changes in catchment areas are anticipated to continue through all subsequent mine phases. Surface water quantity will be primarily affected by the dewatering and discharge of pit water and groundwater from the existing East and Wendy pits. These Project-related inflows will offset the decreased natural surface inflows and will result in temporary flow increases downstream of the PDA.

Operation

During operation, in the absence of mitigation measures, surface water quantity and/or flow could be affected by site water management including open pit dewatering, ongoing mine water collection and storage, and discharge of site surface water and groundwater via water management. Changes in surface water quantity or flow potentially include seasonal and/ or monthly changes to flows and lake levels, as well as annual changes features through re-routing of natural flow patterns. Mine activities during operation are also anticipated to affect local runoff, evapotranspiration, and infiltration characteristics, change effective contributing catchment areas (as addressed in the construction phase), and change local groundwater pathways and levels.

The existing East Pit and Wendy pits will be expanded to become one large open pit, which will continue to be dewatered throughout the operational life of mine (LOM). Interceptor wells will continue to pump non-contact groundwater from the vicinity of the open pit to Gordon and Farley lakes. The additional flows from the interceptor wells will affect downstream surface water flows in hydraulically connected waterbodies by changing historical discharge patterns. Additional surface water inflows from interceptor wells are anticipated to change flows and patterns in waterbodies downstream of discharge points.

Development and use of the MRSA, overburden storage area, ore stockpile areas, and infrastructure areas will affect surface water quantity by reducing infiltration. Contact water from the open pit, MRSA, and overburden areas will be gravity-drained towards collection sumps and pumped to the collection pond. Runoff from the infrastructure areas will also be routed to the collection pond. The collection pond will be pumped to Farley Lake for subsequent discharge. These changes to local drainage patterns will affect the quantity and timing of flows in downstream waterbodies.

The new diversion channel between Gordon Lake to Farley Lake will help maintain connectivity between Gordon and Farley lakes and may intercept shallow groundwater, which can alter groundwater flow paths and levels and affect adjacent surface waterbodies. This change is not anticipated to result in additional effects as already exists with the current diversion channel.

Surface water quantity and/or flow during operation will primarily be affected by additional flows to Gordon and Farley lakes and to downstream waterbodies as a result of the continued dewatering of the remnants of the existing East Pit and Wendy pits, the continued development and dewatering of the open pit, and the use of interceptor wells for groundwater management.

Decommissioning/Closure

During decommissioning/closure, in the absence of mitigation measures, surface water quantity and/or flow could be affected by the removal and reclamation of Project infrastructure/infrastructure areas, re-establishment of drainage patterns to the extent feasible, and the filling of the open pit.

Removal of Project infrastructure and reclamation of associated land will decrease runoff while increasing infiltration. Structures will be demolished to return the site to a vegetated state. Infrastructure areas will be graded to promote surficial flow out of the immediate area. However, changes to catchment areas within the PDA are anticipated to remain.

Surface water runoff from the MRSA, infrastructure areas, and overburden stockpiles will be directed to the open pit. Groundwater interceptor wells will continue to operate throughout this phase, until the open pit water level reaches 260 m elevation (Chapter 8). The diversion channel will remain in place past closure. Changes to groundwater flow direction and discharge locations are expected, which may result in changes to surface water quantity and/or flow in hydraulically connected waterbodies.

Closure of water management facilities will result in the removal of contact-water collection systems (ditches and sumps) that will result in changes to surface water drainage patterns from the MRSAs (historical and new) and overburden storage area. The new MRSA will be reclaimed with a soil cover (Appendix 23B). The collection pond will be backfilled and re-vegetated. These changes will extend into the post-closure phase and are expected to reach a steady-state condition once the open pit is filled.

Groundwater interceptor wells installed between the open pit and Gordon and Farley lakes will be decommissioned once the open pit water level has reached 260 m elevation (Chapter 8). Filling of the open pit is anticipated to take approximately 11 years under average climate conditions, and overflows will be directed to Farley Lake for discharge. Contact-water collection ditches (including sumps) are not anticipated to be required beyond the closure phase, and ditches will be re-contoured and re-vegetated to the extent possible.

MacLellan Site

Construction

During construction, in the absence of mitigation measures, surface water quantity and/or flow could be affected by: site preparation; construction of mine components, including ore pads, ore processing facilities, TMF, and water management facilities; construction of utilities, infrastructure, and other facilities, including administration buildings, access roads, and utility lines; and construction of water development and control including dewatering of pit and underground workings. These activities will affect runoff, evapotranspiration, and infiltration characteristics, change effective contributing catchment areas, and reduce groundwater levels, which may reduce hydraulically connected surface water levels and flow.

Site preparation activities within the PDA include the development of the construction, laydown areas, and other earthworks. These activities involve vegetation removal, topsoil stripping, ground compaction, and the decommissioning and removal of existing historical buildings, and will result in reduced infiltration and evapotranspiration and increased runoff.

Activities during this phase are outlined in Table 9-10 and include the development of mine components, water management facilities, utilities, infrastructure, and other facilities. These activities involve vegetation removal, topsoil stripping, ground compaction, and building construction, which will result in reduced infiltration and evapotranspiration and increased runoff. Construction of trenches and excavations will likely intercept shallow groundwater and alter and reduce groundwater flow paths and levels. This can potentially affect water quantity in hydraulically connected surface waterbodies. Temporary dewatering for the installation of foundations for buildings can affect adjacent surface water quantity. Construction of the TMF will reduce the effective contributing catchment area of Payne Lake, Minton Lake, and other downstream waterbodies and watercourses. The TMF will be used to store and recycle water for ore processing. Water from dewatering activities, including dewatering of the existing mine shaft, will be pumped and stored in the TMF. This increase in water inputs at the TMF will increase groundwater recharge and potentially affect adjacent surface water features.

Construction and operation of the freshwater intake in the Keewatin River is not anticipated to result in substantial changes to water quantity; however, water development and control activities will alter surface water quantity. Dewatering of the existing underground workings and the development and dewatering of the open pit will affect groundwater quantity (Chapter 8) and may affect adjacent surface water features. If intercepted, surface water quantity levels and discharge of these features will be reduced, with reductions propagating downstream. A temporary diversion ditch will be constructed in the area of the MRSA in Year -2 of the Project and will collect and divert non-contact water to unnamed stream KEE3-B2. This diversion ditch will increase runoff and may intercept shallow groundwater and alter and reduce groundwater flow paths and levels.

Operation

During operation, in the absence of mitigation measures, surface water quantity and/or flow could be affected by: the storage and stockpiling of ore and overburden; ore milling and processing; site water management including dewatering, mine water collection and storage, process water supply, and water intake from the Keewatin River; tailings management; and operation of utilities, infrastructure, and other facilities. These activities will affect runoff, evapotranspiration, and infiltration characteristics, change effective contributing catchment areas, and reduce groundwater levels, which may reduce hydraulically connected surface water levels and flow.

Development and use of the MRSA, overburden storage area, and ore storage and stockpiling area will affect surface water quantity by reducing infiltration and evapotranspiration and increasing runoff. Rock, overburden, and ore stockpiles will capture infiltrated water and store as pore-water, which will decrease inputs to surficial groundwater aquifers and hydraulically connected surface waterbodies.

Milling and processing of ore will require water input that is met by the recycling of contact water from the TMF and dewatering of the underground workings and open pit. These sources will supply adequate water for all but the first year of operation, in which an additional 0.27 Mm^3 of make-up water is required. This make-up water will be met by either freshwater from the Keewatin Rive or site contact water.

Water management will affect surface water quantity through the collection, storage, and recycling of contact water, the diversion of non-contact water, and the use of freshwater from the Keewatin River. Contact water will be collected from pit dewatering, runoff from the processing plant area, and seepage from the stockpiles, MRSA, and TMF. Most of this contact water will be diverted and stored in the collection pond; however, a portion of seepage and runoff contact water from the MRSA and open pit dewatering during freshet (April and May) will be diverted and stored in the TMF. The collection pond will control sediment prior to water discharging to the Keewatin River. Water stored in the TMF will supply the water demands of the ore milling and processing facility. The TMF is designed to contain 100-year, 24-hour rainfall event without discharge to the environment. No discharge from the TMF is anticipated to occur under average climate conditions. Pit dewatering will affect groundwater quantity and may result in changes to hydraulically connected surface waterbodies, including East Pond and its outlet.

Non-contact water near the MRSA will be collected by two diversion ditches until Year 1 (diversion ditch 1) and Year 3 (diversion ditch 2) of the Project, when they reach their end-of-life and the MRSA overprints them. The diversion ditches will reduce the volume of contact water and prevent deterioration of water quality. The diversion ditches will increase surface water runoff and may intercept shallow groundwater. This could alter and reduce groundwater flow paths and levels (Chapter 8) and affect adjacent surface waterbodies.

Freshwater will be collected from the Keewatin River by an intake installed near the ore milling and processing facility. This water will be used to supply potable water to site facilities, provide the required make-up water for ore processing in Year 1, and provide water for other uses including dust suppression and fire protection water.

Tailings management and the TMF will affect surface water quantity by decreasing the catchment area of Minton Lake and therefore reducing surface water inputs. This will result in reduced lake levels and outflows. This will partially be balanced by an increase in groundwater inflows caused by higher groundwater gradients from TMF water storage (Chapter 8).

The presence and operation of utilities, infrastructure, and other facilities will affect surface water quantity due to changes in impervious cover, slope, and vegetation, which will alter runoff, evapotranspiration, and infiltration characteristics. Drainage infrastructure will decrease infiltration and increase runoff to the receiving environment.

Decommissioning/Closure

During decommissioning/closure, in the absence of mitigation measures, surface water quantity and/or flow will be affected by the removal and reclamation of Project infrastructure/infrastructure areas, re-establishment of drainage patterns to the extent feasible, and the filling of the open pit. Removal of Project infrastructure and reclamation of land will decrease runoff while increasing infiltration and evapotranspiration.

Once mining is completed and dewatering is terminated, the open pit will begin to fill from groundwater inflow, direct precipitation, surface water runoff, and water from the TMF. This will affect groundwater levels and gradients (Chapter 8), which will result in positive changes to natural surface water quantity and/or flow in adjacent surface water features, possibly including the Keewatin River, East Pond, and the East Pond outlet.

Closure of water management facilities will result in the removal of contact-water collection systems (ditches and sumps). Closure of these facilities will result in changes to surface water drainage patterns from the MRSA, TMF, and overburden storage and establishment of naturally flowing drainage pathways. Trenches will be excavated to drain the seepage collection systems around the perimeter of the overburden, ore, MRSA, and the TMF and direct flow to the open pit by gravity (Appendix 23B). The collection pond will be dewatered and decommissioned with water diverted to the open pit and the area backfilled and regraded to restore original drainage paths to the extent possible. During decommissioning/closure, excess runoff from within the TMF will be directed to the open pit. These changes will extend into post-closure and reach a steady-state condition once the open pit is filled with water.

Model results demonstrate that filling of the open pit will take place over approximately 21 years under average climate conditions. Once the open pit is filled, discharge from the formed pit lake will flow east and increase streamflow in KEE3-B1, which flows into the Keewatin River.

The seepage trench system is expected to remain until permanent closure when water quality has been demonstrated to meet acceptable discharge criteria. At this point seepage collection trenches will be backfilled and re-contoured to restore the original drainage paths, to the extent possible, to allow unabated runoff.

9.4.1.3 Mitigation

The implementation of the mitigation measures and other commitments described in this section will be the responsibility of Alamos and/or contractors. The mechanisms used to require contractors and subcontractors to comply with these measures will include environmental protection plans and contract documents.

Mitigation measures proposed are generally considered to be industry standards and are effective for use in similar applications and environmental conditions. This assessment is based on professional judgment of engineers and scientists in consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited where applicable to justify the selection.

Detailed design of the Project and mitigation strategies is currently ongoing. Mitigation measures will be refined in consideration of environmental assessment approval conditions and permit stipulations which will be incorporated into final environmental management planning. The effectiveness of these mitigation measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs including adaptive management procedures will be reviewed by applicable regulatory agencies prior to their implementation.

The Project has been designed to reduce potential effects on surface water quantity in the following ways:

- Reusing process water to the extent feasible between the TMF and the ore processing facility.
- Constructing water management structures to collect, divert, and release non-contact water to the environment and to collect, store, and re-use contact water in the processing plant.
- Limiting construction footprint (i.e., PDA) to the extent possible.
- Grading perimeter and access roads of open pits to divert runoff away from the open pits to reduce contact water.
- Maintaining access roads by periodically regrading and ditching to improve water flow.
- Maintaining existing drainage patterns with the use of culverts. Inspection of culverts periodically to remove accumulated material and debris to avoid erosion, flooding, habitat damage, property damage, and mobilization of sediment.
- Collecting runoff and groundwater seepage from historical underground workings/open pit dewatering, overburden and ore stockpiles, TMF, and MRSAs.
- Designing for collection, storage, and reuse of contact water (runoff and seepage), only discharging excess water after reuse and treatment, as necessary.
- Balancing timing of recycling from sources to relieve storage pressures on contact-water collection ponds.

- Constructing perimeter and contact-water collection ditches to collect overland flow, toe seepage, and groundwater recharge (Chapter 8, Sections 8.4.2.2 and 8.4.3.2), and to divert non-contact water away from the Project components.
- Intercepting groundwater flowing into the open pit (Chapter 8, Section 8.4.2.2) thereby reducing the volume of contact water and reducing the potential dewatering of Gordon and Farley lakes.
- Pumping excess water to collection ponds as needed.
- Designing contact-water collection ditches to convey the 1:25-year storm event and with positive gradients to limit standing water and maintain positive flow.
- Designing contact-water collection ponds with active water storage that considers ice thickness during winter.
- Designing collection pond inlets and outlets to reduce water velocities/scour and meet sedimentation requirements.
- Designing and operating the TMF with no discharge to the environment during operation through reclaiming and recycling surplus water from the TMF to meet mill demand during operation.
- Refilling open pits with contact water at closure to return groundwater levels to near baseline conditions.

In addition to these mitigation measures to reduce potential environmental effects, Alamos is also committed to follow-up and monitoring, and adaptive management at both sites as outlined in Chapter 23.

9.4.1.4 Project Residual Effects

This section characterizes and discusses residual effects for each Project phase at the assessment nodes (modelled hydrometric sites and waterbodies) presented in Table 9-11 (Gordon site) and Table 9-19 (MacLellan site).

Creeks with changes in mean annual flow and/or MMD of less than 10% are characterized as having either negligible (<5%) or low (<10%) magnitude of effect. These sites are considered to have little to no effect from the Project, or that mitigation measures are successful in reducing Project effects to an acceptable level. These sites are not carried forward in the assessment.

During the winter season (November to April) it is assumed that if the modelled streamflow is less than or equal to 0.010 m^3/s, the stream is expected to be frozen and is reported as “<0.010 m^3/s”. It is likely that for creeks where streamflow is marginally greater than 0.010 m^3/s, the creek also freezes to the bottom during the winter, but 0.010 m^3/s was selected as a conservative threshold. Where baseline streamflow is 0 m^3/s or frozen (i.e., less than 0.010 m^3/s), percent change in streamflow is reported as “–“.

Lakes with a change in lake level that is less than 10% of the average depth of the lake are characterized as having either negligible (<5%) or low (<10%) magnitude of effect. These sites are considered to either have little to no effect from the Project, or the predicted changes are well within the range of natural variability, or that mitigation measures are successful in reducing Project effects to an acceptable level. These sites are not carried forward in the assessment.

Gordon Site

Modelling results for baseline and Project conditions were used to describe changes in flow and lake levels throughout the LAA. Some of the modelling nodes assessed using the water balance represent baseline conditions and experienced little or no change with Project conditions; these are addressed in greater detail in Volume 5 (Appendix E), and full modelling results are presented in Table 9B-1 and Table 9B-2 in Appendix 9B. The assessment focuses on the primary flow path from the Project to downstream sites: beginning at Gordon Lake, flowing to Farley Lake, then to Swede Lake, and finally to Ellystan Lake (the boundary of the LAA). Nodes assessed using the water balance model, and those carried forward in the assessment, are shown in Table 9-10.

Table 9-11 Summary of Model Nodes – Surface Water Quantity – Gordon Site

Model Node ID	Model Node Location	Node Carried Forward in Assessment?
QF01	Southern inlet to Gordon Lake	Yes – average monthly or annual results at this node experience project-related effects greater than 10% and are discussed in the sections below.
QF02	Southwest inlet to Farley Lake	Yes – average monthly or annual results at this node experience project-related effects greater than 10% and are discussed in the sections below.
FAR7	Gordon Lake	No – predicted average monthly or annual changes in water level are less than 10% of the lake's average depth during baseline.
QF03	Gordon Lake outlet	Yes – average monthly or annual results at this node experience project-related effects greater than 10% and are discussed in the sections below.
QF04	Northern inlet to Farley Lake	No – this node is located within the PDA but reflects flows into Farley Lake from upper Gordon and Farley Lake Watershed. This node experiences a negligible magnitude of change from existing conditions due to Project.
FAR5.2 and FAR5.1	Farley Lake	Yes - average monthly or annual changes in water level are more than 10% of the lake's average depth during baseline and are discussed in the sections below.
QF05	Eastern outlet of Farley Lake (Farley Creek)	Yes – average monthly or annual results at this node experience project-related effects greater than 10% and are discussed in the sections below.
QF06	Outlet of Simpson Lake	No – this node is located downstream of the PDA and reflects flows from Simpson Lake to Swede Lake. This node experiences low magnitude of change from existing conditions due to Project.
FAR3	Swede Lake	No – predicted average monthly or annual changes in water level are less than 10% of the lake's average depth during baseline.
QF07	Outlet of Swede Lake	Yes – average monthly or annual results at this node experience project-related effects greater than 10% and are discussed in the sections below.
FAR2	Ellystan Lake	No – as average monthly or annual changes were negligible at Swede Lake it was assumed that water levels in Ellystan Lake would also be less than 10% of the lake's average depth during baseline.

Table 9-11 Summary of Model Nodes – Surface Water Quantity – Gordon Site

Model Node ID	Model Node Location	Node Carried Forward in Assessment?
QF08	Outlet of Ellystan Lake	Yes – average monthly or annual results at this node experience project-related effects greater than 10% and are discussed in the sections below.
QF10	Northern inlet to Gordon Lake	No – this node is located within the PDA but reflects flows into Gordon Lake from upper Gordon and Farley Lake watershed. This node experiences low magnitude of change from existing conditions due to Project.

Model results for nodes QF01 (Table 9-12), QF02 (Table 9-13), QF03 (Table 9-14), QF05 (Table 9-15), QF07 (Table 9-16), QF08 (Table 9-17), and Farley Lake (Table 9-18), and subsequent Project residual effects are discussed by Project phase in the sections below. Figures for these nodes are presented in Figure 9C-1 through Figure 9C-7 in Appendix 9C.

Table 9-12 Model Results – Average Case – Gordon Site – QF01 Southern Inlet to Gordon Lake

Month	Existing Condition	Construction (Year -2 to Year -1)			Operations (Year 1 to Year 6)			Decommissioning and Active Closure (Year 6 to Year 11)			Post-Closure Prior to Open Pit Filling (Year 12 to Year 16)			Post-Closure After Open Pit is Filled (Year 17+)		
	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
Jan	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Feb	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Mar	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Apr	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
May	0.027	0.019	-0.008	-30%	0.019	-0.008	-30%	0.019	-0.008	-30%	0.019	-0.008	-30%	0.019	-0.008	-30%
Jun	0.012	<0.01	-0.003	-30%	<0.01	-0.003	-30%	<0.01	-0.003	-30%	0.008	-0.003	-30%	0.008	-0.003	-30%
Jul	0.016	0.011	-0.005	-29%	0.011	-0.005	-29%	0.011	-0.005	-29%	0.011	-0.005	-29%	0.011	-0.005	-29%
Aug	0.013	<0.01	-0.004	-29%	<0.01	-0.004	-29%	<0.01	-0.004	-29%	<0.01	-0.004	-29%	<0.01	-0.004	-29%
Sep	0.012	<0.01	-0.003	-29%	<0.01	-0.003	-29%	<0.01	-0.003	-29%	<0.01	-0.003	-29%	<0.01	-0.003	-29%
Oct	<0.01	<0.01	-0.002	-	<0.01	-0.002	-	<0.01	-0.002	-	<0.01	-0.002	-	<0.01	-0.002	-
Nov	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Dec	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Annual	0.007	0.005	-0.002	-29%	0.005	-0.002	-29%	0.005	-0.002	-29%	0.005	-0.002	-29%	0.005	-0.002	-29%

Notes:
"–" indicates percent change cannot be calculated as baseline streamflow is 0 m^3/s or frozen
"<0.01" indicates flows during winter months (December to April) are less than or equal to 0.01 m^3/s and are likely frozen
A negative percent change indicates a decrease in flows are predicted.

Table 9-13 Model Results – Average Case – Gordon Site – QF02 Southwest Inlet to Farley Lake

Month	Existing Condition	Construction (Year -2 to Year -1)			Operations (Year 1 to Year 6)			Decommissioning and Active Closure (Year 6 to Year 11)			Post-Closure Prior to Open Pit Filling (Year 12 to Year 16)			Post-Closure After Open Pit is Filled (Year 17+)		
	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
Jan	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Feb	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Mar	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Apr	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
May	0.024	0.017	-0.007	-28%	0.017	-0.007	-28%	0.017	-0.007	-28%	0.017	-0.007	-28%	0.017	-0.007	-28%
Jun	0.011	<0.01	-0.003	-28%	<0.01	-0.003	-28%	<0.01	-0.003	-28%	0.008	-0.003	-28%	0.008	-0.003	-28%
Jul	0.014	0.011	-0.004	-27%	0.011	-0.004	-27%	0.011	-0.004	-27%	0.011	-0.004	-27%	0.011	-0.004	-27%
Aug	0.012	<0.01	-0.003	-27%	<0.01	-0.003	-27%	<0.01	-0.003	-27%	<0.01	-0.003	-27%	<0.01	-0.003	-27%
Sep	0.010	<0.01	-0.003	-27%	<0.01	-0.003	-27%	<0.01	-0.003	-27%	<0.01	-0.003	-27%	<0.01	-0.003	-27%
Oct	<0.01	<0.01	-0.002	-	<0.01	-0.002	-	<0.01	-0.002	-	<0.01	-0.002	-	<0.01	-0.002	-
Nov	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Dec	<0.01	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Annual	0.007	0.005	-0.002	-27%	0.005	-0.002	-27%	0.005	-0.002	-27%	0.005	-0.002	-27%	0.005	-0.002	-27%

Notes:
"–" indicates percent change cannot be calculated as baseline streamflow is 0 m^3/s or frozen
"<0.01" indicates flows during winter months (December to April) are less than or equal to 0.01 m^3/s and are likely frozen
A negative percent change indicates a decrease in flows are predicted.

Table 9-14 Model Results – Average Case – Gordon Site – QF03 Gordon Lake Outlet

Month	Existing Condition	Construction (Year -2 to Year -1)			Operations (Year 1 to Year 6)			Decommissioning and Active Closure (Year 6 to Year 11)			Post-Closure Prior to Open Pit Filling (Year 12 to Year 16)			Post-Closure After Open Pit is Filled (Year 17+)		
	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
Jan	<0.01	<0.01	0.002	-	<0.01	0.003	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Feb	<0.01	<0.01	0.003	-	<0.01	0.003	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Mar	<0.01	<0.01	0.003	-	<0.01	0.003	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Apr	<0.01	<0.01	0.004	-	<0.01	0.004	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
May	0.038	0.040	0.002	4%	0.039	0.001	4%	0.031	-0.007	-17%	0.030	-0.008	-21%	0.030	-0.008	-21%
Jun	0.039	0.039	0.000	0%	0.039	0.000	-1%	0.034	-0.005	-12%	0.032	-0.007	-19%	0.032	-0.007	-19%
Jul	0.037	0.037	-0.001	-2%	0.037	-0.001	-2%	0.033	-0.005	-13%	0.031	-0.006	-17%	0.031	-0.006	-17%
Aug	0.037	0.036	-0.001	-2%	0.036	-0.001	-2%	0.032	-0.004	-12%	0.031	-0.006	-16%	0.031	-0.006	-16%
Sep	0.033	0.033	0.000	0%	0.033	0.000	0%	0.029	-0.004	-12%	0.028	-0.005	-16%	0.028	-0.005	-16%
Oct	0.027	0.028	0.001	4%	0.028	0.001	3%	0.024	-0.003	-11%	0.023	-0.004	-14%	0.023	-0.004	-14%
Nov	0.015	0.017	0.002	14%	0.017	0.002	14%	0.014	-0.001	-7%	0.014	-0.002	-10%	0.014	-0.002	-10%
Dec	<0.01	0.010	0.003	-	0.010	0.003	-	<0.01	0.000	-	<0.01	0.000	-	<0.01	0.000	-
Annual	0.021	0.022	0.001	7%	0.022	0.002	7%	0.018	-0.002	-11%	0.018	-0.003	-16%	0.018	-0.003	-16%

Notes:
"–" indicates percent change cannot be calculated as baseline streamflow is 0 m^3/s or frozen
"<0.01" indicates flows during winter months (December to April) are less than or equal to 0.01 m^3/s and are likely frozen
A negative percent change indicates a decrease in flows are predicted.

Table 9-15 Model Results – Average Case – Gordon Site – QF05 Farley Lake Outlet (Farley Creek)

Month	Existing Condition	Construction (Year -2 to Year -1)			Operations (Year 1 to Year 6)			Decommissioning and Active Closure (Year 6 to Year 11)			Post-Closure Prior to Open Pit Filling (Year 12 to Year 16)			Post-Closure After Open Pit is Filled (Year 17+)		
	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
Jan	0.029	0.070	0.041	141%	0.084	0.055	191%	0.032	0.003	11%	0.027	-0.002	-6%	0.032	0.003	12%
Feb	0.023	0.079	0.056	248%	0.096	0.074	325%	0.024	0.002	7%	0.021	-0.001	-5%	0.027	0.004	18%
Mar	0.019	0.083	0.064	329%	0.084	0.065	335%	0.020	0.001	5%	0.018	-0.001	-6%	0.024	0.005	24%
Apr	0.018	0.086	0.068	375%	0.075	0.057	313%	0.019	0.000	2%	0.017	-0.001	-7%	0.023	0.005	29%
May	0.148	0.257	0.109	74%	0.236	0.089	60%	0.135	-0.012	-8%	0.131	-0.016	-11%	0.161	0.013	9%
Jun	0.153	0.222	0.070	46%	0.189	0.037	24%	0.141	-0.011	-7%	0.138	-0.015	-10%	0.151	-0.002	-1%
Jul	0.154	0.224	0.070	46%	0.178	0.024	16%	0.143	-0.011	-7%	0.140	-0.014	-9%	0.150	-0.004	-2%
Aug	0.157	0.225	0.068	43%	0.175	0.018	11%	0.146	-0.011	-7%	0.145	-0.012	-8%	0.153	-0.004	-3%
Sep	0.143	0.205	0.062	43%	0.159	0.016	11%	0.133	-0.010	-7%	0.133	-0.010	-7%	0.142	-0.002	-1%
Oct	0.124	0.167	0.043	34%	0.137	0.013	10%	0.116	-0.008	-7%	0.116	-0.008	-7%	0.126	0.001	1%
Nov	0.078	0.113	0.035	44%	0.087	0.009	12%	0.074	-0.004	-5%	0.074	-0.004	-5%	0.081	0.003	3%
Dec	0.042	0.077	0.035	82%	0.055	0.012	29%	0.041	-0.001	-3%	0.041	-0.001	-3%	0.046	0.003	8%
Annual	0.091	0.151	0.060	66%	0.130	0.039	43%	0.085	-0.005	-6%	0.083	-0.007	-8%	0.093	0.002	2%

Notes:
A negative percent change indicates a decrease in flows are predicted.

Table 9-16 Model Results – Average Case – Gordon Site – QF07 Swede Lake Outlet

Month	Existing Condition	Construction (Year -2 to Year -1)			Operations (Year 1 to Year 6)			Decommissioning and Active Closure (Year 6 to Year 11)			Post-Closure Prior to Open Pit Filling (Year 12 to Year 16)			Post-Closure After Open Pit is Filled (Year 17+)		
	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
Jan	0.071	0.099	0.029	41%	0.094	0.023	33%	0.072	0.001	2%	0.068	-0.002	-3%	0.073	0.003	4%
Feb	0.054	0.094	0.040	74%	0.106	0.052	95%	0.056	0.002	3%	0.053	-0.001	-3%	0.057	0.003	6%
Mar	0.045	0.096	0.051	114%	0.106	0.061	135%	0.047	0.002	3%	0.044	-0.001	-2%	0.049	0.004	9%
Apr	0.044	0.105	0.061	138%	0.104	0.060	137%	0.045	0.001	2%	0.043	-0.001	-2%	0.048	0.004	10%
May	0.180	0.294	0.114	63%	0.279	0.099	55%	0.176	-0.004	-2%	0.172	-0.008	-4%	0.192	0.013	7%
Jun	0.343	0.440	0.096	28%	0.412	0.069	20%	0.331	-0.012	-4%	0.327	-0.017	-5%	0.349	0.005	2%
Jul	0.362	0.436	0.074	20%	0.396	0.033	9%	0.351	-0.011	-3%	0.348	-0.014	-4%	0.360	-0.002	-1%
Aug	0.361	0.430	0.069	19%	0.382	0.021	6%	0.349	-0.011	-3%	0.348	-0.013	-4%	0.357	-0.004	-1%
Sep	0.302	0.366	0.064	21%	0.319	0.016	5%	0.292	-0.010	-3%	0.291	-0.011	-4%	0.300	-0.003	-1%
Oct	0.258	0.307	0.050	19%	0.271	0.014	5%	0.249	-0.009	-4%	0.248	-0.009	-4%	0.257	0.000	0%
Nov	0.178	0.214	0.036	20%	0.188	0.010	6%	0.172	-0.006	-3%	0.172	-0.006	-3%	0.180	0.002	1%
Dec	0.105	0.136	0.030	29%	0.113	0.008	8%	0.102	-0.003	-3%	0.102	-0.003	-3%	0.107	0.002	2%
Annual	0.192	0.251	0.059	31%	0.231	0.039	20%	0.187	-0.005	-3%	0.185	-0.007	-4%	0.194	0.002	1%

Notes:
A negative percent change indicates a decrease in flows are predicted.

Table 9-17 Model Results – Average Case – Gordon Site – QF08 Ellystan Lake Outlet

Month	Existing Condition	Construction (Year -2 to Year -1)			Operations (Year 1 to Year 6)			Decommissioning and Active Closure (Year 6 to Year 11)			Post-Closure Prior to Open Pit Filling (Year 12 to Year 16)			Post-Closure After Open Pit is Filled (Year 17+)		
	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
Jan	0.111	0.134	0.023	21%	0.123	0.012	11%	0.111	0.000	0%	0.108	-0.003	-2%	0.113	0.002	2%
Feb	0.087	0.117	0.030	34%	0.119	0.032	37%	0.088	0.002	2%	0.085	-0.002	-2%	0.089	0.003	3%
Mar	0.073	0.113	0.040	55%	0.122	0.049	68%	0.074	0.002	2%	0.072	-0.001	-1%	0.076	0.003	4%
Apr	0.067	0.118	0.051	77%	0.123	0.056	84%	0.068	0.001	2%	0.066	-0.001	-1%	0.070	0.004	5%
May	0.501	0.644	0.143	29%	0.633	0.132	26%	0.500	-0.001	0%	0.495	-0.006	-1%	0.516	0.015	3%
Jun	0.639	0.740	0.101	16%	0.715	0.076	12%	0.627	-0.012	-2%	0.623	-0.016	-3%	0.646	0.007	1%
Jul	0.490	0.565	0.076	15%	0.527	0.038	8%	0.479	-0.011	-2%	0.475	-0.015	-3%	0.489	-0.001	0%
Aug	0.487	0.556	0.069	14%	0.510	0.023	5%	0.476	-0.011	-2%	0.474	-0.013	-3%	0.484	-0.004	-1%
Sep	0.435	0.499	0.064	15%	0.452	0.017	4%	0.425	-0.010	-2%	0.424	-0.011	-3%	0.432	-0.003	-1%
Oct	0.355	0.406	0.051	14%	0.369	0.014	4%	0.346	-0.009	-3%	0.346	-0.009	-3%	0.354	-0.001	0%
Nov	0.248	0.284	0.036	14%	0.258	0.010	4%	0.242	-0.006	-3%	0.242	-0.006	-3%	0.249	0.001	0%
Dec	0.157	0.184	0.028	18%	0.164	0.007	5%	0.153	-0.003	-2%	0.153	-0.003	-2%	0.159	0.002	1%
Annual	0.304	0.363	0.059	19%	0.343	0.039	13%	0.299	-0.005	-2%	0.297	-0.007	-2%	0.306	0.002	1%

Notes:
A negative percent change indicates a decrease in flows are predicted.

Table 9-18 Model Results – Average Case – Gordon Site – (FAR5.2 and FAR5.1) Farley Lake Level

Month	Existing Condition	Construction (Year -2 to Year -1)		Operations (Year 1 to Year 6)		Decommissioning and Active Closure (Year 6 to Year 11)		Post-Closure (Year 12+)	
	Lake Level (m)	Lake Level (m)	Change from Existing (m)	Lake Level (m)	Change from Existing (m)	Lake Level (m)	Change from Existing (m)	Lake Level (m)	Change from Existing (m)
Jan	313.58	313.72	0.14	313.76	0.19	313.59	0.01	313.59	0.02
Feb	313.54	313.75	0.21	313.80	0.25	313.55	0.01	313.57	0.02
Mar	313.52	313.76	0.24	313.77	0.24	313.53	0.01	313.55	0.03
Apr	313.51	313.77	0.26	313.74	0.23	313.52	0.00	313.55	0.03
May	313.85	314.03	0.18	314.01	0.15	313.84	-0.02	313.88	0.03
Jun	313.91	314.01	0.10	313.96	0.06	313.89	-0.02	313.90	0.00
Jul	313.91	314.01	0.10	313.95	0.04	313.89	-0.02	313.90	-0.01
Aug	313.91	314.01	0.10	313.94	0.03	313.89	-0.02	313.91	-0.01
Sep	313.89	313.99	0.10	313.92	0.03	313.87	-0.02	313.89	0.00
Oct	313.85	313.93	0.07	313.88	0.02	313.84	-0.02	313.86	0.00
Nov	313.75	313.83	0.08	313.77	0.02	313.74	-0.01	313.75	0.01
Dec	313.64	313.74	0.11	313.68	0.05	313.63	-0.01	313.65	0.01
Annual	313.74	313.88	0.14	313.85	0.11	313.73	-0.01	313.75	0.01

Approximate watershed catchment areas that experience Project-related changes for those nodes carried forward in the assessment are shown in Table 9-19 (further breakdown of these catchment areas by sub-watershed can be found in Volume 5, Appendix D).

Table 9-19 Summary of Watershed Area Changes Due to Project – Gordon Site

Node	Baseline Area (km^2)	Area Affected by Project (km^2)	Percent of Area Affected by Project	Percent of Area Changed (i.e., routed to Project Area)
QF01	1.5	0.44	29%	-29%
QF02	1.1	0.3	27%	-27%
QF03	4.1	0.65	16%	-16%
QF05	12.4	1.24	10%	n/a
QF07	34.5	1.24	4%	n/a
QF08	61.8	1.24	2%	n/a

Notes:
n/a – node is downstream of Project Area re-routing

Construction

The mean annual flows at inlets to Gordon Lake (QF01) and Farley Lake (QF02) are predicted to decrease by 29% and 27%, respectively, in the average climate scenario (Table 9-12, Table 9-13). Changes in mean monthly flows are modelled only during open water season (May to October) for QF01 an QF02 and changes are of similar magnitude. The Project changes are the result of changes in catchment areas due to the Project infrastructure within these nodes (refer to Table 9-19). This effect is expected to continue through to post-closure. The 1:25 year wet and 1:25 year dry scenarios show proportional changes in flows at these two locations (i.e., changes remain around 27% to 30% decrease for wet and dry scenarios). Both creeks flow intermittently, even during open water season, and multiple field visits at these sites have included observations of no flow. Although proportionally the flow change is high, the absolute change is negligible.

The mean annual flow at the outlet of Gordon Lake (QF03) is predicted to increase by 7% from existing conditions during the average climate scenario (Table 9-14). This is primarily due to the addition of pumped flows from the interceptor wells. Monthly percent changes range from 0% in June to 14% in November. Months where flows are less than 0.01 m^3/s may see higher percent changes due to Project-related effects, but this is because flows in this channel are low in the winter (typically from November to April). The absolute changes in mean monthly flows range from 0.001 m^3/s to 0.003 m^3/s and are well within model error. Percent changes in months where baseline flows are <0.01 m^3/s are not calculated here.

The mean annual change in flow at the outlet of Farley Lake (QF05 – Farley Creek) is predicted to increase 66% from the existing conditions (Table 9-15). This increase is related to the additional water from the interceptor wells and the dewatering of the historical East and Wendy pits. The highest percent change is expected in March and April (329%, 375%, respectively) and lowest in October (34%). Percent changes are higher in March and April due to winter low flows (0.019 m^3/s, 0.018 m^3/s) occurring at that time. Although the percent increases are high, the absolute increase in flow (0.064 m^3/s, 0.068 m^3/s) is predicted to be small.

Conditions downstream of Farley Lake are anticipated to experience similar but reduced or attenuated effects: during construction the mean annual flow increases by 31% at Swede Lake outlet (QF07; Table 9-16), and by 19% at the Ellystan Lake outlet (QF08; Table 9-17). Monthly percent changes at QF07 and QF08 follow a similar pattern to that encountered at Farley Lake outlet, with March and April flows indicating the highest percent change.

Annual average lake levels in Farley Lake are anticipated to increase by 15% or 0.14 m (Table 9-18) due to the combination of dewatering of the historical pits and interceptor wells. March and April are anticipated to see the highest changes of 27% (0.24 m) and 29% (0.26 m), respectively.

Mean annual percent changes in the 1:25 year dry scenario indicate generally higher percent changes; as baseline flows are lower in dry years, additional inflows to the system have a proportionally higher effect on mean annual and mean monthly flows at downstream nodes in these years (Appendix 9B, Table 9B-1). For example, a 16% increase in flows is predicted during the 1:25 dry year at the Gordon Lake outlet node (compared to a 7% increase in the average case). Mean annual percent changes at the Farley Lake outlet nodes indicate a 99% increase in the 1:25 year dry scenario (compared to a 66% increase in the average case). This same pattern is encountered at downstream stations. The outlet of Swede Lake sees a mean annual increase of 50% during the 1:25 year dry climate scenario, while the outlet of Ellystan Lake sees a 32% increase. Inflows to Gordon and Farley Lakes (QF01 and QF02) see the same percent change in the 1:25 year dry scenario when compared to the average scenario, as the effects at these locations are based on watershed contribution only.

Similarly, mean annual percent changes in the 1:25 year wet scenario indicate generally lower percent changes - as baseline flows are higher in wet years, additional inflows to the system have proportionally less effect on mean annual and mean monthly flows at downstream nodes in these years (Appendix 9B, Table 9B-1). For example, mean annual percent changes in the 1:25 year wet scenario predicts a 2% increase in outflows from Gordon Lake, and a 47% increase in outflows from Farley Lake. Mean annual percent changes at downstream nodes (QF07, QF08) are also generally lower than the average case scenarios at these nodes (Appendix 9B, Table 9B-1). Inflows to Gordon and Farley Lakes (QF01 and QF02) see similar percent change in the 1:25 year wet scenario when compared to the average scenario, as the effects at these locations are based on watershed contribution only.

Ice regime is likely to be affected within (and downstream of) Farley Lake due to the additional flows from the dewatering of the existing pits and the interceptor wells during the construction phase. These additional flows are anticipated to have temperatures that vary from the historical baseline surface water temperatures (i.e., approximately 6 ºC for groundwater flows, and 3-4 ºC for pit water flows). The extent of the effect is difficult to predict given the uncertainty in the rate of dewatering in the winter and how the presence of beaver dams influence lake temperatures and ice dynamics by altering lake depths. This effect would continue through subsequent Project phases where interceptor wells are in operation. Potential effects of altered ice regimes to fish habitat quality in the aquatic receiving environment are discussed in Chapter 10 (Section 10.4.1).

Operation

During operation, the mean annual flow at the outlet of Gordon Lake is expected to increase by 7% from existing conditions, while the mean annual flow at the outlet of Farley Lake (Farley Creek) is expected to increase by 43% during the average climate scenario. This is primarily due to the influx of pumped groundwater inflows from the interceptor wells and dewatering of the open pit. Additionally, other contact water from the site will also be discharged into Farley Lake. The most substantial percent changes at Farley Lake outflows are encountered in February and March (325%, 335%), as flows during that period under existing conditions are low (approximately 0.02 m^3/s). Absolute changes therefore have a considerable effect on percent change at these locations during this Project phase. Further downstream, flows are once again reduced/attenuated; outflows are anticipated to receive 20% and 13% increases in mean annual flows from existing conditions at Swede Lake and Ellystan Lake, respectively. The same change in mean annual inlet flows to Gordon Lake and Farley Lake (QF01 and QF02) that were predicted in the construction phase are predicted during operation (decrease by 29% and 27% respectively).

Lake levels at Farley Lake are predicted to increase from existing conditions during operation by an annual average of 12% or 0.11 m during the average climate scenario. March and April are anticipated to see the highest increases, at 27% (0.25 m) and 25% (0.24 m).

Following a similar pattern to that observed in the construction phase results, mean annual percent changes in the 1:25 year dry scenario are generally higher at downstream nodes QF03, QF05, QF07, and QF08 when compared to the average climate scenario, due to the increased effect of additional Project-related pumped flows on relatively low baseline flows. Mean annual percent changes in the 1:25 year dry scenario is similar for the Gordon and Farley Lake inflow nodes (QF01 and QF02) as the construction phase (Appendix 9B, Table 9B-1).

Mean annual percent changes in the 1:25 year wet scenario predicts lower percent changes in downstream nodes QF03, QF05, QF07, and QF08 from the average climate scenario (Appendix 9B, Table 9B-1).

Decommissioning/Closure

During active closure, discharge from the collection pond will be directed to the open pit. Interceptor wells will still be operational during the active closure phase, with water pumped to Gordon and Farley lakes. The mean annual flow at the outlet of Gordon Lake is expected to decrease by 11% from the existing conditions during the average climate scenario. The mean annual change in outflow from Farley Lake is expected to decrease by 6% from the existing conditions, a reduction from previous phases. Mean annual flows at the outlets of Swede and Ellystan lakes are anticipated to decrease to changes from baseline of 3% and 2%, respectively. The same change in mean annual inlet flows to Gordon Lake and Farley Lake (QF01 and QF02) that were predicted in construction and operation are predicted in the closure phase (decrease by 29% and 27%, respectively).

Lake levels at Farley Lake are predicted to decrease from existing conditions during active closure by an annual average of 1% or 0.01 m during the average climate scenario. Maximum average monthly decreases are expected to be 2% or 0.02m during open water months.

Similar to the pattern observed in the construction and operation phase results, mean annual percent changes in the 1:25 year dry scenario are generally higher at downstream nodes QF03, QF05, QF07, and QF08 when compared to the average climate scenario, due to the increased effect of additional Project-related pumped flows on relatively low baseline flows. Mean annual percent changes in the 1:25 year dry scenario is similar for the Gordon and Farley Lake inflow nodes (QF01 and QF02) as the construction and operation phases (Appendix 9B, Table 9B-1).

Mean annual percent changes in the 1:25 year wet scenario predicts lower percent changes in downstream nodes QF03, QF05, QF07, and QF08 from the average climate scenario (Appendix 9B, Table 9B-1).

The post-closure phase represents the period of time after completion of decommissioning and active closure: the open pit will be filling with water and become a pit lake, and overflows will be directed to Farley Lake. Interceptor wells will be operational until approximately Year 14 during the average climate scenario. The open pit is anticipated to finish filling in Year 16; therefore, the phase is divided into two parts after active closure: 1) Years 12 to 16 (when the open pit is being filled); and, 2) Year 17 onwards (when the open pit is filled, and pit lake overflows are directed to Farley Lake).

The mean annual flow at the outlet of Gordon Lake is expected to decrease by 16% from the existing conditions during the average climate scenario for the closure periods before and after open pit filling; this change is the result of a portion of the Gordon Lake watershed being rerouted to the open pit/pit lake. The mean annual change in outflow from Farley Lake is expected to decrease by 8% from the existing conditions for years when the open pit is being filled. After this period, the mean annual change in flow at the outlet of Farley Lake is 2%, reflecting the addition of the formed pit lake to the watershed (Volume 5, Appendix D). Mean annual flows at the outlets of Swede and Ellystan Lake are anticipated to increase by 1% after the open pit has filled.

Lake levels at Farley Lake increase from existing conditions during closure by an average of 1% or 0.01 m during the average climate scenario. Maximum lake level changes are expected to occur during the months of January to May, with lake levels increasing either 2% (0.02 m) or 3% (0.03 m) during this phase.

Mean annual percent changes in the 1:25 year dry and wet scenarios are similar for the Gordon and Farley Lake inflow nodes (QF01 and QF02) as for the previously described mine phases (Appendix 9B, Table 9B-1). Mean annual percent change in flows predicted for the 1:25 year wet and 1:25 year dry scenarios are generally similar to the average climate scenarios for all nodes downstream of Project-related effects (QF03, QF05, QF07, QF08) – absolute changes in mean annual flows are within +/- 0.005 m^3/s.

Summary of Project Residual Effects – Gordon Site

The predicted Project residual adverse effects associated with changes to water quantity (streamflow) at the Gordon site are mostly reversible (i.e., at QF07 and QF08), occur within the LAA, and are of medium- or long-term duration, as the effects will extend either throughout construction, operation and active closure, or beyond active closure. After closure, Project residual effects are predicted to be limited to QF01, QF02, QF03 and QF05 (Farley Creek). The effects do not extend as far downstream as Swede Lake. Project residual effects for QF01 and QF02 occur during the open water season (May to October) and are of moderate magnitude (-29% to -27% change relative to baseline). It should be noted that these two creeks are ephemeral in nature and the predicted flow changes are less than 10 L/s. Project residual effects for QF03 occur during the open water season and are of moderate magnitude (-16% change relative to baseline). Project residual effects for QF05 occur predominantly during the winter season and are of moderate magnitude (2% change relative to baseline on an annual basis); residual effects during the open water season at QF05 are low to negligible. These residual effects occur within the PDA (QF01, QF02, QF03) and downstream in the LAA (QF05, QF07, QF08).

The predicted Project residual effects associated with lake levels at the Gordon site are predicted to be limited to Farley Lake, and do not extend downstream. Project residual effects for Farley Lake, occurring within the LAA, are of moderate magnitude (30% change in lake level from existing conditions) during construction and operations, whereas during active closure and post-closure the effects are negligible.

MacLellan Site

Modelling results for baseline and Project conditions were used to describe predicted flow and lake level at various model nodes throughout the LAA. Some of the modelling nodes assessed using the water balance model represent background conditions and experienced little or no change with Project conditions. These are addressed in greater detail in Volume 5, Appendix E, and included in Table 9B-3 and Table 9B-4 in Appendix 9B but are not included in the residual effects assessment. Nodes that are included in the assessment are those that are both potentially affected by the Project and are expected to experience residual effects. Nodes assessed using the water balance model, and those carried forward in the assessment, are shown in Table 9-20.

Table 9-20 Summary of Model Nodes – MacLellan Site

Model Node ID	Model Node Location	Node Carried Forward in Assessment?
QM01	Keewatin River at entrance to LAA	No – this node is located upstream of the PDA and experiences negligible change from existing conditions due to the Project.
QM02	Keewatin River upstream of PDA	No – this node is located upstream of the PDA and experiences negligible change from existing conditions due to the Project.
QM03	Keewatin River south of proposed open pit	No – average monthly or annual results at this node experience project-related effects less than 10% and are not discussed in the sections below.
QM04	Unnamed tributary of the Keewatin River (KEE3-B1)	Yes – average monthly or annual results at this node experience project-related effects greater than 10% and are discussed in the sections below.
QM05	Lynn River	No – this node is not located on a watercourse affect by the Project and experiences negligible change from existing conditions due to the Project.
QM06	Keewatin River downstream of PDA	No – average monthly or annual results at this node experience project-related effects less than 10% and are not discussed in the sections below.
COC2-LOB2-MIN4	Minton Lake	No – predicted average monthly or annual changes in water level are less than 10% of the lake's average depth during baseline.
QM07	Minton Lake outlet	Yes – average monthly or annual results at this node experience project-related effects greater than 10% and are discussed in the sections below.
KEE1	Cockeram Lake	No – predicted average monthly or annual changes in water level are less than 10% of the lake's average depth during baseline.
QM08	Cockeram Lake outlet	No – this node is located downstream from the PDA but experiences negligible change from existing conditions due to the Project.
QM09	Dot Lake outlet	No – this node is located adjacent to the PDA but experiences negligible change from existing conditions due to the Project.
QM11	Cockeram River	No – this node is located downstream from the PDA but experiences negligible change from existing conditions due to the Project.

Model results for nodes QM04 (Table 9-21) and QM07 (Table 9-22) and subsequent Project residual effects are discussed by Project phase in the sections below and presented in Figure 9C-8 through Figure 9C-10 in Appendix 9C.

Payne Lake was not assessed in the model but is expected to have low changes to surface water quantity due to the Project. The TMF will encroach into the watershed of Payne Lake and its outlet (KEE3-PAY1) and will decrease the effective watershed area by 4%. Annual streamflow in KEE3-PAY1 will proportionally decrease by approximately the same amount, with reductions during the spring freshet relatively higher than reductions in the later summer and fall when a larger portion of

Table 9-21 Model Results – Average Climate – MacLellan Site – QM04 (KEE3-B1) Streamflow

Month	Existing Conditions	Construction (Year -2 to Year -1)			Operation (Year 1 to Year 13)			Decommissioning and Active Closure (Year 14 to Year 19)			Post-Closure Prior to Open Pit Filling (Year 20 to Year 35)			Post-Closure After Open Pit is Filled (Year 35+)		
	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
Jan	<0.01	<0.01	0.000	-	<0.01	0.001	-	<0.01	0.002	-	<0.01	0.002	-	0.022	0.022	-
Feb	<0.01	<0.01	0.000	-	<0.01	0.001	-	<0.01	0.002	-	<0.01	0.002	-	0.027	0.027	-
Mar	<0.01	<0.01	0.000	-	<0.01	0.001	-	<0.01	0.002	-	<0.01	0.002	-	0.030	0.030	-
Apr	<0.01	<0.01	-0.006	-	<0.01	-0.006	-	<0.01	-0.006	-	<0.01	-0.006	-	0.036	0.026	-
May	0.127	0.045	-0.082	-64%	0.045	-0.082	-64%	0.045	-0.082	-64%	0.047	-0.079	-63%	0.192	0.065	51%
Jun	0.053	0.019	-0.034	-64%	0.019	-0.034	-64%	0.019	-0.034	-64%	0.023	-0.030	-56%	0.091	0.038	71%
Jul	0.075	0.027	-0.048	-64%	0.027	-0.048	-64%	0.027	-0.048	-64%	0.032	-0.043	-57%	0.121	0.045	60%
Aug	0.065	0.023	-0.042	-64%	0.023	-0.042	-64%	0.023	-0.042	-64%	0.028	-0.038	-58%	0.097	0.032	49%
Sep	0.057	0.020	-0.036	-64%	0.020	-0.036	-64%	0.020	-0.036	-64%	0.025	-0.031	-56%	0.104	0.047	84%
Oct	0.036	0.013	-0.023	-64%	0.013	-0.023	-64%	0.013	-0.023	-64%	0.016	-0.019	-54%	0.076	0.041	115%
Nov	<0.01	<0.01	-0.002	-	<0.01	-0.001	-	<0.01	-0.001	-	<0.01	0.001	-	0.032	0.029	-
Dec	<0.01	<0.01	0.000	-	<0.01	0.001	-	<0.01	0.002	-	<0.01	0.002	-	0.018	0.018	-
Annual	0.035	0.013	-0.023	-64%	0.013	-0.022	-63%	0.013	-0.022	-63%	0.016	-0.020	-56%	0.070	0.035	99%

Notes:
"–" indicates percent change cannot be calculated as baseline streamflow is 0 m^3/s or frozen
"<0.01" indicates flows during winter months (December to April) are less than or equal to 0.01 m^3/s and are likely frozen
A negative percent change indicates a decrease in flows are predicted.
Modelled baseline data has minor variations for each Project phase due to artifacts of the modelling process. Baseline values reported here are for the 2020 modelling period. Calculations for the absolute and percent change in streamflow for each phase used baseline data calculated for that specific phase and may have minor disagreement with the baseline data presented here.

Table 9-22 Model Results – Average Climate – MacLellan Site – QM07 Minton Lake Outlet Streamflow

Month	Existing Conditions	Construction (Year -2 to Year -1)			Operation (Year 1 to Year 13)			Decommissioning and Active Closure (Year 14 to Year 19)			Post-Closure (Year 20+)		
	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
Jan	0.024	0.023	-0.001	-3%	0.022	-0.002	-8%	0.022	-0.003	-11%	0.021	-0.003	-12%
Feb	0.018	0.018	0.000	0%	0.017	-0.001	-4%	0.017	-0.002	-8%	0.017	-0.002	-9%
Mar	0.014	0.015	0.000	3%	0.015	0.000	1%	0.014	-0.001	-5%	0.014	-0.001	-6%
Apr	0.013	0.014	0.001	5%	0.013	0.000	3%	0.012	0.000	-4%	0.012	0.000	-4%
May	0.057	0.045	-0.012	-21%	0.045	-0.012	-21%	0.044	-0.013	-24%	0.044	-0.013	-24%
Jun	0.068	0.052	-0.016	-23%	0.052	-0.016	-23%	0.051	-0.017	-25%	0.051	-0.017	-25%
Jul	0.036	0.028	-0.008	-23%	0.027	-0.008	-23%	0.027	-0.009	-25%	0.027	-0.009	-25%
Aug	0.038	0.027	-0.011	-28%	0.027	-0.011	-28%	0.026	-0.012	-31%	0.026	-0.012	-31%
Sep	0.063	0.046	-0.017	-27%	0.046	-0.017	-27%	0.045	-0.018	-29%	0.045	-0.018	-29%
Oct	0.072	0.055	-0.017	-24%	0.055	-0.017	-24%	0.054	-0.018	-25%	0.054	-0.018	-25%
Nov	0.054	0.045	-0.010	-18%	0.045	-0.010	-18%	0.044	-0.011	-20%	0.044	-0.011	-20%
Dec	0.036	0.031	-0.005	-14%	0.031	-0.005	-14%	0.030	-0.006	-17%	0.030	-0.006	-17%
Annual	0.041	0.033	-0.008	-19%	0.033	-0.008	-20%	0.032	-0.009	-22%	0.032	-0.009	-22%

Notes:

A negative percent change indicates a decrease in flows are predicted.

Modelled baseline data has minor variations for each Project phase due to artifacts of the modelling process. Baseline values reported here are for the 2020 modelling period. Calculations for the absolute and percent change in streamflow for each phase used baseline data calculated for that specific phase and may have minor disagreement with the baseline data presented here.

streamflow is supplied by groundwater. The stream is likely frozen during the winter. Changes in surface water quantity are low and constant through all phases of the Project.

Approximate watershed catchment areas that experience Project-related changes are shown in Table 9-23 (further breakdown of these catchment areas by sub-watershed can be found in Volume 5, Appendix E).

Table 9-23 Summary of Watershed Area Changes Due to Project - MacLellan Site

Node	Baseline Area (km^2)	Construction, Operation, Decommissioning (Active Closure)		Post-Closure	
		Area Affected by Project (km^2)	Percent Area Affected by Project (%)	Area Affected by Project (km^2)	Percent Area Affected by Project (%)
QM04	5.0	-3.66	-73%	3.33	67%
QM07	12.4	-2.35	-19%	-2.35	-19%
KEE3-PAY1 (Payne Lake and outlet)[1]	7.9	-0.32	-4%	-0.32	-4%
Notes: 1 – Payne Lake and the outlet stream are not an assessment node and are assessed qualitatively only Positive values indicate an increase in watershed area, negative values indicate a decrease in watershed area					

Construction

Model results at the unnamed Keewatin River tributary KEE3-B1 (QM04) show a decrease in MAD of 64% during all three climate scenarios (Table 9-21). Streamflow in this creek is likely frozen during winter months (November through April), therefore no Project-related effects to surface water quantity were evaluated for the winter period. Monthly streamflow for the remainder of the year is projected to be 64% lower due to the reduction in catchment area caused by the proposed open pit and plant site (Table 9-23). This reduction equates to a minimum absolute decrease of 0.002 m^3/s in November, and a maximum of 0.082 m^3/s in May under average climate conditions. East Pond is located in the headwaters of KEE3-B1 and is expected to be passively drained as a result of groundwater drawdown associated with the development of the open pit and a reduction in contributing watershed area. East Pond is shallow, freezes to the bottom in winter, and does not directly support CRA fish species. The change in flow is persistent through the operation and early years of the decommissioning and active closure phases of the Project.

Modelling results show that mean annual flow at the outlet of Minton Lake (QM07) decreases by 19% from the baseline condition during the average climate scenario, 20% during 1:25 dry scenario and 19% during 1:25 wet scenario (Table 9-22). The monthly change in flow ranges from 0% in February and March to a decrease of 28% in August during the average climate scenario. A small increase in flow in March and April is associated with the net increase in groundwater inflows. The overall reduction in flow at Minton Lake outlet is associated with the reduction in total drainage area due to the construction of the MRSA and TMF. This change in streamflow at the Minton Lake outlet is maintained through all subsequent phases of the Project. The change is primarily related to in the loss of catchment area and subsequent runoff due to the Project infrastructure.

Change in ice regime at the MacLellan site is expected to be limited in extent to small streams. Changes in streamflow at KEE3-B1 and the Minton Lake outlet may shift the timing of when the streams freeze in the winter and melt in the spring. Substantial changes in ice are not expected to occur in waterbodies or larger watercourses during the operation phase or subsequent Project phase.

Operation

During Year 1 of the Project, 0.27 Mm^3 of process make-up water is required and will be extracted from the Keewatin River freshwater intake. Based on discharge in the Keewatin River, extraction rates will vary throughout the year; maximum pumping rates of 0.087 m^3/s will occur during freshet and higher summer flows. Based on the mean monthly flow estimates from QM03 pumping rates are not anticipated to exceed 5% of instantaneous discharge during the winter low flow period.

Monthly changes in surface water quantity at unnamed Keewatin River tributary KEE3-B1 (QM04) are similar to changes outlined for the construction phase. Discharge at node QM07 is anticipated to experience a 20% decrease from existing conditions on a mean annual basis, with changes ranging from -28% in August to +3% in April.

Decommissioning/Closure

Effects at unnamed Keewatin River tributary KEE3-B1 (QM04) during the active closure and post-closure phases are expected to vary depending on the stage of open pit filling. While the open pit is filling (until Year 35), streamflow at QM04 will be similar to streamflow during previous Project phases (construction, operation). A predicted decrease in mean annual discharge of 56% will occur under the average climate scenario (Table 9-21). Streamflow is expected to be frozen during winter months (November through April); therefore, limited Project-related effects to surface water quantity are predicted to occur and were therefore not evaluated for this time period. Streamflow reductions for the remaining of the year are projected to range from 54% lower to 64% lower by month.

Streamflow patterns are predicted to change once the open pit is filled and begins to discharge towards QM04. The MAD is anticipated to increase 99% from 0.035 m^3/s to 0.070 m^3/s. Streamflow is predicted to increase from existing conditions each month, and during the winter will likely not be frozen and will continue to flow. Increases will vary from 49% (or 0.032 m^3/s) in August to 115% (or 0.041 m^3/s) in October. These higher streamflows are within the annual range of baseline MMDs, as shown in Figure 9C-16 in Appendix 9C.

Changes to streamflow in KEE3-B1 (QM04) are related to the short-term decrease in catchment area and decrease in groundwater elevations (Chapter 8), and the long-term increase in catchment area. During construction and operation, the development of the open pit reduces the catchment area of KEE3-B1 and proportionally decreases streamflow (Table 9-23). During the decommissioning/closure phase, water from the TMF will flow to the open pit with the TMF effectively diverting a portion of the Minton Lake catchment to the KEE3-B1 catchment. For approximately 21 years, the open pit will fill under the average climate scenario, keeping streamflow in KEE3-B1 at post-Project develop lows. Once the open pit is filled, the increased catchment area of KEE3-B1 will cause a long-term increase in streamflow. Routing the outflow from the pit lake was done to address concerns expressed by DFO (see Chapter 10).

Throughout decommissioning/closure, discharge at node QM07 is anticipated to experience a 22% decrease from existing conditions on a mean annual basis, with changes ranging from -4% in April to -31% in August.

Summary of Project Residual Effects – MacLellan Site

The Project residual adverse effects associated with changes to water quantity (streamflow) at the MacLellan site are predicted to be limited to QM04 and QM07. The effects do not extend as far downstream as QM03 (Keewatin River) for QM04 or the Cockeram River (QM11) for QM07. Project residual effects for QM04 occur during the open water season (May to October) and are of high magnitude relative to baseline; during construction, operation, and decommissioning/closure (period of pit filling), with mean annual flows predicted to decrease by greater than 60% relative to baseline. Once the open pit is filled and is discharging into KEE3-B1, mean annual flows are predicted to increase by 76%. Although the magnitude of change at QM04 is high, the geographic extent of change is limited to this tributary. Additionally, the decision to route the open pit outfall into KEE3-B1 was based on consultation with DFO. The potential for adverse effects to aquatic life resulting from project-induced changes in streamflow at QM04 are discussed in Chapter 10.

Project residual effects for QM07 occur during the open water season and are of moderate magnitude (-20% change relative to baseline) through all mine phases. The magnitude of change at QM07 is therefore moderate and limited to this tributary. The potential for adverse effects to aquatic life resulting from project-induced changes in streamflow at QM07 are discussed in Chapter 10.

9.4.2 Surface Water Quality

9.4.2.1 Analytical Assessment Methods

Potential changes in surface water quality were predicted using mass-balance models for the Gordon and MacLellan sites using GoldSim^{TM} software. Details of model development, inputs, assumptions, and results are described in Volume 5, Appendices D and E. The water quality models incorporated results from baseline programs completed, including geochemistry (Volume 4; Appendix F), hydrology (Volume 4; Appendix G), hydrogeology (Volume 4, Appendix H), and water quality (Volume 4, Appendix I), and the results of groundwater modelling (Volume 5, Appendices F and G).

Potential changes in surface water quality were assessed for construction, operation, and decommissioning/closure. Two scenarios were modeled to predict monthly water quality concentrations at various assessment nodes. The scenarios encompass the range of water quality conditions that may occur, including the following:

- **Expected Case**: Mean precipitation scenario from the hydrology model paired with mean geochemical source terms (i.e., loading rates from humidity cell tests) and mean background monthly water quality.
- **Upper Case**: Mean precipitation scenario from the hydrology model paired with 95th percentile geochemistry and 95th percentile monthly background water quality.

Results from the Expected Case were used to evaluate where and when water quality parameters may exceed applicable guidelines during construction, operation, and decommissioning/closure, and to identify if additional mitigation measures beyond those included in the Project design are necessary. Results from the Upper Case were used to show potential extreme changes in water quality parameters. However, due to the conservatism in the Upper-Case scenario, these predictions do not represent a scenario likely to actually occur within the LOM.

Details of the assumptions (including mitigation measures), limitations, and conservatism built into the water quality models can be found in Volume 5, Appendix D, Section 5 (Gordon site) and Volume 5, Appendix E, Section 5 (MacLellan site).

To determine the effects of climate on the model predictions, a dry climate scenario (1:25 year dry precipitation) was also modelled. Based on the results of this scenario, it was determined that climate has a negligible influence on predicted water chemistry at the Gordon and MacLellan sites compared to the influence of the geochemical source terms in the models (Volume 5; Appendices D and E). Therefore, the dry climate scenario was not included in this assessment. A wet climate scenario was not modelled because increased precipitation would result in greater dilution capacity in the receiving environment and a less conservative scenario relative to the Expected Case. Therefore, the Upper Case represents the most conservative scenario of the scenarios modelled and better represents extreme water quality predictions.

Identification of Parameters of Potential Concern

Only those water quality parameters predicted by the water quality models that met the following two screening criteria, at least once during any mine phase, were carried forward into the assessment of the potential residual effects and, therefore, were considered POPCs:

- The parameter was predicted to exceed an applicable water quality guideline (e.g., CWQG-FAL and MWQSOG-FAL).
- The parameter was predicted to exceed the corresponding modelled baseline concentration by greater than 20% for the same node, phase, and month.

Due to the conservatism of the Upper-Case sensitivity scenarios (Volume 5, Appendices D and E), only the Expected Case was used to identify POPCs. However, in this assessment, each POPC is presented in the context of the Expected Case (paired with the modeled ‘Expected Baseline’ average baseline) and the Upper Case (paired with the modeled ‘Upper Case Baseline’ 95th percentile baseline) scenarios.

Modelled parameters screened for POPCs included those for which long-term and short-term CWQG-FAL and MWQSOG-FAL or Health Canada (GCDWQ; Health Canada 2020) and MWQSOG (MWS 2011) drinking water guidelines exist. Relative to the short-term guidelines and the drinking water guidelines, the long-term CWQG-FAL and MWQSOG-FAL are generally more stringent (see Table 9-2, Section 9.1.1.1). The exceptions to this rule are the following drinking water guidelines, which are lower (i.e., more stringent) than CWQG-FAL or MWQSOG-FAL or do not have a corresponding aquatic life guideline:

- Total antimony (GCDWQ and MWQSOG; 0.006 mg/L).

- Barium (GCDWQ and MWQSOG = 1.0 mg/L).
- Total cyanide (GCDWQ and MWQSOG = 0.2 mg/L).
- Total lead (CWQG-DW = 0.005 mg/L, which is lower than the hardness-dependent CWQG-FAL of 0.007 mg/L when hardness >180 mg/L as $CaCO_3$).
- Total manganese (GCDWQ = 0.12 mg/L).

Long-term guidelines that are hardness-dependent (see Table 9-2) were calculated using mean monthly observed background values for each assessment node rather than predicted Project-induced hardness. This was a conservative approach because Project-induced increases in hardness would result in higher guideline values. Where a monthly mean hardness value (as mg $CaCO_3$/L) was not available at a given site, the lowest observed monthly mean value at the same site was used as a surrogate hardness value for the missing month.

Observed background pH for each assessment node was used to calculate the pH-dependent guidelines for total aluminum (CWQG-FAL and MWQSOG-FAL), dissolved manganese (CWQG-FAL), dissolved zinc (CWQG-FAL), and ammonia (CWQG-FAL and MWQSOG-FAL). The ammonia guidelines are also temperature-dependent and were calculated by assigning seasonal values for water temperature (5ºC for November to April; 20ºC for May to August; 15ºC for September and October). The assigned temperatures are generally greater than observed seasonal mean temperatures in the aquatic receiving environment at the Gordon and MacLellan LAAs, which results in more conservative (i.e., lower) ammonia guidelines.

The CWQG-FAL for dissolved zinc is dependent on hardness, pH, and dissolved organic carbon (DOC). Like hardness, a lower value for DOC results in a more stringent guideline. Background values for hardness and pH were used as described above, and DOC was conservatively assigned a value of 0.5 mg/L, which is well below the minimum observed value for DOC among all baseline monitoring sites in the RAA (2.66 mg/L).

Evaluated parameters included geochemical species that are commonly associated with metal mining operations, including total and dissolved metals (e.g., aluminum, cadmium, copper), metalloids (e.g., arsenic, selenium, antimony), nutrients (e.g., ammonia, nitrate, nitrite, phosphorus), and major anions (e.g., chloride, sulphate, fluoride). Complete model predictions, summarized by Project phase and month, are provided for both the Expected Case and Upper Case in Volume 5, Appendices D and E.

Additional Water Quality Parameters

Due to modelling limitations for some parameters, Project-related changes in dissolved oxygen (DO), pH, and turbidity (as TSS) were not assessed quantitatively. Changes in water temperature were modelled and assessed in the Fish and Fish Habitat assessment (Chapter 10, Section 10.4.2). Further details for DO, pH, TSS, and water temperature are provided below.

Dissolved Oxygen

Potential changes in DO concentrations in lakes and streams due to the Project were not modelled. However, the Project has the potential to influence DO concentrations in surface waters due to the release of mine effluent and groundwater seepage with lower concentrations of DO than existing concentrations in the receiving environment. Because DO is a critical parameter for fish health, growth, and survival, potential effects associated with potential changes to DO concentrations due to the Project are qualitatively assessed in Chapter 10 (Section 10.4.2).

pH

Potential changes in pH in lakes and streams due to the Project were not modelled. However, the Project has the potential to influence pH in surface waters due to the release of mine effluent and groundwater seepage that has come into contact with a combination of potentially acid generating (PAG) and non-PAG mine rock and/or tailings. According to the MDMER, effluent pH must be within 6.5 - 9.0, and pH is a required parameter for EEM in the receiving environment. Effluent treatment will be implemented to achieve compliance with the MDMER if necessary. Therefore, potential adverse effects to aquatic life due to Project-related changes in pH in the aquatic receiving environment are not expected to occur as mine discharges must be compliant with MDMER limits. In addition to potential effluent treatment, other adaptive management approaches and mitigation measures (see Section 9.4.2.3) will be implemented as necessary to maintain acceptable water quality in the receiving environment. Potential changes in pH due to the storage of PAG and non-PAG materials at each mine site is discussed in Volume 4, Appendix F and Volume 5, Appendices D and E.

Turbidity and Total Suspended Solids

Potential changes in turbidity and TSS concentrations in lakes and streams due to the Project were not modelled. TSS is an MDMER Schedule 4 parameter with an end-of-pipe effluent limit of 15 mg/L. Project discharges subject to MDMER will meet Schedule 4 limits and effluent treatment will be implemented to achieve regulatory compliance if necessary. Because TSS has the potential to affect fish health, growth, and survival, potential changes to TSS concentrations due to Project activities (including construction, when MDMER does not apply) are qualitatively assessed in Chapter 10 (Section 10.4.2).

Water Temperature

In the construction phase, Wendy and East pits will be dewatered into the west basin of Farley Lake. Due to the volume of water in these pits, and the nearly constant temperatures of the water below 10 m deep (i.e., 4°C), discharge of pit water into Farley Lake during construction may alter water temperature in the lake and, depending on the time of year, affect the health, growth, and survival of fish and other aquatic biota upon which fish depend for food. Potential changes to water temperatures in Farley Lake were modelled (Volume 5; Appendix D), and the results are assessed in Chapter 10 (Section 10.4.2).

Surface Water Quality Assessment Nodes

Potential changes in surface water quality were predicted at six lakes in the Gordon LAA (Table 9-24). These nodes included: three sites within the PDA (Gordon Lake, West Farley Lake, East Farley Lake), two sites downstream of the PDA (Swede Lake and Ellystan Lake) and one site in the adjacent watershed that may be potentially affected by changes in groundwater quantity and quality (Susan Lake). The Gordon site water quality sites, which correspond to assessment node locations, are presented in Maps 9-16 and 9-17.

Table 9-24 Gordon Site Assessment Nodes

Assessment Node Name	Corresponding Water Quality Site	Assessment Node Description
Susan Lake	AQF11	Downstream of the PDA and upstream of Hughes Lake
Gordon Lake	AQF2	Adjacent to PDA; will receive discharges from groundwater interceptor wells
West Farley Lake	AQF34	Adjacent to PDA; planned to receive discharge from collection pond and open pit
East Farley Lake	AQF9	Eastern basin of Farley Lake; linked to West Farley Lake via a narrow channel
Swede Lake	AQF15	Downstream of East Farley Lake
Ellystan Lake	AQF20	Downstream of Swede Lake; farthest node downstream of the PDA

Potential changes in surface water quality were predicted at nine sites in the MacLellan LAA (Table 9-25). These nodes included: one site upstream of the PDA (QM02 in the Keewatin River), one site within the PDA (KEE3-B1, a small Keewatin River tributary); and seven sites downstream of the PDA (KEE3-PAY1, a small Keewatin River tributary north of the PDA, QM03 in the Keewatin River immediately downstream of the PDA, QM06 in the Keewatin River downstream of QM03 and KEE3-B1, QM05 in the Keewatin River downstream of QM06 and the confluence with Lynn River, Minton Lake to the East of the PDA, QM10 in the Cockeram River downstream of Minton Lake, and QM08 at the outlet of Cockeram Lake downstream of the QM06 and QM10). For consistency (Volume 5, Appendix E), these assessment nodes were named after hydrometric stations (e.g., QM02, QM03) or subcatchments (KEE3-PAY1 and KEE3-B1) rather than the baseline water quality sites that were used as model source terms (e.g., AQM4, AQM7). The MacLellan site water quality sites corresponding to assessment node locations are presented in Maps 9-18 and 9-19.

Table 9-25 MacLellan Site Assessment Nodes

Assessment Node Name	Corresponding Water Quality Site	Assessment Node Description
QM02	AQM4	Keewatin River upstream of PDA (no anticipated effects here)
KEE3-PAY1	AQM31	Tributary to Keewatin River; downstream of Payne Lake; adjacent to TMF
QM03	AQM7	Keewatin River; First node downstream of collection pond discharge
KEE3-B1	AQM18	Small tributary to Keewatin River; Within PDA; South East of Open Pit
QM06	AQM8	Keewatin River; downstream of QM03, Kee3-B1, and PDA
QM05	AQM29	Keewatin River; downstream of QM06 and confluence with Lynn River
Minton Lake	AQM16	South East of MRSA and TMF
QM10	AQM10	South Cockeram River; downstream of Minton Lake
QM08	AQM11	South Cockeram Lake; downstream of QM10

9.4.2.2 Project Pathways

The Project activities and components that have the potential to affect surface water quality at the Gordon and MacLellan sites during construction, operation, and decommissioning/closure phases are identified in Table 9-10. Atmospheric deposition of fugitive dust to surface water is a Project pathway that has the potential to influence surface water quality. However, this pathway of effect was not modelled or assessed because the mitigation measures to reduce the volume, frequency, and duration of fugitive dust at mines are effective industry-standard methods, including frequent watering of haul and access roads and blast protocols, that are highly likely to prevent material changes in surface water quality in nearby lakes and streams from potential dust deposition from haul roads and blasting in the open pits. These mitigation measures include frequent watering or haul roads and access roads within the PDAs (Chapter 6).

Gordon Site

Without mitigation, the Project activities and components that have the potential to affect surface water quality at the Gordon site are:

- Dewatering of Wendy and East pits during construction.
- Discharge of groundwater pumped from the groundwater interceptor wells installed between the open pit and Gordon Lake and Farley Lake during construction, operation, and decommissioning/closure.
- Discharge of contact water from the collection pond during operation.
- Overflow from the open pit at closure.

Except for groundwater from the groundwater interceptor wells between the open pit and Gordon Lake, the discharges identified above would be directed to West Farley Lake. Water from Gordon Lake will be conveyed to Farley Lake by a new diversion channel built to the north of the existing diversion channel to allow the expansion of the open pit. Surface runoff from the MRSA, the overburden stockpile, and the ore stockpile will be directed to a collection pond, and ultimately West Farley Lake, via a series of sumps and small ponds.

During decommissioning/closure, contact water will be directed to the open pit by decommissioning and/or realigning collection ditches and sumps. The pit is expected to fill in approximately 11 years under average climate and runoff conditions at the Gordon site. Once the open pit is filled, water in the formed pit lake will be allowed to flow into West Farley Lake.

Potential effects on surface water quality in Gordon, Farley, and Susan lakes due to groundwater seepage from the Project MRSA were not assessed because the groundwater travel times to these lakes were predicted to exceed 800 years by the groundwater model (Volume 5, Appendix F).

The water quality model assumes surface runoff from two historical MRSAs on site (i.e., the north and south MRSAs) will continue to run into West Farley Lake in all Project phases. Therefore, the influence of the historical MRSAs on water quality in West Farley Lake is accounted for in model predictions.

A conceptual map of Gordon site Project components and how they interact with surface water quality assessment nodes during operation is presented in Figure 9-2. Conceptual maps for the other mine phases (as well as current conditions) are provided in Volume 5, Appendix D.

MacLellan Site

In the absence of mitigation, the Project activities and components that have the potential to affect surface water quality at the MacLellan site are:

- Discharge of mine effluent from the collection pond to the Keewatin River during construction and operation.
- Groundwater seepage from the TMF to unnamed Keewatin River tributaries draining East Pond (KEE3-B1) and Payne Lake (KEE3-PAY1) and to Minton Lake (mine phases and seepage travel times depend on the model scenario).
- Groundwater seepage from the MRSA to the unnamed Keewatin River tributary draining East Pond (KEE3-B1) and to Minton Lake (mine phases and seepage travel times depend on the model scenario).
- Overflow from the open pit to the unnamed Keewatin River tributary (KEE3-B1) at closure.

During construction, water in the existing underground workings will be pumped to the TMF. This Project activity is not expected to change surface water quality because there is no release of contact water to lakes or streams. During operation, runoff contact water from the MRSA, the processing plant area, and the ore and overburden stockpiles will be diverted to a collection pond. Contact water in the open pit will be pumped to the TMF. Runoff from part of the MRSA will be collected and pumped to the TMF.

During decommission/closure and the first five to six years of active closure, Project infrastructure will be removed, and natural drainage pathways will be established to the extent feasible. The collection pond will be dewatered and decommissioned and contact water ditches and sumps will be removed or realigned to direct contact water to the open pit by gravity (Appendix 23B).

The water quality model for the MacLellan site did not incorporate discharges from the sewage treatment plant because design details had not been finalized. However, the sewage treatment plant will be designed to treat effluent such that it meets federal and provincial effluent quality criteria. The potential for adverse effects in the aquatic receiving environment due to phosphorus nutrient loading from the sewage treatment plant are discussed in Chapter 10.

As described in Section 9.4.2.4, residual effects at the MacLellan site are predicted to occur only in post-closure; therefore, a conceptual map of the MacLellan site is presented for post-closure in Figure 9-3. Note that to capture the influence of the KEE3-PAY1 tributary on Keewatin river water quality, the model assumes that KEE3-PAY1 drains into a reach of Keewatin River represented by the nearest water quality site (upstream site AQM4). Conceptual maps for the other mine phases (as well as current conditions) are provided in Volume 5, Appendix F.

9.4.2.3 Mitigation

The implementation of the mitigation measures and other commitments described in this section will be the responsibility of Alamos and/or contractors. The mechanisms used to require contractors and subcontractors to comply with these measures will include environmental protection plans and contract documents.

Mitigation measures proposed are generally considered to be industry standards and effective for use in similar applications and environmental conditions. This assessment is based on professional judgment of engineers and scientists in consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited where applicable to justify the selection.

Detailed design of the Project and mitigation strategies is currently ongoing. Mitigation measures will be refined in consideration of environmental assessment approval conditions and permit stipulations which will be incorporated into final environmental management planning. The effectiveness of these mitigation measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs including adaptive management procedures will be reviewed by applicable regulatory agencies prior to their implementation.

Project-specific mitigation measures presented to avoid or reduce potential effects on surface water quantity (Section 9.4.1.3) are also used to avoid or reduce potential effects on surface water quality. These measures are not repeated here for brevity. Additional mitigation measures specific to surface water quality at both sites are described below.

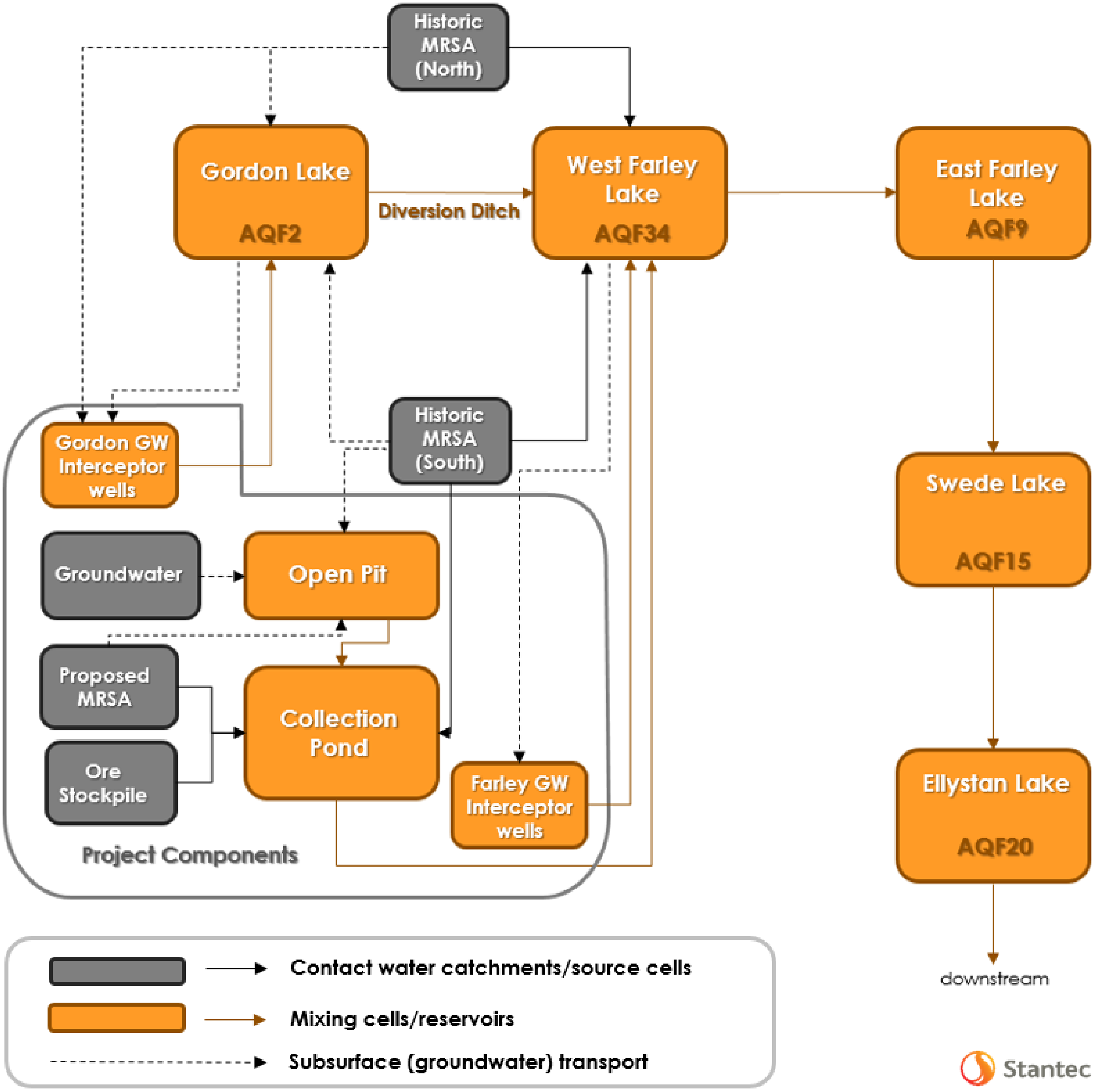

Figure 9-2 Gordon Site Conceptual Map of Surface Water Quality Pathways in Operations

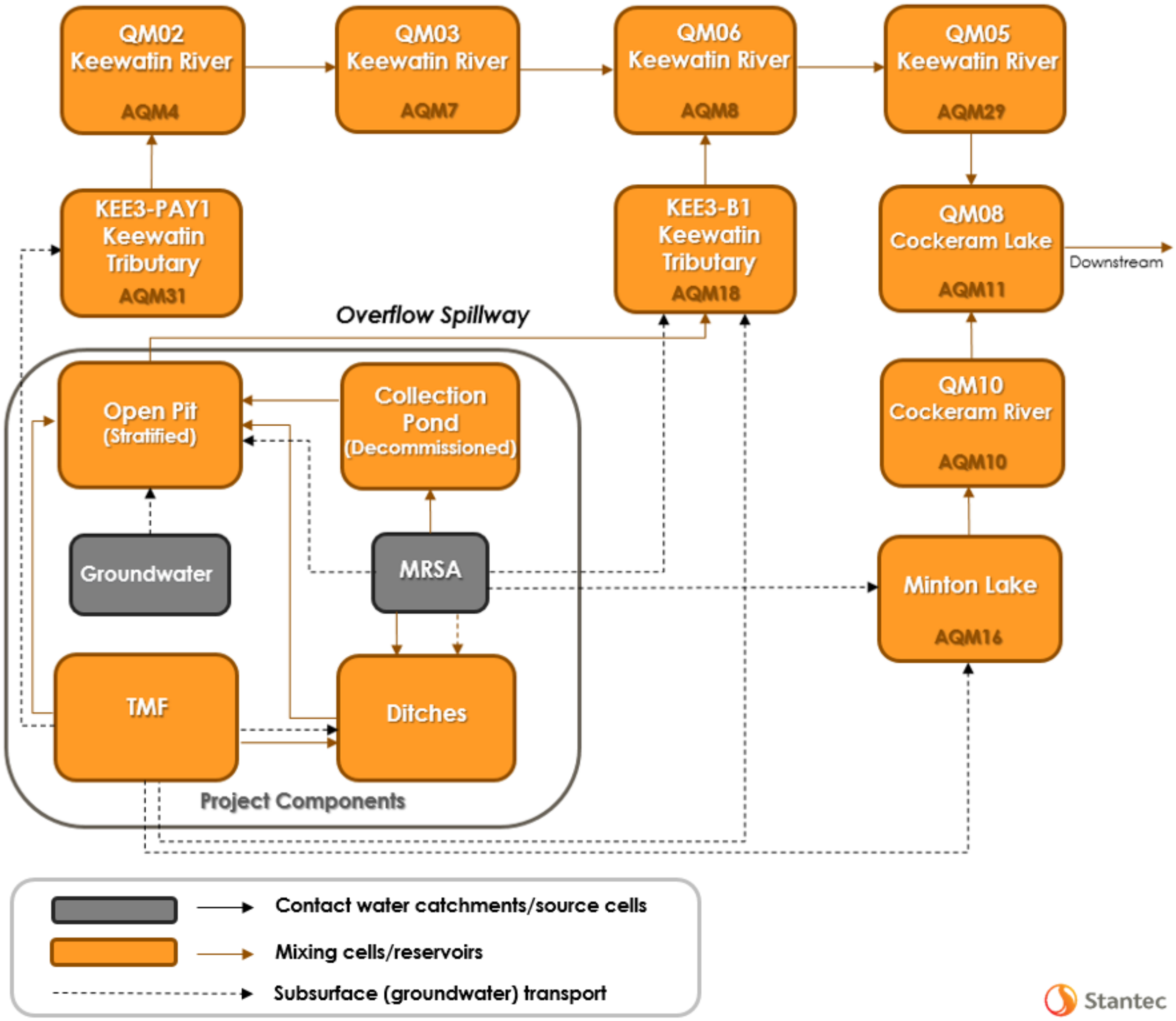

Figure 9-3 MacLellan Site Conceptual Map of Surface Water Quality Pathways in Post-Closure

Gordon Site

Additional mitigation measures to avoid or reduce potential effects to surface water quality, beyond those already described to avoid or reduce potential effects on surface water quantity, at the Gordon site include:

- Design of water management facilities to collect and treat (as required) contact water such that effluent meets applicable federal and provincial regulatory requirements, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER (amended), prior to discharge to the environment.
- Implementing fugitive dust measures such as frequent watering of haul and access roads as outlined in Chapter 6, Section 6.4.1.3.
- Transporting domestic waste to the sewage treatment plant at the MacLellan site.
- Aerating Wendy and East pits to encourage precipitation of elements that form oxides (e.g., iron oxide) and to break down thermal stratification prior to dewatering.
- Aerating groundwater from groundwater interceptor wells to encourage precipitation of elements that form oxides (e.g., iron oxide) and to increase dissolved oxygen concentrations prior to discharge to Gordon and Farley lakes.
- Dust suppression measures for exposed ground areas of the PDA, to reduce atmospheric deposition to surface water (Chapter 6).
- Sediment and erosion control measures during construction to limit the release of TSS and turbidity.
- Expediting re-filling of open pits during decommissioning/closure to reduce exposure of pit walls.
- Treating and handling of building material that is used in water to avoid the release or leaching of substances that would reduce water quality.

MacLellan Site

Additional mitigation measures to avoid or reduce potential effects on surface water quality, beyond those already described to avoid or reduce potential effects on surface water quantity, at the MacLellan site include:

- Design of water management facilities to collect and treat (as required) surplus contact water such that effluent meets applicable federal and provincial regulatory requirements, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER (amended), prior to discharge to the environment.
- Designing the TMF with two cells to allow progressive development during operation to reduce freshwater requirements.
- Operating the TMF as a non-discharging facility during operation through decommissioning/closure.

- Recycling water between the TMF and the processing facility to the maximum extent possible during operations to reduce freshwater make-up requirements.
- Implementing passive treatment options (e.g., controlled pit stratification, fertilizer amendment, flow segregation) in the open pit should monitoring show that pit water quality is not suitable for release to the environment during the anticipated 21 years to fill the open pit with contact water at the conclusion of mine operation.
- Using a closed circuit for cyanide use and cyanide destruction in the processing plant (via Air/SO_2 oxidation and precipitation of metals) to reduce cyanide concentrations in tailings slurry prior to release of the slurry for storage in the TMF (Chapter 2, Section 2.3.2.1).
- Constructing groundwater cut-off ditches to reduce groundwater seepage from the TMF reaching Minton Lake.
- Treating domestic waste in an average 60,000 L/day sewage treatment plant so that it meets "Wastewater Systems Effluent Regulations" under the *Fisheries Act* prior to discharge to the Keewatin River via a pipeline and diffuser.

In addition to these mitigation measures to reduce potential environmental effects, Alamos is also committed to follow-up and monitoring, and adaptive management for both sites as outlined in Chapter 23.

9.4.2.4 Project Residual Effect

Predicted changes to surface water quality due to Project-related activities and components during construction, operation, and decommissioning/closure (active-closure and post-closure) phases at both sites are assessed in the sections below. Graphical representations of Project predictions for each POPC and corresponding assessment node are provided in Appendix 9D. Additional graphical representations of modelled parameters are provided in Volume 5, Appendices D and E.

Gordon Site

Water quality of each potential source of effluent discharge (i.e., fully mixed water in Wendy and East pits during construction, groundwater from interceptor wells and contact water in the collection pond during operation, and pit overflow at the end of closure) to the receiving environment at the Gordon site is predicted to be below the short-term CWQG-FAL and MWQSOG-FAL and below Schedule 4 effluent limits of the MDMER for the Expected Case and Upper Case scenarios (Appendix 9E). For the residual effects assessment, all receiving environment nodes were screened against the most stringent long-term aquatic life guidelines and drinking water quality guidelines to identify POPCs in the aquatic receiving environment.

Surface water quality POPCs identified in the Gordon site LAA are listed in Table 9-26. As described in Section 9.4.2.1, POPCs were identified if Expected Case predictions simultaneously exceed modelled Expected Baseline + 20% and the most stringent water quality guideline. For the Gordon site, fluoride and phosphorus were identified as POPCs. These POPCs are carried forward in the residual effects assessment and are assessed according to the methods described in Section 9.4.2.1. Residual effects are assessed by POPC and predicted mean, and maximum values are summarized for each phase at the assessment nodes associated with the POPC. A detailed summary of monthly model predictions by phase is provided for all assessment nodes and modelled parameters with existing CWQG-FAL and MWQSOG-FAL in Volume 5, Appendix D.

Table 9-26 Identified Parameters of Potential Concern in the Gordon Site Receiving Environment

Parameter of Potential Concern (POPC)	Assessment Nodes Associated with Identification of POPC	Phase Associated with Identification of POPC
Fluoride	Gordon Lake	All phases
	West Farley Lake	All phases
	East Farley Lake	All phases
	Swede Lake	Operation and Decommissioning/Closure
Total Phosphorus	West Farley Lake	Construction

Fluoride

Fluoride occurs in bedrock as fluoride minerals that can naturally leach to surface water from groundwater sources. Fluoride is naturally found as several inorganic forms, including hydrogen fluoride (HF), calcium fluoride (CaF; fluorspar), sodium fluoride (NaF), and sulfur hexafluoride (SF_6). The concentration of fluoride in natural surface waters depends on hydrogeological processes, including the weathering of shales (sedimentary rock) and alkalic/silicic igneous rock. The solubility of inorganic fluorides is inversely correlated with pH (i.e., increasing solubility with decreasing pH) and water hardness (i.e., increasing solubility with decreasing hardness), and is affected by the presence of calcium and aluminum ions, and ion-exchange substrates such as clays and humic acid (CCME 2002). Fluoride has not been observed to bioaccumulate through aquatic food webs, but it can become toxic to aquatic life at elevated concentrations. Although fluoride toxicity is reported to be inversely proportional to water hardness (as $CaCO_3$), the current long-term CWQG-FAL and MWQSOG-FAL for fluoride (0.12 mg/L) are not hardness-dependent due to a lack of supporting toxicological data at the time of guideline development (CCME 2002).

Fluoride was identified as a POPC because fluoride concentrations are predicted to exceed modeled Expected Baseline by more than 20% and the long-term CWQG-FAL (0.12 mg/L) in Gordon Lake, West Farley Lake, East Farley Lake, and Swede Lake (Table 9-27). West Farley Lake is predicted to have the greatest mean and maximum fluoride concentrations among the six assessment nodes in all phases. Time series plots for predicted fluoride concentrations across all phases are presented for the Expected Case and Upper Case at West Farley Lake (Figure 9D-1, Appendix 9D).

During construction (Year -2, Year -1), West Farley Lake will receive discharges from dewatering of the existing Wendy and East pits, whose water currently exceeds the CWQG-FAL for fluoride (Volume 4; Appendix I). West Farley Lake will also receive discharges from the groundwater interceptor wells in the second year of construction. During this time, the mean fluoride concentration in West Farley Lake is predicted to be approximately 0.15 mg/L in the Expected Case, with infrequent maxima of approximately 0.19 mg/L (Table 9-27; Figure 9D-1, Appendix 9D), concentrations that are 1.3 and 1.6 times higher than the CWQG-FAL of 0.12 mg/L.

Table 9-27 Predicted Fluoride Concentrations by Phase at Gordon Site Nodes Associated with Exceedances of Screening Criteria in the Expected Case and Corresponding Upper Case Predictions

Model Scenario	Node	Phase	Number of Years in Phase	Long term CWQG-FAL and MWQSOG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Guideline Exceedance (mg/L)	
Expected Case	Gordon Lake	Construction	2	0.12	0.0603	0.078	0.121	0.153	2.1	1.3	46%
		Operations	6	0.12	0.0603	0.078	0.122	0.152	2.1	1.3	50%
		Active Closure	5-6	0.12	0.0603	0.078	0.122	0.154	2.1	1.3	50%
		Post-Closure	117	0.12	0.0603	0.078	0.0606	0.144	2.0	1.2	1%
	West Farley Lake	Construction	2	0.12	0.0737	0.0898	0.149	0.191	2.5	1.6	92%
		Operations	6	0.12	0.0737	0.0898	0.15	0.183	2.5	1.5	98%
		Active Closure	5-6	0.12	0.0737	0.0898	0.124	0.155	1.8	1.3	50%
		Post-Closure	117	0.12	0.0737	0.0898	0.113	0.150	1.7	1.3	45%
	East Farley Lake	Construction	2	0.12	0.0688	0.1	0.111	0.165	2.1	1.4	29%
		Operations	6	0.12	0.0688	0.1	0.122	0.186	2.1	1.6	47%
		Active Closure	5-6	0.12	0.0688	0.1	0.119	0.165	2.1	1.4	50%
		Post-Closure	117	0.12	0.0688	0.1	0.0796	0.154	1.8	1.3	8%
	Swede Lake	Construction	2	0.12	0.0789	0.0864	0.0955	0.119	-	-	-
		Operations	6	0.12	0.079	0.0864	0.109	0.129	1.5	1.1	25%
		Active Closure	5-6	0.12	0.079	0.0865	0.108	0.131	1.5	1.1	26%
		Post-Closure	117	0.12	0.0791	0.0866	0.0846	0.118	-	-	-

Table 9-27 Predicted Fluoride Concentrations by Phase at Gordon Site Nodes Associated with Exceedances of Screening Criteria in the Expected Case and Corresponding Upper Case Predictions

Model Scenario	Node	Phase	Number of Years in Phase	Long term CWQG-FAL and MWQSOG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Guideline Exceedance (mg/L)	
Upper Case	Gordon Lake	Construction	2	0.12	0.0722	0.0946	0.209	0.268	3.2	2.2	100%
		Operations	6	0.12	0.0722	0.0946	0.213	0.266	3.2	2.2	100%
		Active Closure	5-6	0.12	0.0722	0.0946	0.214	0.268	3.2	2.2	100%
		Post-Closure	117	0.12	0.0722	0.0946	0.0737	0.256	2.9	2.1	1%
	West Farley Lake	Construction	2	0.12	0.0742	0.0869	0.191	0.247	2.9	2.1	96%
		Operations	6	0.12	0.0742	0.0869	0.215	0.25	3.1	2.1	100%
		Active Closure	5-6	0.12	0.0742	0.0869	0.21	0.252	3.0	2.1	100%
		Post-Closure	117	0.12	0.0742	0.0869	0.114	0.246	2.9	2.1	46%
	East Farley Lake	Construction	2	0.12	0.0691	0.0914	0.159	0.258	3.1	2.2	88%
		Operations	6	0.12	0.0691	0.0914	0.18	0.263	3.2	2.2	92%
		Active Closure	5-6	0.12	0.0691	0.0914	0.175	0.265	3.2	2.2	92%
		Post-Closure	117	0.12	0.0691	0.0914	0.0932	0.259	3.1	2.2	16%
	Swede Lake	Construction	2	0.12	0.0751	0.0826	0.115	0.147	1.8	1.2	50%
		Operations	6	0.12	0.0753	0.083	0.143	0.167	2.0	1.4	100%
		Active Closure	5-6	0.12	0.0757	0.0834	0.139	0.167	2.0	1.4	100%
		Post-Closure	117	0.12	0.0758	0.0834	0.0847	0.153	1.9	1.3	1%

Notes:
CWQG-FAL = Canadian Water Quality Guideline - Freshwater Aquatic Life
Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded (1) baseline + 20% and (2) the applicable guideline by any amount.
"-" = not applicable; values not provided for phases not associated with the identification of the POPC

Gordon Lake, which will receive discharges from groundwater interceptor wells in the second year of construction, and East Farley Lake, immediately downstream of West Farley Lake, are also predicted to have elevated fluoride concentrations during construction for the Expected Case, but not as great or as frequent as those in West Farley Lake. Fluoride was not identified as a POPC in Swede Lake or Ellystan Lake in the construction phase.

During operation, West Farley Lake will continue to receive discharges from the groundwater interceptor wells and will also receive contact water effluent from the collection pond. Mean fluoride concentration in West Farley Lake is predicted to be approximately 0.15 mg/L for the Expected Case, with infrequent maxima of approximately 0.18 mg/L (Table 9-27; Figure 9D-1, Appendix 9D). Gordon Lake, which will receive discharges from groundwater interceptor wells during operations, and East Farley Lake, immediately downstream of West Farley Lake, and Swede Lake, downstream of Farley Lake, are also predicted to have elevated fluoride concentrations during operations, but again, not as high or as frequent as in West Farley Lake. Fluoride was not identified as a POPC in Ellystan Lake, farthest downstream lake within the LAA, during operations (Table 9-27).

During decommissioning/closure (active closure; Years 6 to 11), West Farley Lake will no longer receive contact water effluent from the collection pond as this water will be diverted to the open pit. However, West Farley lake will continue to receive discharge from the groundwater interceptor wells until the end of Year 11. The mean fluoride concentration in West Farley Lake during closure is predicted to be approximately the same as the CWQG-FAL of 0.12 mg/L for the Expected Case, with maximum values reaching approximately 0.16 mg/L (Table 9-27; Figure 9D-1, Appendix 9D).

Gordon Lake (which will continue to receive discharges from groundwater interceptor wells), East Farley Lake, and Swede Lake are also predicted to have elevated fluoride concentrations above the CWQG-FAL during decommissioning/closure in the Expected Case. However, fluoride was not identified as a POPC in Ellystan Lake, the farthest downstream lake within the LAA (Table 9-27).

West Farley Lake will not receive mine discharges until the open pit begins to overflow in approximately Year 24. Before the open pit begins to overflow, fluoride concentrations in West Farley Lake are expected to substantially decrease relative to the previous phases, with an overall mean fluoride concentration in post-closure of approximately 0.11 mg/L, and annual maxima not exceeding 0.15 mg/L following open pit overflow (Table 9-27; Figure 9D-1, Appendix 9D). Gordon Lake, East Farley Lake, and Swede Lake are also predicted to have elevated fluoride concentrations in the Expected Case. However, fluoride was not identified as a POPC in Ellystan Lake, the furthest downstream lake within the LAA (Table 9-27).

Expected and Upper-Case Maxima

The maximum fluoride concentrations in the Gordon site LAA are predicted to be:

- Expected Case: 0.19 mg/L in West Farley Lake during the construction phase, which is approximately 1.6 times the long-term CWQG-FAL and MWQSOG-FAL of 0.12 mg/L and 2.5 times Expected Baseline fluoride concentration (Table 9-27; Figure 9D-1, Appendix 9D).
- Upper Case: 2.7 mg/L in Gordon Lake during construction, operation, and decommissioning/closure phases, which is approximately 2.2 times higher than the long-term CWQG-FAL and MWQSOG-FAL

of 0.12 mg/L and 3.2 times higher than the Expected Upper Baseline fluoride concentrations (Table 9-27; Figure 9D-1, Appendix 9D).

Seasonal Trends for Fluoride

Predicted seasonal trends in fluoride concentrations in West Farley Lake, Gordon Lake, and Swede Lake differ by mine phase and modelling scenario (Figure 9D-2, Appendix 9D). Seasonal increases of fluoride in the lakes are predicted to occur during the winter (November to April) due to reduced flows and dilution capacity. Higher flows during the spring freshet are predicted to decrease fluoride concentrations throughout the open water season between May and October. In post-closure, mean monthly fluoride concentrations are lower than the earlier phases because the groundwater interceptor wells (a major source of fluoride) are no longer operating.

Observed Existing Concentrations

Between May 2017 and October 2018, the range of observed background fluoride concentrations in Gordon, West Farley, East Farley, and Swede lakes (i.e., nodes where modelled fluoride was identified as a POPC in the Expected Case) were as follows:

- Gordon Lake (AQF2): 0.045 to 0.073 mg/L (mean = 0.057 mg/L; n = 7).
- West Farley Lake (AQF34): 0.05 to 0.076 mg/L (mean = 0.067 mg/L; n = 7).
- East Farley Lake (AQF9): 0.04 to 0.081 mg/L (mean = 0.066; n = 7).
- Swede Lake (AQF15): 0.06 to 0.080 mg/L (mean = 0.072; n = 7).

Existing fluoride concentrations were also observed to frequently exceed the CWQG-FAL and MWQSOG-FAL of 0.12 mg/L in the Wendy and East pits at depths below 10 m. Maximum predicted fluoride concentrations in Gordon, West Farley, East Farley, and Swede lakes for the Expected Case are predicted to exceed the range of observed existing fluoride concentrations in these lakes. Further details pertaining to observed existing conditions can be found in Volume 4, Appendix I.

Summary of Project Residual Effects Due to Fluoride

For the Gordon site, Project residual effects associated with the identification of fluoride as a POPC are predicted to be limited to the LAA, specifically Gordon, West Farley, East Farley, and Swede lakes, and will not extend as far downstream as Ellystan Lake. These Project residual effects are predicted to occur with a regular seasonal frequency (i.e., winter highs and summer lows) in all Project phases. Therefore, the duration of the effect is medium-term for the construction and operation phases and long-term for the decommissioning/closure phase because fluoride concentrations remain elevated into post-closure. Fluoride is predicted to exceed modelled Expected Baseline by >20% and the applicable water quality guidelines, with a maximum guideline exceedance of 1.6 times the long-term CWQG-FAL and MWQSOG-FAL of 0.12 mg/L. The magnitude of this residual effect is characterized as moderate as it is unlikely to have an adverse effect on aquatic biota in the receiving environment. The potential for adverse effects to aquatic life resulting from project-induced changes of fluoride concentrations is discussed in the Fish and Fish Habitat assessment (Chapter 10).

Phosphorus

Phosphorus naturally occurs in mineral forms such as apatite (i.e., tri-calcium phosphate) and is found in most rock and soils. Phosphorus adsorbs to soil particles, and commonly enters freshwater environments via seepage or surface runoff from watershed soils. In surface waters, sediment acts as a phosphorus sink; phosphorus is strongly absorbed in bottom sediment as iron, aluminum, and calcium phosphates, and adsorbed onto iron and aluminum oxides and hydroxides. Most total phosphorus in natural aquatic environments is composed of particulate phosphorus (i.e., phosphorus bound to, or a component of, particulate matter; Boyd 2015). However, concentrations of total phosphorus in some waterbodies may overestimate the availability for uptake by aquatic organisms because bioavailable dissolved inorganic phosphorus (e.g., in the form of the orthophosphate ion PO_4^{3-}) is often a relatively small fraction of total phosphorus (Boyd 2015). As an essential nutrient, phosphorus plays a key role in the trophic status (e.g., oligotrophic or nutrient poor vs. eutrophic or nutrient rich) of aquatic systems.

The CWQG-FAL for phosphorus follows a ‘framework-based approach’ (CCME 2004) that incorporates trigger ranges for the trophic status of lakes and rivers, and the degree to which total phosphorus increases relative to background concentrations. Further assessment is recommended in the CWQG-FAL if there is an increase above the trigger range, or if phosphorus concentrations are above 50% of background. In contrast, the MWQSOG-FAL guidance states that total phosphorus concentrations should not exceed 0.025 mg/L in “*any reservoir, lake, pond, or in a tributary at the point where it enters such bodies of water*”.

Phosphorus was identified as a POPC because phosphorus concentrations are predicted to exceed the long-term MWQSOG-FAL and the modeled Expected Baseline by more than 20% in West Farley Lake during the construction phase in the Expected Case scenario (Table 9-28). Time series plots for predicted phosphorus concentrations across all phases are presented for the Expected Case and Upper Case in West Farley Lake (Figure 9D-3, Appendix 9D).

During construction, West Farley Lake will receive discharges from dewatering of the existing Wendy and East pits. Phosphorus concentrations in the existing pits currently exceed the MWQSOG-FAL of 0.025 mg/L (Volume 4; Appendix I). West Farley Lake will also receive discharges from the groundwater interceptor wells in the second year of construction and groundwater in these wells will contribute to elevated phosphorus concentrations in West Farley Lake due to relatively high phosphorus concentrations in groundwater relative to background phosphorus concentrations in West Farley Lake (Volume 5, Appendix D). During construction, the mean phosphorus concentration in West Farley Lake is predicted to be approximately 0.021 mg/L in the Expected Case, with a single month higher than the MWQSOG-FAL (predicted value of 0.027 mg/L vs. the MWQSOG-FAL of 0.012 mg/L).

Table 9-28 Predicted Phosphorus Concentrations by Phase at Gordon Site Nodes Associated with Exceedances of Screening Criteria in the Expected Case and Corresponding Upper Case Predictions

Model Scenario	Node	Phase	Number of Years in Phase	Long-term MSOG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months In Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Exceedance of Long-term CWQG-FAL	
Expected Case	West Farley Lake	Construction	2	0.025	0.0214	0.0232	0.0213	0.0266	1.2	1.1	13%
		Operations	6	0.025	0.0214	0.0232	0.0194	0.0223	-	-	-
		Active Closure	5-6	0.025	0.0214	0.0232	0.0172	0.0193	-	-	-
		Post-Closure	117	0.025	0.0214	0.0232	0.0237	0.0254	-	-	-
Upper Case	West Farley Lake	Construction	2	0.025	0.0213	0.0246	0.0523	0.0918	4.4	3.7	71%
		Operations	6	0.025	0.0213	0.0246	0.0548	0.0896	4.2	3.6	77%
		Active Closure	5-6	0.025	0.0213	0.0246	0.0541	0.0851	4.4	3.4	79%
		Post-Closure	117	0.025	0.0213	0.0246	0.0232	0.0768	3.5	3.1	13%

Notes:

MSOG-FAL = Manitoba Standards, Objectives, and Guidelines - Freshwater Aquatic Life

Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded (1) baseline + 20% and (2) the applicable guideline by any amount.

"-" = not applicable; metrics not provided for phases not associated with the identification of the POPC

During operation, West Farley Lake will continue to receive discharges from the groundwater interceptor wells but will also receive contact water discharged from the collection pond. Due to the geochemistry of the mined rock from the open pit, phosphorus in the collection pond is predicted to be less concentrated than in discharges from the groundwater interceptor wells and less concentrated than in West Farley Lake (Volume 5; Appendix D). For this reason, West Farley Lake is predicted to have lower phosphorus concentrations during operations than during construction, and lower concentrations than modelled baseline. During operation, the mean phosphorus concentration in West Farley Lake is predicted to be approximately 0.019 mg/L for the Expected Case, with the maximum concentration (0.022 mg/L) not exceeding the MWQSOG-FAL.

During decommissioning/closure (active closure; Years 6 to 11), West Farley Lake will no longer receive contact water effluent from the collection pond as this water will be diverted to the open pit. However, the lake will continue to receive discharge from the groundwater interceptor wells until the end of Year 11. The mean phosphorus concentration in West Farley Lake during closure is predicted to be approximately 0.17 mg/L for the Expected Case, with the maximum concentration (0.019 mg/L) not exceeding the MWQSOG-FAL. During this period, phosphorus is predicted to be lower than modelled baseline.

In post-closure (i.e., Year 12 onward), West Farley Lake will not receive project-related discharges until the open pit begins to overflow in approximately Year 24. Prior to overflow, phosphorus concentrations in West Farley Lake are predicted to increase slightly compared to operations due to the absence of the more diluted phosphorus inputs from the collection pond and from elevated phosphorus inflows from Gordon Lake via the diversion channel. The overall mean phosphorus concentration in post-closure is predicted to be approximately 0.024 mg/L, with annual maxima (0.025 to 0.026 mg/L) marginally exceeding the MWQSOG-FAL following open pit overflow. In the Expected Case, phosphorus in West Farley Lake is predicted to be greater than baseline (but below baseline + 20%), and below the MWQSOG-FAL of 0.025 mg/L for 10 months of the year. Each February and May in post-closure, phosphorus is predicted to marginally exceed the MWQSOG-FAL by no more than 1.02 times (maximum concentrations are predicted to be below 0.026 mg/L).

Expected and Upper-Case Maxima

The maximum phosphorus concentrations in the Gordon site LAA are predicted to be:

- Expected Case: 0.027 mg/L in West Farley Lake for a single month during construction, which is approximately 1.1 times higher than the long-term CWQG-FAL (0.025 mg/L) and 1.2 times higher than the Expected Baseline phosphorus concentration (Table 9-28; Figure 9D-3, Appendix 9D).
- Upper Case: 0.092 mg/L in West Farley Lake during construction, operation, and closure phases, which is approximately 3.7 times higher than the long-term CWQG-FAL (0.025 mg/L) and 4.4 times higher than the Upper Baseline phosphorus concentrations during these phases (Table 9-28; Figure 9D-3, Appendix 9D).

Seasonal Trends for Phosphorus

To provide estimated seasonal trends at three different lakes within the Gordon site LAA, monthly mean concentrations in West Farley Lake, Gordon Lake, and Swede Lake are provided for operation and decommissioning/closure (active closure and post-closure) in Figure 9D-4 (Appendix 9D).

Predicted seasonal trends in Gordon, West Farley, and Swede lakes differ by mine phase and modelling scenario. For the Expected Case, seasonal trends during all Project phases in these three lakes reasonably correspond to modelled baseline seasonal trends. However, during construction and operation, the influence of the Project on phosphorus concentrations in Gordon and West Farley lakes can be seen in the lower predicted phosphorus concentrations in winter due to dilution from lower phosphorus content groundwater from the interceptor wells. In post-closure, the Project influence on phosphorus concentrations in these lakes decreases and phosphorus concentrations return to near modeled baseline concentrations once the groundwater interceptor wells are turned off.

For the Upper Case, there is uncertainty in predicted seasonal trends due to model assumptions regarding the seasonal distribution of percent phosphorous removal at each assessment node. The removal fractions are based on the 95th percentile of seasonal surface water concentrations in existing conditions (2015 to 2018), and indirectly represent the percent of mass loading lost from surface water due to sedimentation and uptake in aquatic biota such as algae (Volume 5, Appendix D). When mass loadings from the Project are increased in the Upper Case (elevated leaching rates in mine materials and 95th percentile concentrations for groundwater discharges), the uncertainty of the assumed seasonal removal fractions for phosphorus is amplified. Due to the amplified uncertainty of seasonal removal fractions in the Upper Case, the Upper-Case seasonal trends are not discussed in detail. Annual changes in phosphorus concentrations (when averaged across seasons) reduce the uncertainty associated with seasonal removal fractions and can be used to estimate long-term Project-related changes in phosphorus concentrations.

Observed Existing Concentrations

Between May 2017 and October 2018, the range of observed existing phosphorus concentrations in West Farley Lake (i.e., the only lake within the Gordon LAA where Expected Case phosphorus concentrations were identified as a POPC) was 0.014 to 0.038 mg/L with a mean concentration of 0.026 mg/L (n = 7). As part of existing conditions on site, phosphorus concentrations also exceeded the MWQSOG-FAL within Wendy and East pits (Section 9.2.2.2).

Based on the observed existing phosphorus concentrations, the maximum Project-related concentrations in West Farley Lake for the Expected Case are predicted to be slightly above the range of existing concentrations which frequently exceed the MWQSOG-FAL. Further details pertaining to observed existing conditions can be found in Volume 4, Appendix I.

Summary of Project Residual Effects Due to Phosphorus

For the Gordon site, Project residual effects associated with the identification of phosphorus as a POPC are predicted to be limited to the LAA and only in West Farley Lake. This residual effect is predicted to occur in only a single month during construction (April, Year -2) and is therefore considered to be of short-term duration. Phosphorus is predicted to exceed modelled Expected Baseline by >20% and the applicable water quality guideline, with a maximum guideline exceedance of 1.1 times the long-term MWQSOG-FAL of 0.025 mg/L. The magnitude of this residual effect is characterized as moderate as it is unlikely to have an adverse effect on aquatic biota in the receiving environment and is of short duration and occurs once. The potential for adverse effects to aquatic life in West Farley Lake resulting from the predicted project-induced changes of phosphorus concentrations is discussed in the Fish and Fish Habitat assessment (Chapter 10).

MacLellan Site

Water quality of each potential source of discharge to the receiving environmental at the MacLellan site (i.e., collection pond effluent to the Keewatin River during construction and operations, groundwater seepage from the TMF to unnamed Keewatin River tributaries draining East Pond (KEE3-B1) and Payne Lake (KEE3-PAY1) and Minton Lake, groundwater seepage from the MRSA to KEE3-B1 and Minton Lake, and overflow from the open pit to KEE3-B1 in post-closure) is predicted to be below the short-term CWQG-FAL and MWQSOG-FAL and below Schedule 4 effluent limits of the MDMER for the Expected Case (Appendix 9E). In the Upper-Case scenario, only ammonia exceeds the short-term MWQSOG-FAL for total ammonia (as N) and the MDMER effluent limit for unionized ammonia (0.5 mg/L) in the collection pond during operation. Project discharges subject to MDMER are required to meet Schedule 4 limits and effluent treatment will be implemented to achieve regulatory compliance if necessary (as described in Appendix 9E, effluent quality is predicted to remain below MDMER limits in the Expected Case). For the residual effect assessment, the modelled receiving environment nodes (regardless of proximity to discharge points) were screened against the most stringent long-term aquatic life guidelines to identify POPCs in the aquatic receiving environment.

Surface water quality POPCs identified in the MacLellan site LAA are listed in Table 9-29. All POPCs occur in the decommissioning/closure (specifically post-closure) phase. These POPCs, during this phase, are carried forward in the residual effects assessment and assessed according to the methods described in Section 9.4.2.1. Residual effects are assessed by POPC and predicted mean and maximum values are summarized for each phase at the assessment nodes associated with the POPC. A detailed summary of monthly model predictions by phase is provided for all assessment nodes and modelled parameters with existing CWQG-FAL and MWQSOG-FAL in Volume 5, Appendix E.

Table 9-29 Identified Parameters of Potential Concern in the MacLellan Site Receiving Environment in the Expected Case

Parameter of Potential Concern (POPC)	Assessment Node Associated with Identification of POPC	Phase Associated with Identification of POPC
Total Aluminum	KEE3-B1, Keewatin River (QM06)	Post-Closure
Total Arsenic	KEE3-B1	Post-Closure
Total Cadmium	Minton Lake, KEE3-B1	Post-Closure
Dissolved Cadmium	KEE3-B1	Post-Closure
Total Copper	KEE3-B1	Post-Closure
Fluoride	KEE3-B1	Post-Closure

KEE3-B1 is a small fish-bearing tributary to the Keewatin River located within the PDA. This stream currently drains East Pond to the Keewatin River. East Pond is predicted to be passively dewatered during mine operations due to development of the open pit and flows in KEE3-B1 are predicted to decline as a result of loss of outflow from East Pond.

Project-related changes to water quality at KEE3-B1 are associated with groundwater seepage from the MRSA and TMF, as well as post-closure overflow from the open pit. In the Expected Case, groundwater seepage from the MRSA and TMF only reaches KEE3-B1 in post-closure. In contrast, groundwater seepage from the MRSA and TMF reaches KEE3-B1 in the operation phase for the Upper Case (Volume 5, Appendix E).

For the first 15 years of post-closure (Year 20 to Year 34), groundwater seepage from the MRSA dominates water quality in KEE3-B1. After the open pit/pit lake begins to overflow in approximately Year 34, water quality at KEE3-B1 is influenced more by open pit overflow than by groundwater seepage from the MRSA.

Downstream of the mouth of KEE3-B1, predicted changes in water quality in the Keewatin River (QM06) are generally lower than in KEE3-B1 due to the much larger volume and assimilative capacity of the Keewatin River.

Minton Lake is a fish-bearing waterbody within the PDA located southeast of the proposed MRSA and TMF. Predicted changes to water quality in Minton Lake are associated with groundwater seepage from the MRSA and TMF. In the Expected Case, groundwater seepage does not daylight in Minton Lake until well into post-closure (Year 71). In the Upper Case, accelerated groundwater seepage reaches Minton Lake as soon as the operation phase.

Total Aluminum

Aluminum is one of the most abundant elements in the Earth's crust and is typically detected as a trace element in surface waters. Aluminum can enter surface water through natural processes such as weathering of rocks (e.g., as a major component of silt), but also through anthropogenic activity such as mining (US EPA 2018). The chemistry and fate of aluminum in surface water is complex due to various factors that influence its solubility, which in turn affect its bioavailability to aquatic organisms. These factors include pH (aluminum is an amphoteric substance that becomes more soluble in water as the pH is decreased), specific ions (e.g., chloride, fluoride, nitrate, phosphate, and sulfate) that can form soluble complexes with aluminum, fulvic and humic acids, which can form strong complexes with aluminum, and hydroxide ions, which complex with aluminum to form both soluble and insoluble polymers (e.g., gibbsite; US EPA 2018). Due to the well-known effect of pH on the solubility and bioavailability of aluminum, the long-term CWQG-FAL and MWQSOG-FAL for total aluminum (which share the same guideline value) is pH-dependent (0.1 mg/L when pH is ≥6.5; 0.005 mg/L when pH is <6.5).

Total aluminum is not predicted to exceed the federal or provincial long-term water quality guidelines at the nine assessment nodes during construction, operation, and decommissioning/closure. However, total aluminum was identified as a POPC because Expected Case concentrations are predicted to exceed both the pH-dependent long-term CWQG-FAL and MWQSOG-FAL and the modeled Expected Baseline by more than 20% in the Keewatin River tributary (KEE3-B1) and in the Keewatin River (QM06) downstream of the

MacLellan site in post-closure. Time series plots for predicted aluminum concentrations across all phases are presented for the Expected Case and Upper Case for KEE3-B1 (Figure 9D-5; Appendix 9D) and QM06 (Figure 9D-6; Appendix 9D).

For the first 15 years of post-closure, maximum annual aluminum concentrations in KEE3-B1 for the Expected Case are predicted to be approximately 0.05 mg/L, which is lower than the pH-dependent CWQG-FAL and MWQSOG-FAL of 0.1 mg/L. Within ten years of the start of overflow from the open pit, aluminum concentrations in KEE3-B1 are predicted to substantially increase and then stabilize, with annual Expected Case concentrations ranging between approximately 0.13 and 0.20 mg/L (and exceed the CWQG-FAL and MWQSOG-FAL by 1.3 and 2.0 times, respectively).

Total aluminum concentrations in the Keewatin River downstream of the MacLellan site (QM06) are predicted to reach annual maxima of 0.04 mg/L during the first 10 years of post-closure and increase to just under 0.05 mg/L after the open pit discharges to KEE3-B1. This is approximately 1.25 times higher than the modeled annual maximum baseline total aluminum concentrations of 0.04 mg/L, but still below observed maximum background concentrations of aluminum at QM06 (discussed below).

Expected Case Maxima

For the Expected Case, maximum total aluminum concentrations in the Keewatin River tributary (KEE3-B1) and in the Keewatin River downstream of the MacLellan site (QM06) during post-closure are:

- 0.20 mg/L in KEE3-B1, which is two times the long-term CWQG-FAL and MWQSOG-FAL (0.1 mg/L) and 29 times Expected Baseline in post-closure (Table 9-30; Figure 9D-1, Appendix 9D).
- 0.05 mg/L at QM06, which does not exceed the long-term CWQG-FAL and MWQSOG-FAL of 0.1 mg/L when pH ≥6.5. In post-closure, seasonal maxima generally occur in May. However, in January, the CWQG-FAL and MWQSOG-FAL decreases to 0.005 mg/L when the mean observed pH in the Keewatin River is 6.4 (just slightly lower than the pH value triggering a higher total aluminum guideline value). The predicted maximum total aluminum concentration in the Keewatin River at QM06 in January is 0.016 mg/L, which is approximately three times the long-term CWQG-FAL and MWQSOG-FAL (0.005 mg/L when pH <6.5) and is approximately 1.2 times Expected Baseline in post-closure (Table 9-30; Figure 9D-2, Appendix 9D).

Upper Case Maxima

For the Upper Case, maximum total aluminum concentrations in the Keewatin River tributary (KEE3-B1) and in the Keewatin River downstream of the MacLellan site (QM06) during post-closure are:

- 0.20 mg/L in KEE3-B1, which is over two times the long-term CWQG-FAL and MWQSOG-FAL of 0.1 mg/L when pH ≥ 6.5 and 21 times modelled Upper Baseline in post-closure. The maximum value occurs in April and repeats annually from approximately Year 42 onward. Upper Case maximum values are equivalent to Expected Case maximum values due to a solubility constraint of 0.2 mg/L applied in the model (Volume 5; Appendix E).

Table 9-30 Predicted Aluminum Concentrations by Phase at the MacLellan Site Nodes (KEE3-B1 and QM06) Associated with Exceedances of Screening Criteria in the Expected Case and Corresponding Upper Case Predictions

Scenario	Node	Phase	Number of Years in Phase	Long-term CWQG-FAL and MWQSOG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Exceedance of Long-term CWQG-FAL and MWQSOG-FAL	
Expected Case	KEE3-B1	Construction	2	0.1	0.0115	0.0115	0.015	0.015	-	-	-
		Operations	13	0.1	0.0115	0.0115	0.015	0.015	-	-	-
		Active Closure	5-6	0.1	0.0115	0.0115	0.015	0.015	-	-	-
		Post-Closure	109	0.1	0.0115	0.152	0.015	0.2	28.6	2	84%
	QM06	Construction	2	0.005 - 0.1	0.023	0.0258	0.0366	0.0446	-	-	-
		Operations	13	0.005 - 0.1	0.023	0.0265	0.0366	0.0456	-	-	-
		Active Closure	5-6	0.005 - 0.1	0.023	0.0236	0.0366	0.0415	-	-	-
		Post-Closure	109	0.005 - 0.1	0.023	0.0284	0.0366	0.0488	1.2	3.2	8%
Upper Case	KEE3-B1	Construction	2	0.1	0.0166	0.0166	0.022	0.022	-	-	-
		Operations	13	0.1	0.0166	0.0417	0.022	0.141	6.4	1.4	7%
		Active Closure	5-6	0.1	0.0166	0.051	0.022	0.163	7.4	1.6	8%
		Post-Closure	109	0.1	0.0166	0.163	0.022	0.202	21.2	2	88%
	QM06	Construction	2	0.005 - 0.1	0.0293	0.0332	0.0476	0.0572	-	-	-
		Operations	13	0.005 - 0.1	0.0293	0.038	0.0476	0.0614	1.2	4	8%
		Active Closure	5-6	0.005 - 0.1	0.0293	0.0301	0.0476	0.0523	-	-	-
		Post-Closure	109	0.005 - 0.1	0.0293	0.0349	0.0476	0.0587	1.2	4	8%

Notes: CWQG-FAL = Canadian Water Quality Guideline - Freshwater Aquatic Life; MWQSOG-FAL = Manitoba Standards, Objectives, and Guidelines - Freshwater Aquatic Life

The CWQG-FAL and MWQSOG-FAL are the same for total aluminum. The guideline is pH-dependent (0.005 mg/L when pH is equal to or below 6.5, and 0.1 mg/L when pH is above 6.5). There is no short-term guideline.

Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded (1) baseline + 20% and (2) the applicable guideline by any amount.

- 0.06 mg/L at QM06, which does not exceedance the long-term CWQG-FAL and MWQSOG-FAL of 0.1 mg/L when pH ≥ 6.5 but does exceed the long-term CWQG-FAL and MWQSOG-FAL of 0.005 mg/L in January (0.02 mg/L) when pH in the Keewatin River is 6.4. These annual maximum total aluminum concentrations are four times higher than the CWQG-FAL and MWQSOG-FAL and approximately 1.2 times higher than the Upper Baseline concentrations in January.

Seasonal Trends for Aluminum

Predicted seasonal trends in total aluminum in KEE3-B1 differ by mine phase and modelling scenario. Seasonal trends in predicted total aluminum concentrations in KEE3-B1, QM06, and Cockeram Lake are provided for the operation and decommissioning/closure (active closure and post-closure) phases in Figure 9D-7 (Appendix 9D).

In the Expected Case, marginal seasonal increases of total aluminum during the winter (November to April) at KEE3-B1 are due to reduced flows and dilution capacity in the tributary; these changes are indiscernible in Figure 9D-7 due to scaling of the Y axis to fit the Upper Case predictions. The spring freshet results in higher flows and a dip in seasonal aluminum concentrations as shown in the construction, operation, and decommissioning/closure phases in Figure 9D-7 (Appendix 9D). In post-closure, mean monthly concentrations at KEE3-B1 are higher than the earlier phases (due to the influence of discharges from the open pit), but generally follow the same seasonal trend (i.e., annual maxima occur between November and April).

In the Upper Case, seasonal aluminum spikes are predicted to occur in April during the operation and decommissioning/closure phases. These April spikes are the result of groundwater seepage from the MRSA and TMF discharging to KEE3-B1 in April followed by dilution in May from snowmelt. In post-closure, the April groundwater spikes are less pronounced relative to other months because of dilution of groundwater from the open pit overflow that begins to dominate water quality in KEE3-B1.

Observed Existing Concentrations

Between May 2017 and October 2018, the range of observed existing total aluminum concentrations in KEE3-B1 was 0.04 mg/L to 0.022 mg/L with a mean concentration of 0.019 mg/L (n = 7). The range of observed existing total aluminum concentrations in the Keewatin River downstream of the MacLellan site (QM06) were 0.018 mg/L to 0.062 mg/L with a mean of 0.039 mg/L (n=7). Observed total aluminum concentrations were observed to occasionally exceed the pH-dependent CWQG-FAL and MWQSOG-FAL in the Keewatin River but not in KEE3-B1.

Based on the observed existing total aluminum concentrations in KEE3-B1 and in the Keewatin River (QM06), maximum project-related Expected Case total aluminum concentrations are predicted to fall within the range of existing background total aluminum concentrations at both locations. While total aluminum is not predicted to exceed maximum concentrations observed in existing conditions, it was screened in as a POPC because predictions exceeded modelled Expected Baseline +20% and guidelines (modelled baseline aluminum concentrations are calibrated from, but less variable than, observed existing concentrations). Further details pertaining to observed existing conditions can be found in Volume 4, Appendix I).

Summary of Project Residual Effects Due to Aluminum

Project residual effects associated with the identification of aluminum as a POPC are predicted to be limited to the LAA, and only at the unnamed Keewatin River tributary in the PDA (KEE3-B1) and at the nearest downstream node in Keewatin River (QM06). These Project residual effects (relative to modelled baseline) are expected to begin only in post-closure once the open pit starts overflowing in Year 34. Effects are predicted to occur in all months except May in KEE3-B1, or only in January in the Keewatin River (QM06). These effects are characterized as long-term due to spanning multiple years in post-closure. Aluminum is predicted to exceed modelled Expected Baseline +20%, with Expected Case maxima exceeding the water quality guidelines by up to 29 times at KEE3-B1 and by up to three times at QM06. However, predicted maxima are not greater than maximum observed existing concentrations and are not expected to result in adverse population-level effects to aquatic biota in the receiving environment. For these reasons, residual effects associated with aluminum are characterized as low in magnitude. The potential for adverse effects to aquatic life resulting from project-induced increases of total aluminum is discussed in the Fish and Fish Habitat assessment (Chapter 10).

Total Arsenic

Arsenic is a metalloid (i.e., an element which has both metal and non-metal properties) and forms minerals such as arsenopyrite (AsFeS), realgar (AsS), and orpiment (As_2S_3). Through weathering, arsenic can be released from minerals to form arsenite (AsO_3^{3-}) or arsenate (AsO_4^{3-}). Under natural conditions, total arsenic in surface water is generally present in low concentrations because it is not found in high concentrations in most soils or sediments, and its mineral forms are not very soluble (Boyd 2015). The distribution and fate of arsenic in the environment is dependent on redox conditions, pH, ion availability, sorption-desorption, dissolution, and biological activity (Panagiotaras 2015). Arsenic has not been observed to bioaccumulate in aquatic food webs, and its bioavailability to aquatic organisms has been reported to be attenuated by phosphorus because arsenic competes with phosphorus at biological binding sites (Reuther 1992). Despite the attenuation of arsenic uptake by phosphorus, the long-term CWQG-FAL for arsenic (0.005 mg/L) does not account for this relationship (i.e., it is not phosphorus-dependent).

For the Expected Case, total arsenic concentrations are predicted to remain below the long-term CWQG-FAL at the nine assessment nodes in the MacLellan LAA throughout construction, operation, and decommissioning/closure (active closure). However, arsenic was identified as a POPC because in post-closure, arsenic concentrations are predicted to exceed the long-term CWQG-FAL and the modeled baseline concentrations by more than 20% in the unnamed Keewatin River tributary (KEE3-B1) during post-closure for the Expected Case, both before and after the open pit starts to overflow into KEE3-B1. Time series plots for predicted arsenic concentrations across all phases are presented for the Expected Case and Upper Case at node KEE3-B1 (Figure 9D-8; Appendix 9D).

For the first 15 years of post-closure, maximum annual arsenic concentrations in KEE3-B1 are predicted to be approximately 0.012 mg/L, a maximum concentration 2.4 times the CWQG-FAL of 0.005 mg/L. Within ten years of the open pit beginning to overflow into KEE3-B1, maximum annual arsenic concentrations in KEE3-B1 are predicted to remain below 0.012 mg/L but still exceed the CWQF-FAL.

Total arsenic concentrations are not predicted to exceed the CWQF-FAL of 0.005 mg/L in the Keewatin River downstream of the MacLellan site and the confluence with KEE3-B1. This is due to the large flow volume and assimilative capacity of the river.

Expected and Upper-Case Maxima

The maximum arsenic concentrations in the unnamed Keewatin River tributary (KEE3-B1) during post-closure are predicted to be:

- Expected Case: 0.203 mg/L, a maximum total arsenic concentration approximately 4.5 times the long-term CWQG-FAL (0.005 mg/L) and 21 times modelled Expected Baseline in post-closure (Table 9-31). However, total arsenic concentrations are predicted to exceed 0.0125 mg/L only twice (during post-closure).
- Upper Case: 0.12 mg/L, a maximum total arsenic concentration approximately 24 times the long-term CWQG-FAL and 86 times modelled Upper Baseline in the operation phase (Table 9-31). However, within ten years of the open pit overflowing, total arsenic concentrations in KEE3-B1 are predicted to remain below 0.03 mg/L.

Seasonal Trends for Arsenic

Predicted seasonal trends at KEE3-B1 differ by mine phase and modelling scenario. To provide estimated seasonal trends at three hydrodynamically distinct waterbodies within the MacLellan LAA, monthly mean concentrations in KEE3-B1, Cockeram Lake, and QM06 are provided for the operation and decommissioning/closure (active closure and post-closure) phases in Figure 9D-9, Appendix 9D.

For the Expected Case, seasonal increases of arsenic are predicted to occur at node KEE3-B1 during the winter (November to April) as a result of reduced flows and dilution capacity (indiscernible in Figure 9D-9 due to scaling of the Y axis to fit the Upper Case predictions). Higher flows during the spring freshet result in a decrease in arsenic concentrations. In post-closure, mean monthly concentrations are higher than the earlier phases due to the influence of groundwater seepage and open pit overflow but generally show the same seasonal trends as the over phases (i.e., higher arsenic concentrations in winter and summer during low flow conditions and lower arsenic concentrations in spring during higher flow conditions).

For the Upper Case, seasonal increases of arsenic are predicted to occur in April during operations, closure, and post-closure phases. Because the Upper Case incorporates accelerated groundwater travel times, the influence of groundwater at KEE3-B1 is predicted to occur as early as the operation phase. The April spikes are the result of groundwater discharging in the tributary during low surface flow conditions in April, followed by dilution in May from increased snow melt run-off. The April spikes are less pronounced in post-closure because open pit overflow discharges are greater than groundwater seepage volumes in KEE3-B1 during this period.

Table 9-31 Predicted Total Arsenic Concentrations at the MacLellan Site Node (KEE3-B1) Associated with Exceedances of Screening Criteria in the Expected Case and Corresponding Upper Case Predictions

Model Scenario	Node	Phase	Number of Years in Phase	Long term CWQG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Exceedance of Long-term CWQG-FAL	
Expected Case	KEE3-B1	Construction	2	0.005	0.00101	0.00101	0.0011	0.0011	-	-	-
		Operations	13	0.005	0.00101	0.00101	0.0011	0.0011	-	-	-
		Active Closure	5-6	0.005	0.00101	0.00101	0.0011	0.0011	-	-	-
		Post-Closure	109	0.005	0.00101	0.0083	0.0011	0.0227	20.6	4.5	88%
Upper Case	KEE3-B1	Construction	2	0.005	0.00125	0.00125	0.0014	0.0014	-	-	-
		Operations	13	0.005	0.00125	0.0158	0.0014	0.0891	63.6	17.8	56%
		Active Closure	5-6	0.005	0.00125	0.0284	0.0014	0.12	85.6	24	67%
		Post-Closure	109	0.005	0.00125	0.0207	0.0014	0.0785	56	15.7	96%

Notes:

CWQG-FAL = Canadian Water Quality Guideline - Freshwater Aquatic Life. There is no corresponding short-term guideline.

Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded (1) baseline + 20% and (2) the applicable guideline by any amount.

"-" = not applicable; values not provided for phases not associated with the identification of the POPC

Observed Existing Concentrations

Between May 2017 and October 2018, the range of observed existing arsenic concentrations in KEE3-B1 was 0.0006 mg/L to 0.001 mg/L with a mean of 0.0009 mg/L (n=7). Based on these observed existing arsenic concentrations, the maximum Project-related concentration in the Expected Case (0.023 mg/L) is 23 times the maximum observed existing arsenic concentration (and 4.6 times higher than the CWQG-FAL). Further details pertaining to observed existing conditions can be found in Volume 4, Appendix I.

Summary of Project Residual Effects Due to Arsenic

Project residual effects associated with the identification of arsenic as a POPC are predicted to be limited to the LAA, and only at the unnamed Keewatin River tributary in the PDA (KEE3-B1). These Project residual effects are limited to post-closure. After the open pit begins to overflow in Year 34, exceedances of baseline +20% and guidelines are predicted to generally occur in all months. These residual effects are characterized as long-term due to spanning multiple years in post-closure. In the Expected Case, predicted maxima exceed the CWQG-FAL (0.005 mg/L) by up to 4.5 times. However, predicted maxima are not expected to result in adverse population-level effects to aquatic biota in the receiving environment. For this reason, residual effects associated with arsenic are characterized as moderate in magnitude. The potential for adverse effects to aquatic life resulting from Project-induced increases of total arsenic is discussed in Chapter 10.

Total and Dissolved Cadmium

Cadmium is found in rock as a minor component of mineral sulphides such as sphalerite and wurtzite, which are both zinc sulphides. In surface waters, cadmium can be found as several chemical species such as hydrated ions, chloride salts, or complexes with organic or inorganic ligands (CCME 2014). Due to geochemical processes, cadmium may be naturally elevated in some waterbodies. The spatiotemporal variability of natural cadmium concentrations in surface waters is dependent on redox potential, mineral composition, weathering rates, climate, soil types, pH, alkalinity, and dissolution (the solubility of cadmium increases with decreasing pH and alkalinity). Dissolved cadmium is the more bioavailable and, therefore, the most toxicologically relevant form of cadmium, but its uptake is also a function of water hardness (i.e., cadmium uptake is inversely proportional to water hardness as $CaCO_3$). Accordingly, the long-term CWQG-FAL for total cadmium and the long-term MWQSOG-FAL for dissolved cadmium are hardness-dependent.

For the Expected Case, total cadmium is predicted to remain below the long-term CWQG-FAL at all nine assessment nodes in the MacLellan LAA during construction, operation, and active closure. However, total and dissolved cadmium were identified as POPCs because for the Expected Case in post-closure, cadmium concentrations are predicted to exceed the long-term CWQG-FAL for total cadmium (e.g., 0.000038 to 0.00047 mg/L based on site-specific water hardness of 15.3 to 368 mg/L as $CaCO_3$), the long-term MWQSOG-FAL for dissolved cadmium (0.000435 - 0.000607 mg/L based on the same water hardness), and the modeled Expected Baseline by more than 20% in the unnamed Keewatin River tributary (KEE3-B1; total and dissolved cadmium) and Minton Lake (total cadmium).

For the first 15 years of post-closure, maximum annual cadmium concentrations in KEE3-B1 are predicted to be approximately 0.0025 mg/L (total and dissolved) for the Expected Case. After the open pit begins to overflow in approximately Year 34, water quality at KEE3-B1 begins to be influenced more by open pit overflow than by groundwater seepage. After approximately ten years of discharging from the open pit, maximum annual cadmium concentrations in KEE3-B1 are predicted to remain below 0.0001 mg/L (total and dissolved) and, therefore, below the CWQG-FAL and MWQSOG-FAL (Figure 9D-10, Appendix 9D). At the nearest downstream node in the Keewatin River (QM06), cadmium was not identified as a POPC due to the dilution capacity of the Keewatin River.

Minton Lake is a fish bearing waterbody adjacent to the PDA and located southeast of the MRSA and TMF. Modelled Project-related changes to water quality in Minton Lake are associated with groundwater seepage from the MRSA and TMF. In the Expected Case, groundwater seepage is not predicted to daylight in Minton Lake until well into post-closure (Year 71), after which total cadmium concentrations in Minton Lake are predicted to exceed the long-term CWQF-FAL (0.000038 to 0.000061 mg/L at a site-specific hardness of 15.3 to 31.4 mg/L) throughout post-closure in May, July, August, and September. In the Upper Case, accelerated groundwater seepage reaches Minton Lake during the operation phase (Table 9-32; Figure 9D-11, Appendix 9D).

Due to the similarity of modelling results between total and dissolved cadmium, graphical summaries for cadmium are presented for total cadmium only (Figures 9D-10 and 9D-11, Appendix 9D). Mean monthly predictions for total and dissolved cadmium in each phase are presented in Volume 5, Appendix E.

Expected Case Maximum

For the Expected Case, the maximum cadmium concentrations in KEE3-B1 and Minton Lake during post-closure are:

- 0.00052 mg/L (total and dissolved cadmium) in KEE3-B1, a maximum cadmium concentration approximately 1.6 times higher than the long-term CWQG-FAL and MWQSOG-FAL and 115 times higher than Expected Baseline (Tables 9-32 and 9-33).
- 0.000042 mg/L (total and dissolved cadmium) in Minton Lake, a maximum cadmium concentration only marginally above the long-term CWQG-FAL and below the MWQSOG-FAL, and nine times higher than Expected Baseline (Tables 9-32 and 9-33).

At KEE3-B1, aquatic life guidelines are exceeded for only two of all modelled months across all phases. Both exceedances occur in April in post-closure when flows in the stream are lowest; the hardness-dependent CWQG-FAL and MWQSOG-FAL are 0.00047 mg/L (total cadmium) and 0.00044 mg/L (dissolved cadmium), respectively, due to an April hardness of 228 mg/L (as $CaCO_3$) calculated from existing conditions in East Pond, the headwater lake of KEE3-B1.

Upper Case Maxima

For the Upper Case, the maximum cadmium concentrations in KEE3-B1 and Minton Lake during post-closure are:

- 0.0025 mg/L (total and dissolved cadmium) in KEE3-B1, a maximum cadmium concentration approximately eight times higher than the long-term CWQG-FAL (total cadmium), six times higher than the MWQSOG-FAL (dissolved cadmium), and over 490 times higher than the Upper Baseline (Tables 9-32 and 9-33).

- 0.00027 mg/L (total and dissolved cadmium) in Minton Lake, a maximum cadmium concentration approximately seven times higher than the hardness-dependent CWQG-FAL (total cadmium), four times higher than the hardness-dependent MWQSOG-FAL (dissolved cadmium), and 32 times higher than the Upper Baseline (Tables 9-32 and 9-33).

Seasonal trends for Cadmium

For the Expected Case, seasonal variation of total cadmium is predicted to remain unaffected by the Project at KEE3-B1 during construction, operations, and decommissioning/closure (active closure) phases (Figure 9D-12, Appendix 9D). Seasonal cadmium increases occur during the winter (November to April) in KEE3-B1 due to reduced flows and dilution capacity but are indiscernible in Figure 9D-12 due to scaling of the Y axis to fit the Upper-Case predictions. In the Expected Case, mean monthly concentrations at KEE3-B1 are higher in post-closure than the earlier phases (due to the influence of discharges from groundwater and the open pit), and generally follow the same seasonal trends as the operation and active closure phases.

For the Upper Case, seasonal cadmium spikes are predicted to occur in April in KEE3-B1 during operation and decommissioning/closure (active closure and post-closure) phases. Because the Upper Case incorporates accelerated groundwater travel times, the influence of groundwater at KEE3-B1 is predicted to occur as early as the operation phase. The April spikes are the result of groundwater seepage in KEE3-B1 during a period of low surface flow, followed by dilution in May from increased snow melt runoff. The April spikes are less obvious in post-closure because overflow from open pit dominates water quality in KEE3-B1 during this period.

To provide estimated seasonal trends at three hydrodynamically distinct waterbodies within the MacLellan LAA, monthly mean concentrations in KEE3-B1, QM06, and Cockeram Lake are provided for the operation and decommissioning/closure (active closure and post-closure) phases in Figure 9D-12 (Appendix 9D).

Observed Existing Concentrations

Between May 2017 and October 2018, the range of observed existing total and dissolved cadmium concentrations in the unnamed Keewatin River tributary (KEE3-B1) was 0.0000025 mg/L to 0.000005 mg/L with a mean of 0.0000029 mg/L (n= 7). Over this same period, the range of observed existing total cadmium concentrations in Minton Lake was 0.0000025 mg/L to 0.000019 mg/L with a mean of 0.0000058 mg/L (n = 7) and the range of observed existing dissolved cadmium in Minton Lake was 0.0000025 mg/L to 0.0000058 mg/L with a mean of 0.0000041 mg/L (n = 7).

Based on the observed existing cadmium concentrations in KEE3-B1 and Minton Lake, the maximum Project-related concentrations in the Expected Case will substantially exceed existing conditions (and are consistent with modelled baseline predictions). Further details pertaining to observed existing conditions can be found in Volume 4, Appendix I.

Table 9-32 Predicted Total Cadmium Concentrations by Phase at MacLellan Site Nodes (KEE3-B1 and QM06) Associated with Exceedances of Screening Criteria in the Expected Case and Corresponding Upper Case Predictions

Model Scenario	Node	Phase	Number of Years in Phase	Long term CWQG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Exceedance of Long-term CWQG-FAL	
Expected Case	KEE3-B1	Construction	2	0.000314 - 0.000467	0.00000435	0.00000435	0.0000046	0.0000046	-	-	-
		Operations	13	0.000314 - 0.000467	0.00000435	0.00000435	0.0000046	0.0000046	-	-	-
		Active Closure	5-6	0.000314 - 0.000467	0.00000435	0.00000435	0.0000046	0.0000046	-	-	-
		Post-Closure	109	0.000314 - 0.000467	0.00000435	0.0000675	0.0000046	0.000518	115	1.6	<1%
	Minton Lake	Construction	2	0.0000375 - 0.0000606	0.00000472	0.0000047	0.00000492	0.00000488	-	-	-
		Operations	13	0.0000375 - 0.0000606	0.00000483	0.00000478	0.00000499	0.00000495	-	-	-
		Active Closure	5-6	0.0000375 - 0.0000606	0.00000471	0.00000474	0.00000494	0.00000493	-	-	-
		Post-Closure	109	0.0000375 - 0.0000606	0.00000465	0.0000214	0.00000481	0.0000423	9.0	1.1	12%
Upper Case	KEE3-B1	Construction	2	0.000314 - 0.000467	0.000005	0.000005	0.000005	0.000005	-	-	-
		Operations	13	0.000314 - 0.000467	0.000005	0.000129	0.000005	0.000807	161	2.5	9%
		Active Closure	5-6	0.000314 - 0.000467	0.000005	0.000302	0.000005	0.00133	266	4.2	25%
		Post-Closure	109	0.000314 - 0.000467	0.000005	0.000475	0.000005	0.00246	492	7.8	86%
	Minton Lake	Construction	2	0.0000375 - 0.0000606	0.00000897	0.0000092	0.00000942	0.00000981	-	-	-
		Operations	13	0.0000375 - 0.0000606	0.00000969	0.0000444	0.00001	0.0000848	8.5	2.2	52%
		Active Closure	5-6	0.0000375 - 0.0000606	0.00000888	0.0000979	0.00000986	0.000124	14.3	3.3	100%
		Post-Closure	109	0.0000375 - 0.0000606	0.0000085	0.000259	0.00000873	0.000274	31.6	7.04	100%

Notes:
CWQG-FAL = Canadian Water Quality Guideline - Freshwater Aquatic Life
The long-term and short-term guidelines for cadmium are hardness-dependent. The short-term guideline was excluded from this table because no exceedances were predicted.
Monthly mean baseline hardness was used to calculate the guidelines for each month (shown as ranges in table).
Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded (1) baseline + 20% and (2) the applicable guideline by any amount.
"-" = not applicable; values not provided for phases not associated with the identification of the POPC

Table 9-33 Predicted Dissolved Cadmium Concentrations by Phase at the MacLellan Site Node (KEE3-B1) Associated with Exceedances of Screening Criteria in the Expected Case and Corresponding Upper Case Predictions

Model Scenario	Node	Phase	Number of Years in Phase	Long term CWQG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Exceedance of Long-term MWQSOG-FAL	
Expected Case	KEE3-B1	Construction	2	0.000435 - 0.000607	0.00000435	0.00000435	0.0000046	0.0000046	-	-	-
		Operations	13	0.000435 - 0.000607	0.00000435	0.00000435	0.0000046	0.0000046	-	-	-
		Active Closure	5-6	0.000435 - 0.000607	0.00000435	0.00000435	0.0000046	0.0000046	-	-	-
		Post-Closure	109	0.000435 - 0.000607	0.00000435	0.0000644	0.0000046	0.000518	115	1.2	<1%
Upper Case	KEE3-B1	Construction	2	0.000435 - 0.000607	0.000005	0.000005	0.000005	0.000005	-	-	-
		Operations	13	0.000435 - 0.000607	0.000005	0.000131	0.000005	0.000818	164	1.9	6%
		Active Closure	5-6	0.000435 - 0.000607	0.000005	0.000304	0.000005	0.00134	268	3.1	21%
		Post-Closure	109	0.000435 - 0.000607	0.000005	0.000472	0.000005	0.00247	494	5.7	35%

Notes:
MWQSOG-FAL = Manitoba Water Quality Standards, Objectives, and Guidelines - Freshwater Aquatic Life
The long-term and short-term guidelines for dissolved cadmium are hardness-dependent. The short-term guideline was excluded from this table because no exceedances were predicted.
Monthly mean baseline hardness was used to calculate the guidelines for each month (shown as ranges in table).
Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded (1) baseline + 20% and (2) the applicable guideline by any amount.
"-" = not applicable; metrics not provided for phases not associated with the identification of the POPC

Summary of Project Residual Effects Due to Cadmium

Project residual effects associated with the identification of cadmium (total and dissolved) as a POPC are predicted to be limited to the LAA, and only at the unnamed Keewatin River tributary in the PDA (KEE3-B1) and Minton Lake (total cadmium only). At KEE3-B1, these Project residual effects only occur in two months (April of Years 34 and 35 in closure) and are therefore considered to be a low-frequency event of short-term duration (e.g., occurring twice for a period of less than one year during post-closure). However, by Year 36 (after two years of pit overflowing), total and dissolved cadmium concentrations at KEE3-B1 are predicted to remain below the water quality guidelines. This is because the source of cadmium at KEE3-B1 is groundwater seepage, which gets diluted by pit overflow water.

In Minton Lake, Project residual effects associated with the identification of cadmium as a POPC do not occur until Year 87 due to the daylighting of groundwater seepage from the MRSA and TMF. By approximately Year 87, total cadmium concentrations in Minton Lake are predicted to exceed the long-term water quality guideline throughout post-closure in the months of May, July, August, and September, a long-term, multiple regular event.

In the Expected Case, maximum total and dissolved cadmium are predicted to exceed modelled Expected Baseline +20% and the CWQG-FAL and MWQSOG-FAL by up to approximately 1.6 times. However, residual effects associated with cadmium at KEE3-B1 and Minton Lake are characterized as moderate magnitude as they are not expected to have an adverse effect on aquatic biota in the receiving environment. The potential for adverse effects to aquatic life resulting from project-induced increases of total and dissolved cadmium is discussed in Chapter 10.

Total Copper

Copper naturally occurs in both mineralized form and as a free metal. Copper can be released into surface waters through the natural weathering of rocks and soils, and from anthropogenic sources including metal mine effluents. In natural surface waters, copper is found in various forms such as free ions, copper hydroxides, carbonate complexes, and numerous organic complexes (BC MOECCS 2019). Most copper in freshwater environments binds to suspended particles and eventually settles into sediment, but some copper remains waterborne in dissolved form (Georgopolous et al 2001). Dissolved copper is the more bioavailable and, therefore, toxicologically relevant form of copper, and its uptake is a function of water hardness (i.e., copper uptake is inversely proportional to water hardness as $CaCO_3$). Other factors that influence copper bioavailability include dissolved organic carbon (DOC), pH, alkalinity, and water temperature; these parameters are standard variables in biotic ligand models used to estimate safe levels of copper to aquatic life. The long-term CWQG-FAL for total copper is hardness-dependent and ranges from 0.002 mg/L (hardness <82 mg/L as $CaCO_3$) to 0.004 mg/L (hardness >180 mg/L as $CaCO_3$). The long-term MWQSOG-FAL for dissolved copper is also hardness-dependent; however, dissolved copper was not identified as a POPC and is not discussed further in this assessment.

For the Expected Case, total copper is predicted to remain below the long-term CWQG-FAL at all nine assessment nodes in the MacLellan LAA during construction, operation, and decommissioning/closure (active closure). However, total copper was identified as a POPC because total copper concentrations are predicted to exceed the long-term CWQG-FAL (0.004 mg/L) and exceed the modeled Expected Baseline total copper concentrations by more than 20% in the unnamed Keewatin River tributary (KEE3-B1) in post-closure for the Expected Case.

For the first 15 years of post-closure, maximum annual total copper concentrations in KEE3-B1 are predicted to be approximately 0.0034 mg/L in the Expected Case, concentrations that are below the long-term, hardness-dependent CWQG-FAL of 0.004 mg/L. After the open pit/pit lake begins to overflow in approximately Year 34, water quality at KEE3-B1 is more influenced by water quality in the open pit overflow than by groundwater seepage. After ten years of discharging from the open pit, annual Expected Case maxima in KEE3-B1 are predicted to remain below approximately 0.0045 mg/L.

At the nearest downstream node in the Keewatin River (QM06), total copper was not identified as a POPC due to the larger flow volume and dilution capacity of the Keewatin River. Time series plots for predicted copper concentrations across all phases are presented for the Expected Case and Upper Case at node KEE3-B1 (Figure 9D-13, Appendix 9D).

Expected and Upper-Case Maxima

The maximum total copper concentrations in the unnamed Keewatin River tributary (KEE3-B1) are:

- Expected Case: 0.0059 mg/L, a total copper concentration approximately 1.5 times higher than the long-term CWQG-FAL (0.004 mg/L when hardness is >180 mg/L $CaCO_3$) and 17 times higher than the Expected Baseline concentration at the start of pit overflow in post-closure. Copper exceeds 0.0045 mg/L only twice across all modeled months (Table 9-34).

- Upper Case: 0.024 mg/L, a total copper concentration approximately six times higher than the long-term CWQG-FAL (0.004 mg/L when hardness is >180 mg/L $CaCO_3$) and 36 times higher than the Upper Baseline in active closure and post-closure (Table 9-34).

Seasonal Trends for Copper

Predicted seasonal trends at KEE3-B1 differ by mine phase and modelling scenario. To provide estimated seasonal trends at three hydrodynamically distinct waterbodies within the MacLellan LAA, monthly mean concentrations in KEE3-B1, QM06, and Cockeram Lake are provided for the operation and decommissioning/closure (active closure and post-closure) phases in Figure 9D-14 (Appendix 9D).

For the Expected Case, seasonal increases of copper are predicted to occur at node KEE3-B1 during the winter (November to April) due to reduced surface flows and dilution capacity in the stream; these increases are indiscernible in Figure 9D-14 due to scaling of the Y axis to fit the Upper Case predictions. Higher flows during the spring freshet results in lower total copper concentrations. In the Expected Case, mean monthly concentrations at KEE3-B1 are higher in post-closure than the earlier phases (due to the influence of discharges from groundwater and the open pit), and generally follow the same seasonal trends as the operation and decommissioning/closure phases.

Table 9-34 Predicted Copper Concentrations by Phase at the MacLellan Site Node (KEE3-B1) Associated with Exceedances of Screening Criteria in the Expected Case and Corresponding Upper Case Predictions

Model Scenario	Node	Phase	Number of Years in Phase	Long term CWQG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Exceedance of Long-term CWQG-FAL	
Expected Case	KEE3-B1	Construction	2	0.004	0.000297	0.000297	0.00034	0.00034	-	-	-
		Operations	13	0.004	0.000297	0.000297	0.00034	0.00034	-	-	-
		Active Closure	5-6	0.004	0.000297	0.000297	0.00034	0.00034	-	-	-
		Post-Closure	109	0.004	0.000297	0.0029	0.00034	0.00586	17.2	1.5	6%
Upper Case	KEE3-B1	Construction	2	0.004	0.000507	0.000507	0.00066	0.00066	-	-	-
		Operations	13	0.004	0.000507	0.00418	0.00066	0.0201	30.5	5.0	45%
		Active Closure	5-6	0.004	0.000507	0.00581	0.00066	0.0235	35.7	5.9	65%
		Post-Closure	109	0.004	0.000507	0.00764	0.00066	0.024	36.4	6	96%

Notes:
CWQG-FAL = Canadian Water Quality Guideline - Freshwater Aquatic Life
The long-term guideline for copper is hardness-dependent. Monthly mean baseline hardness was used to calculate the guideline value for each month.
Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded (1) baseline + 20% and (2) the applicable guideline by any amount.
"-" = not applicable; values not provided for phases not associated with the identification of the POPC

For the Upper Case, seasonal copper spikes are predicted to occur in April during operation and decommissioning (active closure and post-closure) phases. Because the Upper Case incorporates accelerated groundwater travel times, the influence of groundwater at KEE3-B1 is predicted to occur as early as the operation phase. The April spikes are the result of groundwater discharging in the tributary in April followed by dilution from increased snow melt runoff in May. The April copper spikes are less pronounced in post-closure because open pit overflow dominates water quality in KEE3-B1 during this period.

Observed Existing Concentrations

Between May 2017 and October 2018, the range of observed existing total copper concentrations in the unnamed Keewatin River tributary (KEE3-B1) was 0.00025 mg/L to 0.00045 mg/L, with a mean concentration of 0.00029 mg/L (n = 5).

Based on measured existing concentrations, more than 99% of all modelled months are predicted to fall within the range of existing concentrations in KEE3-B1. Only 13 months are predicted to exceed the maximum observed concentration, and these single exceedances mostly occur one year apart (in April or November) between Years 34 and 48 in closure. Further details pertaining to observed existing conditions can be found in Volume 4, Appendix I.

Summary of Project Residual Effects Due to Copper

Project residual effects associated with the identification of copper as a POPC are predicted to be limited to the LAA, and only at the unnamed Keewatin River tributary in the PDA (node KEE3-B1). These Project residual effects only begin to occur in post-closure. After the open pit begins to overflow in Year 34, exceedances of baseline +20% and guidelines are predicted to generally occur in winter months (mostly February, March, and April, but occasionally October, November, and December). In the Expected Case, predicted maxima exceed the CWQG-FAL by up to 1.5 times. These effects are characterized as long-term due to spanning multiple years in post-closure. After Year 89, copper is not predicted to exceed the water quality guidelines in KEE3-B1 and, therefore, the effect is reversible. Predicted maxima are not expected to result in adverse population-level effects to aquatic biota in the receiving environment. For this reason, residual effects associated with copper are characterized as moderate in magnitude. The potential for adverse effects to aquatic life resulting from Project-induced increases of total copper is discussed in the Fish and Fish Habitat assessment (Chapter 10).

Fluoride

The geochemistry and toxicology of fluoride was described in the residual effects section for the Gordon site LAA (see Section 9.5.2.4, Gordon Site). Time series plots for predicted fluoride concentrations across all phases are presented for the Expected Case and Upper Case at node KEE3-B1 (Figure 9D-15, Appendix 9D).

For the Expected Case, fluoride is predicted to remain below the long-term CWQG-FAL of 0.12 mg/L at all nine assessment nodes in the MacLellan LAA during construction, operation, and decommissioning/closure (active closure). However, fluoride was identified as a POPC because fluoride concentrations are predicted to exceed the long-term CWQG-FAL and exceed the modeled Expected Baseline by more than 20% in the unnamed Keewatin River tributary (KEE3-B1) in post-closure for the Expected Case.

For the first 15 years of post-closure, maximum annual fluoride concentrations in KEE3-B1 are predicted to be approximately 0.20 mg/L for the Expected Case. After the open pit/pit lake begins to overflow in approximately Year 34, water quality at KEE3-B1 begins to be influenced more by open pit overflow than by groundwater seepage. After approximately ten years of discharging from the open pit, annual fluoride maxima in KEE3-B1 are predicted to be approximately 0.15 mg/L, or slightly higher than the CWQG-FAL of 0.12 mg/L, for the Expected Case (Figure 9D-15, Appendix 9D).

Fluoride was not identified as a POPC in the Keewatin River downstream of the MacLellan site (QM06) during any mine phase due to the higher flow volumes and dilution capacity of the Keewatin River.

Expected and Upper-Case Maxima

Maximum fluoride concentrations in KEE3-B1 are:

- Expected Case: 0.21 mg/L, a maximum fluoride concentration approximately 1.7 times higher than the long-term CWQG-FAL and MWQSOG-FAL (0.12 mg/L) and 4.7 times higher than the Expected Baseline in post-closure. However, fluoride concentrations are predicted to exceed 0.15 mg/L only twice across all modeled months (Table 9-35).
- Upper Case: 1.3 mg/L, a maximum fluoride concentration approximately 11 times higher than the long-term CWQG-FAL and MWQSOG-FAL (0.12 mg/L) and 25 times higher than the Upper Baseline during the decommissioning/closure (active closure and post-closure) phase (Table 9-35).

Seasonal Trends for Fluoride

Predicted seasonal trends at KEE3-B1 differ by mine phase and modelling scenario. To provide estimated seasonal trends at three hydrodynamically distinct waterbodies within the MacLellan LAA, monthly mean concentrations in KEE3-B1, Cockeram Lake, and in the Keewatin River (QM06) are provided for the operation, closure, and post-closure phases in Figure 9D-16 (Appendix 9D).

For the Expected Case, seasonal increases of fluoride are predicted to occur in KEE3-B1 during the winter (November to April) due to reduced flows and dilution capacity; these increases are indiscernible in Figure 9D-16 due to scaling of the Y axis to fit the Upper Case predictions. Higher flows during the spring freshet results in decreased fluoride concentrations. In the Expected Case, mean monthly concentrations at KEE3-B1 are higher in post-closure than the earlier phases (due to the influence of discharges from groundwater and the open pit), and generally follow the same seasonal trends as the operation and decommissioning/closure phases.

Table 9-35 Predicted Fluoride Concentrations by Phase at the MacLellan Site Node (KEE3-B1) Associated with Exceedances of Screening Criteria in the Expected Case and Corresponding Upper Case Predictions

Model Scenario	Node	Phase	Number of Years in Phase	Long term CWQG-FAL and MWQSOG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Guideline Exceedance (mg/L)	
Expected Case	KEE3-B1	Construction	2	0.12	0.0403	0.0403	0.044	0.044	-	-	-
		Operations	13	0.12	0.0403	0.0403	0.044	0.044	-	-	-
		Active Closure	5-6	0.12	0.0403	0.0403	0.044	0.044	-	-	-
		Post-Closure	109	0.12	0.0403	0.109	0.044	0.207	4.7	1.7	30%
Upper Case	KEE3-B1	Construction	2	0.12	0.0468	0.0468	0.053	0.053	-	-	-
		Operations	13	0.12	0.0468	0.186	0.053	0.819	15.5	6.8	56%
		Active Closure	5-6	0.12	0.0468	0.268	0.053	1.01	19	8.4	67%
		Post-Closure	109	0.12	0.0468	0.517	0.053	1.34	25.3	11.2	96%

Notes:
CWQG-FAL = Canadian Water Quality Guideline - Freshwater Aquatic Life
Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded (1) baseline + 20% and (2) the applicable guideline by any amount.
"-" = not applicable; values not provided for phases not associated with the identification of the POPC

For the Upper Case, seasonal fluoride spikes are predicted to occur in April during operation, closure, and post-closure phases. Because the Upper Case incorporates accelerated groundwater travel times, the influence of groundwater seepage at KEE3-B1 is predicted to occur as early as the operation phase. The April spikes are the result of groundwater discharging in KEE3-B1 in April followed by dilution from snow melt runoff from snow melt runoff in May. The April groundwater spikes are less pronounced in post-closure because overflow discharge from the open pit dominates water quality in KEE3-B1 during this time.

Observed Existing Concentrations

Between May 2017 and October 2018, the range of observed existing fluoride concentrations in the unnamed Keewatin River tributary (KEE3-B1) was 0.031 mg/L to 0.042 mg/L, with a mean concentration of 0.038 mg/L (n = 7).

Based on the observed existing concentrations of fluoride at KEE3-B1, the maximum project-related concentrations in the Expected Case are expected to exceed the range of existing conditions concentrations. Further details pertaining to observed existing conditions can be found in Volume 4, Appendix I.

Summary of Project Residual Effects Due to Fluoride

For the MacLellan site, Project residual effects associated with the identification of fluoride as a POPC are predicted to be limited to unnamed Keewatin River tributary in the PDA (node KEE3-B1). These Project residual effects are limited to post-closure. Exceedances of baseline +20% and guidelines are predicted to occur throughout post-closure, but the number of months in exceedance (i.e., from 1 to 10 months) vary with year. These effects are characterized as long-term due to spanning multiple years in post-closure. In the Expected Case, fluoride is predicted to exceed the CWQG-FAL and MWQSOG-FAL (0.12 mg/L) by up to 1.7 times at KEE3-B1. However, predicted maxima are not expected to result in adverse population-level effects to aquatic biota in the receiving environment. For this reason, residual effects associated with fluoride are characterized as moderate in magnitude. The potential for adverse effects to aquatic life resulting from project-induced increases of fluoride is discussed in Chapter 10.

9.4.3 Summary of Project Residual Environmental Effects on Surface Water

A summary of residual environmental effects that are likely to occur to surface water quantity and surface water quality as a result of the Project are described below and summarized in Table 9-36. Residual effects are classified using the criteria established in Table 9-5 with each characterization considered independently of the others. Potential changes in surface water quantity and quality due to the Project occur at different locations, at different times, and at different magnitudes, frequencies, and durations. Therefore, residual effects have been characterized by mine phase by considering the location at which the greatest potential change in surface water quantity or surface water quality is predicted to occur. The residual effect characterization is, therefore, a conservative approach. These residual effect characterizations are then used to determine whether the Project is expected to result in significant adverse effects to surface water quantity and surface water quality in Section 9.6. Residual adverse effects that are expected to extend beyond the LAA are carried forward to the cumulative effect assessment in Section 9.5.

9.4.3.1 Surface Water Quantity

The Project will result in changes to surface water quantity within the Gordon site and MacLellan site LAAs. At the Gordon site, high magnitude changes in water quantity are predicted due to changes in monthly streamflow exceeding 30% in several small watercourses within the PDA (QF01, QF02, QF03, QF05) and downstream in the LAA (QF07, QF08) during the construction and operation phases of the Project. Changes in these watercourses begin during the construction phase with the development of mine infrastructure within the PDA and the subsequent reduction in effective catchment area resulting in adverse changes in streamflow (i.e., flow reduction) at QF01 and QF02. It should be noted that these two creeks are ephemeral in nature and that the predicted flow changes are less than 10 L/s. The operation of the interceptor wells and dewatering of the legacy pits during the construction phase produces flow increases at QF03, QF05, QF07, and QF08. These changes are anticipated to continue through operations and are also related to the interceptor wells and dewatering associated with the new open pit. The timing of changes in streamflow is predicted to occur continuously during most months throughout the year, and ranges from low to high magnitude changes. Once mining is complete, the interceptor wells will cease operation and the open pit will be allowed to fill. During pit filling, flow changes in QF03, QF05, QF07, and QF08 range from negligible to moderate, with the magnitude varying by location and month. Once the open pit has filled, QF05 (Farley Creek) is anticipated to have negligible to moderate magnitude changes in average monthly streamflows and QF07 has negligible to low magnitude changes in winter. Mean annual flow changes are negligible at these locations. When the open fit has filled, changes to surface water quantity will become stable and irreversible, while changes in streamflow at QF01 and QF02 are stable and irreversible from the construction phase onwards. Changes in surface water quantity are not anticipated to extend beyond the LAA as changes to mean annual discharge are negligible by QF05 (Farley Creek). Predicted changes in water quantity are associated with watercourses and waterbodies that have either previously been or potentially continue to be influenced by historical anthropogenic disturbance, including the historical Farley Lake Mine.

At the MacLellan site, high magnitude changes in water quantity are predicted; changes in streamflow exceed 30% at KEE3-B1 (QM04) and the Minton Lake outlet (QM07) on a mean monthly basis. Changes at KEE3-B1 and the Minton Lake outlet begin during construction with the development of mine infrastructure within the PDA and the subsequent reduction in effective catchment area; these changes will continue through decommissioning/closure. The timing of changes is predicted to occur continuously during most months throughout the year and are not expected to be affected by seasonal aspects. Changes generally cause a reduction in streamflow for each Phase; however, once the open pit is filled, overflow from the formed pit lake will cause streamflow at KEE3-B1 to increase. When the open fit has filled, changes to surface water quantity will become stable and irreversible. Changes in streamflow are anticipated to be contained to the LAA as the changes in streamflow are reduced to negligible in magnitude at Cockeram Lake (QM08). Predicted changes in water quantity are associated with watercourses and waterbodies that have either previously been or potentially continue to be influenced by historical anthropogenic disturbance, including the historical MacLellan Mine.

Project-induced changes to surface water quantity have the potential to cause adverse effects to fish through changes in fish habitat (Chapter 10).

9.4.3.2 Surface Water Quality

The Project will result in changes to surface water quality within the Gordon site and MacLellan site LAAs. However, conservatism in the water quality modelling has resulted in predicted changes in water quality that are likely over-estimated in both magnitude and frequency.

At the Gordon site, the magnitude of potential residual effects due to predicted fluoride and phosphorus concentrations are characterized as moderate. This is because predicted concentrations for fluoride and phosphorus exceed modelled Expected Baseline by +20% and the long-term guidelines for the protection of aquatic life but are not anticipated to have an adverse effect on aquatic biota in the receiving environment. Toxicity thresholds are further evaluated in the Fish and Fish Habitat assessment (Chapter 10). Generally, Project residual effects are predicted to be greatest in West Farley Lake and never extend downstream to Ellystan Lake.

For fluoride, Project residual effects are identified in all phases and assessment nodes except Susan Lake and Ellystan Lake where fluoride was not identified as a POPC. The greatest magnitude guideline exceedance is predicted to be 1.6 times the CWQG-FAL and MWQSOG-FAL (0.012 mg/L) in West Farley Lake (construction) and East Farley Lake (operation). Project residual effects due to fluoride generally occur on a seasonal basis (during the winter months when flows and dilution capacity are reduced) in all phases. One exception is West Farley Lake, where elevated fluoride concentrations are predicted to occur for 11 months of the year in construction and operation. For phosphorus, Project residual effects were limited to only a single month in the construction phase (April, Year -2). This single residual effect is predicted to occur in West Farley Lake where baseline and the MWQSOG-FAL are exceeded by approximately 1.2 and 1.1 times, respectively. Because residual effects within the Gordon site LAA are dominated by fluoride (which is associated with seasonal residual effects), the timing is characterized as ‘applicable’.

For the MacLellan site, the magnitude of residual effects are characterized as low during construction, operation, and decommissioning/closure (active closure) because predicted changes in water quality either do not exceed modelled baseline +20%, or do not exceed water quality guidelines (i.e., no POPCs were identified for construction, operation, and active closure). However, the magnitude of potential residual effects due to total aluminum, total arsenic, total and dissolved cadmium, total copper, and fluoride are characterized as moderate during post-closure. This is because predicted concentrations of these parameters exceed modelled baseline +20% and the long-term guidelines for the protection of aquatic life but are not expected to result in adverse effects on aquatic biota (evaluated in the Fish and Fish Habitat assessment; Chapter 10). Generally, Project residual effects for the above parameters occur at the KEE3-B1 tributary within the PDA, but some residual effects are also predicted to occur downstream in the Keewatin River at node QM06 (total aluminum) and in Minton Lake (total cadmium).

The seasonal timing of Project residual effects within the MacLellan LAA depends on the POPC; residual effects due to aluminum and arsenic generally occur in all months of the year at KEE3-B1, whereas residual effects due to copper and fluoride generally occur in the winter months (November to April) due to reduced flows and dilution capacity. For total and dissolved cadmium, residual effects are predicted to be limited to only two single months in post-closure (both in April of Year 34 and Year 35). Because residual effects are predicted to occur in all months of the year (when all POPCs are combined), the seasonal timing of residual effects is characterized as 'not applicable'.

At both the Gordon and MacLellan sites, no residual effects are predicted at the most downstream assessment nodes within each LAA. The duration of potential residual effects to surface water quality is characterized as medium-term during construction and operation phases and long-term during decommissioning/closure at both sites due to the potential for concentrations of POPCs at each site to exceed modelled baseline +20% and guidelines through construction, operations, and decommissioning/closure (aluminum only) and for multiple years beyond active closure (aluminum, arsenic, cadmium, copper and fluoride).

The frequency of potential residual effects to surface water quality is characterized as a multiple regular event at both sites because many POPCs are predicted to be elevated during the same time of year during the same flow conditions. For this reason, the timing of residual effects to surface water quality are also characterized as not applicable.

Reversibility of potential residual effects at both sites is characterized as irreversible because many POPCs are predicted to occur in post-closure and are not predicted to return to baseline concentrations within the time frame predicted by the water quality models.

The ecological context for the potential residual effects at both sites is characterized as disturbed due to former mining operations at both sites. Predicted changes in water quality are associated with waterbodies that have either previously been or potentially continue to be influenced by historical anthropogenic activity.

Table 9-36 Project Residual Effects on Surface Water

Residual Effect	Project Phase	Residual Effects Characterization							
		Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context
Gordon Site									
Change in Surface Water Quantity	C	A	H	LAA	ST	NA	C	R	D
	O	A	H	LAA	MT	NA	C	R	D
	D	A	N	LAA	LT	NA	C	I	D
Change in Surface Water Quality	C	A	M	LAA	MT	A	R	R	D
	O	A	M	LAA	MT	A	R	R	D
	D	A	M	LAA	LT	A	R	I	D

Table 9-36 Project Residual Effects on Surface Water

Residual Effect	Project Phase	Residual Effects Characterization: Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context
MacLellan Site									
Change in Surface Water Quantity	C	A	N	LAA	ST	NA	C	R	D
	O	A	N	LAA	MT	NA	C	R	D
	D	A	N	LAA	LT	NA	C	I	D
Change in Surface Water Quality	C	A	L	LAA	MT	NA	R	R	D
	O	A	L	LAA	MT	NA	R	R	D
	D	A	M	LAA	LT	NA	R	I	D

KEY
See Table 9-5 for detailed definitions

Project Phase
C: Construction
O: Operation
D: Decommissioning

Direction:
P: Positive
A: Adverse
N: Neutral

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PDA: Project Development Area
LAA: Local Assessment Area
RAA: Regional Assessment Area

Duration:
ST: Short-term;
MT: Medium-term
LT: Long-term
N/A: Not applicable

Timing:
N/A: Not Applicable
A: Applicable

Frequency:
S: Single event
IR: Multiple Irregular event
R: Multiple regular event
C: Continuous

Reversibility:
R: Reversible
I: Irreversible

Ecological/Socio-Economic Context:
D: Disturbed
U: Undisturbed

9.5 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS ON SURFACE WATER

The Project residual effects described in Section 9.4, are likely to interact cumulatively with residual environmental effects from other physical activities (past, present, and reasonably foreseeable).

The effects of past and current projects relative to conditions prior to historical mining activities contribute to baseline conditions upon which Project effects are assessed. Conditions prior to historical mining activities are generally considered to be similar to currently undisturbed areas of the RAA.

The resulting cumulative environmental effects are assessed. Cumulative effects without the Project (i.e., future scenario without the Project) are also described. This is followed by an analysis of the Project contribution to cumulative effects. Future projects and activities that are reasonably foreseeable are defined as those that (a) have been publicly announced with a defined project execution period and with sufficient project details that allow for a meaningful assessment, (b) are currently undergoing an environmental assessment or (c) are in a permitting process.

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- The Project has residual environmental effects on the VC, and
- The residual effects could act cumulatively with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either is not met, the assessment of cumulative effects concludes with a statement that further assessment of cumulative effects is not warranted because the Project does not interact cumulatively with other projects or activities.

9.5.1 Project Residual Effects Likely to Interact Cumulatively

Table 4C-1 in Chapter 4, Environmental Assessment Methods, presents the project and physical activities inclusion list, which identifies other projects and physical activities that might act cumulatively with the Project. Where residual environmental effects from the Project act cumulatively with residual effects from other projects and physical activities (Table 9-37), a cumulative effects assessment is undertaken.

Table 9-37 Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Environmental Effects	Environmental Effects	
	Change in Surface Water Quantity	Change in Surface Water Quality
Past and Present Physical Activities and Resource Use		
Mineral Development		
• “A” Mine	✓	✓
• EL Mine	✓	✓
• Fox Mine	–	–
• Farley Mine	✓	✓
• Ruttan Mine	–	–

Table 9-37 Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Environmental Effects	Environmental Effects: Change in Surface Water Quantity	Environmental Effects: Change in Surface Water Quality
• MacLellan Mine (Historical)	✓	✓
• Burnt Timber Mine	✓	✓
• Farley Lake Mine	✓	✓
• Keystone Gold Mine	✓	✓
• East/West Tailings Management Areas	✓	✓
Mineral Exploration	✓	✓
Water and Waste Projects (sewage plants, waste disposal grounds)	✓	✓
Residential and Community Development (including cottage subdivisions)	✓	✓
Infrastructure Development (transmission line, airport, highways, roads, rail)	✓	✓
Other Resource Activities (hunting, fishing, berry picking)	–	–
Future Physical Activities		
Mineral Development	✓	✓
Mineral Exploration	✓	✓
Traditional Land Use	–	–
Resource Use Activities	–	–
Recreation	–	–

NOTES:
✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with Project residual environmental effects.
– = Interactions between the residual effects of other projects and residual effects of the Project are not expected.
For a detailed description and mapped locations of Projects and Physical Activities, where applicable, see Chapter 4, Table 4D-2 and Maps 4-1 and 4-2.

From the assessments provided in Section 9.4, residual effects to surface water quantity and surface water quality are likely to occur due to construction, operation, and decommissioning/closure of the Project. Therefore, the Project has the potential to interact cumulatively if there are residual effects from other past, present, and reasonably foreseeable project in the LAAs and RAA.

Projects and activities identified in Table 9-37 that do not have a check marks do not have residual effects that are likely to interact spatially or temporally with potential residual effects of the Project and, therefore, are not discussed further. The Ruttan Mine and Fox Mine, for example, are outside of the RAA and are not anticipated to interact cumulatively with the Project. Also, past and present resource activities, such as hunting, fish, and berry picking, and physical activities such as traditional land use, resource use activities, and recreation are not likely to have measurable residual effects on surface water quality and, therefore, are not expected to interact cumulatively with Project residual effects. Map 4-3 in Chapter 4 shows the other location of the projects and activities that could potentially interact with the residual effects of the Project.

Past and present effects of historical mining activities on surface water quantity and surface water quality in the LAAs have been included in the Project-specific residual effects assessment because these past effects are represented in the existing baseline conditions. For this reason, it is only present or reasonably foreseeable future projects with real or potential residual effects that are assessed in concert with residual effects from the Project.

Predictions for Project-related changes in surface water quality implicitly capture potential cumulative effects associated with the past and present projects and activities listed in Table 9-37. This is because the surface water quality models incorporated the results of an extensive multi-year baseline water quality monitoring program (Volume 4, Appendix I), and effects associated with existing and historical projects are, therefore, reflected in the observed (i.e., measured) baseline water quality data for the waterbodies within the LAAs. This includes past contamination caused by the ETMA, the former Burnt Timber Mine, and the former MacLellan Mine in the MacLellan LAA and the former Farley Mine in the Gordon LAA.

Short-term effects to surface water quantity related to construction, operation, active-closure, and initial stages of the post-closure (prior to open pit filling) of the Project are anticipated to decrease with increasing distance downstream from the Project. Long-term substantial effects to surface water quantity are anticipated to be limited to the LAA at the Gordon site and the PDA at the MacLellan site once the open pits have completed filling.

At the Gordon site, effects of the Project on surface water quantity at QF08 (the outlet of Ellystan Lake, at the edge of the LAA) are encountered primarily during construction, operation, and decommissioning/ closure. The effect of the Project on mean annual discharge in post-closure is a 1% change from existing conditions (ranging from -1% change to 5% change on a monthly basis) and is therefore considered low or negligible in magnitude. Lake levels at Ellystan Lake are anticipated to experience negligible effects from the Project. Therefore, other projects or physical activities downstream Ellystan Lake do not have the potential for cumulative environmental effects.

At the MacLellan site, short-term effects from the Project are negligible at QM06 along the Keewatin River and at QM11 along the Cockeram River. Therefore, other projects or physical activities downstream of these points do not have the potential for cumulative environmental effects. This includes projects or physical activities in the Lynn River watershed and projects or physical activities downstream of Cockeram Lake, including all mineral development projects except the historical MacLellan and Farley Lake Mines, known mineral exploration, water and waste projects, residential and community development, and infrastructure development. As a result, effects to these projects and activities are not discussed further.

The Gordon and MacLellan sites will discharge into watercourses that eventually drain to Granville Lake at the southern edge of the RAA. However, Project residual effects are not predicted to extend beyond the Gordon and MacLellan LAAs. Therefore, cumulative effects to surface water quantity due to interactions with residual effects from other projects or activities in the RAA (i.e., beyond the LAAs) are not expected to occur.

There are several community sewage treatment plants or on-site sewage treatment systems at cottage subdivisions that could produce effluents containing nutrients (e.g., phosphorus and nitrogen species). These POPCs could affect surface water quality if these effluents were discharged to the aquatic receiving environment or transported to surface water via groundwater. While the sewage treatment facilities have the potential to release nutrients to a localized area of the aquatic environment, the facilities are outside of the LAA and not close enough to have physical overlap with the areas where Project residual effects to water quality identified.

Future mineral exploration or mining project developments could contribute nutrients and metals to the local downstream aquatic environment. However, these projects would be expected to also implement mitigation measures to protect water quality, similar to what has been proposed for the Project. Therefore, residual effects to water quality from other mineral exploration or mining projects would likely be low in magnitude and restricted to a relatively small area downstream.

The Gordon and MacLellan sites will discharge into watercourses that eventually drain to Granville Lake at the southern edge of the RAA. However, Project residual effects are not predicted to extend beyond the Gordon and MacLellan site LAAs. Therefore, cumulative effects to surface water quality due to interactions with residual effects from other projects or activities in the RAA (i.e., beyond the LAAs) are not expected to occur.

Without the proposed Project, future cumulative effects to surface water quantity are assumed to be equivalent to existing background conditions. Without the Project, surface water quantity within the RAA may also be influenced by reasonably foreseeable projects such as mineral exploration or mining project developments. However, these projects would be expected to implement mitigation measures to protect water quantity, similar to what has been proposed for the Project. Any changes to water quantity from other projects would likely be limited to a localized area downstream of the future exploration site or mine. With or without the Project, significant cumulative effects to background water quantity as a result of future potential projects within the RAA are not anticipated.

Without the proposed Project, future cumulative effects to surface water quality are assumed to be equivalent to existing background conditions. Water quality within the RAA will continue to be potentially influenced by the past and present projects and activities listed in Table 9-37, particularly the ETMA which, as baseline water quality sampling between 2015 and 2018 indicates, continues to affect surface water quality downstream of the Lynn River despite recent remediation efforts.

Without the Project, water quality within the RAA may also be influenced by reasonably foreseeable projects such as mineral exploration or mining project developments. However, these projects would be expected to implement mitigation measures to protect water quality, similar to what has been proposed for the Project. Any changes to water quality from other projects would likely be limited to a localized area downstream of the future exploration site or mine. With or without the Project, significant cumulative effects to background water quality as a result of future potential projects within the RAA are not anticipated.

9.6 EFFECTS TO FEDERAL LANDS

Federal lands within the LAA and RAA for surface water consist of Black Sturgeon Reserve which falls within the RAA.

The Black Sturgeon Reserve is located on the Western shore of Hughes Lake approximately 8 km Southwest of the Gordon Site PDA. The Black Sturgeon Reserve is outside of both the Gordon Site and MacLellan site LAAs but is hydraulically connected to the Gordon site LAA via Susan Lake and downstream watercourses that drain to Hughes Lake. As described in Sections 9.4 and 9.5, Project residual effects to surface water are not predicted to extend beyond the Gordon and MacLellan site LAAs, and cumulative effects are not predicted to occur within the RAA. Therefore, Project-related residual and cumulative effects to surface water are not anticipated to occur in waterbodies adjacent to or within the Black Sturgeon Reserve.

9.7 DETERMINATION OF SIGNIFICANCE

9.7.1 Significance of Project Residual Effects

9.7.1.1 Surface Water Quantity

With mitigation, potential residual effects for the average climate scenario due to Project-related changes in surface water quantity are predicted to be not significant. This is because, although there are likely to be measurable changes in lake levels and streamflows with the LAAs, the predicted changes are not expected to exceed a 30% relative change from existing conditions. This determination also takes into account the frequency and duration of residual effects. The potential for Project-related changes in surface water quantity to cause adverse effects to Land and Resource Use (Chapter 15) and Fish and Fish Habitat (Chapter 10) are assessed separately.

9.7.1.2 Surface Water Quality

With mitigation, potential residual effects due to Project-related changes in surface water quality for the Expected Case are predicted to be not significant. This is because, although there are concentrations of some water quality parameters that are predicted to exceed federal and/or provincial water quality guidelines for the protection of aquatic life and baseline concentrations by more than 20% (i.e., POPCs), the predicted concentrations are below the toxicological thresholds at which adverse effects are expected to occur in fish and other aquatic biota (Chapter 10). Therefore, the potential for population-level effects (i.e., survival, growth, reproduction) in fish and aquatic life due to Project-related changes in water quality is expected to be negligible.

9.8 PREDICTION CONFIDENCE

9.8.1 Surface Water Quantity

The level of confidence in the assessment of residual environmental effects on surface water is moderate. The predicted effects are common among mining operations and are well-understood. Substantial conservatism was built into the modelling, to account for potential uncertainty in the baseline monitoring information and potential Project effects.

Effects on surface water quantity are assessed based on runoff characterization, changes in effective contributing catchment areas, changes in groundwater discharges, anticipated water management strategies, and treated effluent discharges and are founded upon multi-year field monitoring, supporting comprehensive empirical and deterministic modelling using GoldSim™. The effects were quantified through the use of regional regression relationships developed between catchment areas and flows based on long-term flow records of selected regional Water Survey of Canada stations, hydrogeological modelling, and water balance modelling. Effects on change in drainage patterns and alteration of watercourses were assessed based on changes in catchment areas, which were quantified using GIS tools. Data limitations that affect modelling results include limited winter flow data, limited local climate data, beaver dam effects, model resolution (i.e., monthly average inputs and outputs) and data collection issues in the field, and are further discussed in Volume 4 (Appendix G) and Volume 5 (Appendices D and E). Potential variability in model results is anticipated to be reasonably captured in the various climate scenarios (1:25 year wet climate scenario, average climate scenario, 1:25 year dry climate scenario) for surface water quantity. Conservative assumptions were made for several model inputs that were deemed to have a high level of uncertainty or variability. Potential effects on surface water quantity are addressed through standard and site-specific mitigation measures as discussed in Section 9.4.1.3.

9.8.2 Surface Water Quality

The assessment of potential Project-specific and cumulative effects on surface water quality was based on GoldSim™ water quality models developed for the Gordon and MacLellan sites. The accuracy and reliability of modelling water quality relies on the data inputs to the models including baseline water quality (Volume 4; Appendix I), baseline hydrology (Volume 4, Appendix G), geochemical source terms (Volume 4, Appendix F), groundwater quality, quantity, and flow paths predicted from a groundwater model (Volume 5, Appendices F and G), and water balance models (Volume 5, Appendices D and E). Each of these model source terms has inherent uncertainty, and conservatism has been incorporated into the model inputs to reduce these uncertainties whenever possible. The water quality models are particularly sensitive the scaling of geochemistry data from bench scale testing up to the rock volumes expected to occur in the open pits, MRSAs, ore stockpiles, and overburden stockpiles at the Gordon and MacLellan sites as well as the TMF at the MacLellan site.

Additional risk analysis was not deemed to be necessary due to the conservatism incorporated into the water quality models and the sensitivity analyses conducted using the water quality models. With the conservatism of the water quality modelling (discussed in Section 9.4.2.1), predicted changes due to Project activities are likely over-estimated for both the Expected Case and the Upper-Case scenarios. The water quality modelling for both sites was conducted for the Expected Case (i.e., average climate, mean geochemical source terms, mean baseline surface water quality) and a conservative Upper Case (i.e., average climate, 95th percentile geochemical source terms, 95th percentile baseline surface water quality) to provide concentrations for the scenario most likely to occur (i.e., Expected Case) and an upper bounds for a scenario that is unlikely to occur. The sensitivity scenarios address the inherent uncertainty in water quality models and assess potential for variability of geochemical source terms and existing conditions water quality.

Follow-up water quality monitoring will be conducted to confirm predicted water quality and residual effects. Monitoring will be used to assess the effectiveness of potential mitigation measures and inform adaptive management (Chapter 23). At the MacLellan site, there will be approximately 21 years between the end of operations and the beginning of discharge to the KEE3-B1 subcatchment, allowing time to assess the need for, test, and implement passive treatment strategies. The conservatism of the water quality modelling, follow-up monitoring, and adaptive management are considered sufficient to assess and manage potential risks.

For the reasons above, the prediction confidence is characterized as moderate.

9.9 FOLLOW-UP AND MONITORING

A conceptual framework and scope for environmental management and monitoring plans (EMMPs), including follow up and monitoring programs is provided in Chapter 23. In the event that an unexpected deterioration of the environment is observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process described in Chapter 23, Section 23.2. This may include an investigation of the cause of the deterioration and identification of existing and/or new mitigation measures to be implemented to address it.

9.10 SURFACE WATER QUANTITY

Surface water quantity monitoring locations will be established prior to construction and be maintained throughout all phases of the Project, or as modified through consultation. The monitoring program will be based on the Surface Water Monitoring and Management Plan (Chapter 23, Section 23.5.5). The purpose of the Surface Water Monitoring and Management Plan is to:

- Provide a framework for monitoring surface water quantity in near-field, far-field, and reference sites at both sites, and lake level and streamflow monitoring at baseline locations (modified to focus on areas of potential effects) in accordance with regulatory requirements.
- Outline standard management practices for drainage control, dewatering, control of site runoff and seepage, contact-water collection, storage, and reuse, tailings management, water management facilities for collection and treatment, maintenance of drainage patterns and works to address infiltration and evapotranspiration capacity, and open pit filling at decommissioning/closure.

Surface water quantity is expected to stabilize during post-closure once the open pits have been filled. Surface water quantity is not used as criteria to determine permanent closure.

9.10.1 Surface Water Quality

Surface water quality monitoring throughout all phases of the Project will be based on the Surface Water Monitoring and Management Plan (Chapter 23, Section 23.5.5). The purpose of the Surface Water Monitoring and Management Plan is to:

- Provide a framework for monitoring surface water quality in near-field, far-field, and reference sites at both sites, and lake level and streamflow monitoring at baseline locations (modified to focus on areas of potential effects) in accordance with regulatory requirements.
- Outline standard management practices for drainage control, dewatering, control of site runoff and seepage, contact-water collection, storage, and reuse, tailings management, water management facilities for collection and treatment, maintenance of drainage patterns and works to address infiltration and evapotranspiration capacity, and open pit filling at decommissioning/closure.

In addition to the Surface Water Monitoring Plan, Management plans that may pertain to the source(s) of identified surface water POPCs include:

- The Mine Rock Management Plan (MRMP; Chapter 23, Section 23.5.3) to guide the handling, storage, and management of mine rock for the Project. The MRMP will outline procedures and test methods to classify the acid rock drainage and metal leaching (ARD/ML) potential and geochemical properties of the materials.
- The Groundwater Monitoring Plan (Chapter 23, Section 23.5.4) to provide a framework for monitoring potential changes in groundwater quantity and quality in relation to the Project.
- The Erosion and Sediment Control Plan (Chapter 23, Section 23.5.13) to provide environmental protection measures for the aquatic environment and protect watercourses and wetlands from the experiencing effects from mobilization of sediment.

In accordance with MDMER, an Environmental Effects Monitoring Plan (EEMP) will be developed to address the potential treatment of discharge water, and to plan Project-specific details for monitoring and reporting as required under the MDMER (Chapter 23, Section 23.5.19). The EEMP will be subject to approval by ECCC.

A Conceptual Closure Plan (Chapter 23, Appendix 23B) has been prepared to provide direction in the development of the closure strategy (which includes monitoring) for the Project sites at the end of their life cycle. The objective of closure activities is to restore the sites to a satisfactory condition in accordance with provincial legislation and guidelines. Some examples of rehabilitation-related activities that may influence surface water quality in post-closure include:

- Providing reasonable paths for surface drainage.
- Discharging water in compliance with effluent surface water and groundwater quality criteria.

The Conceptual Closure Plan will also include monitoring plans for surface water quality and aquatic elements as follows:

- Water chemistry monitoring – surface water monitoring (pit lake water, TMF sediment pond, receiving waterbodies and watercourses upstream and downstream of discharge flows); groundwater monitoring (around open pits, in vicinity of Gordon and Farley lakes and Keewatin River, and monitoring wells upgradient and downgradient of TMF, MRSAs, and other material stockpiles); and water quality (general parameters, anions, metals).
- Aquatic monitoring – Environmental Monitoring and Management Plans (EMMPs) will be prepared for the aquatic and terrestrial environments as the project progresses. The EMMPs will include monitoring programs to assess the effectiveness of the mitigation measures related to revegetation and the establishment of wildlife/fish habitat.

As described in the Conceptual Closure Plan, maintenance and monitoring will continue through Active Closure and Post-Closure while water quality is not of sufficient quality to allow unabated discharge to the environment. Permanent Closure can be considered to be complete when surface water quality is within the pertinent guidelines and discharge will be allowed. Monitoring and maintenance will cease at this point. A detailed Closure Plan will be developed that conforms with *The Mines and Minerals Act* Mine Closure Regulation and will describe specific closure criteria. The detailed Closure Plan must be submitted prior to the commencement of advanced exploration and mining operations. The detailed Closure Plan will be developed once the detailed design process progresses.

If monitoring indicates that corrective action is required, the proposed approach for managing the action will be identified with adaptive management. Adaptive management is a planned and systematic process for continuously improving environmental management practices and adjusting monitoring approaches by learning from outcomes. Adaptive management provides the flexibility to address/accommodate new circumstances, to adjust monitoring, implement new mitigation measures or modify existing measures. The Project will identify and correct incidents with appropriate measures aimed to avoid reoccurrence and/or similar occurrences. The Adaptive Management Framework is described Chapter 23, Section 23.2.

9.11 SUMMARY OF COMMITMENTS

9.11.1 Surface Water Quantity

As described in Section 9.4.1.3, the following measures will be implemented to reduce potential effects of the Project on water levels in lakes and wetlands and flows in stream and rivers within the Gordon site and MacLellan site LAAs:

- Establish surface water quantity monitoring program prior to onset of construction activities.
- During Year 1 of the Project, extraction of freshwater from the Keewatin River for process make-up water, potable water, and other water uses will not exceed 10% of instantaneous stream discharge.

9.11.2 Surface Water Quality

Alamos is committed to implementing the monitoring and management plans associated with surface water quality and outlined in Section 9.8.2. In addition, the below mitigation measures (previously described in Section 9.4.2.3) will be implemented to reduce potential effects of the Project on water quality in the aquatic receiving environment of the Gordon site and MacLellan site LAAs.

Gordon Site

- Design of water management facilities to collect and treat (as required) contact water such that effluent meets applicable federal and provincial regulatory requirements, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER (amended), prior to discharge to the environment.
- Transporting domestic waste to the sewage treatment plant at the MacLellan site.
- Aerating Wendy and East pits to encourage precipitation of elements that form oxides (e.g., iron oxide) and to break down of thermal stratification prior to dewatering.
- Aerating groundwater from groundwater interceptor wells to encourage precipitation of elements that form oxides (e.g., iron oxide) and to increase dissolved oxygen concentrations prior to discharge to Gordon and Farley lakes.
- Dust suppression measures for exposed ground areas of the PDA, to reduce atmospheric deposition to surface water (Chapter 6).
- Sediment and erosion control measures during construction to limit the release of TSS and turbidity.
- Expediting the re-filling of open pit during closure to reduce exposure of pit walls.
- Treating and handling of building material that is used in water to avoid the release or leaching of substances that would reduce water quality.

MacLellan Site

- Design of water management facilities to collect and treat (as required) surplus contact water such that effluent meets applicable federal and provincial regulatory requirements, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER (amended), prior to discharge to the environment.
- Designing the TMF with two cells to allow progressive development during operations to reduce freshwater requirements.
- Operating the TMF as a non-discharging facility during operation through decommissioning/closure.
- Recycling water between the TMF and the processing facility to the maximum extent possible during operations to reduce freshwater make-up requirements.

- Implementing passive treatment options (e.g., controlled pit stratification, fertilizer amendment, flow segregation) in the open pit should monitoring show that pit water quality is not suitable for release to the environment during the approximately 21 years anticipated to fill the open pit with contact water at the conclusion of mine operation.
- Using a closed circuit for cyanide use and cyanide destruction in the processing plant (via Air/SO_2 oxidation and precipitation of metals) to reduce cyanide concentrations in tailings slurry prior to release of the slurry for storage in the TMF (Chapter 2, Section 2.3.2.1).
- Constructing groundwater cut-off ditches to reduce groundwater seepage from the TMF reaching Minton Lake.
- Treating domestic waste in an average 60,000 L/day sewage treatment plant so that it meets “Wastewater Systems Effluent Regulations” under the *Fisheries Act* prior to discharge to the Keewatin River via a pipeline and diffuser.

Alamos is committed to implementing the above mitigation measures if such measures are deemed necessary and adequate to improve Project-related changes in water quality, and to prevent or reduce the potential for adverse effects to aquatic biota in the receiving environment.

9.12 REFERENCES

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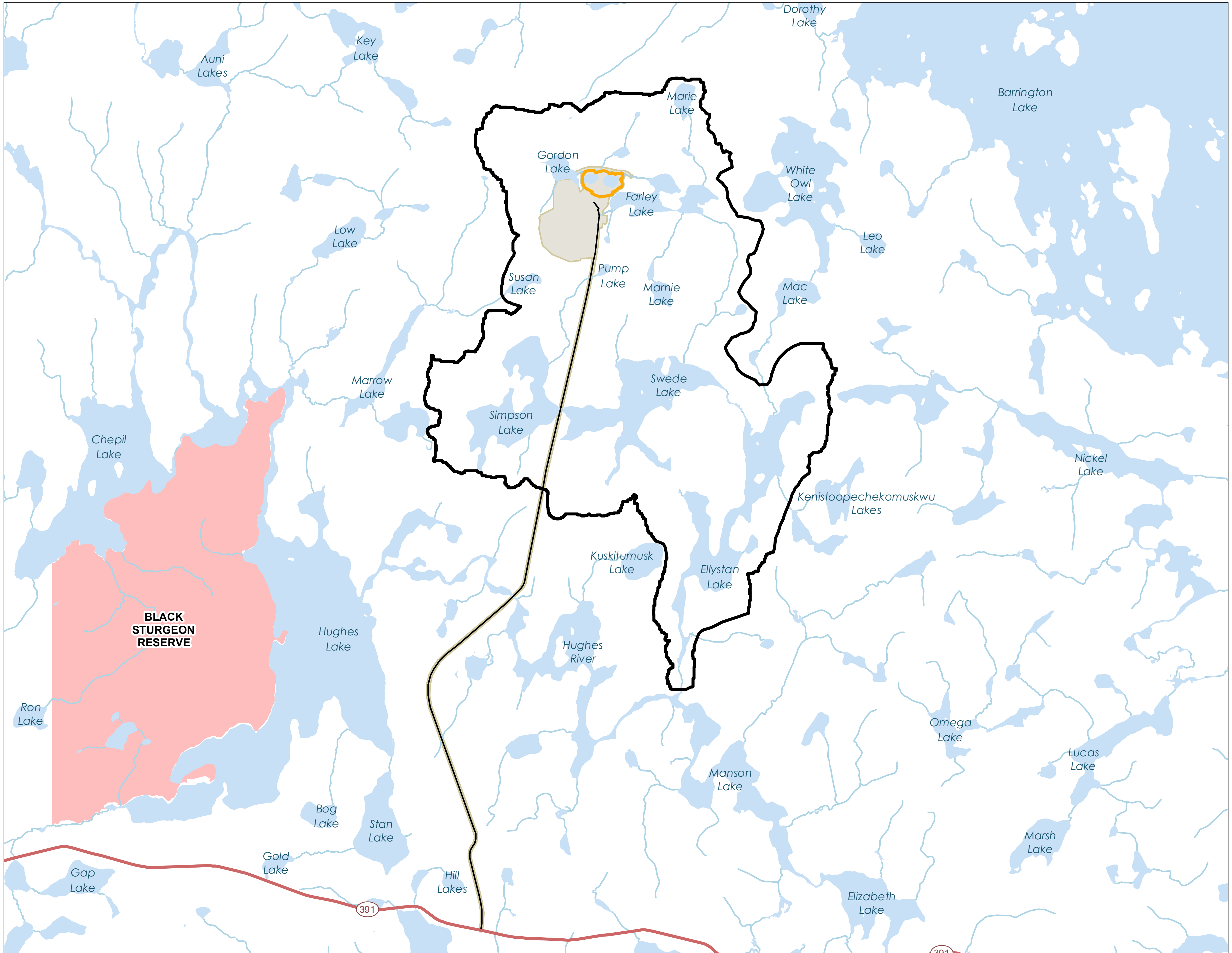


Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Surface Water Local Assessment Area (LAA)

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody
- First Nation Reserve

N

0 1 2 Kilometres

(At original document size of 11x17)
1:75,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

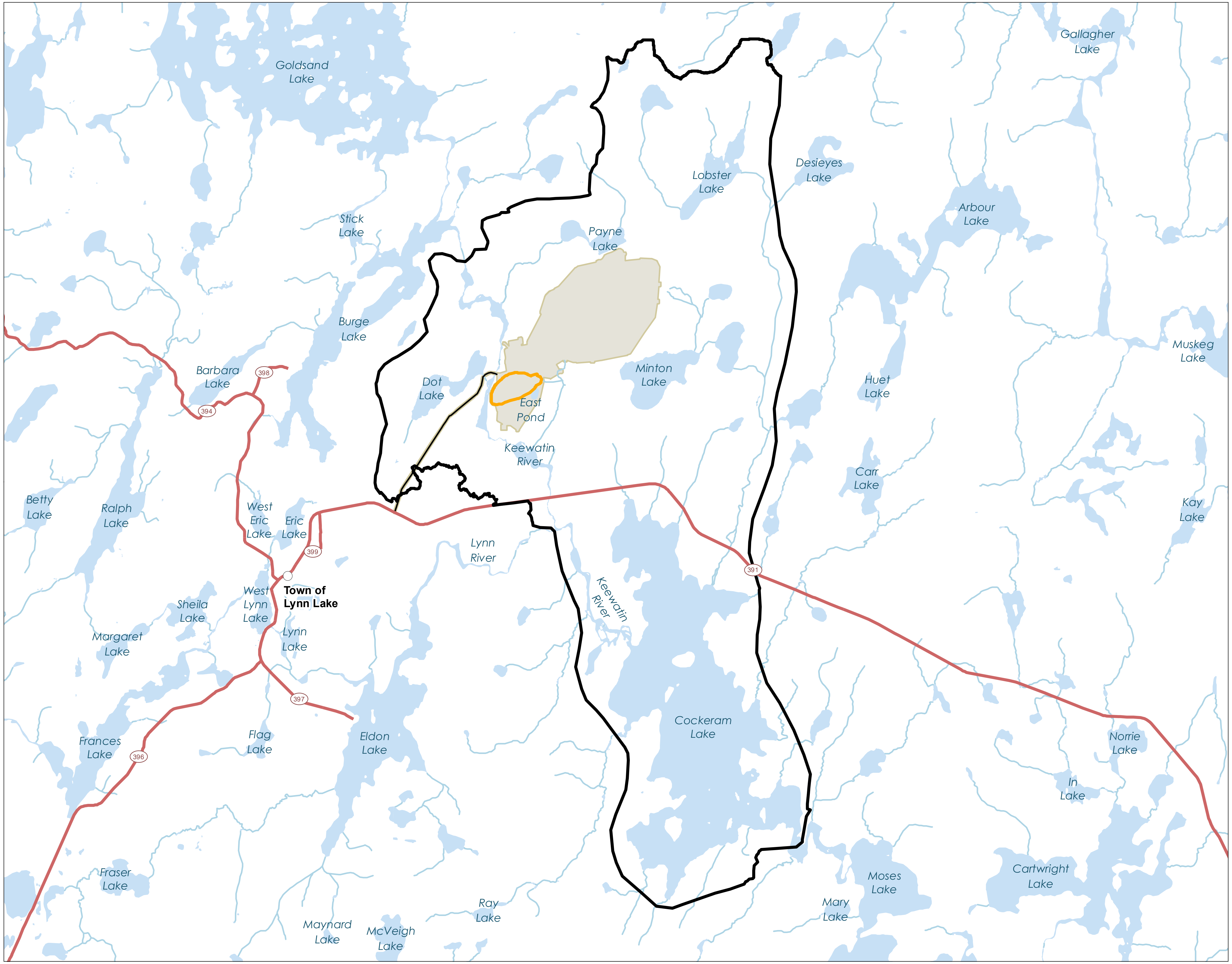
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-1

Title
Surface Water Local Assessment Area - Gordon Site



Stantec

ALAMOS GOLD INC.

Project Infrastructure

Proposed Open Pit

Project Development Area

Study Area

Surface Water Local Assessment Area (LAA)

Landbase

Existing Access Road

Highway

Watercourse

Waterbody

N

0 1.5 3 Kilometres

(At original document size of 11x17)
1:100,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

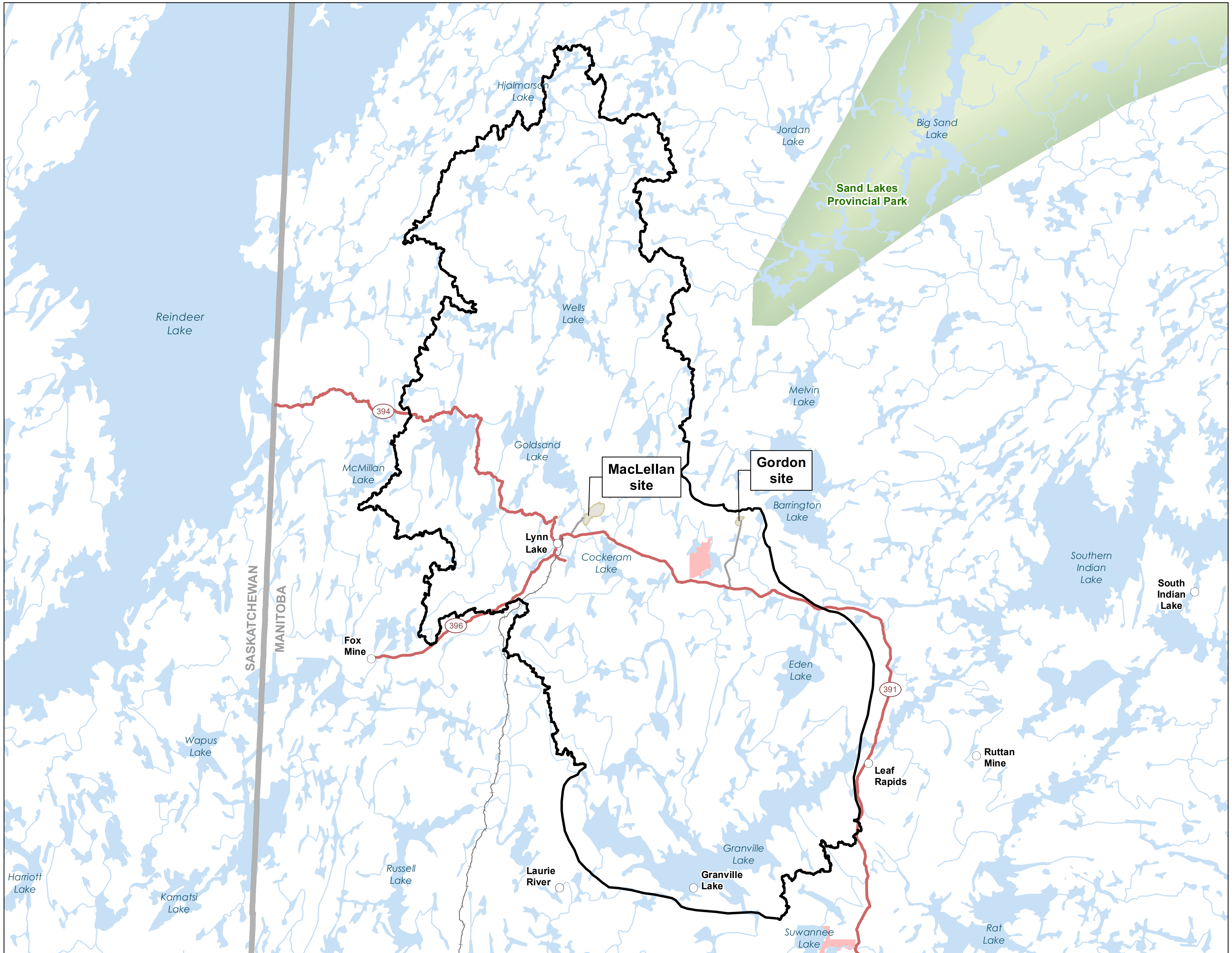
Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-05-05
Technical Review by JJackson on 2020-05-05
Senior GIS Review by GKroupa on 2020-03-30

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-2

Title
Surface Water Local Assessment Area - MacLellan Site



Stantec

ALAMOS GOLD INC.

Project Infrastructure
- Project Development Area

Study Area
- Surface Water Regional Assessment Area (RAA)

Landbase
- Community
- Highway
- Access Road
- Rail
- Watercourse
- Waterbody
- First Nation Reserve
- Provincial Park
- Provincial Border

N

0 10 20 Kilometres

(At original document size of 11x17)
1:800,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada

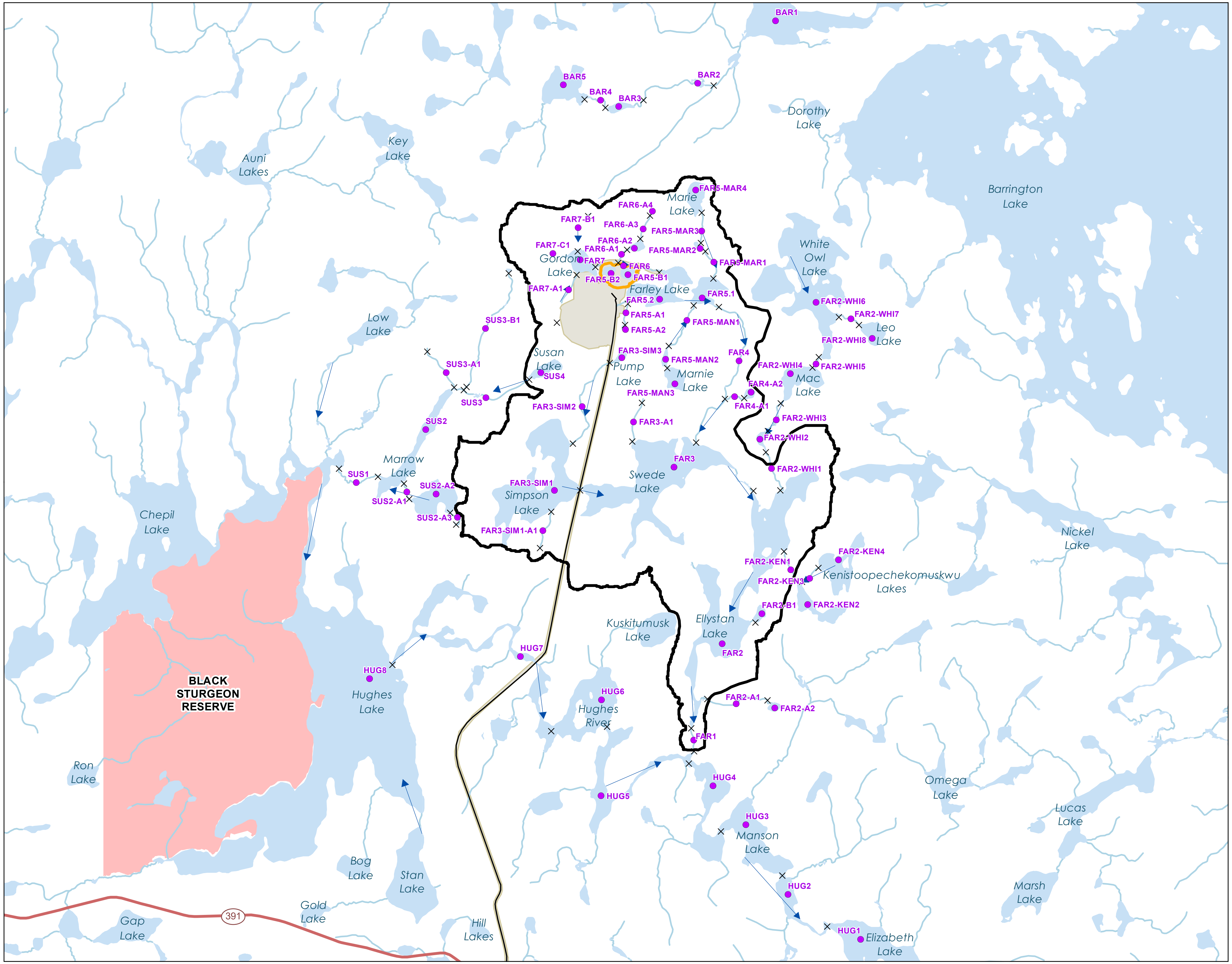
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-3

Title
Surface Water - Regional Assessment Area



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Surface Water Local Assessment Area (LAA)

Reach Locations

- Break Centrepoint
- Reach Boundary
- Surface Water Flow Direction

Landbase

- Existing Access
- Highway
- Watercourse
- Waterbody
- First Nation Reserve

N

0 1.5 3 Kilometres

(At original document size of 11x17)
1:80,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

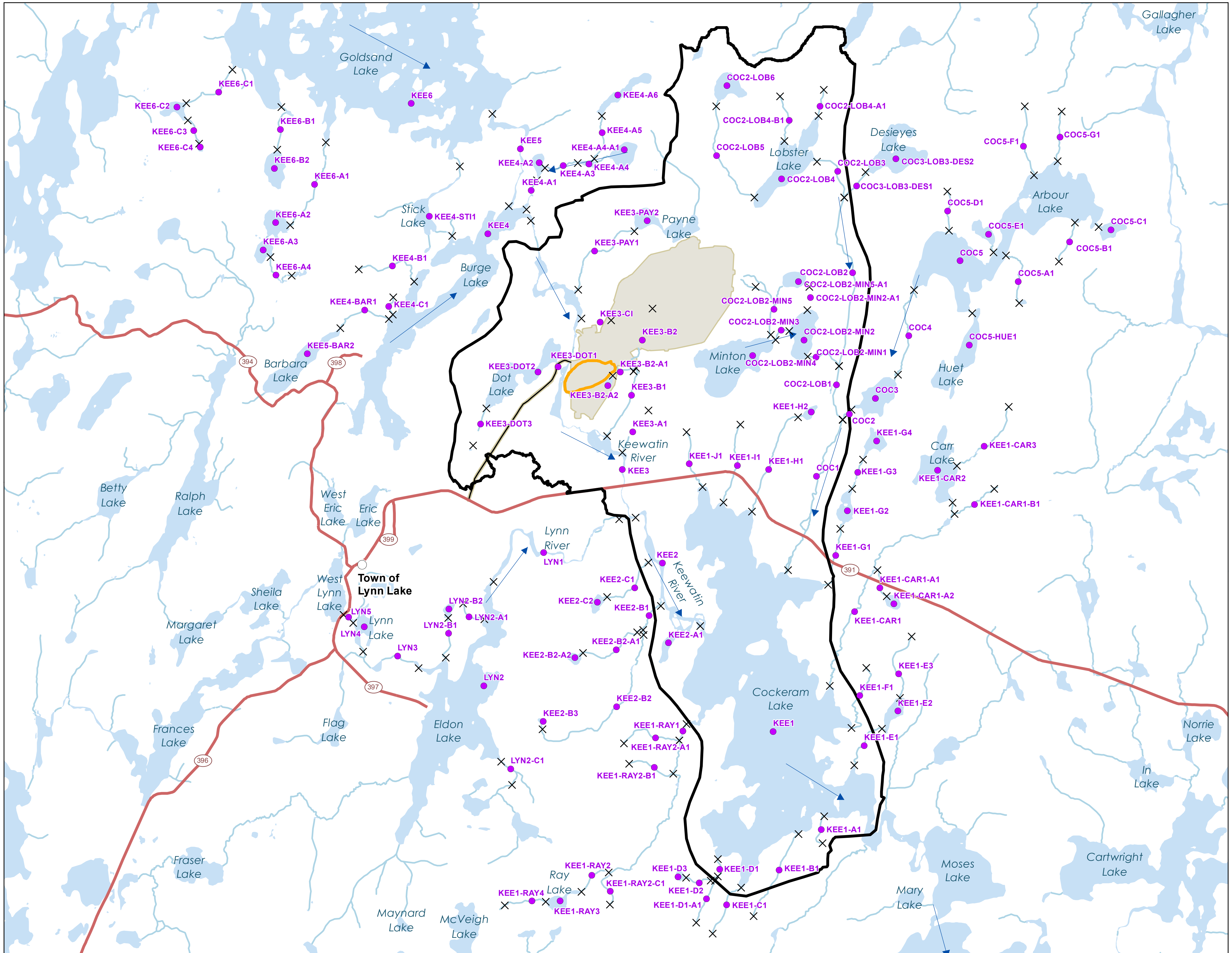
Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project 111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-4

Title
Reach Locations - Gordon Site



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Surface Water Local Assessment Area (LAA)

Reach Locations

- Break Centrepoint
- Reach Boundary
- Surface Water Flow Direction

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 1.5 3 Kilometres

(At original document size of 11x17)
1:100,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake,
Manitoba

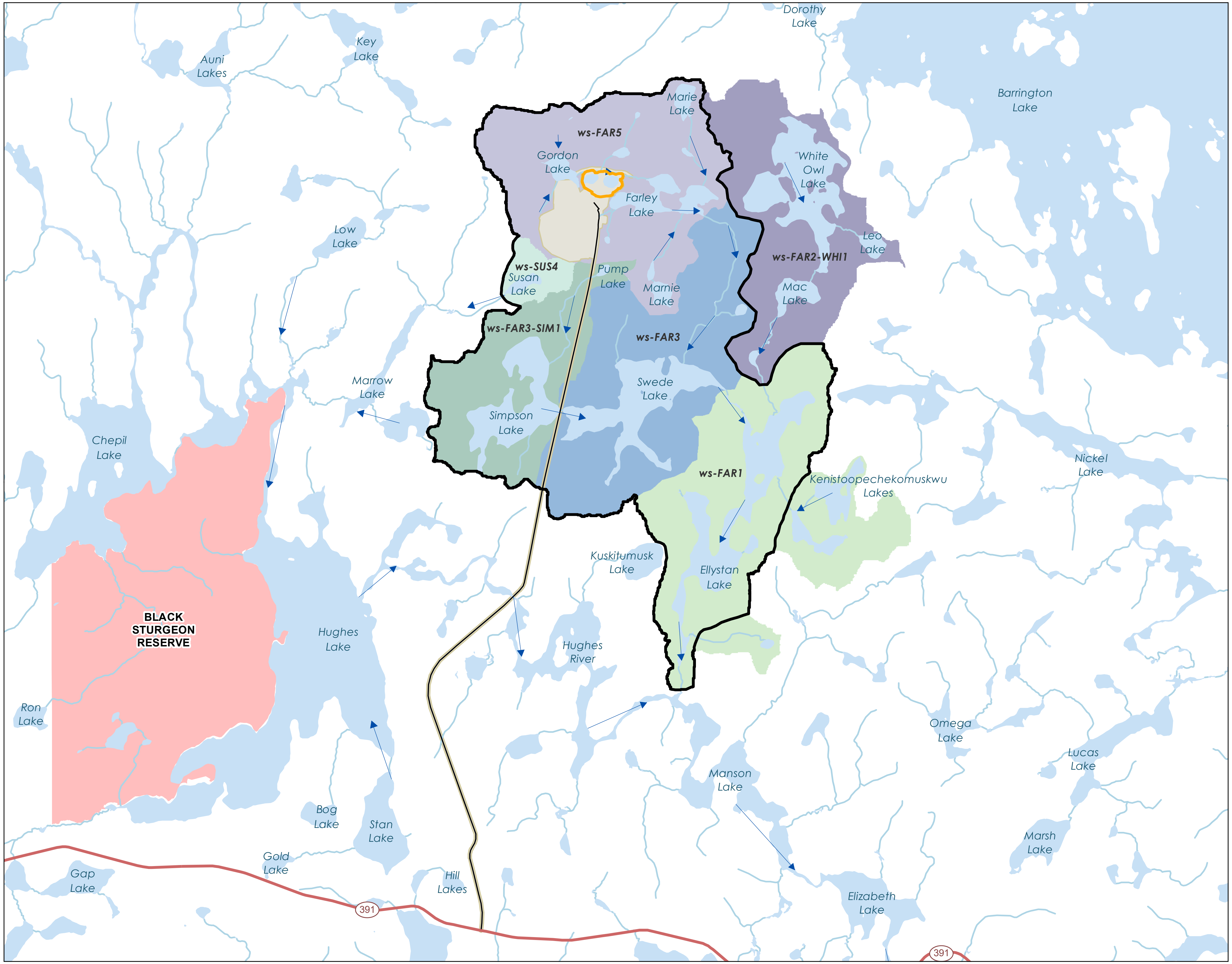
Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project
111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-5

Title
Reach Locations - MacLellan Site



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Surface Water Local Assessment Area (LAA)

Watersheds & Drainage

- Surface Water Flow Direction

Watersheds

- ws-FAR1
- ws-FAR2-WHI1
- ws-FAR3
- ws-FAR3-SIM1
- ws-FAR5
- ws-SUS4

Landbase

- Existing Access
- Highway
- Watercourse
- Waterbody
- First Nation Reserve

N

0 1 2 Kilometres

(At original document size of 11x17)
1:75,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-6

Title
Watersheds - Gordon Site

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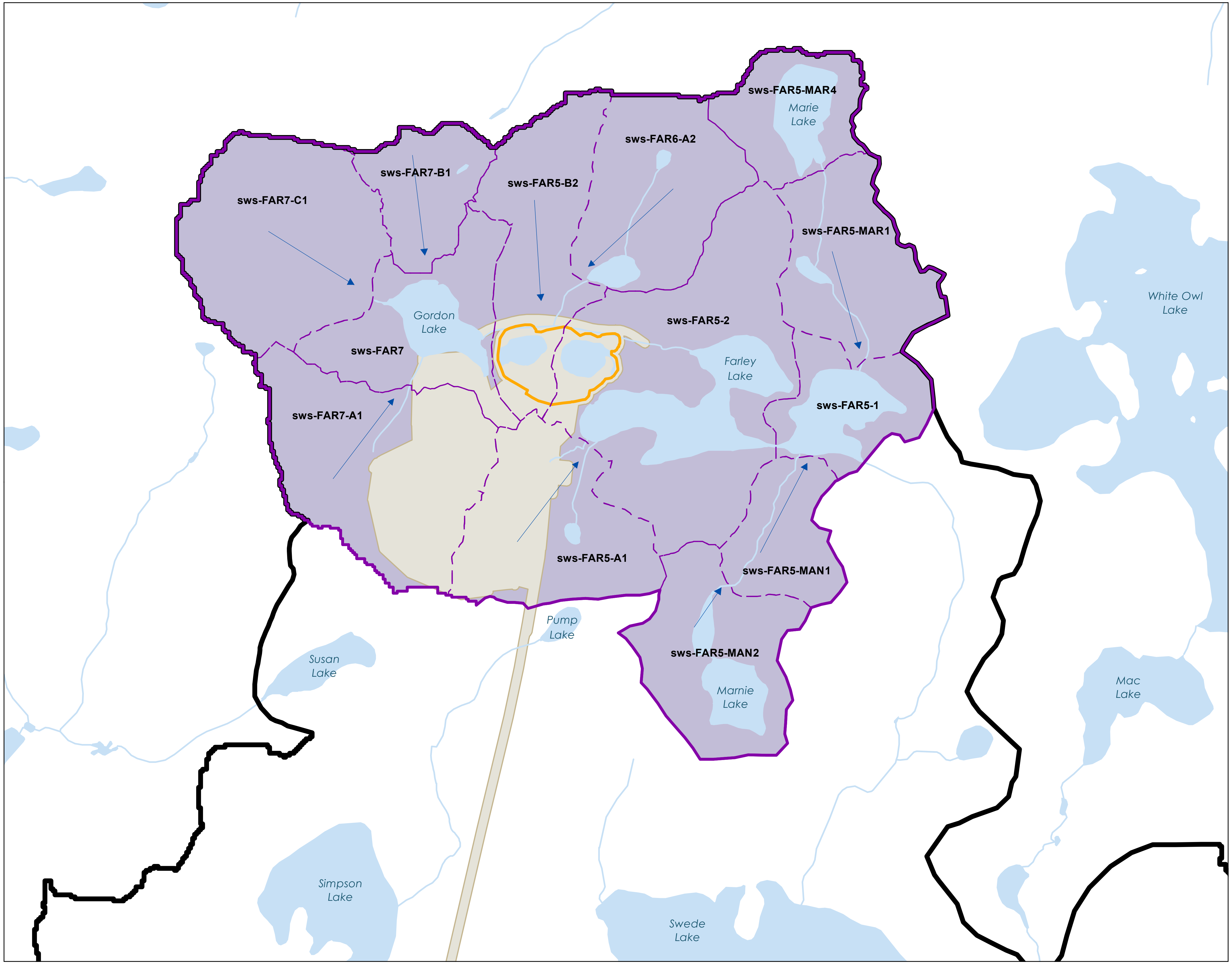


Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Surface Water Local Assessment Area (LAA)

Watersheds & Drainage

- Surface water Flow Direction
- Subwatersheds
- Gordon Site Watershed

Landbase

- Watercourse
- Waterbody

N

0 500 1,000 Metres

(At original document size of 11x17)
1:25,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake,
Manitoba

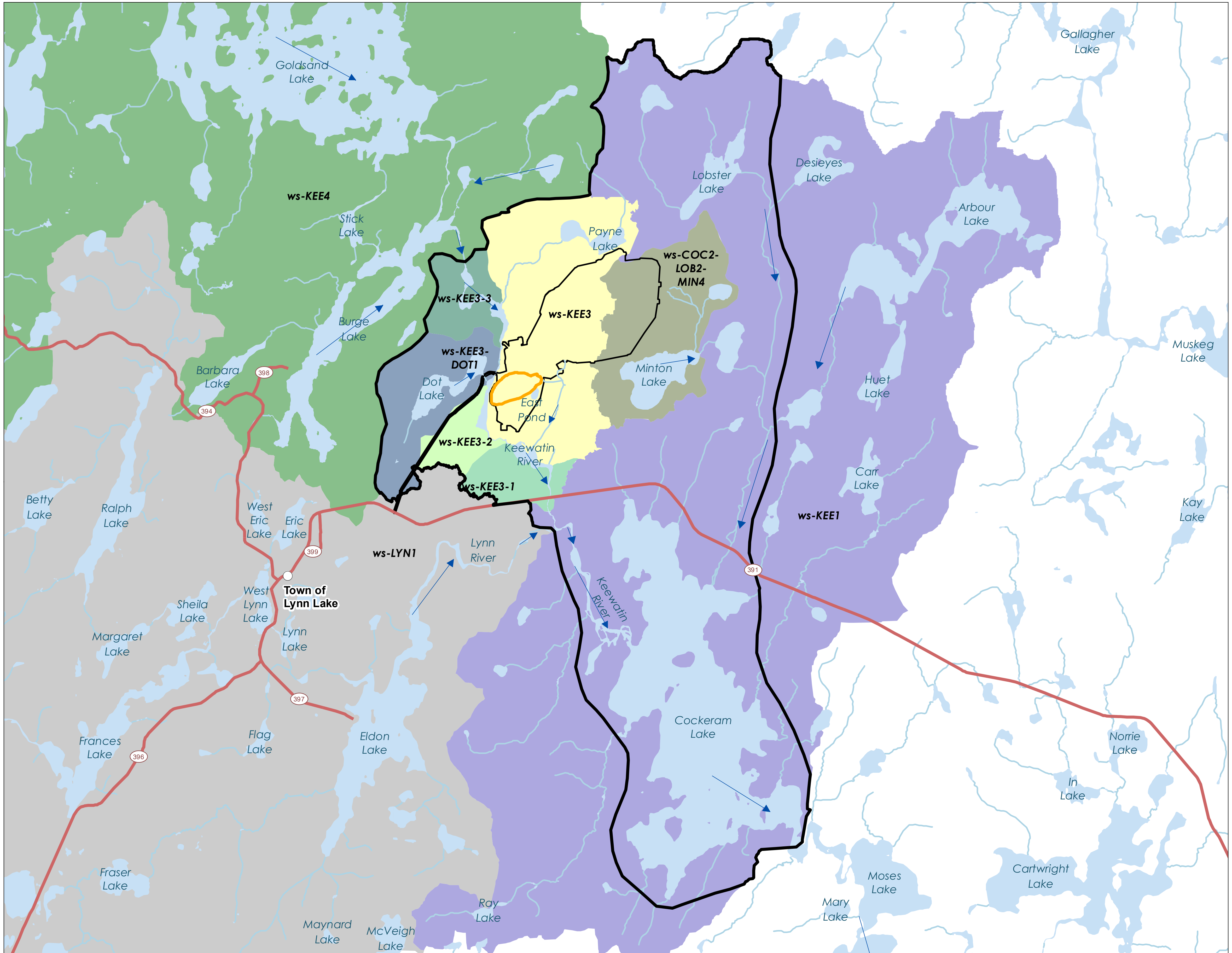
Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project
111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-7

Title
Subwatersheds - Gordon Site



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Surface Water Local Assessment Area (LAA)

Watersheds and Drainage

- Surface Water Flow Direction
- ws-COC2-LOB2-MIN4
- ws-KEE1
- ws-KEE3
- ws-KEE3-1
- ws-KEE3-2
- ws-KEE3-3
- ws-KEE3-DOT1
- ws-KEE4
- ws-LYN1

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 1.5 3 Kilometres

(At original document size of 11x17)
1:100,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

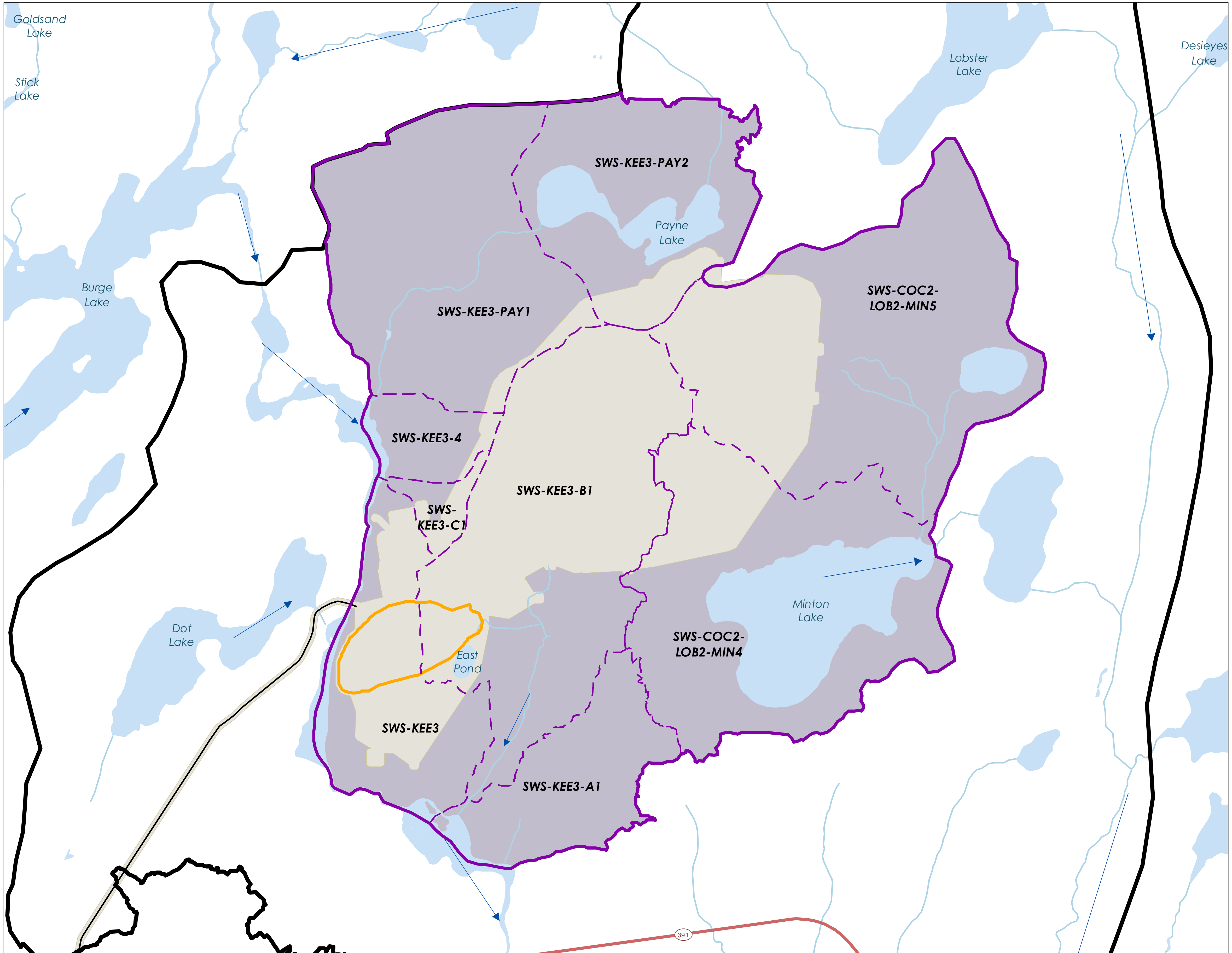
Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-05-05
Technical Review by JJackson on 2020-05-05
Senior GIS Review by GKroupa on 2020-03-30

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-8

Title
Watersheds - MacLellan Site



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Surface Water Local Assessment Area (LAA)

Watersheds and Drainage

- Surface Water Flow Direction
- Subwatersheds
- MacLellan Site Watershed

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 0.5 1 Kilometres

(At original document size of 11x17)
1:35,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

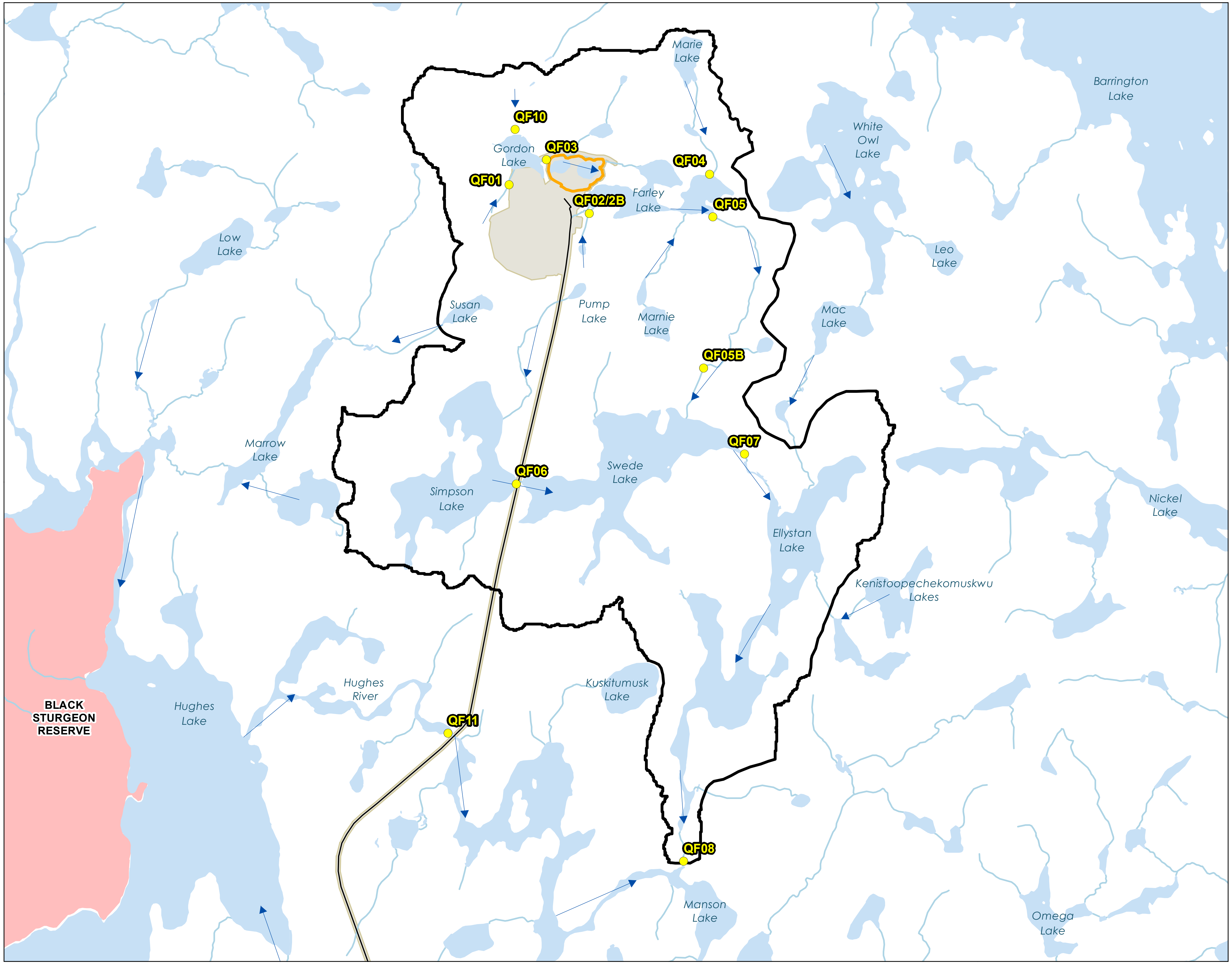
Prepared by ACampigotto on 2020-05-05
Technical Review by JJackson on 2020-05-05
Senior GIS Review by GKroupa on 2020-03-30

Client/Project 111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-9

Title
Subwatersheds - MacLellan Site



Stantec

Alamos Gold Inc.

Project Infrastructure

Proposed Open Pit

Project Development Area

Study Area

Surface Water Local Assessment Area (LAA)

Sample Locations

Hydrology Monitoring Station

Surface Water Flow Direction

Landbase

Existing Access Road

Watercourse

Waterbody

First Nation Reserve

N

0 1 2 Kilometres

(At original document size of 11x17)
1:55,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

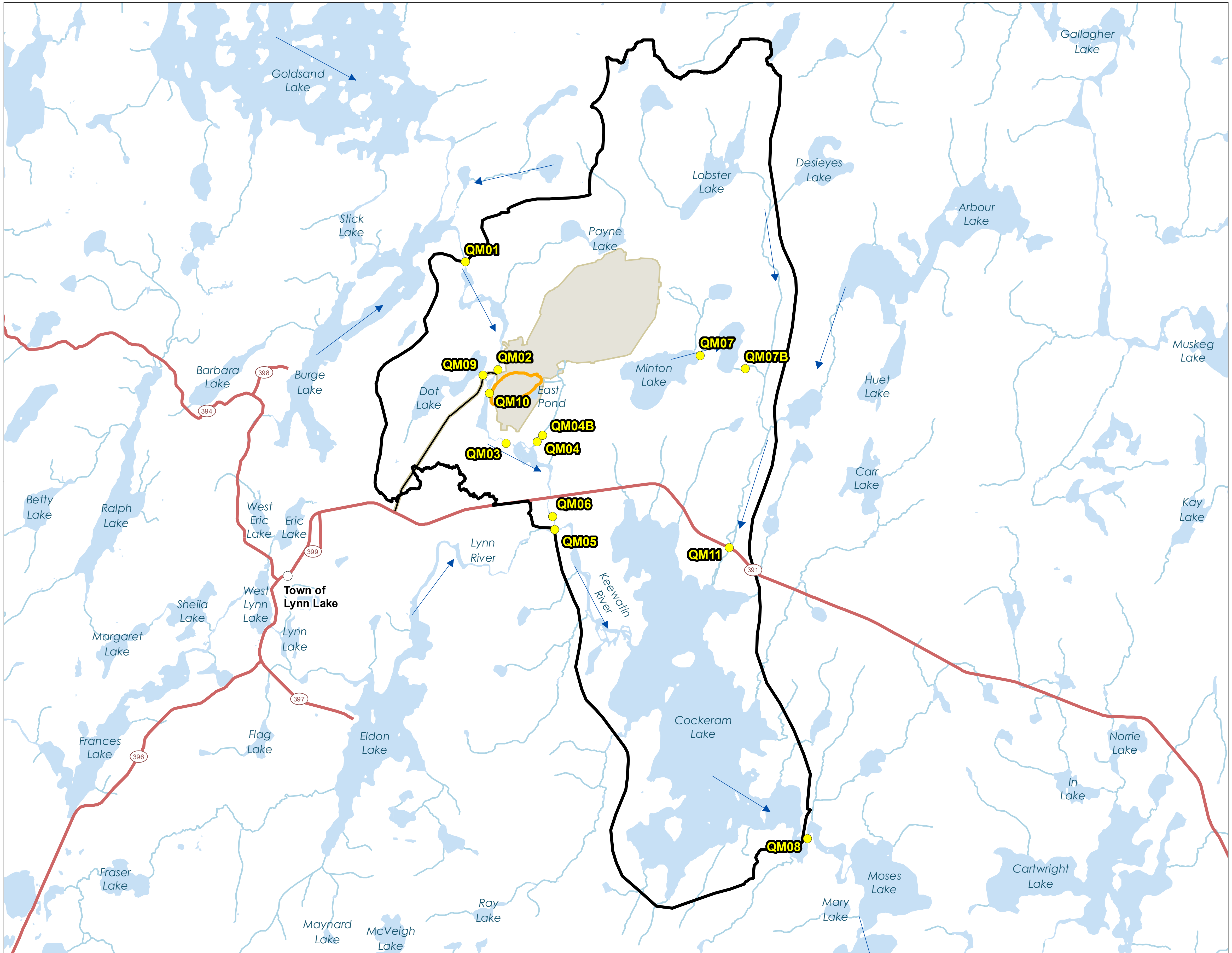
Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-10

Title
Hydrometric Monitoring Stations
Gordon Site



Stantec

Alamos Gold Inc.

Project Infrastructure

Proposed Open Pit

Project Development Area

Study Area

Surface Water Local Assessment Area (LAA)

Sample Locations

Hydrology Monitoring Station

Surface Water Flow Direction

Landbase

Existing Access Road

Highway

Watercourse

Waterbody

N

0 1.5 3 Kilometres

(At original document size of 11x17)
1:100,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

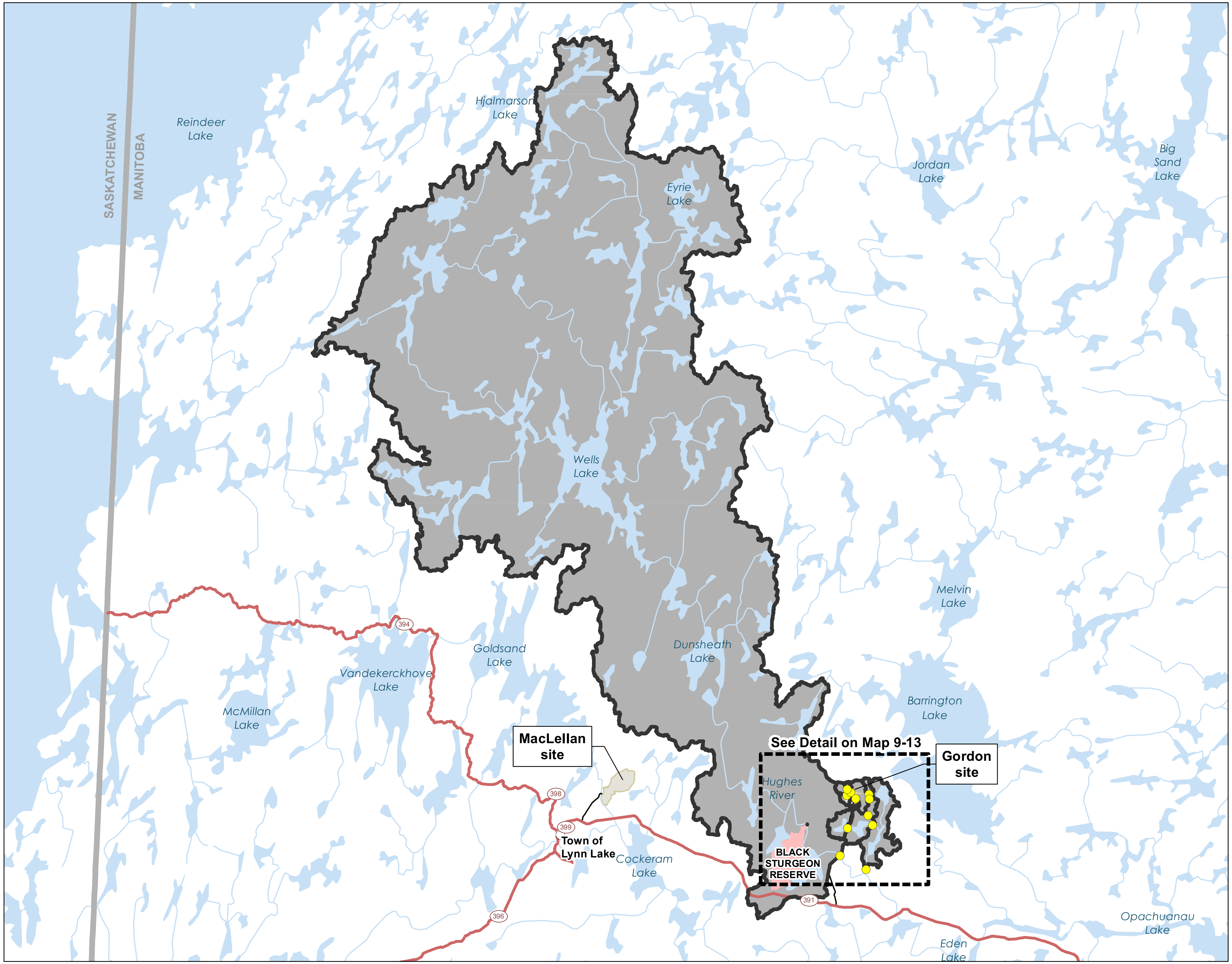
Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-05-05
Technical Review by JJackson on 2020-05-05
Senior GIS Review by GKroupa on 2020-03-30

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-11

Title
Hydrometric Monitoring Stations
MacLellan Site



Stantec

Alamos Gold Inc.

Project Infrastructure

Project Development Area

Sample Locations

Hydrology Monitoring Station

Hydrology Monitoring Station Drainage Area

Landbase

Existing Access Road

Highway

First Nation Reserve

N

0 10 20 Kilometres

(At original document size of 11x17)
1:500,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

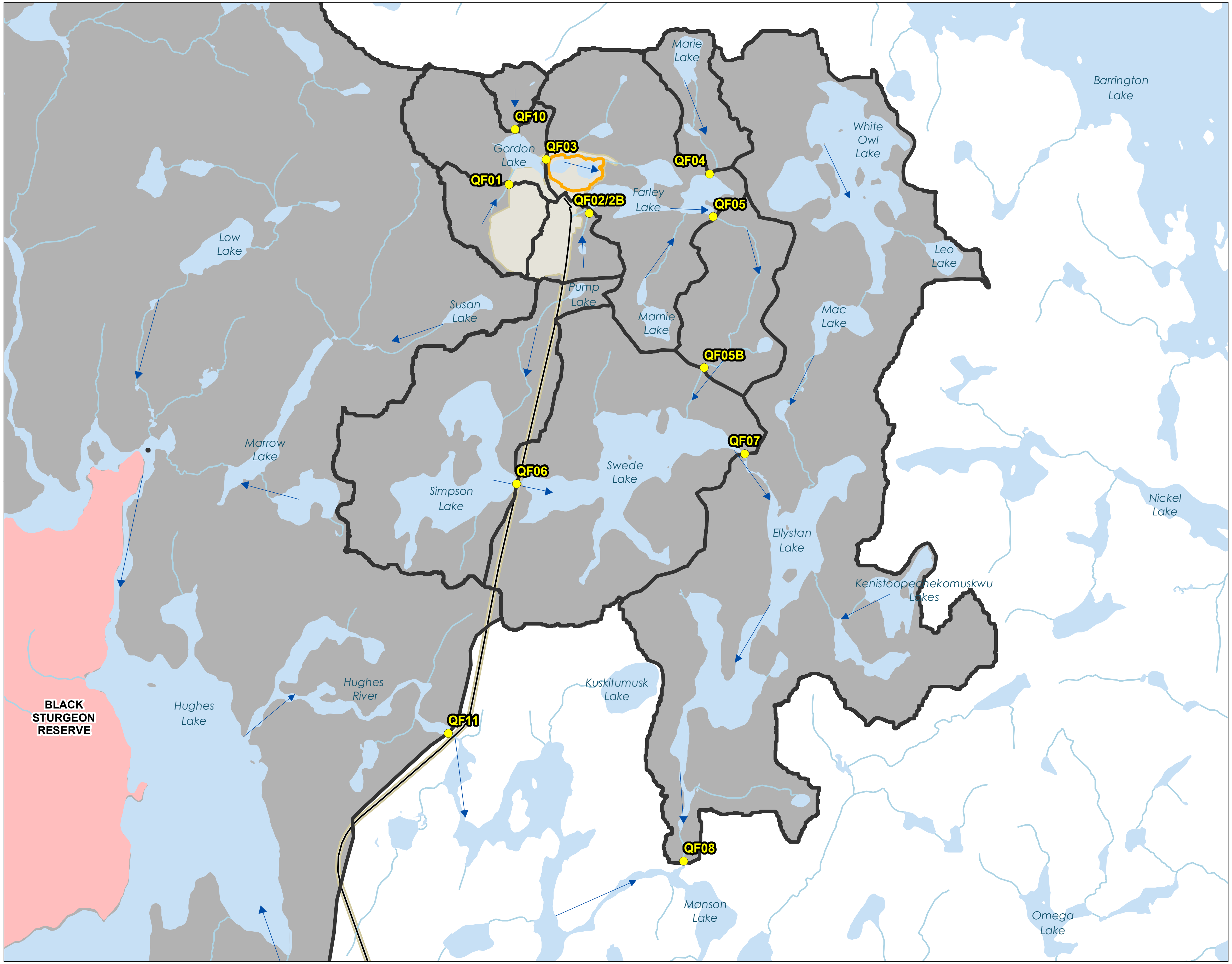
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-12

Title
Gordon Site Drainage Areas for Hydrometric Monitoring Stations - Overview



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Sample Locations

- Hydrology Monitoring Station
- Surface Water Flow Direction
- Hydrology Monitoring Station Drainage Area

Landbase

- Existing Access Road
- Watercourse
- Waterbody
- First Nation Reserve

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

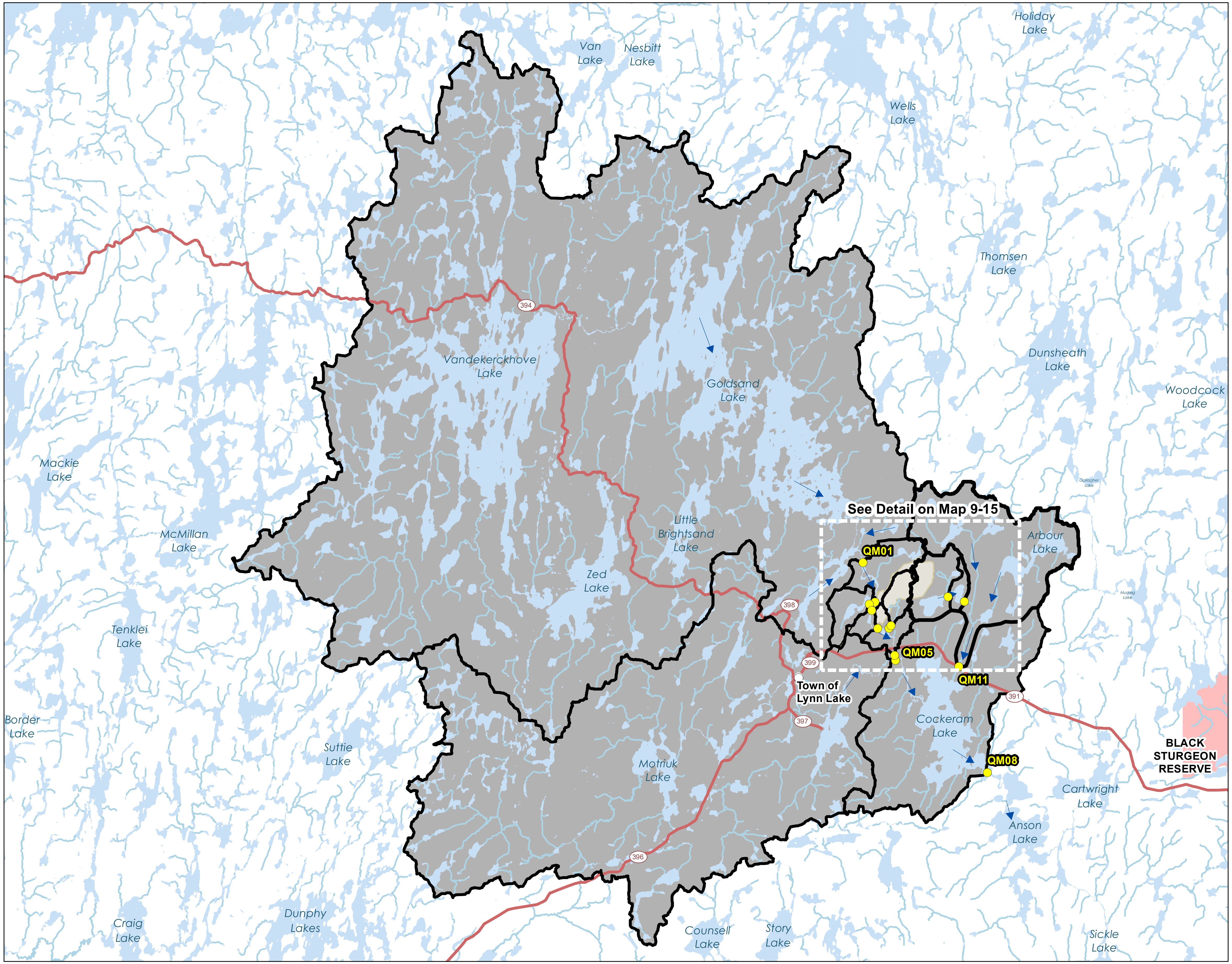
Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-12
Technical Review by JJackson on 2020-05-12
Senior GIS Review by GKroupa on 2020-03-30

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-13

Title
Gordon Site Drainage Areas for Hydrometric Monitoring Stations



Stantec

Alamos Gold Inc.

Project Infrastructure

Project Development Area

Sample Locations

Hydrology Monitoring Station

Surface Water Flow Direction

Hydrology Monitoring Station Drainage Area

Landbase

Existing Access Road

Highway

Watercourse

Waterbody

First Nation Reserve

N

0 5 10 Kilometres

(At original document size of 11x17)
1:275,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project 111473008

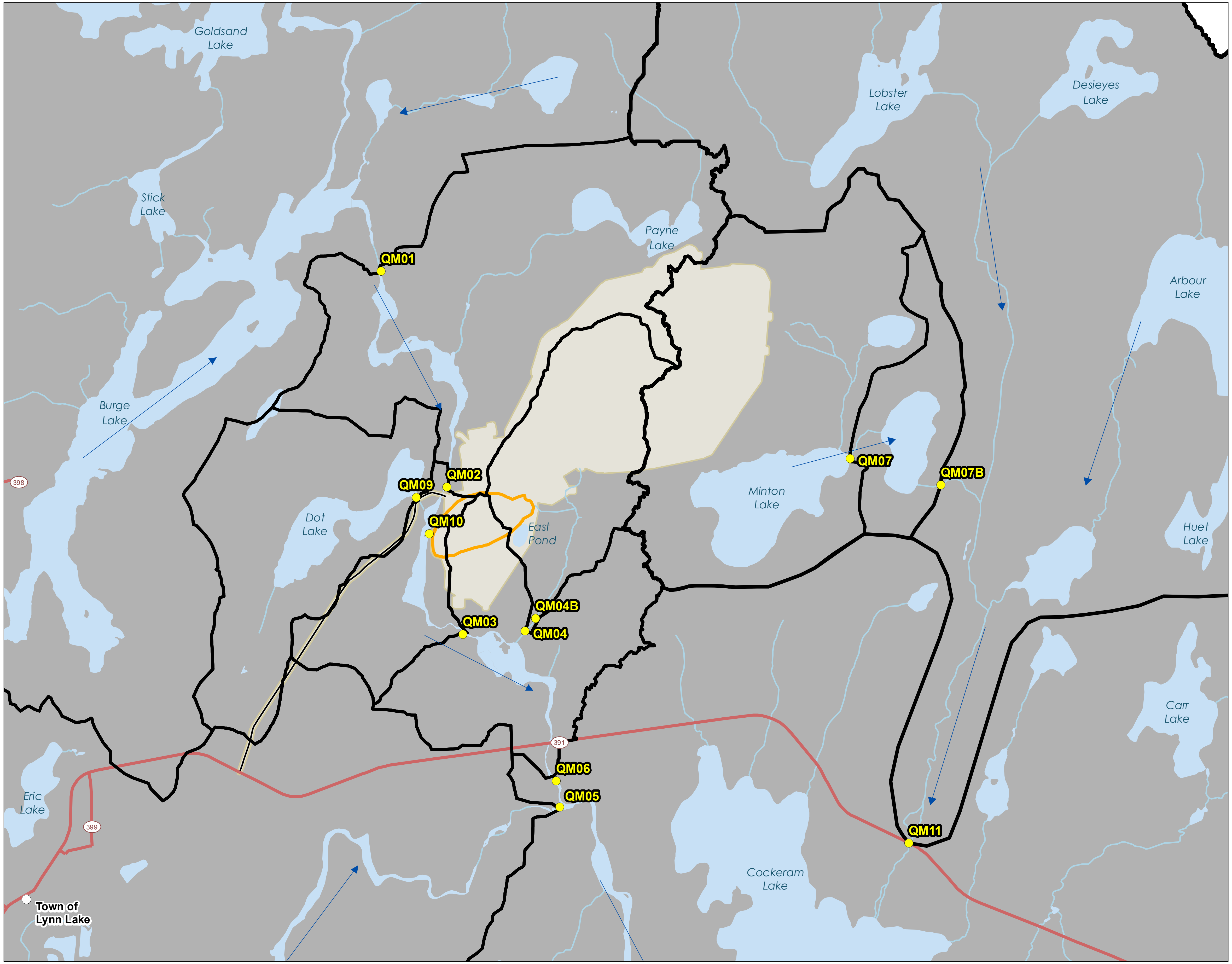
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.

9-14

Title

MacLellan Site Drainage Areas for Hydrometric Monitoring Stations - Overview



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Sample Locations

- Hydrology Monitoring Station
- Surface Water Flow Direction
- Hydrology Monitoring Station Drainage Area

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 0.5 1 Kilometres

(At original document size of 11x17)
1:50,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

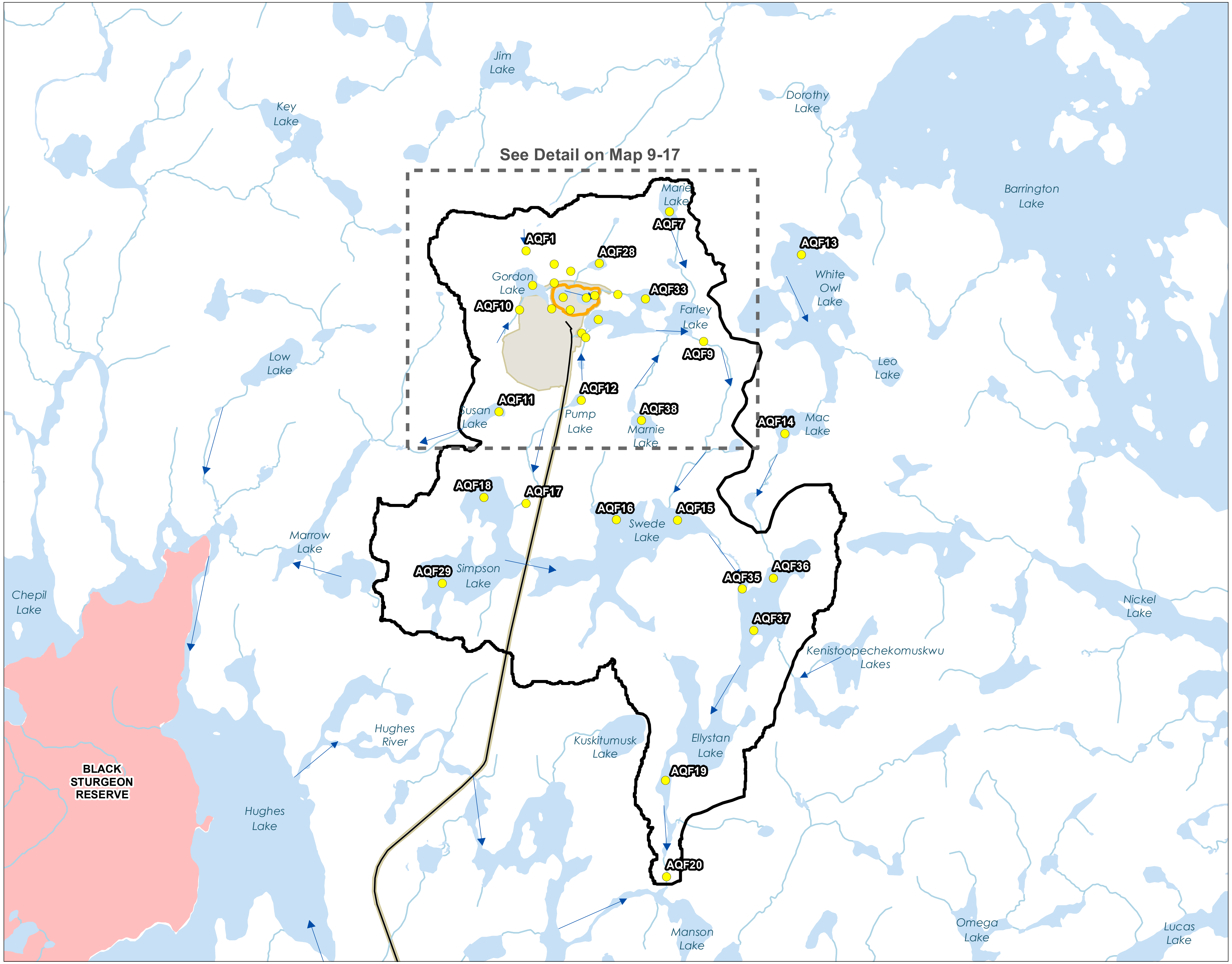
Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-05-05
Technical Review by JJackson on 2020-05-05
Senior GIS Review by GKroupa on 2020-03-30

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-15

Title
MacLellan Site Drainage Areas for Hydrometric Monitoring Stations - Detailed



Stantec

ALAMOS GOLD INC.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Study Area

- Surface Water Local Assessment Area (LAA)

Sample Locations

- Water Quality Sample Location
- Surface Water Flow Direction

Landbase

- Existing Access
- Watercourse
- Waterbody
- First Nation Reserve

N

0 1 2 Kilometres

(At original document size of 11x17)
1:65,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake, Manitoba

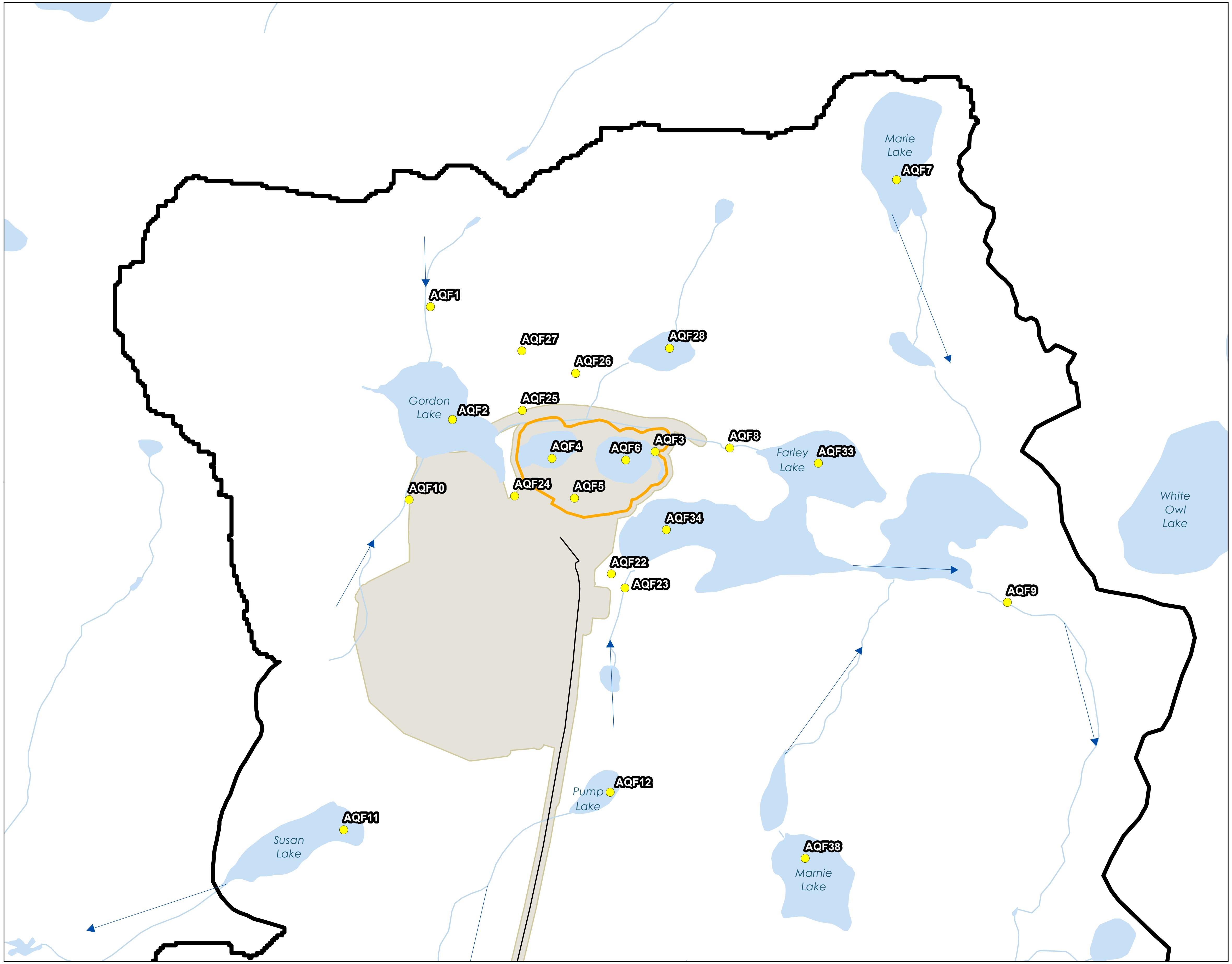
Prepared by ACampigotto on 2020-04-10
Technical Review by JJackson on 2020-04-10
Senior GIS Review by GKroupa on 2020-04-10

Client/Project
111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-16

Title
Water Quality Sample Sites
Gordon Site



Stantec

Alamos Gold Inc.

Project Infrastructure
- Proposed Open Pit
- Project Development Area

Study Area
- Surface Water Local Assessment Area (LAA)

Sample Locations
- Water Quality Sample Location
- Surface Water Flow Direction

Landbase
- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:20,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake,
Manitoba

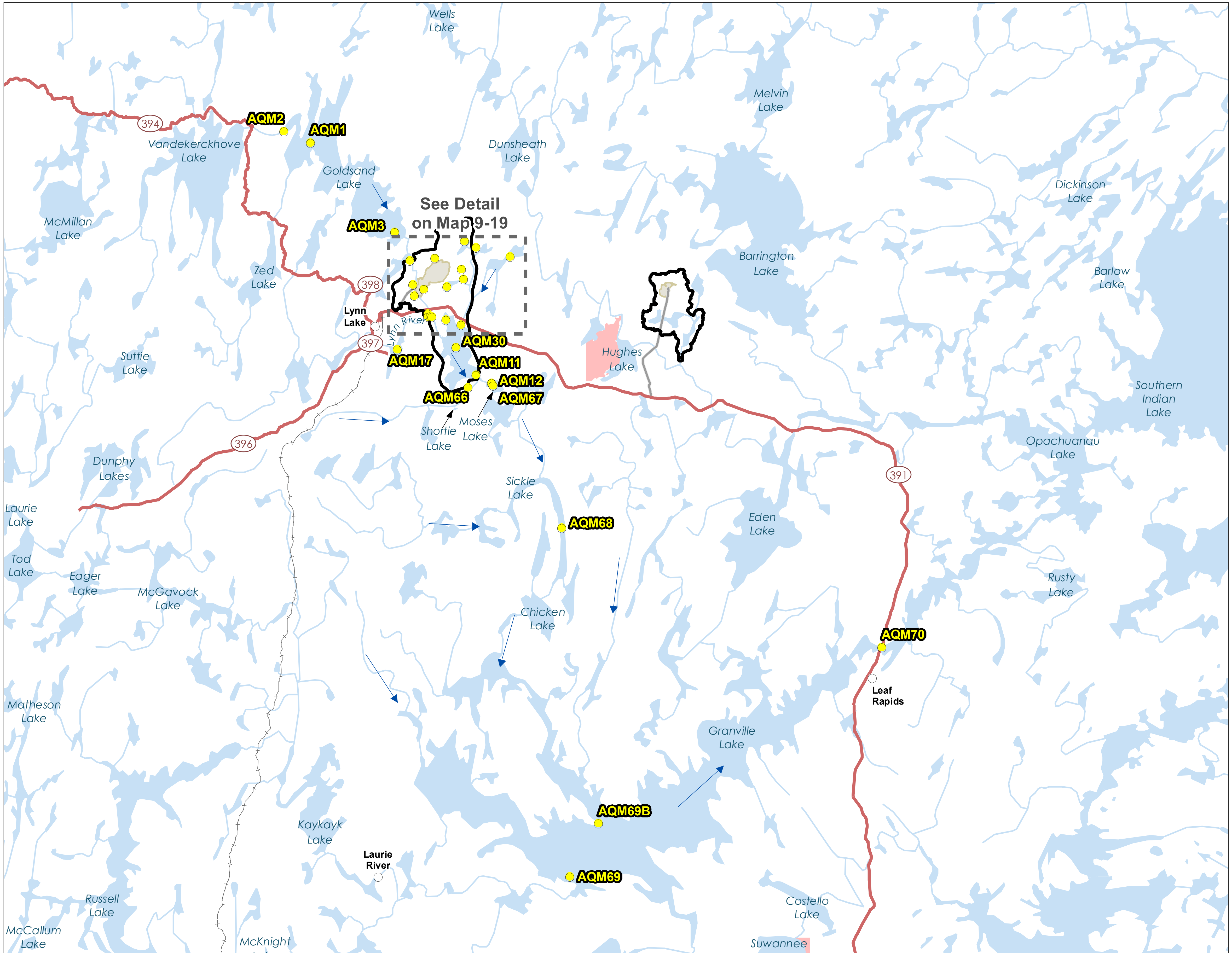
Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project 111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-17

Title
Water Quality Sample Sites
Gordon Site

G:_GIS_Project_Folder\111473008_LLGP_EA\figures\Ch9_Surface_Water\For_Review\Map9-17_SURFACEWATER_Gordon_WaterQualitySitesDetailed_20200313.mxd Revised: 2020-04-01 By: ACampigotto



Stantec

Alamos Gold Inc.

Project Infrastructure

Project Development Area

Study Area

Surface Water Local Assessment Area (LAA)

Sample Locations

Water Quality Sample Location

Surface Water Flow Direction

Landbase

Community

Highway

Access Road

Rail

Watercourse

Waterbody

First Nation Reserve

N

0 5 10 Kilometres

(At original document size of 11x17)
1:500,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-01
Technical Review by JJackson on 2020-04-01
Senior GIS Review by GKroupa on 2020-03-30

Client/Project 111473008

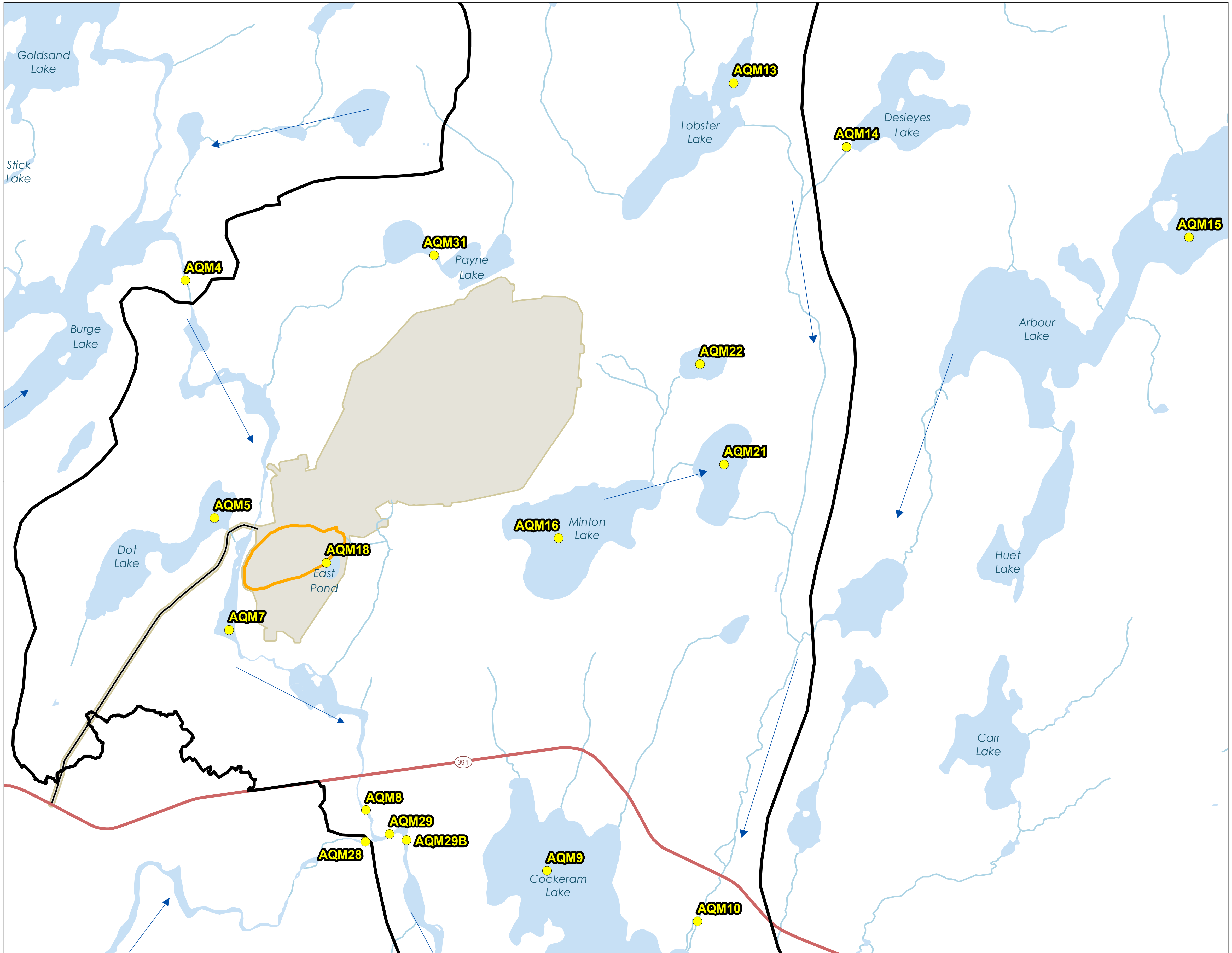
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.

9-18

Title

MacLellan Site Water Quality Sampling Sites - Overview



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Project Development Area

Sample Locations

- Water Quality Sample Location
- Surface Water Flow Direction
- Subwatersheds

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody

N

0 0.5 1 Kilometres

(At original document size of 11x17)
1:50,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2020-05-05
Technical Review by JJackson on 2020-05-05
Senior GIS Review by GKroupa on 2020-03-30

Client/Project
111473008
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9-19

Title
MacLellan Site Water Quality Sampling Sites - Detailed

Appendix 9A MONITORING SITES FOR EXISTING CONDITIONS SURFACE WATER QUANTITY AND QUALITY

Table 9A-1 Gordon Hydrometric Stations

Year										2015	2015	2015	2016	2016	2016	2016	2017	2017	2018	2018	2018	Total
Month										May	Jul	Sep	Mar	May	Jul	Oct	July	Sept	May	July	Oct	
Watershed	Station ID	Waterbody	Drainage Area (km²)	Lake Coverage (%)	Logger Type	UTM Easting	UTM Northing	Period of Record	Rationale													
Gordon and Farley Lakes Watershed	QF01	Southern inlet to Gordon Lake	1.5	0.7	OTT Ecolog 800	411478	6307677	May 2015 - October 2016	Within PDA; monitor flow into Gordon Lake from lower Gordon and Farley lakes watershed	1	1	1	-	1	1	1						6
	QF10	Northern inlet to Gordon Lake	0.5	2.0	Diver	411560	6308446	May 2015 – October 2018	Within PDA; monitor flow into Gordon Lake from upper Gordon and Farley lakes watershed	1	1	1	-	3	1	1	-[1]	-[1]	1	-	1	10
	QF03	Gordon Lake	4.3	4.4	OTT Ecolog 800	411996	6308032	May 2015 – present	Within PDA; monitor water level in Gordon Lake	-[1]	-[1]	-[1]	-	-[1]	-[1]	-[1]	-[1]	-	-[1]	-	-[1]	0
	QF02B	Southwest inlet to Farley Lake	1.1	0.9	OTT Ecolog 800	412595	6307280	May 2016 – present	Within PDA; monitor flow into Farley Lake from the lower Gordon and Farley lakes watershed					3	1	1	1	-	1	-	1	8
	QF04	Northern inlet to Farley Lake	1.5	14	OTT Ecolog 800	414243	6307786	May 2015 - May 2016	Within PDA; monitor flow into Farley Lake from the upper Gordon and Farley lakes watershed (moved upstream in May 2016 due to flooding)	1	1	1	-									3
	QF04B	Northern inlet to Farley Lake	1.5	14	OTT Ecolog 800	414270	6307825	May 2016 - October 2016	Within PDA; monitor flow into Farley Lake from the upper Gordon and Farley lakes watershed (50 m upstream from QF04)					3	1	1						5
	QF05	Eastern outlet of Farley Lake	13	9.3	Diver	414317	6307228	May 2015 – present	Within PDA; monitor water level in Farley Lake	1	1	-[1]	-	3	1	1	-[1]	-[1]	-[1]	-[1]	-[1]	7
	QF05B	Eastern outlet of Farley Lake	16	9.4	PT2X	414190	6305125	May 2018 – October 2018	Within PDA; monitor flow into Swede Lake from Farley Lake										1	1	-[2]	2
Simpson Lake Watershed	QF06	Outlet of Simpson Lake	8.0	22	Diver	411577	6303510	May 2015 – present	Downstream of PDA; monitor flow into Swede Lake from Simpson Lake	1	1	-[1]	-	3	1	1	-[1]	-[1]	1	-	-[1]	8
Swede Lake Watershed	QF07	Outlet of Swede Lake	35	16	OTT Ecolog 800	414759	6303927	May 2015 – present	Downstream of PDA; monitor flow into Ellystan Lake from Swede Lake	-[1]	-[1]	-[1]	-	3	1	1	-[1]	-	1	-	1	7
Ellystan Lake Watershed	QF08	Outlet of Ellystan Lake	62	19	OTT Ecolog 800	413309	6298252	May 2015 – present	Downstream of PDA; monitor flow from Ellystan Lake	1	1	1	1	3	1	1	-[1]	-	1	1	1	12
Hughes Lake Watershed	QF11	Hughes River	3,160	16	OTT Ecolog 800	410630	6300035	May 2018 – present	Downstream of PDA and LAA; monitor flow in Hughes River										2	1	1	4
Total Number of Discharge Measurements										5	5	3	1	21	7	7	1	0	8	3	5	66

Notes:

shaded – station was not yet established or was decommissioned

"-" – station was not visited

[1] – water level data was collected and level survey was completed but no discharge measurement was completed

[2] – station was decommissioned due to flooding by beaver

Table 9A-2 MacLellan Hydrometric Stations

Year										2015	2015	2015	2016	2016	2016	2016	2017	2017	2018	2018	2018	Total
Month										May	Jul	Sep	Mar	May	Jul	Oct	Jul	Sep	May	Jul	Oct	
Watershed	Station ID	Waterbody	Drainage Area (km^2)	Lake Coverage (%)	Logger Type	UTM Easting	UTM Northing	Period of Record	Rationale													
Lower Keewatin River Watershed	QM01	Keewatin River	1,310.1	23	PT2X	379676	6310698	May 2015 – present	Upstream of PDA and LAA; monitor flow in the Keewatin River	1	1	1	-	3	1	1	-[1]	-	1	1	1	11
	QM02	Keewatin River	1,323.3	23	OTT Ecolog 800	380500	6307978	May 2015 - May 2016	Upstream of PDA; monitor flow in the Keewatin River (superseded by QM10 in May 2016)	1	1	1	-	2	-	1						6
	QM10	Keewatin River	1,330.0	23	OTT Ecolog 800	380282	6307378	May 2016 - October 2016	Adjacent to the PDA; monitor flow in the Keewatin River (630 m downstream from QM02)					-[1]	-[1]	-[1]						0
	QM03	Keewatin River	1,333.7	23	OTT Ecolog 800	380709	6306104	May 2015 – present	Within PDA; monitor flow in the Keewatin River	1	1	1	-	3	1	1	-[1]	-	1	-	1	10
	QM09	Dot Lake outlet	7.5	14	Solinst	380118	6307832	May 2015 – present*	Within PDA; monitor water level in Dot Lake	-[1]	1	1	1	4	1	1	-[1]	-	1	-[1]	-[1]	10
	QM04B	Tributary to Keewatin River	5.1	1.0	OTT Ecolog 800	381631	6306301	July 2017 – present	Within PDA; monitor flow into Keewatin River								1	1	1	1	1	5
Lower Lynn River Watershed	QM05	Lynn River	470.4	10	PT2X	381934	6303917	June 2015 – present	Unaffected by the PDA; monitor flow in the Lynn River	1	1	1	-	4	1	1	-[1]	-	1	1	1	12
	QM06	Keewatin River	1,344.8	23	OTT Ecolog 800	381890	6304248	May 2015 – present	Downstream of PDA; monitor flow in the Keewatin River	1	1	1	-	4	1	1	-[1]	-	1	-	1	11
Cockeram Lake Watershed	QM07	Minton Lake outlet	12.4	13	OTT Ecolog 800	385616	6308332	May 2015 – September 2017	Upstream of PDA; monitor flow from Minton Lake	-[1]	-[1]	-[1]	-	-[1]	-[1]	-[1]	-[1]	-	-[2]			0
	QM07B	Unnamed Lake outlet	16.1	16	PT2X	386761	6307992	May 2018 – present	Upstream of PDA; monitor flow from Minton Lake										1	1	1	3
	QM11	Cockeram River	86.0	14	PT2X	386360	6303458	May 2018 – present	Upstream of PDA; monitor flow from Minton Lake drainage area										1	1	1	3
	QM08	Cockeram Lake outlet	2,004.5	19	OTT Ecolog 800	388343	6296091	May 2015 – present	Downstream of PDA; monitor flow in the Cockeram River	1	1	1	-	3	1	1	-[1]	-	1	1	1	11
Total Number of Discharge Measurements										6	7	7	1	23	6	7	1	1	9	6	8	82

Notes:

shaded – station was not yet established or was decommissioned

"-" – station was not visited

[1] – water level data was collected and level survey was completed but no discharge measurement was completed

[2] – station was decommissioned due to flooding by beaver

* – station was decommissioned in 2019

Table 9A-3 Gordon Water Quality Sites

Year							**2015**	**2015**	**2015**	**2015**	**2015**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2017**	**2017**	**2017**	**2017**	**2017**	**2017**	**2018**	**2018**	**2018**	**2018**	**Total Number of Samples**
Month							**May**	**Jun**	**Jul**	**Sep**	**Oct**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Jan**	**Feb**	**Mar**	**May**	**Jul**	**Sep**	**Feb**	**May**	**Jul**	**Oct**	
Watershed	**Site ID**	**Site ID**	**Waterbody**	**UTM Easting**	**UTM Northing**	**Rationale**																								
Gordon and Farley Lakes Watershed	AQF10	AQF10 - Surface	Gordon Lake South Inlet	411478	6307677	Within PDA; hydrology station present	1		1	1	1				1	1	1	1	1				1	1	1		1	1	1	15
	AQF1	AQF1 - Surface	Gordon Lake North Inlet	411587	6308654	Within PDA; hydrology station present	1	1	1	1	1				1	1	1	1	1											10
	AQF4	AQF4 - Surface	Wendy Pit	412203	6307886	Within PDA; open pit lake at historical mine site	1	1	1		1		1	1	1	1	1	1	1	1	1		2	2	3	3	2	3	3	31
	AQF4	AQF4 - Deep								1			1	1	1		1		1			1	4	4	4	4	3	3	3	32
	AQF6	AQF6 - Surface	East Pit	412576	6307879	Within PDA; open pit lake at historical mine site	1	1	1		1		1	1	1	1	1	1	1	1	1		1	1	2	2	3	2	2	26
	AQF6	AQF6 - Deep								1			1	1	1		1		1			1	6	6	7	6	6	6	6	50
	AQF3	AQF3 - Surface	Unnamed Pond 1	412724	6307920	Within PDA; pond at outlet of East Pit	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1								15
	AQF2	AQF2 - Surface	Gordon Lake Outlet	411699	6308083	Within PDA; hydrology station present	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQF2	AQF2 - Deep																							1					1
	AQF22	AQF22 - Surface	Upper Farley Lake southwest inlet	412503	6307300	Within PDA	1	1	1	1	1				1	1	1	1	1				1	1	1		1	1	1	16
	AQF23	AQF23 - Surface	Upper Farley Lake southwest inlet	412571	6307230	Within PDA; hydrology station present	1	1	1	1	1			1	1	1	1	1	1				1	1	1		1	1	1	17
	AQF8	AQF8 - Surface	Upper Farley Lake Inlet	413102	6307940	Within PDA; discharge channel downstream of Gordon Lake	1	1	1	1	1		1	1	1	1	1	1	1	1	1									14
	AQF34	AQF34 - Surface	Upper Farley Lake	412782	6307525	Within PDA							1	1	1	1	1	1	1				1	1	1	1	1	1	1	14
	AQF34	AQF34 - Deep											1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			15
	AQF33	AQF33 - Surface	Lower Farley Lake	413552	6307861	Within PDA							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17

Table 9A-3 Gordon Water Quality Sites

Year							2015	2015	2015	2015	2015	2016	2016	2016	2016	2016	2016	2016	2016	2017	2017	2017	2017	2017	2017	2018	2018	2018	2018	Total Number of Samples
Month							**May**	**Jun**	**Jul**	**Sep**	**Oct**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Jan**	**Feb**	**Mar**	**May**	**Jul**	**Sep**	**Feb**	**May**	**Jul**	**Oct**	
	AQF33	AQF33 - Deep																	1											1
	AQF9	AQF9 - Surface	Lower Farley Lake outlet	414509	6307157	Within PDA; hydrology station present	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQF28	AQF28 - Surface	Unnamed Lake north of East Pit	412797	6308446	Within PDA; adjacent to existing mine rock pile	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQF7	AQF7 - Surface	Marie Lake	413949	6309299	Upstream of PDA	1	1		1	1		1	1	1	1	1	1	1											11
	AQF7	AQF7 - Deep																		1	1	1								3
	AQF38	AQF38 - Surface	Marnie Lake	413485	6305860	Downstream of PDA										1	1	1	1				1	1	1	1	1	1	1	11
Simpson Lake Watershed	AQF12	AQF12 - Surface	Pump Lake	412497	6306196	Within PDA; east of access road	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQF17	AQF17 - Surface	Simpson Lake Inlet	411592	6304497	Downstream of PDA and Pump Lake; west of access road	1	1	1	1	1				1	1	1	1	1				1	1	1		1	1	1	16
	AQF18	AQF18 - Surface	North Simpson L.	410893	6304592	Downstream of PDA and Pump Lake	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQF29	AQF29 - Surface	South Simpson L.	410206	6303182	Downstream of PDA and Pump Lake	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1								15
Swede Lake Watershed	AQF16	AQF16 - Surface	West Swede Lake	413076	6304227	Downstream of PDA and Pump and Farley lakes	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1				19
	AQF15	AQF15 - Surface	East Swede Lake	414084	6304219	Downstream of PDA and Pump and Farley lakes; hydrology station at outlet	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQF15	AQF15 - Deep											1			1	1	1	1											5
Ellystan Lake Watershed	AQF36	AQF36 - Surface	Ellystan at Mac Lake Inlet	415656	6303264	Downstream of PDA and Swede Lake							1	1	1	1	1	1	1											7
	AQF36	AQF36 - Deep											1	1		1	1	1	1	1	1	1								9
	AQF35	AQF35 - Surface	Ellystan at Swede Lake Inlet	415148	6303087	Downstream of PDA and Swede Lake							1	1	1	1	1	1	1	1	1									9

Table 9A-3 Gordon Water Quality Sites

Year							**2015**	**2015**	**2015**	**2015**	**2015**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2017**	**2017**	**2017**	**2017**	**2017**	**2017**	**2018**	**2018**	**2018**	**2018**	**Total Number of Samples**
Month							**May**	**Jun**	**Jul**	**Sep**	**Oct**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Jan**	**Feb**	**Mar**	**May**	**Jul**	**Sep**	**Feb**	**May**	**Jul**	**Oct**	
	AQF37	AQF37 - Surface	Middle Ellystan L.	415339	6302407	Downstream of PDA and Swede Lake							1	1	1	1	1	1	1				1	1	1	1	1	1	1	14
	AQF37	AQF37 - Deep											1	1		1	1	1	1	1	1	1	1	1		1	1	1		14
	AQF19	AQF19 - Surface	South Ellystan L.	413886	6299933	Downstream of PDA and Swede Lake	1	1	1	1	1		1	1	1	1	1	1	1											12
	AQF19	AQF19 - Deep											1	1		1	1	1	1	1	1	1								9
	AQF20	AQF20 - Surface	Ellystan L. Outlet	413902	6298354	Downstream of PDA and Swede Lake; hydrology station present	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQF13	AQF13 - Surface	White Owl Lake	416124	6308593	Upstream of Ellystan Lake; reference area	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQF14	AQF14 - Surface	Mac Lake	415846	6305640	Upstream of Ellystan Lake; reference area				1	1																			2
Susan Lake Watershed	AQF11	AQF11 - Surface	Susan Lake	411147	6306005	Downstream of PDA and upstream of Hughes Lake		1	1	1	1		1	1	1	1	1	1	1				1	1	1	1	1	1	1	18
	AQF11	AQF11 - Deep																		1	1	1	1	1	1	1	1	1		9
Total Number of Samples							21	21	21	23	23	0	29	29	30	33	35	33	36	22	22	20	34	34	37	32	36	35	33	**639**

Table 9A-4 MacLellan Water Quality Sites

Year							2015	2015	2015	2015	2015	2016	2016	2016	2016	2016	2016	2016	2016	2017	2017	2017	2017	2017	2017	2018	2018	2018	2018	Total Number of Samples
Month							**May**	**Jun**	**Jul**	**Sep**	**Oct**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Jan**	**Feb**	**Mar**	**May**	**Jul**	**Sep**	**Feb**	**May**	**Jul**	**Oct**	
Watershed	**Site ID**	**Site ID**	**Water Body**	**UTM Easting**	**UTM Northing**	**Rationale**																								
Hughes Lake Watershed	AQM2	AQM2 - Surface	Goldsand Lake	363654	6327400	Upstream of PDA; potential reference site for MacLellan site	1		1	1	1		1	1	1	1	1	1	1	1	1	1								14
	AQM1	AQM1 - Surface	Goldsand Lake	366990	6325965	Upstream of PDA; potential reference site for MacLellan site	1		1	1	1		1	1	1	1	1	1	1											11
		AQM1 - Deep											1	1		1	1	1	1	1	1	1								9
	AQM3	AQM3 - Surface	Goldsand Lake	377683	6314652	Upstream of PDA; potential reference site for MacLellan site	1		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
Lower Keewatin River Watershed	AQM4	AQM4 - Surface	Keewatin River	379584	6310992	Upstream of PDA; hydrology station present	1	1	1	1	1		1	1	1	1	1	1	1	1			1	1	1		1		1	18
	AQM5	AQM5 - Surface	Dot Lake	379952	6307987	Close to PDA and within potential open pit groundwater cone of depression	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQM18	AQM18 - Surface	East Pond	381369	6307417	Within PDA; at the historic MacLellan Mine	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQM31	AQM31 - Surface	Payne Lake	382779	6311309	Upstream of PDA										1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
	AQM7	AQM7 - Surface	Keewatin River	380132	6306566	Within PDA; downstream of historical MacLellan Mine; hydrology station present	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	21
	AQM8	AQM8 - Surface	Keewatin River	381867	6304284	Downstream of PDA; downstream of historical	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22

Table 9A-4 MacLellan Water Quality Sites

Year							**2015**	**2015**	**2015**	**2015**	**2015**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2017**	**2017**	**2017**	**2017**	**2017**	**2017**	**2018**	**2018**	**2018**	**2018**	**Total Number of Samples**
Month							**May**	**Jun**	**Jul**	**Sep**	**Oct**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Jan**	**Feb**	**Mar**	**May**	**Jul**	**Sep**	**Feb**	**May**	**Jul**	**Oct**	
Watershed	**Site ID**	**Site ID**	**Water Body**	**UTM Easting**	**UTM Northing**	**Rationale**																								
						MacLellan Mine; hydrology station present																								
Lower Lynn River Watershed	AQM17	AQM17 - Surface	Eldon Lake	377973	6299785	Downstream of historic mining activities near the Town of Lynn Lake and the associated East Tailings Management Area (ETMA)	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQM28	AQM28 - Surface	Lower Lynn River	381861	6303889	Downstream of Eldon Lake (AQM17) and ETMA; hydrology station present						1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17
	AQM29	AQM29 - Surface	Keewatin River	382170	6303985	Downstream of PDA, historical MacLellan Mine, and confluence with Lynn River (downstream of ETMA)							1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	16
	AQM29B	AQM29B - Surface	Keewatin River	382386	6303813	Downstream of AQM29, PDA, historical MacLellan Mine, and confluence with Lynn River (downstream of ETMA)																			1	1	1	1	1	5
Cockeram Lake Watershed	AQM9	AQM9 - Surface	North Cockeram Lake	384164	6303521	Downstream of PDA, historical MacLellan Mine, and ETMA	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22

Table 9A-4 MacLellan Water Quality Sites

Year							2015	2015	2015	2015	2015	2016	2016	2016	2016	2016	2016	2016	2016	2017	2017	2017	2017	2017	2017	2018	2018	2018	2018	Total Number of Samples
Month							**May**	**Jun**	**Jul**	**Sep**	**Oct**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Jan**	**Feb**	**Mar**	**May**	**Jul**	**Sep**	**Feb**	**May**	**Jul**	**Oct**	
Watershed	**Site ID**	**Site ID**	**Water Body**	**UTM Easting**	**UTM Northing**	**Rationale**																								
	AQM11	AQM11 - Surface	South Cockeram Lake	387965	6296541	Downstream of PDA, historical MacLellan Mine, and ETMA	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQM30	AQM30 - Surface	Middle Cockeram Lake	385444	6300040	Downstream of PDA, historical MacLellan Mine, and ETMA						1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17
	AQM16	AQM16 - Surface	Minton Lake	384279	6307327	Within PDA	1		1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
	AQM21	AQM21 - Surface	Unnamed Lake d/s of Minton Lake	386402	6308661	Downstream of Minton Lake and PDA			1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
	AQM22	AQM22 - Surface	Unnamed Lake u/s of Minton Lake	386097	6309935	Downstream of Minton Lake and PDA			1	1	1	1	1		1	1	1	1	1	1	1	1								13
	AQM10	AQM10 - Surface	South Cockeram River	386069	6302875	Downstream of Minton and Lobster lakes and PDA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23
	AQM13	AQM13 - Surface	Lobster Lake	386524	6313490	Outside of PDA	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
	AQM14	AQM14 - Surface	Deseiyes Lake	387953	6312683	Outside of PDA	1	1	1	1	1			1	1	1	1	1	1											11
	AQM15	AQM15 - Surface	Arbour Lake	392292	6311543	Outside of PDA; upstream of Cockeram Lake			1	1	1			1		1	1	1	1				1	1	1	1	1	1	1	15
	AQM66	AQM66 - Surface	Shortie Lake Outlet	386920	6294958	Downstream of PDA and former Burnt Timber mine																	1	1	1	1	1	1	1	7
	AQM67	AQM67 - Surface	Moses Lake	390155	6295209	Downstream of PDA and historical MacLellan and Burnt Timber mines																	1	1	1	1	1	1	1	7
Granville Lake Watershed	AQM68	AQM68 - Surface	Granville Lake	398857	6277170	Downstream of PDA and historical MacLellan																	1	1	1	1	1	1	1	7

Table 9A-4 MacLellan Water Quality Sites

Year							**2015**	**2015**	**2015**	**2015**	**2015**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2017**	**2017**	**2017**	**2017**	**2017**	**2017**	**2018**	**2018**	**2018**	**2018**	**Total Number of Samples**
Month							**May**	**Jun**	**Jul**	**Sep**	**Oct**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Jan**	**Feb**	**Mar**	**May**	**Jul**	**Sep**	**Feb**	**May**	**Jul**	**Oct**	
Watershed	**Site ID**	**Site ID**	**Water Body**	**UTM Easting**	**UTM Northing**	**Rationale**																								
						and Burnt Timber mines																								
	AQM69	AQM69 - Surface	Granville Lake	399839	6232981	Downstream of PDA and historical MacLellan and Burnt Timber mines																		1						1
	AQM69B	AQM69B - Surface	Granville Lake	403492	6239715	Downstream of PDA and historical MacLellan and Burnt Timber mines																			1	1	1	1	1	5
	AQM70	AQM70 - Surface	Churchill River	439339	6262067	Downstream of PDA and historical MacLellan and Burnt Timber mines; near Town of Leaf Rapids																	1	1	1		1	1	1	6
Total Number of Samples							15	11	18	18	18	12	13	18	20	23	23	23	23	20	19	19	22	23	23	22	23	23	24	**453**

Table 9A-5 Gordon Drainage Areas

Watershed Name	Sub-Watershed Name	Waterbodies and Project Components within Watershed or Sub-Watershed	Area (km²)	Minimum Elevation (m)	Maximum Elevation (m)	Lake Coverage (%)	Wetland Coverage (%)	Tributary to
ws-FAR5 (Gordon Site Watershed)	sws-FAR7-A1	Mine Rock Storage Area and Overburden Stockpile	1.5	345	317	0	54	Gordon Lake
	sws-FAR7-B1	n/a*	0.52	351	315	0	52	Gordon Lake
	sws-FAR7-C1	n/a*	1.4	359	315	0	52	Gordon Lake
	sws-FAR7	Gordon Lake	0.91	346	314	22	30	Diversion Channel to Farley Lake
		Overburden Stockpile						
	sws-FAR6-A2	Unnamed lakes FAR6-A1 and FAR6-A4	1	341	316	5	50	runoff to sws-FAR5-B2
	sws-FAR5-B2	Wendy Pit and Diversion Channel	1	346	314	5	35	Diversion Channel to Farley Lake
		Proposed Pit						
	sws-FAR5-A1	Unnamed lake FAR5-A2	1.1	351	313	1	41	Upper Farley Lake
		Mine Rock Storage Area, Ore Stockpiles, and Mine Site Access Road						
	sws-FAR5-MAR4	Marie Lake	0.61	345	331	28	44	Unnamed stream FAR5-MAR3 to Lower Farley Lake
	sws-FAR5-MAR1	Unnamed lake FAR5-MAR2	0.91	341	313	2	68	Lower Farley Lake
	sws-FAR5-MAN2	Marnie Lake	0.99	340	319	18	39	Unnamed stream FAR5-MAN1 to Lower Farley Lake
	sws-FAR5-MAN1	n/a*	0.51	337	313	0	46	Lower Farley Lake
	sws-FAR5.2	Upper Farley Lake and Diversion Channel	2.2	342	312	24	43	Lower Farley Lake
	sws-FAR5.1	Lower Farley Lake	0.6	333	312	27	65	Unnamed stream FAR4 to Swede Lake
ws-FAR3-SIM1	n/a	White Owl Lake and Mac Lake	8	354	301	22	26	Swede Lake
ws-FAR3	n/a	Swede Lake	13	338	296	17	33	Ellystan Lake
ws-FAR2-WHI1	n/a	White Owl Lake and Mac Lake	11	351	305	27	48	Ellystan Lake
ws-FAR1	n/a	Ellystan Lake	16	339	281	20	25	Hughes River
ws-SUS4	n/a	Pump Lake and Simpson Lake	1.2	310	351	10	30	Unnamed stream SUS3 to Marrow Lake

Notes:
n/a – this watershed was not divided into subwatersheds
n/a* - no lake coverage or project components exist within this subwatershed

Table 9A-6 MacLellan Drainage Areas

Watershed Name	Sub-Watershed Name	Waterbodies and Project Components within Watershed or Sub-Watershed	Area (km²)	Minimum Elevation (m)	Maximum Elevation (m)	Lake Coverage (%)	Wetland Coverage (%)	Tributary to
ws-KEE4	n/a	Goldsand Lake and Burge Lake	1310	339	443	-	-	Keewatin River
ws-KEE3.3	n/a	Keewatin River	3.4	337	364	0.81	10	Keewatin River
ws-KEE3	sws-KEE3-PAY2	Payne Lake	3.3	348	364	18	42	Unnamed stream KEE3-PAY1 to Keewatin River
(West MacLellan site watershed)	sws-KEE3-PAY1	n/a*	4.6	334	37	0	45	Keewatin River
	sws-KEE3-4	Keewatin River	0.71	334	372	7	40	Keewatin River
	sws-KEE3-C1	Mine Rock Storage Area and Overburden Stockpile	0.32	335	356	0	47	Keewatin River
	sws-KEE3	Keewatin River	2.6	321	359	6	26	Keewatin River
		Proposed Pit						
	sws-KEE3-B1	East Pond	5.7	321	376	1	32	Keewatin River
		Processing Plant, Proposed Pit, Mine Rock Storage Area, Ore Stockpile, and Overburden Stockpile						
	sws-KEE3-A1	Keewatin River	1.9	321	349	5	38	Keewatin River
ws-KEE3-DOT1	n/a	Dot Lake	7.2	336	368	1.4	14	Keewatin River
ws-KEE3.2	n/a	Keewatin River	2.3	335	367	0.99	4.4	Keewatin River
ws-KEE3.1	n/a	Keewatin River	3	319	351	0.98	5.1	Keewatin River
ws-LYN1	n/a	Lynn River	470	318	444	-	-	Keewatin River
ws-COC2-LOB2-MIN4	sws-COC2-LOB2-MIN5	Unnamed lake COC2-LOB2-MIN5-A1	6.3	330	363	3	40	Unnamed stream COC2-LOB2-MIN5 to Minton Lake
(East MacLellan site watershed)		Tailings Management Facility						
	sws-COC2-LOB2-MIN4	Minton Lake	5.7	329	363	29	27	Unnamed stream COC2-LOB2-MIN3 to unnamed lake COC2-LOB2-MIN2 to Cockeram River
		Tailings Management Facility						
ws-KEE1	n/a	Cockeram Lake, Carr Lake, Huet Lake, Arbour Lake, Desieyes Lake, Lobster Lake, Unnamed lake COC2-LOB2-MIN2	189	311	382	-	-	Moses Lake

Notes:
n/a – this watershed was not divided into subwatersheds
n/a* - no lake coverage or project components exist within this subwatershed
"-" – available LiDAR data does not cover the entire watershed and therefore lake and wetland coverage cannot be calculated

Appendix 9B WATER QUANTITY MODEL RESULTS TABLES

Table 9B-1 Gordon Hydrology Water Balance Model – Streamflow Results

Average Climate Conditions

	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 6)			Decommis-sion, Closure (year 6 to 11)			Post-Closure (year 12+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QF01	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	Apr	0.001	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0
QF01	May	0.027	0.019	-0.008	-30	0.019	-0.008	-30	0.019	-0.008	-30	0.019	-0.008	-30
QF01	Jun	0.012	0.008	-0.003	-30	0.008	-0.003	-30	0.008	-0.003	-30	0.008	-0.003	-30
QF01	Jul	0.016	0.011	-0.005	-29	0.011	-0.005	-29	0.011	-0.005	-29	0.011	-0.005	-29
QF01	Aug	0.013	0.009	-0.004	-29	0.009	-0.004	-29	0.009	-0.004	-29	0.009	-0.004	-29
QF01	Sep	0.012	0.008	-0.003	-29	0.008	-0.003	-29	0.008	-0.003	-29	0.008	-0.003	-29
QF01	Oct	0.007	0.005	-0.002	-29	0.005	-0.002	-29	0.005	-0.002	-29	0.005	-0.002	-29
QF01	Nov	0.001	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0
QF01	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	**Annual**	0.007	0.005	-0.002	-29	0.005	-0.002	-29	0.005	-0.002	-29	0.005	-0.002	-29
QF02	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Apr	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	May	0.024	0.017	-0.007	-28	0.017	-0.007	-28	0.017	-0.007	-28	0.017	-0.007	-28
QF02	Jun	0.011	0.008	-0.003	-28	0.008	-0.003	-28	0.008	-0.003	-28	0.008	-0.003	-28
QF02	Jul	0.014	0.011	-0.004	-27	0.011	-0.004	-27	0.011	-0.004	-27	0.011	-0.004	-27
QF02	Aug	0.012	0.009	-0.003	-27	0.009	-0.003	-27	0.009	-0.003	-27	0.009	-0.003	-27
QF02	Sep	0.010	0.008	-0.003	-27	0.008	-0.003	-27	0.008	-0.003	-27	0.008	-0.003	-27
QF02	Oct	0.006	0.005	-0.002	-27	0.005	-0.002	-27	0.005	-0.002	-27	0.005	-0.002	-27
QF02	Nov	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	**Annual**	0.007	0.005	-0.002	-27	0.005	-0.002	-27	0.005	-0.002	-27	0.005	-0.002	-27
QF03	Jan	0.005	0.007	0.002	40	0.008	0.003	58	0.005	0.000	0	0.005	0.000	0
QF03	Feb	0.004	0.007	0.003	70	0.007	0.003	79	0.004	0.000	0	0.004	0.000	0
QF03	Mar	0.003	0.007	0.003	93	0.007	0.003	97	0.004	0.000	0	0.003	0.000	0
QF03	Apr	0.003	0.007	0.004	109	0.007	0.004	109	0.003	0.000	0	0.003	0.000	0

1:25 Dry Climate Conditions

	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 5)			Decommis-sion, Closure (year 6 to 11)			Post-Closure (year 12+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QF01	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	Apr	0.001	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0
QF01	May	0.018	0.013	-0.005	-30	0.013	-0.005	-30	0.013	-0.005	-30	0.013	-0.005	-30
QF01	Jun	0.008	0.006	-0.002	-30	0.006	-0.002	-30	0.006	-0.002	-30	0.006	-0.002	-30
QF01	Jul	0.012	0.008	-0.003	-29	0.008	-0.003	-29	0.008	-0.003	-29	0.008	-0.003	-29
QF01	Aug	0.010	0.007	-0.003	-29	0.007	-0.003	-29	0.007	-0.003	-29	0.007	-0.003	-29
QF01	Sep	0.008	0.006	-0.002	-29	0.006	-0.002	-29	0.006	-0.002	-29	0.006	-0.002	-29
QF01	Oct	0.005	0.004	-0.001	-29	0.004	-0.001	-29	0.004	-0.001	-29	0.004	-0.001	-29
QF01	Nov	0.001	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0
QF01	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	**Annual**	0.005	0.004	-0.002	-29	0.004	-0.002	-29	0.004	-0.002	-29	0.004	-0.002	-29
QF02	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Apr	0.001	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000	0
QF02	May	0.016	0.011	-0.004	-28	0.011	-0.004	-28	0.011	-0.004	-28	0.011	-0.004	-28
QF02	Jun	0.007	0.005	-0.002	-28	0.005	-0.002	-28	0.005	-0.002	-28	0.005	-0.002	-28
QF02	Jul	0.010	0.007	-0.003	-27	0.007	-0.003	-27	0.007	-0.003	-27	0.007	-0.003	-27
QF02	Aug	0.008	0.006	-0.002	-27	0.006	-0.002	-27	0.006	-0.002	-27	0.006	-0.002	-27
QF02	Sep	0.007	0.005	-0.002	-27	0.005	-0.002	-27	0.005	-0.002	-27	0.005	-0.002	-27
QF02	Oct	0.004	0.003	-0.001	-27	0.003	-0.001	-27	0.003	-0.001	-27	0.003	-0.001	-27
QF02	Nov	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	**Annual**	0.005	0.003	-0.001	-27	0.003	-0.001	-27	0.003	-0.001	-27	0.003	-0.001	-27
QF03	Jan	0.005	0.007	0.002	44	0.008	0.003	66	0.005	0.000	0	0.004	0.000	0
QF03	Feb	0.004	0.006	0.003	76	0.007	0.003	88	0.004	0.000	0	0.003	0.000	0
QF03	Mar	0.003	0.006	0.003	102	0.007	0.003	108	0.003	0.000	0	0.003	0.000	0
QF03	Apr	0.003	0.006	0.004	120	0.006	0.004	121	0.003	0.000	0	0.003	0.000	0

1:25 Wet Climate Conditions

	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 5)			Decommis-sion, Closure (year 6 to 11)			Post-Closure (year 12+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QF01	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	Apr	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	May	0.040	0.028	-0.012	-31	0.028	-0.012	-31	0.028	-0.012	-31	0.028	-0.012	-31
QF01	Jun	0.015	0.011	-0.004	-29	0.011	-0.004	-29	0.011	-0.004	-29	0.011	-0.004	-29
QF01	Jul	0.022	0.016	-0.006	-29	0.016	-0.006	-29	0.016	-0.006	-29	0.016	-0.006	-29
QF01	Aug	0.018	0.013	-0.005	-29	0.013	-0.005	-29	0.013	-0.005	-29	0.013	-0.005	-29
QF01	Sep	0.016	0.011	-0.005	-29	0.011	-0.005	-29	0.011	-0.005	-29	0.011	-0.005	-29
QF01	Oct	0.010	0.007	-0.003	-29	0.007	-0.003	-29	0.007	-0.003	-29	0.007	-0.003	-29
QF01	Nov	0.001	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0
QF01	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF01	**Annual**	0.010	0.007	-0.003	-30	0.007	-0.003	-30	0.007	-0.003	-30	0.007	-0.003	-30
QF02	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	Apr	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	May	0.034	0.024	-0.010	-29	0.024	-0.010	-29	0.024	-0.010	-29	0.024	-0.010	-29
QF02	Jun	0.014	0.010	-0.004	-27	0.010	-0.004	-27	0.010	-0.004	-27	0.010	-0.004	-27
QF02	Jul	0.020	0.014	-0.005	-27	0.014	-0.005	-27	0.014	-0.005	-27	0.014	-0.005	-27
QF02	Aug	0.016	0.011	-0.004	-27	0.011	-0.004	-27	0.011	-0.004	-27	0.011	-0.004	-27
QF02	Sep	0.014	0.010	-0.004	-27	0.010	-0.004	-27	0.010	-0.004	-27	0.010	-0.004	-27
QF02	Oct	0.009	0.006	-0.002	-27	0.006	-0.002	-27	0.006	-0.002	-27	0.006	-0.002	-27
QF02	Nov	0.001	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0
QF02	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF02	**Annual**	0.009	0.006	-0.002	-28	0.006	-0.002	-28	0.006	-0.002	-28	0.006	-0.002	-28
QF03	Jan	0.006	0.008	0.002	36	0.009	0.003	52	0.006	0.000	0	0.006	0.000	0
QF03	Feb	0.005	0.007	0.003	64	0.008	0.003	71	0.005	0.000	0	0.004	0.000	0
QF03	Mar	0.004	0.007	0.003	85	0.007	0.003	87	0.004	0.000	0	0.004	0.000	0
QF03	Apr	0.004	0.007	0.004	98	0.007	0.004	98	0.004	0.000	0	0.004	0.000	0

Table 9B-1 Gordon Hydrology Water Balance Model – Streamflow Results

		Average Climate Conditions													1:25 Dry Climate Conditions														1:25 Wet Climate Conditions													
	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 6)			Decommis-sion, Closure (year 6 to 11)			Post-Closure (year 12+)			Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 5)			Decommis-sion, Closure (year 6 to 11)			Post-Closure (year 12+)			Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 5)			Decommis-sion, Closure (year 6 to 11)			Post-Closure (year 12+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Flow (m^3/s)	Change (m3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QF03	May	0.038	0.040	0.002	4	0.039	0.001	4	0.031	-0.007	-17	0.030	-0.008	-21	0.025	0.028	0.003	14	0.028	0.003	14	0.020	-0.005	-18	0.019	-0.006	-24	0.050	0.050	-0.001	-1	0.050	-0.001	-2	0.042	-0.009	-17	0.040	-0.010	-20
	Jun	0.039	0.039	0.000	0	0.039	0.000	0	0.034	-0.005	-12	0.032	-0.007	-19	0.022	0.024	0.002	7	0.024	0.002	7	0.019	-0.003	-13	0.018	-0.004	-19	0.066	0.063	-0.003	-5	0.063	-0.003	-5	0.058	-0.008	-12	0.055	-0.011	-17
	Jul	0.037	0.037	-0.001	-2	0.037	-0.001	-2	0.033	-0.005	-13	0.031	-0.006	-17	0.023	0.024	0.001	4	0.024	0.001	3	0.020	-0.003	-15	0.019	-0.005	-20	0.060	0.057	-0.003	-5	0.057	-0.003	-5	0.053	-0.007	-12	0.050	-0.011	-18
	Aug	0.037	0.036	-0.001	-2	0.036	-0.001	-2	0.032	-0.004	-12	0.031	-0.006	-16	0.024	0.025	0.001	3	0.025	0.001	2	0.021	-0.003	-14	0.020	-0.005	-19	0.053	0.051	-0.002	-4	0.051	-0.002	-5	0.047	-0.006	-12	0.045	-0.008	-16
	Sep	0.033	0.033	0.000	0	0.033	0.000	0	0.029	-0.004	-12	0.028	-0.005	-16	0.022	0.023	0.001	5	0.023	0.001	5	0.019	-0.003	-13	0.018	-0.004	-18	0.047	0.045	-0.001	-3	0.045	-0.002	-3	0.041	-0.005	-12	0.040	-0.007	-15
	Oct	0.027	0.028	0.001	4	0.028	0.001	3	0.024	-0.003	-11	0.023	-0.004	-14	0.019	0.021	0.002	9	0.021	0.002	8	0.017	-0.002	-11	0.016	-0.003	-15	0.037	0.037	0.000	0	0.037	0.000	0	0.033	-0.004	-12	0.031	-0.006	-15
	Nov	0.015	0.017	0.002	14	0.017	0.002	14	0.014	-0.001	-7	0.014	-0.002	-10	0.012	0.015	0.002	20	0.014	0.002	20	0.011	-0.001	-8	0.011	-0.001	-11	0.019	0.021	0.002	10	0.021	0.002	9	0.018	-0.001	-8	0.017	-0.002	-10
	Dec	0.008	0.010	0.003	37	0.010	0.003	36	0.007	0.000	0	0.007	0.000	0	0.007	0.009	0.003	43	0.009	0.003	42	0.006	0.000	0	0.006	0.000	0	0.009	0.011	0.003	32	0.011	0.003	31	0.008	0.000	0	0.008	0.000	0
	Annual	0.021	0.022	0.001	7	0.022	0.002	7	0.018	-0.002	-11	0.018	-0.003	-16	0.014	0.016	0.002	16	0.016	0.002	16	0.012	-0.002	-12	0.012	-0.002	-17	0.030	0.030	0.001	2	0.030	0.001	2	0.027	-0.003	-11	0.025	-0.005	-16
QF04	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Apr	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.001	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	May	0.032	0.032	0.000	0	0.032	0.000	0	0.032	0.000	0	0.032	0.000	0	0.021	0.021	0.000	0	0.021	0.000	0	0.021	0.000	0	0.021	0.000	0	0.045	0.046	0.000	0	0.045	0.000	0	0.045	0.000	0	0.045	0.000	0
	Jun	0.014	0.014	0.000	0	0.014	0.000	0	0.014	0.000	0	0.014	0.000	0	0.010	0.010	0.000	0	0.010	0.000	0	0.010	0.000	0	0.010	0.000	0	0.019	0.019	0.000	0	0.019	0.000	0	0.019	0.000	0	0.019	0.000	0
	Jul	0.020	0.020	0.000	0	0.020	0.000	0	0.020	0.000	0	0.020	0.000	0	0.014	0.014	0.000	0	0.014	0.000	0	0.014	0.000	0	0.014	0.000	0	0.027	0.027	0.000	0	0.027	0.000	0	0.027	0.000	0	0.027	0.000	0
	Aug	0.016	0.016	0.000	0	0.016	0.000	0	0.016	0.000	0	0.016	0.000	0	0.012	0.012	0.000	0	0.012	0.000	0	0.012	0.000	0	0.012	0.000	0	0.022	0.022	0.000	0	0.022	0.000	0	0.022	0.000	0	0.022	0.000	0
QF04	Sep	0.014	0.014	0.000	0	0.014	0.000	0	0.014	0.000	0	0.014	0.000	0	0.010	0.010	0.000	0	0.010	0.000	0	0.010	0.000	0	0.010	0.000	0	0.019	0.019	0.000	0	0.019	0.000	0	0.019	0.000	0	0.019	0.000	0
	Oct	0.009	0.009	0.000	0	0.009	0.000	0	0.009	0.000	0	0.009	0.000	0	0.006	0.006	0.000	0	0.006	0.000	0	0.006	0.000	0	0.006	0.000	0	0.012	0.012	0.000	0	0.012	0.000	0	0.012	0.000	0	0.012	0.000	0
	Nov	0.001	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0
	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Annual	0.009	0.009	0.000	0	0.009	0.000	0	0.009	0.000	0	0.009	0.000	0	0.006	0.006	0.000	0	0.006	0.000	0	0.006	0.000	0	0.006	0.000	0	0.012	0.012	0.000	0	0.012	0.000	0	0.012	0.000	0	0.012	0.000	0
QF05	Jan	0.029	0.070	0.041	141	0.084	0.055	191	0.032	0.003	11	0.032	0.003	11	0.025	0.065	0.041	163	0.094	0.069	277	0.031	0.007	26	0.028	0.003	12	0.033	0.074	0.041	123	0.060	0.027	79	0.034	0.000	0	0.037	0.003	10
	Feb	0.023	0.079	0.056	248	0.096	0.074	325	0.024	0.002	7	0.026	0.004	17	0.020	0.076	0.056	282	0.089	0.069	349	0.023	0.003	14	0.023	0.003	17	0.026	0.083	0.057	218	0.099	0.073	280	0.026	0.000	0	0.030	0.004	17
	Mar	0.019	0.083	0.064	329	0.084	0.065	335	0.020	0.001	5	0.024	0.004	23	0.017	0.080	0.063	375	0.077	0.060	354	0.019	0.002	10	0.021	0.004	23	0.022	0.086	0.064	287	0.095	0.072	325	0.022	0.000	0	0.027	0.005	23
	Apr	0.018	0.086	0.068	375	0.075	0.057	313	0.019	0.000	0	0.023	0.005	27	0.016	0.084	0.068	430	0.068	0.052	333	0.017	0.001	8	0.020	0.004	27	0.021	0.089	0.068	323	0.084	0.063	300	0.021	0.000	0	0.027	0.006	28
	May	0.148	0.257	0.109	74	0.236	0.089	60	0.135	-0.012	-8	0.159	0.012	8	0.095	0.199	0.104	110	0.172	0.077	81	0.089	-0.006	-6	0.104	0.010	10	0.193	0.304	0.111	58	0.294	0.102	53	0.174	-0.019	-10	0.208	0.016	8
	Jun	0.153	0.222	0.070	46	0.189	0.037	24	0.141	-0.011	-7	0.150	-0.002	-2	0.090	0.162	0.072	80	0.123	0.033	37	0.084	-0.006	-6	0.089	0.000	0	0.264	0.329	0.065	25	0.306	0.042	16	0.244	-0.021	-8	0.258	-0.006	-2
	Jul	0.154	0.224	0.070	46	0.178	0.024	16	0.143	-0.011	-7	0.149	-0.004	-3	0.092	0.164	0.072	78	0.113	0.021	23	0.085	-0.006	-7	0.088	-0.004	-4	0.236	0.303	0.067	28	0.266	0.030	13	0.217	-0.018	-8	0.230	-0.005	-2
	Aug	0.157	0.225	0.068	43	0.175	0.018	11	0.146	-0.011	-7	0.152	-0.004	-3	0.097	0.167	0.070	72	0.114	0.017	17	0.090	-0.007	-7	0.092	-0.005	-5	0.230	0.296	0.065	28	0.250	0.019	8	0.213	-0.017	-8	0.226	-0.005	-2

Table 9B-1 Gordon Hydrology Water Balance Model – Streamflow Results

		Average Climate Conditions													1:25 Dry Climate Conditions													1:25 Wet Climate Conditions												
	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 6)			Decommis-sion, Closure (year 6 to 11)			Post-Closure (year 12+)			Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 5)			Decommis-sion, Closure (year 6 to 11)			Post-Closure (year 12+)			Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 5)			Decommis-sion, Closure (year 6 to 11)			Post-Closure (year 12+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Flow (m^3/s)	Change (m3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QF05	Sep	0.143	0.205	0.062	43	0.159	0.016	11	0.133	-0.010	-7	0.141	-0.002	-1	0.092	0.147	0.055	59	0.107	0.015	16	0.086	-0.006	-6	0.089	-0.003	-3	0.206	0.272	0.066	32	0.223	0.017	8	0.190	-0.016	-8	0.205	-0.001	0
	Oct	0.124	0.167	0.043	34	0.137	0.013	10	0.116	-0.008	-7	0.125	0.001	1	0.086	0.128	0.042	49	0.099	0.013	15	0.081	-0.005	-6	0.086	0.001	1	0.173	0.224	0.052	30	0.186	0.013	8	0.160	-0.013	-7	0.174	0.001	1
	Nov	0.078	0.113	0.035	44	0.087	0.009	12	0.074	-0.004	-5	0.080	0.002	3	0.059	0.095	0.036	60	0.069	0.010	17	0.057	-0.003	-4	0.062	0.002	4	0.103	0.139	0.037	36	0.112	0.009	9	0.096	-0.006	-6	0.105	0.002	2
	Dec	0.042	0.077	0.035	82	0.055	0.012	29	0.041	-0.001	-3	0.045	0.003	7	0.035	0.075	0.040	114	0.060	0.025	70	0.035	-0.001	-2	0.038	0.003	8	0.050	0.083	0.033	66	0.059	0.008	17	0.048	-0.002	-4	0.054	0.003	7
	Annual	0.091	0.151	0.060	66	0.130	0.039	43	0.085	-0.005	-6	0.092	0.002	2	0.060	0.120	0.060	99	0.099	0.038	64	0.058	-0.002	-4	0.062	0.001	2	0.130	0.190	0.061	47	0.169	0.040	31	0.120	-0.009	-7	0.132	0.002	2
QF06	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Apr	0.009	0.009	0.000	0	0.009	0.000	0	0.009	0.000	0	0.009	0.000	0	0.010	0.010	0.000	0	0.010	0.000	0	0.010	0.000	0	0.010	0.000	0	0.007	0.007	0.000	0	0.007	0.000	0	0.007	0.000	0	0.007	0.000	0
	May	0.168	0.168	0.000	0	0.168	0.000	0	0.168	0.000	0	0.168	0.000	0	0.113	0.113	0.000	0	0.113	0.000	0	0.113	0.000	0	0.113	0.000	0	0.187	0.187	0.000	0	0.187	0.000	0	0.187	0.000	0	0.187	0.000	0
	Jun	0.067	0.067	0.000	0	0.067	0.000	0	0.067	0.000	0	0.067	0.000	0	0.049	0.049	0.000	0	0.049	0.000	0	0.049	0.000	0	0.049	0.000	0	0.151	0.151	0.000	0	0.151	0.000	0	0.151	0.000	0	0.151	0.000	0
	Jul	0.094	0.094	0.000	0	0.094	0.000	0	0.094	0.000	0	0.094	0.000	0	0.069	0.069	0.000	0	0.069	0.000	0	0.069	0.000	0	0.069	0.000	0	0.129	0.129	0.000	0	0.129	0.000	0	0.129	0.000	0	0.129	0.000	0
	Aug	0.078	0.078	0.000	0	0.078	0.000	0	0.078	0.000	0	0.078	0.000	0	0.058	0.058	0.000	0	0.058	0.000	0	0.058	0.000	0	0.058	0.000	0	0.109	0.109	0.000	0	0.109	0.000	0	0.109	0.000	0	0.109	0.000	0
	Sep	0.070	0.070	0.000	0	0.070	0.000	0	0.070	0.000	0	0.070	0.000	0	0.051	0.051	0.000	0	0.051	0.000	0	0.051	0.000	0	0.051	0.000	0	0.096	0.096	0.000	0	0.096	0.000	0	0.096	0.000	0	0.096	0.000	0
	Oct	0.043	0.043	0.000	0	0.043	0.000	0	0.043	0.000	0	0.043	0.000	0	0.031	0.031	0.000	0	0.031	0.000	0	0.031	0.000	0	0.031	0.000	0	0.061	0.061	0.000	0	0.061	0.000	0	0.061	0.000	0	0.061	0.000	0
	Nov	0.004	0.004	0.000	0	0.004	0.000	0	0.004	0.000	0	0.004	0.000	0	0.003	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0	0.005	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0
	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Annual	0.044	0.044	0.000	0	0.044	0.000	0	0.044	0.000	0	0.044	0.000	0	0.032	0.032	0.000	0	0.032	0.000	0	0.032	0.000	0	0.032	0.000	0	0.062	0.062	0.000	0	0.062	0.000	0	0.062	0.000	0	0.062	0.000	0
QF07	Jan	0.071	0.099	0.029	41	0.094	0.023	33	0.072	0.001	2	0.073	0.002	3	0.058	0.087	0.029	50	0.093	0.035	60	0.062	0.004	7	0.060	0.002	4	0.085	0.113	0.029	34	0.096	0.011	14	0.084	0.000	0	0.087	0.003	3
	Feb	0.054	0.094	0.040	74	0.106	0.052	95	0.056	0.002	3	0.057	0.003	6	0.045	0.084	0.039	88	0.101	0.056	124	0.049	0.004	9	0.048	0.003	6	0.065	0.106	0.041	63	0.103	0.038	59	0.065	0.000	0	0.068	0.004	5
	Mar	0.045	0.096	0.051	114	0.106	0.061	135	0.047	0.002	3	0.049	0.004	8	0.037	0.088	0.050	135	0.096	0.059	157	0.040	0.003	8	0.041	0.003	9	0.054	0.107	0.052	97	0.115	0.060	111	0.054	0.000	0	0.059	0.004	8
	Apr	0.044	0.105	0.061	138	0.104	0.060	137	0.045	0.001	2	0.048	0.004	10	0.037	0.097	0.060	164	0.093	0.057	154	0.039	0.002	6	0.040	0.004	10	0.053	0.114	0.062	117	0.117	0.065	123	0.052	0.000	0	0.057	0.005	9
	May	0.180	0.294	0.114	63	0.279	0.099	55	0.176	-0.004	-2	0.191	0.012	7	0.133	0.240	0.107	80	0.220	0.087	65	0.133	0.000	0	0.142	0.009	7	0.208	0.324	0.116	56	0.319	0.111	53	0.201	-0.007	-4	0.224	0.016	8
	Jun	0.343	0.440	0.096	28	0.412	0.069	20	0.331	-0.012	-4	0.348	0.004	1	0.209	0.303	0.094	45	0.271	0.061	29	0.204	-0.005	-2	0.214	0.005	2	0.600	0.699	0.100	17	0.680	0.081	13	0.575	-0.024	-4	0.602	0.002	0
	Jul	0.362	0.436	0.074	20	0.396	0.033	9	0.351	-0.011	-3	0.359	-0.003	-1	0.191	0.264	0.073	38	0.222	0.031	16	0.185	-0.006	-3	0.190	-0.001	0	0.634	0.703	0.069	11	0.671	0.037	6	0.615	-0.019	-3	0.629	-0.005	-1
	Aug	0.361	0.430	0.069	19	0.382	0.021	6	0.349	-0.011	-3	0.356	-0.004	-1	0.170	0.240	0.070	41	0.190	0.020	12	0.163	-0.006	-4	0.166	-0.004	-2	0.645	0.710	0.066	10	0.668	0.024	4	0.626	-0.018	-3	0.640	-0.005	-1
	Sep	0.302	0.366	0.064	21	0.319	0.016	5	0.292	-0.010	-3	0.299	-0.003	-1	0.167	0.231	0.064	38	0.183	0.017	10	0.160	-0.006	-4	0.163	-0.004	-2	0.536	0.599	0.064	12	0.553	0.017	3	0.520	-0.016	-3	0.533	-0.002	0
	Oct	0.258	0.307	0.050	19	0.271	0.014	5	0.249	-0.009	-4	0.257	-0.001	0	0.169	0.219	0.050	29	0.184	0.015	9	0.163	-0.006	-3	0.168	-0.002	-1	0.376	0.430	0.054	14	0.390	0.014	4	0.363	-0.013	-3	0.376	0.000	0
	Nov	0.178	0.214	0.036	20	0.188	0.010	6	0.172	-0.006	-3	0.180	0.001	1	0.131	0.169	0.038	29	0.142	0.011	9	0.127	-0.004	-3	0.132	0.001	1	0.227	0.267	0.039	17	0.237	0.010	4	0.219	-0.009	-4	0.229	0.002	1
	Dec	0.105	0.136	0.030	29	0.113	0.008	8	0.102	-0.003	-3	0.107	0.002	2	0.083	0.116	0.033	40	0.095	0.012	14	0.081	-0.002	-2	0.085	0.002	2	0.129	0.160	0.031	24	0.137	0.008	6	0.125	-0.004	-3	0.131	0.002	2

Table 9B-1 Gordon Hydrology Water Balance Model – Streamflow Results

Average Climate Conditions

Station	Month	Existing Conditions Flow (m^3/s)	Construction (year -2 to -1) Flow (m^3/s)	Construction Change (m^3/s)	Construction Change (%)	Operation (year 1 to 6) Flow (m^3/s)	Operation Change (m^3/s)	Operation Change (%)	Decommis-sion, Closure (year 6 to 11) Flow (m^3/s)	Decommission Change (m^3/s)	Decommission Change (%)	Post-Closure (year 12+) Flow (m^3/s)	Post-Closure Change (m^3/s)	Post-Closure Change (%)
QF07	Annual	0.192	0.251	0.059	31	0.231	0.039	20	0.187	-0.005	-3	0.194	0.002	1
QF08	Jan	0.111	0.134	0.023	21	0.123	0.012	11	0.111	0.000	0	0.112	0.002	2
QF08	Feb	0.087	0.117	0.030	34	0.119	0.032	37	0.088	0.002	2	0.089	0.003	3
QF08	Mar	0.073	0.113	0.040	55	0.122	0.049	68	0.074	0.002	2	0.076	0.003	4
QF08	Apr	0.067	0.118	0.051	77	0.123	0.056	84	0.068	0.001	2	0.070	0.003	5
QF08	May	0.501	0.644	0.143	29	0.633	0.132	26	0.500	-0.001	0	0.515	0.014	3
QF08	Jun	0.639	0.740	0.101	16	0.715	0.076	12	0.627	-0.012	-2	0.645	0.006	1
QF08	Jul	0.490	0.565	0.076	15	0.527	0.038	8	0.479	-0.011	-2	0.488	-0.002	0
QF08	Aug	0.487	0.556	0.069	14	0.510	0.023	5	0.476	-0.011	-2	0.483	-0.004	-1
QF08	Sep	0.435	0.499	0.064	15	0.452	0.017	4	0.425	-0.010	-2	0.432	-0.003	-1
QF08	Oct	0.355	0.406	0.051	14	0.369	0.014	4	0.346	-0.009	-3	0.354	-0.001	0
QF08	Nov	0.248	0.284	0.036	14	0.258	0.010	4	0.242	-0.006	-3	0.249	0.001	0
QF08	Dec	0.157	0.184	0.028	18	0.164	0.007	5	0.153	-0.003	-2	0.158	0.002	1
QF08	Annual	0.304	0.363	0.059	19	0.343	0.039	13	0.299	-0.005	-2	0.306	0.002	1
QF10	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Apr	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	May	0.008	0.008	0.000	0	0.008	0.000	0	0.008	0.000	0	0.008	0.000	0
QF10	Jun	0.004	0.004	0.000	0	0.004	0.000	0	0.004	0.000	0	0.004	0.000	0
QF10	Jul	0.006	0.006	0.000	0	0.006	0.000	0	0.006	0.000	0	0.006	0.000	0
QF10	Aug	0.005	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0
QF10	Sep	0.004	0.004	0.000	0	0.004	0.000	0	0.004	0.000	0	0.004	0.000	0
QF10	Oct	0.003	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0
QF10	Nov	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Annual	0.002	0.002	0.000	0	0.002	0.000	0	0.002	0.000	0	0.002	0.000	0

1:25 Dry Climate Conditions

Station	Month	Existing Conditions Flow (m^3/s)	Construction (year -2 to -1) Flow (m^3/s)	Construction Change (m^3/s)	Construction Change (%)	Operation (year 1 to 5) Flow (m^3/s)	Operation Change (m^3/s)	Operation Change (%)	Decommis-sion, Closure (year 6 to 11) Flow (m^3/s)	Decommission Change (m^3/s)	Decommission Change (%)	Post-Closure (year 12+) Flow (m^3/s)	Post-Closure Change (m^3/s)	Post-Closure Change (%)
QF07	Annual	0.119	0.178	0.059	50	0.158	0.038	32	0.117	-0.002	-2	0.121	0.002	1
QF08	Jan	0.091	0.115	0.024	26	0.110	0.019	20	0.093	0.002	2	0.093	0.002	2
QF08	Feb	0.072	0.101	0.029	40	0.110	0.038	53	0.076	0.003	5	0.075	0.002	3
QF08	Mar	0.061	0.099	0.038	62	0.110	0.050	82	0.064	0.003	5	0.063	0.003	4
QF08	Apr	0.055	0.104	0.049	89	0.108	0.053	97	0.057	0.003	5	0.058	0.003	5
QF08	May	0.320	0.456	0.136	42	0.440	0.120	37	0.323	0.003	1	0.331	0.011	3
QF08	Jun	0.344	0.439	0.095	28	0.411	0.067	20	0.340	-0.004	-1	0.350	0.007	2
QF08	Jul	0.263	0.338	0.075	28	0.300	0.036	14	0.258	-0.005	-2	0.264	0.001	0
QF08	Aug	0.236	0.304	0.069	29	0.258	0.022	10	0.230	-0.006	-3	0.233	-0.003	-1
QF08	Sep	0.232	0.299	0.067	29	0.250	0.018	8	0.225	-0.006	-3	0.228	-0.004	-2
QF08	Oct	0.228	0.281	0.053	23	0.243	0.015	7	0.222	-0.006	-3	0.225	-0.003	-1
QF08	Nov	0.182	0.221	0.039	21	0.193	0.012	6	0.177	-0.004	-2	0.182	0.000	0
QF08	Dec	0.125	0.155	0.030	24	0.134	0.009	7	0.122	-0.002	-2	0.126	0.001	1
QF08	Annual	0.184	0.243	0.059	32	0.222	0.038	21	0.182	-0.002	-1	0.186	0.002	1
QF10	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Apr	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	May	0.005	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0
QF10	Jun	0.003	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0
QF10	Jul	0.004	0.004	0.000	0	0.004	0.000	0	0.004	0.000	0	0.004	0.000	0
QF10	Aug	0.003	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0
QF10	Sep	0.003	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0
QF10	Oct	0.002	0.002	0.000	0	0.002	0.000	0	0.002	0.000	0	0.002	0.000	0
QF10	Nov	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Annual	0.002	0.002	0.000	0	0.002	0.000	0	0.002	0.000	0	0.002	0.000	0

1:25 Wet Climate Conditions

Station	Month	Existing Conditions Flow (m^3/s)	Construction (year -2 to -1) Flow (m^3/s)	Construction Change (m^3/s)	Construction Change (%)	Operation (year 1 to 5) Flow (m^3/s)	Operation Change (m^3/s)	Operation Change (%)	Decommis-sion, Closure (year 6 to 11) Flow (m^3/s)	Decommission Change (m^3/s)	Decommission Change (%)	Post-Closure (year 12+) Flow (m^3/s)	Post-Closure Change (m^3/s)	Post-Closure Change (%)
QF07	Annual	0.301	0.361	0.060	20	0.340	0.040	13	0.292	-0.009	-3	0.303	0.002	1
QF08	Jan	0.132	0.155	0.023	18	0.140	0.008	6	0.131	-0.001	-1	0.134	0.002	2
QF08	Feb	0.103	0.134	0.031	30	0.124	0.021	20	0.103	0.000	0	0.106	0.003	3
QF08	Mar	0.087	0.130	0.042	48	0.132	0.044	51	0.088	0.000	0	0.091	0.004	4
QF08	Apr	0.082	0.136	0.054	66	0.141	0.059	72	0.082	0.000	0	0.086	0.004	5
QF08	May	0.720	0.866	0.146	20	0.864	0.144	20	0.715	-0.005	-1	0.738	0.018	3
QF08	Jun	1.196	1.302	0.106	9	1.284	0.088	7	1.171	-0.024	-2	1.200	0.005	0
QF08	Jul	0.858	0.927	0.069	8	0.897	0.039	5	0.840	-0.019	-2	0.853	-0.005	-1
QF08	Aug	0.850	0.915	0.066	8	0.875	0.025	3	0.831	-0.018	-2	0.845	-0.005	-1
QF08	Sep	0.748	0.810	0.062	8	0.765	0.017	2	0.732	-0.015	-2	0.745	-0.003	0
QF08	Oct	0.527	0.580	0.053	10	0.541	0.014	3	0.514	-0.013	-2	0.527	0.000	0
QF08	Nov	0.316	0.354	0.038	12	0.326	0.010	3	0.307	-0.009	-3	0.317	0.001	0
QF08	Dec	0.190	0.219	0.029	15	0.197	0.007	4	0.186	-0.005	-2	0.192	0.002	1
QF08	Annual	0.484	0.544	0.060	12	0.524	0.040	8	0.475	-0.009	-2	0.486	0.002	0
QF10	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Apr	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	May	0.012	0.012	0.000	0	0.012	0.000	0	0.012	0.000	0	0.012	0.000	0
QF10	Jun	0.005	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0
QF10	Jul	0.008	0.008	0.000	0	0.008	0.000	0	0.008	0.000	0	0.008	0.000	0
QF10	Aug	0.006	0.006	0.000	0	0.006	0.000	0	0.006	0.000	0	0.006	0.000	0
QF10	Sep	0.005	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0	0.005	0.000	0
QF10	Oct	0.003	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0
QF10	Nov	0.001	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0	0.001	0.000	0
QF10	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
QF10	Annual	0.003	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0	0.003	0.000	0

Notes
Existing condition baseline data has minor variations for each Project phase due to artifacts of the modelling process, values for 2020 are reported as existing conditions. Calculations for the absolute and percent change in flow for each phase use baseline data calculated for that specific phase and may have minor disagreement with the reported baseline data.

Table 9B-2 Gordon Hydrology Water Balance Model – Lake Level Results

		Average Climate Conditions									1:25 Dry Climate Conditions									1:25 Wet Climate Conditions								
	Month	Existing Conditions	Construction (year -2 to -1)		Operation (year 1 to 6)		Decommission, Closure (year 6 to 11)		Post-Closure (year 12+)		Existing Conditions	Construction (year -2 to -1)		Operation (year 1 to 5)		Decommis-sion, Closure (year 6 to 11)		Post-Closure (year 12+)		Existing Conditions	Construction (year -2 to -1)		Operation (year 1 to 5)		Decommis-sion, Closure (year 6 to 11)		Post-Closure (year 12+)	
		Level (masl)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)
Gordon Lake	Jan	315.117	315.153	0.036	315.168	0.052	315.121	0.004	315.112	-0.005	315.105	315.144	0.038	315.161	0.055	315.109	0.004	315.100	-0.006	315.129	315.164	0.035	315.177	0.048	315.132	0.003	315.125	-0.004
	Feb	315.094	315.149	0.056	315.156	0.062	315.096	0.002	315.090	-0.004	315.083	315.141	0.058	315.149	0.066	315.086	0.003	315.079	-0.005	315.105	315.158	0.053	315.164	0.059	315.107	0.002	315.102	-0.003
	Mar	315.079	315.148	0.068	315.150	0.071	315.081	0.002	315.076	-0.004	315.069	315.141	0.071	315.144	0.074	315.071	0.002	315.065	-0.004	315.091	315.156	0.065	315.158	0.067	315.092	0.001	315.088	-0.003
	Apr	315.073	315.149	0.076	315.149	0.076	315.073	0.000	315.069	-0.004	315.064	315.143	0.079	315.143	0.080	315.064	0.000	315.058	-0.005	315.085	315.158	0.072	315.157	0.072	315.085	0.000	315.082	-0.004
	May	315.361	315.381	0.021	315.381	0.020	315.329	-0.031	315.322	-0.038	315.299	315.330	0.031	315.330	0.030	315.270	-0.029	315.261	-0.039	315.403	315.416	0.013	315.415	0.012	315.369	-0.034	315.363	-0.040
	Jun	315.404	315.403	-0.001	315.403	-0.001	315.380	-0.024	315.367	-0.037	315.308	315.320	0.011	315.319	0.011	315.287	-0.022	315.276	-0.033	315.507	315.497	-0.010	315.496	-0.011	315.480	-0.027	315.468	-0.039
	Jul	315.396	315.393	-0.003	315.392	-0.003	315.372	-0.024	315.362	-0.034	315.314	315.320	0.006	315.320	0.006	315.289	-0.025	315.280	-0.034	315.489	315.479	-0.010	315.479	-0.011	315.463	-0.026	315.450	-0.040
	Aug	315.393	315.389	-0.003	315.389	-0.004	315.369	-0.023	315.361	-0.031	315.321	315.325	0.005	315.325	0.004	315.296	-0.025	315.287	-0.033	315.464	315.455	-0.009	315.454	-0.009	315.439	-0.025	315.430	-0.034
	Sep	315.373	315.373	0.000	315.372	0.000	315.350	-0.022	315.343	-0.030	315.307	315.315	0.008	315.314	0.007	315.285	-0.022	315.277	-0.030	315.438	315.432	-0.006	315.432	-0.006	315.415	-0.024	315.407	-0.031
	Oct	315.337	315.344	0.006	315.343	0.006	315.319	-0.018	315.313	-0.024	315.286	315.299	0.013	315.298	0.013	315.268	-0.018	315.261	-0.025	315.393	315.393	0.000	315.393	0.000	315.371	-0.022	315.363	-0.029
	Nov	315.248	315.268	0.021	315.268	0.020	315.238	-0.010	315.233	-0.014	315.217	315.243	0.026	315.242	0.025	315.207	-0.010	315.202	-0.015	315.280	315.296	0.016	315.296	0.015	315.269	-0.011	315.266	-0.015
	Dec	315.159	315.198	0.039	315.197	0.038	315.155	-0.004	315.153	-0.007	315.144	315.187	0.043	315.185	0.042	315.139	-0.005	315.136	-0.008	315.175	315.211	0.035	315.210	0.034	315.171	-0.004	315.169	-0.006
	Annual	315.253	315.279	0.026	315.281	0.028	315.240	-0.012	315.233	-0.019	315.210	315.242	0.033	315.244	0.034	315.198	-0.012	315.190	-0.020	315.297	315.318	0.021	315.319	0.023	315.283	-0.014	315.276	-0.021
Farley Lake	Jan	313.578	313.722	0.144	313.764	0.187	313.590	0.013	313.593	0.016	313.556	313.708	0.152	313.790	0.233	313.582	0.026	313.572	0.016	313.599	313.736	0.137	313.697	0.098	313.600	0.000	313.615	0.015
	Feb	313.544	313.753	0.209	313.796	0.252	313.552	0.008	313.565	0.021	313.526	313.744	0.218	313.778	0.252	313.541	0.015	313.547	0.021	313.563	313.763	0.200	313.802	0.239	313.563	0.000	313.586	0.022
	Mar	313.523	313.764	0.241	313.766	0.243	313.528	0.006	313.550	0.027	313.506	313.757	0.251	313.747	0.241	313.517	0.012	313.532	0.026	313.542	313.772	0.231	313.792	0.250	313.541	-0.001	313.571	0.029
	Apr	313.515	313.772	0.257	313.742	0.228	313.517	0.003	313.546	0.031	313.497	313.766	0.268	313.724	0.227	313.506	0.009	313.527	0.030	313.534	313.779	0.245	313.767	0.233	313.531	-0.003	313.568	0.034
	May	313.855	314.034	0.180	314.010	0.155	313.836	-0.019	313.884	0.030	313.769	313.968	0.199	313.926	0.157	313.757	-0.012	313.795	0.026	313.910	314.080	0.171	314.071	0.161	313.884	-0.026	313.947	0.037
	Jun	313.905	314.009	0.103	313.962	0.057	313.886	-0.019	313.901	-0.004	313.780	313.920	0.140	313.850	0.070	313.766	-0.014	313.779	-0.001	314.058	314.129	0.071	314.104	0.046	314.033	-0.024	314.051	-0.007
	Jul	313.907	314.010	0.103	313.945	0.038	313.888	-0.019	313.900	-0.007	313.785	313.924	0.138	313.832	0.046	313.770	-0.015	313.776	-0.009	314.026	314.103	0.077	314.062	0.037	314.002	-0.024	314.019	-0.007
	Aug	313.913	314.012	0.099	313.941	0.028	313.894	-0.019	313.905	-0.007	313.798	313.930	0.132	313.833	0.036	313.782	-0.016	313.785	-0.012	314.019	314.096	0.077	314.043	0.024	313.996	-0.023	314.013	-0.006
	Sep	313.890	313.985	0.096	313.916	0.026	313.871	-0.018	313.886	-0.003	313.787	313.895	0.108	313.821	0.034	313.772	-0.014	313.780	-0.007	313.986	314.069	0.083	314.009	0.023	313.964	-0.022	313.985	-0.001
	Oct	313.854	313.927	0.073	313.877	0.023	313.837	-0.016	313.856	0.002	313.771	313.858	0.087	313.802	0.031	313.758	-0.013	313.773	0.002	313.937	314.010	0.073	313.957	0.020	313.917	-0.020	313.939	0.002
	Nov	313.748	313.826	0.078	313.772	0.024	313.737	-0.011	313.755	0.007	313.696	313.787	0.091	313.726	0.030	313.688	-0.008	313.704	0.008	313.805	313.876	0.071	313.826	0.020	313.792	-0.014	313.811	0.006
	Dec	313.637	313.742	0.105	313.682	0.045	313.631	-0.005	313.648	0.012	313.607	313.740	0.132	313.698	0.090	313.604	-0.003	313.620	0.013	313.666	313.759	0.092	313.694	0.028	313.659	-0.008	313.678	0.012
	Annual	313.739	313.880	0.141	313.848	0.109	313.731	-0.008	313.749	0.010	313.673	313.833	0.160	313.794	0.121	313.670	-0.003	313.683	0.009	313.804	313.931	0.127	313.902	0.098	313.790	-0.014	313.815	0.011
Swede Lake	Jan	297.141	297.174	0.033	297.169	0.028	297.143	0.002	297.144	0.003	297.124	297.160	0.036	297.168	0.044	297.129	0.006	297.127	0.003	297.158	297.189	0.031	297.172	0.013	297.158	-0.001	297.161	0.003
	Feb	297.118	297.169	0.050	297.182	0.064	297.121	0.003	297.123	0.004	297.105	297.157	0.053	297.177	0.072	297.110	0.006	297.109	0.004	297.133	297.182	0.048	297.179	0.046	297.133	0.000	297.138	0.005
	Mar	297.105	297.172	0.067	297.182	0.077	297.107	0.002	297.110	0.006	297.092	297.162	0.070	297.171	0.079	297.097	0.005	297.097	0.005	297.119	297.183	0.064	297.192	0.073	297.119	0.000	297.125	0.006
	Apr	297.103	297.181	0.078	297.180	0.077	297.105	0.002	297.110	0.007	297.091	297.172	0.081	297.168	0.077	297.095	0.004	297.097	0.006	297.116	297.191	0.075	297.194	0.078	297.116	0.000	297.123	0.007
	May	297.240	297.328	0.088	297.319	0.078	297.237	-0.003	297.250	0.010	297.203	297.294	0.091	297.279	0.076	297.203	0.000	297.211	0.009	297.260	297.346	0.086	297.343	0.083	297.255	-0.005	297.273	0.012
	Jun	297.370	297.428	0.057	297.412	0.042	297.362	-0.008	297.373	0.003	297.276	297.344	0.068	297.322	0.046	297.272	-0.004	297.280	0.004	297.511	297.559	0.047	297.550	0.039	297.499	-0.012	297.512	0.001
	Jul	297.382	297.425	0.044	297.402	0.020	297.375	-0.007	297.380	-0.002	297.261	297.317	0.056	297.286	0.024	297.257	-0.005	297.261	-0.001	297.528	297.560	0.032	297.546	0.018	297.519	-0.009	297.526	-0.002

Table 9B-2 Gordon Hydrology Water Balance Model – Lake Level Results

		Average Climate Conditions									1:25 Dry Climate Conditions									1:25 Wet Climate Conditions								
	Month	Existing Conditions	Construction (year -2 to -1)		Operation (year 1 to 6)		Decommission, Closure (year 6 to 11)		Post-Closure (year 12+)		Existing Conditions	Construction (year -2 to -1)		Operation (year 1 to 5)		Decommis-sion, Closure (year 6 to 11)		Post-Closure (year 12+)		Existing Conditions	Construction (year -2 to -1)		Operation (year 1 to 5)		Decommis-sion, Closure (year 6 to 11)		Post-Closure (year 12+)	
		Level (masl)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)
Swede Lake	Aug	297.381	297.422	0.041	297.394	0.013	297.374	-0.007	297.378	-0.003	297.243	297.300	0.056	297.261	0.017	297.238	-0.006	297.240	-0.003	297.533	297.564	0.031	297.544	0.011	297.525	-0.009	297.531	-0.002
	Sep	297.344	297.384	0.041	297.354	0.011	297.337	-0.007	297.341	-0.002	297.241	297.293	0.052	297.255	0.014	297.235	-0.006	297.237	-0.004	297.479	297.511	0.032	297.488	0.009	297.471	-0.008	297.478	-0.001
	Oct	297.312	297.347	0.034	297.322	0.010	297.306	-0.007	297.312	0.000	297.243	297.284	0.041	297.256	0.013	297.238	-0.005	297.242	-0.001	297.389	297.421	0.032	297.398	0.008	297.381	-0.008	297.389	0.000
	Nov	297.250	297.279	0.029	297.258	0.009	297.245	-0.005	297.251	0.001	297.208	297.242	0.035	297.218	0.011	297.204	-0.004	297.208	0.001	297.289	297.318	0.029	297.297	0.008	297.283	-0.007	297.290	0.001
	Dec	297.181	297.211	0.030	297.190	0.009	297.178	-0.003	297.183	0.002	297.156	297.192	0.036	297.170	0.014	297.154	-0.002	297.159	0.002	297.205	297.234	0.029	297.213	0.008	297.201	-0.004	297.208	0.002
	Annual	297.244	297.293	0.049	297.280	0.036	297.241	-0.003	297.246	0.002	297.187	297.243	0.056	297.228	0.041	297.186	-0.001	297.189	0.002	297.310	297.355	0.045	297.343	0.033	297.305	-0.005	297.313	0.003
Ellystan Lake	Jan	282.863	282.879	0.016	282.873	0.009	282.864	0.000	282.865	0.001	282.847	282.866	0.019	282.863	0.016	282.849	0.002	282.849	0.002	282.879	282.892	0.014	282.884	0.005	282.878	-0.001	282.880	0.001
	Feb	282.843	282.867	0.024	282.870	0.027	282.844	0.001	282.845	0.002	282.828	282.855	0.027	282.863	0.036	282.831	0.003	282.830	0.002	282.858	282.880	0.022	282.873	0.016	282.858	0.000	282.860	0.003
	Mar	282.828	282.865	0.036	282.872	0.044	282.830	0.002	282.832	0.003	282.814	282.853	0.039	282.863	0.050	282.817	0.004	282.817	0.003	282.844	282.877	0.034	282.879	0.035	282.844	0.000	282.847	0.004
	Apr	282.821	282.869	0.048	282.873	0.052	282.823	0.002	282.825	0.004	282.806	282.858	0.052	282.862	0.056	282.809	0.003	282.810	0.004	282.838	282.881	0.043	282.885	0.047	282.838	0.000	282.842	0.004
	May	282.989	283.021	0.032	283.019	0.031	282.989	0.000	282.992	0.003	282.947	282.988	0.041	282.984	0.037	282.949	0.001	282.951	0.004	283.026	283.052	0.026	283.052	0.026	283.025	-0.001	283.029	0.003
	Jun	283.031	283.047	0.016	283.043	0.012	283.029	-0.002	283.032	0.001	282.967	282.992	0.025	282.985	0.018	282.966	-0.001	282.969	0.002	283.103	283.113	0.010	283.111	0.008	283.100	-0.002	283.103	0.000
	Jul	283.005	283.020	0.015	283.013	0.008	283.003	-0.002	283.005	0.000	282.943	282.967	0.025	282.955	0.013	282.941	-0.002	282.943	0.000	283.066	283.074	0.009	283.071	0.005	283.063	-0.002	283.065	-0.001
	Aug	283.005	283.018	0.014	283.009	0.005	283.002	-0.002	283.004	-0.001	282.932	282.957	0.025	282.941	0.009	282.930	-0.002	282.931	-0.001	283.065	283.073	0.008	283.068	0.003	283.062	-0.002	283.064	-0.001
	Sep	282.993	283.007	0.014	282.997	0.004	282.991	-0.002	282.992	-0.001	282.931	282.955	0.025	282.938	0.007	282.928	-0.003	282.929	-0.002	283.050	283.059	0.009	283.053	0.003	283.048	-0.002	283.050	0.000
	Oct	282.972	282.985	0.013	282.976	0.004	282.969	-0.003	282.972	0.000	282.929	282.949	0.020	282.935	0.006	282.927	-0.002	282.928	-0.001	283.012	283.022	0.010	283.014	0.003	283.009	-0.003	283.012	0.000
	Nov	282.936	282.949	0.013	282.940	0.004	282.934	-0.002	282.937	0.000	282.908	282.925	0.018	282.913	0.006	282.905	-0.002	282.908	0.000	282.960	282.971	0.011	282.963	0.003	282.957	-0.003	282.960	0.000
	Dec	282.894	282.909	0.014	282.898	0.004	282.892	-0.002	282.895	0.001	282.874	282.893	0.019	282.880	0.006	282.872	-0.002	282.875	0.001	282.912	282.924	0.013	282.915	0.003	282.909	-0.002	282.912	0.001
	Annual	282.932	282.953	0.021	282.949	0.017	282.931	-0.001	282.933	0.001	282.894	282.921	0.028	282.915	0.022	282.894	0.000	282.895	0.001	282.967	282.985	0.017	282.981	0.013	282.966	-0.001	282.969	0.001

Notes
Existing condition baseline data has minor variations for each Project phase due to artifacts of the modelling process, values for 2020 are reported as existing conditions. Calculations for the absolute and percent change in flow for each phase use baseline data calculated for that specific phase and may have minor disagreement with the reported baseline data.

ALAMOS GOLD INC.

Table 9B-3 MacLellan Hydrology Water Balance Model – Streamflow Results

Average Climate Conditions

Station	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM01	Jan	7.044	7.045	0.001	0	7.048	0.004	0	7.047	0.003	0	7.048	0.003	0
	Feb	6.397	6.408	0.012	0	6.408	0.012	0	6.406	0.010	0	6.408	0.011	0
	Mar	5.825	5.844	0.019	0	5.842	0.017	0	5.839	0.015	0	5.841	0.017	0
	Apr	5.308	5.325	0.017	0	5.323	0.015	0	5.321	0.013	0	5.323	0.015	0
	May	6.896	6.912	0.016	0	6.910	0.015	0	6.908	0.012	0	6.910	0.014	0
	Jun	11.718	11.732	0.014	0	11.731	0.013	0	11.729	0.011	0	11.730	0.012	0
	Jul	12.863	12.878	0.015	0	12.877	0.014	0	12.875	0.012	0	12.876	0.013	0
	Aug	9.561	9.579	0.018	0	9.579	0.017	0	9.577	0.015	0	9.578	0.017	0
	Sep	6.908	6.924	0.017	0	6.924	0.016	0	6.922	0.014	0	6.923	0.015	0
	Oct	6.012	6.018	0.006	0	6.017	0.005	0	6.016	0.004	0	6.017	0.005	0
	Nov	6.910	6.908	-0.002	0	6.906	-0.003	0	6.906	-0.004	0	6.907	-0.003	0
	Dec	7.526	7.525	-0.001	0	7.524	-0.003	0	7.523	-0.003	0	7.524	-0.002	0
	Annual	7.747	7.758	0.011	0	7.757	0.010	0	7.756	0.008	0	7.757	0.010	0
QM02	Jan	7.044	7.045	0.001	0	7.050	0.006	0	7.050	0.006	0	7.050	0.006	0
	Feb	6.397	6.408	0.012	0	6.411	0.014	0	6.409	0.012	0	6.410	0.014	0
	Mar	5.825	5.844	0.019	0	5.844	0.019	0	5.842	0.017	0	5.844	0.019	0
	Apr	5.329	5.346	0.016	0	5.344	0.015	0	5.342	0.012	0	5.344	0.014	0
	May	7.173	7.181	0.008	0	7.179	0.006	0	7.177	0.004	0	7.179	0.006	0
	Jun	11.835	11.845	0.010	0	11.844	0.009	0	11.842	0.007	0	11.843	0.009	0
	Jul	13.028	13.038	0.010	0	13.037	0.009	0	13.035	0.007	0	13.036	0.008	0
	Aug	9.704	9.718	0.014	0	9.717	0.013	0	9.715	0.011	0	9.717	0.012	0
	Sep	7.032	7.045	0.013	0	7.044	0.012	0	7.042	0.010	0	7.043	0.011	0
	Oct	6.090	6.094	0.004	0	6.093	0.003	0	6.092	0.002	0	6.093	0.003	0
	Nov	6.917	6.915	-0.002	0	6.915	-0.002	0	6.914	-0.002	0	6.916	-0.001	0
	Dec	7.526	7.525	-0.001	0	7.526	0.000	0	7.526	-0.001	0	7.527	0.000	0
	Annual	7.825	7.834	0.009	0	7.834	0.009	0	7.832	0.007	0	7.833	0.008	0
QM03	Jan	7.050	7.052	0.003	0	7.055	0.005	0	7.049	-0.001	0	7.049	0.000	0
	Feb	6.402	6.418	0.016	0	6.453	0.051	1	6.408	0.006	0	6.410	0.007	0
	Mar	5.830	5.861	0.031	1	5.926	0.096	2	5.841	0.011	0	5.843	0.013	0
	Apr	5.356	5.387	0.030	1	5.386	0.029	1	5.362	0.005	0	5.364	0.007	0

1:25 Dry Climate Conditions

Station	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM01	Jan	5.083	5.083	0.000	0	5.085	0.002	0	5.085	0.002	0	5.085	0.002	0
	Feb	4.636	4.644	0.007	0	4.644	0.008	0	4.643	0.006	0	4.644	0.007	0
	Mar	4.245	4.258	0.013	0	4.257	0.011	0	4.255	0.010	0	4.256	0.011	0
	Apr	3.890	3.901	0.011	0	3.900	0.010	0	3.899	0.009	0	3.900	0.010	0
	May	4.596	4.607	0.011	0	4.605	0.010	0	4.604	0.008	0	4.605	0.009	0
	Jun	7.231	7.241	0.010	0	7.240	0.009	0	7.238	0.007	0	7.239	0.008	0
	Jul	8.140	8.150	0.010	0	8.149	0.009	0	8.148	0.008	0	8.149	0.009	0
	Aug	6.459	6.471	0.013	0	6.471	0.012	0	6.469	0.011	0	6.470	0.012	0
	Sep	4.992	5.004	0.012	0	5.004	0.011	0	5.002	0.010	0	5.003	0.011	0
	Oct	4.393	4.397	0.005	0	4.397	0.004	0	4.396	0.003	0	4.397	0.004	0
	Nov	4.967	4.966	-0.001	0	4.965	-0.002	0	4.964	-0.002	0	4.965	-0.001	0
	Dec	5.393	5.393	0.000	0	5.392	-0.001	0	5.391	-0.002	0	5.392	-0.001	0
	Annual	5.335	5.343	0.008	0	5.342	0.007	0	5.341	0.006	0	5.342	0.007	0
QM02	Jan	5.083	5.083	0.000	0	5.088	0.004	0	5.087	0.004	0	5.088	0.004	0
	Feb	4.636	4.644	0.007	0	4.646	0.010	0	4.645	0.009	0	4.646	0.010	0
	Mar	4.245	4.258	0.013	0	4.259	0.014	0	4.257	0.012	0	4.259	0.013	0
	Apr	3.915	3.925	0.011	0	3.924	0.010	0	3.923	0.008	0	3.924	0.009	0
	May	4.782	4.787	0.005	0	4.786	0.004	0	4.784	0.002	0	4.785	0.003	0
	Jun	7.315	7.322	0.007	0	7.321	0.006	0	7.319	0.005	0	7.321	0.006	0
	Jul	8.260	8.266	0.006	0	8.265	0.006	0	8.264	0.004	0	8.265	0.005	0
	Aug	6.563	6.572	0.009	0	6.572	0.009	0	6.570	0.007	0	6.571	0.008	0
	Sep	5.081	5.090	0.009	0	5.090	0.009	0	5.088	0.007	0	5.089	0.008	0
	Oct	4.449	4.452	0.003	0	4.451	0.002	0	4.450	0.001	0	4.451	0.002	0
	Nov	4.972	4.971	-0.001	0	4.971	0.000	0	4.971	-0.001	0	4.972	0.000	0
	Dec	5.393	5.393	0.000	0	5.394	0.001	0	5.394	0.001	0	5.395	0.001	0
	Annual	5.391	5.397	0.006	0	5.397	0.006	0	5.396	0.005	0	5.397	0.006	0
QM03	Jan	5.089	5.090	0.001	0	5.083	-0.006	0	5.087	-0.002	0	5.087	-0.002	0
	Feb	4.642	4.653	0.011	0	4.668	0.026	1	4.645	0.003	0	4.645	0.004	0
	Mar	4.251	4.273	0.023	1	4.322	0.072	2	4.257	0.006	0	4.258	0.007	0
	Apr	3.945	3.968	0.023	1	3.967	0.022	1	3.946	0.001	0	3.947	0.002	0

1:25 Wet Climate Conditions

Station	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM01	Jan	9.605	9.608	0.003	0	9.612	0.007	0	9.610	0.005	0	9.611	0.006	0
	Feb	8.671	8.688	0.017	0	8.688	0.017	0	8.685	0.015	0	8.687	0.017	0
	Mar	7.853	7.881	0.028	0	7.878	0.025	0	7.874	0.021	0	7.877	0.024	0
	Apr	7.118	7.142	0.025	0	7.140	0.022	0	7.136	0.019	0	7.139	0.022	0
	May	9.252	9.276	0.024	0	9.274	0.021	0	9.270	0.018	0	9.273	0.020	0
	Jun	15.632	15.653	0.020	0	15.651	0.018	0	15.648	0.015	0	15.650	0.018	0
	Jul	21.484	21.506	0.022	0	21.504	0.020	0	21.502	0.017	0	21.504	0.019	0
	Aug	23.448	23.474	0.026	0	23.472	0.025	0	23.469	0.022	0	23.471	0.024	0
	Sep	17.935	17.958	0.023	0	17.957	0.022	0	17.954	0.019	0	17.956	0.021	0
	Oct	10.731	10.738	0.007	0	10.736	0.005	0	10.735	0.004	0	10.736	0.005	0
	Nov	9.690	9.687	-0.003	0	9.685	-0.006	0	9.684	-0.006	0	9.686	-0.005	0
	Dec	10.353	10.350	-0.002	0	10.348	-0.005	0	10.348	-0.005	0	10.349	-0.004	0
	Annual	12.648	12.663	0.016	0	12.662	0.014	0	12.660	0.012	0	12.662	0.014	0
QM02	Jan	9.605	9.608	0.003	0	9.614	0.009	0	9.613	0.008	0	9.614	0.008	0
	Feb	8.671	8.688	0.017	0	8.690	0.020	0	8.688	0.017	0	8.690	0.019	0
	Mar	7.853	7.881	0.028	0	7.880	0.027	0	7.877	0.024	0	7.879	0.027	0
	Apr	7.135	7.159	0.024	0	7.157	0.022	0	7.153	0.019	0	7.156	0.021	0
	May	9.641	9.653	0.011	0	9.650	0.009	0	9.647	0.006	0	9.650	0.008	0
	Jun	15.800	15.816	0.015	0	15.813	0.013	0	15.811	0.010	0	15.813	0.012	0
	Jul	21.710	21.725	0.015	0	21.723	0.013	0	21.720	0.010	0	21.722	0.012	0
	Aug	23.645	23.664	0.020	0	23.663	0.019	0	23.660	0.016	0	23.662	0.017	0
	Sep	18.104	18.121	0.018	0	18.120	0.017	0	18.118	0.014	0	18.119	0.015	0
	Oct	10.836	10.840	0.004	0	10.838	0.002	0	10.837	0.000	0	10.838	0.002	0
	Nov	9.704	9.701	-0.004	0	9.699	-0.005	0	9.699	-0.005	0	9.701	-0.004	0
	Dec	10.353	10.350	-0.002	0	10.350	-0.002	0	10.350	-0.003	0	10.351	-0.001	0
	Annual	12.755	12.767	0.012	0	12.767	0.012	0	12.764	0.010	0	12.766	0.011	0
QM03	Jan	9.611	9.616	0.005	0	9.621	0.010	0	9.613	0.002	0	9.613	0.002	0
	Feb	8.676	8.699	0.022	0	8.737	0.061	1	8.687	0.011	0	8.689	0.013	0
	Mar	7.858	7.900	0.042	1	7.966	0.108	1	7.876	0.018	0	7.879	0.021	0
	Apr	7.157	7.197	0.040	1	7.200	0.043	1	7.169	0.012	0	7.171	0.014	0

Table 9B-3 MacLellan Hydrology Water Balance Model – Streamflow Results

Average Climate Conditions

	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommission, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM03	May	7.455	7.489	0.034	0	7.492	0.037	0	7.440	-0.015	0	7.441	-0.014	0
QM03	Jun	11.956	11.989	0.033	0	12.049	0.093	1	11.952	-0.005	0	11.953	-0.003	0
QM03	Jul	13.198	13.233	0.035	0	13.296	0.099	1	13.190	-0.007	0	13.192	-0.006	0
QM03	Aug	9.852	9.889	0.036	0	9.944	0.091	1	9.850	-0.002	0	9.851	-0.001	0
QM03	Sep	7.161	7.191	0.030	0	7.228	0.067	1	7.159	-0.002	0	7.160	-0.001	0
QM03	Oct	6.173	6.184	0.011	0	6.193	0.020	0	6.165	-0.008	0	6.166	-0.007	0
QM03	Nov	6.929	6.931	0.002	0	6.931	0.001	0	6.921	-0.009	0	6.922	-0.008	0
QM03	Dec	7.532	7.532	0.001	0	7.528	-0.004	0	7.525	-0.007	0	7.526	-0.006	0
QM03	**Annual**	7.908	7.930	0.022	0	7.957	0.049	1	7.905	-0.003	0	7.907	-0.001	0
QM04	Jan	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.019	0.019	n/a
QM04	Feb	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.023	0.023	n/a
QM04	Mar	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.026	0.026	n/a
QM04	Apr	0.010	0.003	-0.006	n/a	0.004	-0.006	n/a	0.004	-0.006	n/a	0.031	0.021	n/a
QM04	May	0.127	0.045	-0.082	-64	0.045	-0.082	-64	0.045	-0.082	-64	0.170	0.044	35%
QM04	Jun	0.053	0.019	-0.034	-64	0.019	-0.034	-64	0.019	-0.034	-64	0.081	0.028	52
QM04	Jul	0.075	0.027	-0.048	-64	0.027	-0.048	-64	0.027	-0.048	-64	0.108	0.032	43%
QM04	Aug	0.065	0.023	-0.042	-64	0.023	-0.042	-64	0.023	-0.042	-64	0.087	0.022	33
QM04	Sep	0.057	0.020	-0.036	-64	0.020	-0.036	-64	0.020	-0.036	-64	0.092	0.036	63
QM04	Oct	0.036	0.013	-0.023	-64	0.013	-0.023	-64	0.013	-0.023	-64	0.068	0.032	90
QM04	Nov	0.003	0.001	-0.002	n/a	0.002	-0.001	n/a	0.002	-0.001	n/a	0.028	0.025	n/a
QM04	Dec	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.015	0.015	n/a
QM04	**Annual**	0.035	0.013	-0.023	-64	0.013	-0.022	-63	0.013	-0.022	-63	0.062	0.027	76
QM05	Jan	2.391	2.390	-0.001	0	2.397	0.006	0	2.397	0.006	0	2.397	0.006	0
QM05	Feb	2.009	2.015	0.006	0	2.021	0.011	1	2.019	0.010	1	2.020	0.011	1
QM05	Mar	1.654	1.664	0.010	1	1.669	0.015	1	1.667	0.013	1	1.669	0.014	1
QM05	Apr	1.367	1.375	0.008	1	1.380	0.013	1	1.378	0.012	1	1.379	0.013	1
QM05	May	3.502	3.509	0.007	0	3.514	0.012	0	3.513	0.011	0	3.514	0.012	0
QM05	Jun	7.780	7.785	0.005	0	7.791	0.011	0	7.790	0.010	0	7.790	0.011	0
QM05	Jul	5.846	5.850	0.004	0	5.856	0.010	0	5.855	0.009	0	5.856	0.010	0
QM05	Aug	3.747	3.751	0.004	0	3.757	0.010	0	3.756	0.009	0	3.756	0.009	0

1:25 Dry Climate Conditions

	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommission, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM03	May	4.973	5.000	0.027	1	5.001	0.029	1	4.960	-0.013	0	4.961	-0.011	0
QM03	Jun	7.404	7.430	0.026	0	7.485	0.081	1	7.398	-0.005	0	7.399	-0.004	0
QM03	Jul	8.384	8.411	0.027	0	8.467	0.083	1	8.376	-0.007	0	8.377	-0.006	0
QM03	Aug	6.672	6.700	0.028	0	6.749	0.077	1	6.668	-0.004	0	6.669	-0.003	0
QM03	Sep	5.176	5.199	0.024	0	5.229	0.053	1	5.172	-0.003	0	5.173	-0.002	0
QM03	Oct	4.510	4.518	0.009	0	4.523	0.013	0	4.502	-0.007	0	4.503	-0.006	0
QM03	Nov	4.982	4.984	0.002	0	4.981	-0.001	0	4.975	-0.007	0	4.976	-0.006	0
QM03	Dec	5.399	5.400	0.001	0	5.390	-0.008	0	5.393	-0.005	0	5.394	-0.005	0
QM03	**Annual**	5.452	5.469	0.017	0	5.489	0.037	1	5.448	-0.004	0	5.449	-0.003	0
QM04	Jan	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.015	0.015	n/a
QM04	Feb	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.016	0.016	n/a
QM04	Mar	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.018	0.018	n/a
QM04	Apr	0.011	0.004	-0.007	-64	0.004	-0.007	-64	0.004	-0.007	-63	0.023	0.012	105
QM04	May	0.085	0.030	-0.055	-64	0.030	-0.055	-64	0.030	-0.055	-64	0.111	0.026	30
QM04	Jun	0.038	0.014	-0.025	-64	0.014	-0.025	-64	0.014	-0.025	-64	0.045	0.007	19
QM04	Jul	0.054	0.019	-0.035	-64	0.019	-0.035	-64	0.019	-0.035	-64	0.061	0.006	12
QM04	Aug	0.047	0.017	-0.031	-64	0.017	-0.031	-64	0.017	-0.031	-64	0.049	0.002	4
QM04	Sep	0.041	0.014	-0.026	-64	0.014	-0.026	-64	0.014	-0.026	-64	0.057	0.016	39
QM04	Oct	0.026	0.009	-0.016	-64	0.009	-0.016	-64	0.009	-0.016	-64	0.045	0.020	78
QM04	Nov	0.002	0.001	-0.001	n/a	0.002	-0.001	n/a	0.002	0.000	n/a	0.020	0.018	n/a
QM04	Dec	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.013	0.013	n/a
QM04	**Annual**	0.025	0.009	-0.016	-64	0.009	-0.016	-63	0.010	-0.016	-62	0.039	0.014	55
QM05	Jan	1.674	1.673	-0.001	0	1.680	0.006	0	1.680	0.006	0	1.680	0.006	0
QM05	Feb	1.415	1.418	0.004	0	1.424	0.010	1	1.424	0.009	1	1.424	0.009	1
QM05	Mar	1.171	1.178	0.007	1	1.183	0.012	1	1.182	0.011	1	1.183	0.012	1
QM05	Apr	0.973	0.979	0.005	1	0.984	0.011	1	0.983	0.010	1	0.984	0.011	1
QM05	May	2.458	2.463	0.005	0	2.468	0.011	0	2.467	0.010	0	2.468	0.010	0
QM05	Jun	4.377	4.381	0.004	0	4.387	0.010	0	4.386	0.009	0	4.386	0.009	0
QM05	Jul	3.157	3.161	0.003	0	3.167	0.009	0	3.166	0.008	0	3.166	0.009	0
QM05	Aug	2.366	2.369	0.003	0	2.375	0.009	0	2.374	0.008	0	2.374	0.008	0

1:25 Wet Climate Conditions

	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommission, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM03	May	10.034	10.076	0.043	0	10.161	0.127	1	10.015	-0.019	0	10.018	-0.016	0
QM03	Jun	15.973	16.015	0.042	0	16.095	0.122	1	15.969	-0.004	0	15.971	-0.002	0
QM03	Jul	21.940	21.988	0.048	0	22.081	0.140	1	21.934	-0.007	0	21.936	-0.005	0
QM03	Aug	23.846	23.895	0.048	0	23.969	0.123	1	23.846	0.000	0	23.848	0.002	0
QM03	Sep	18.277	18.317	0.040	0	18.381	0.104	1	18.277	0.000	0	18.278	0.001	0
QM03	Oct	10.947	10.960	0.013	0	10.987	0.041	0	10.936	-0.011	0	10.937	-0.009	0
QM03	Nov	9.724	9.725	0.001	0	9.727	0.003	0	9.712	-0.012	0	9.713	-0.011	0
QM03	Dec	10.358	10.358	0.000	0	10.354	-0.004	0	10.349	-0.009	0	10.351	-0.007	0
QM03	**Annual**	12.867	12.896	0.029	0	12.940	0.073	1	12.865	-0.002	0	12.867	0.000	0
QM04	Jan	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.026	0.026	n/a
QM04	Feb	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.031	0.031	n/a
QM04	Mar	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.035	0.035	n/a
QM04	Apr	0.008	0.003	-0.005	n/a	0.003	-0.005	n/a	0.003	-0.005	n/a	0.041	0.033	n/a
QM04	May	0.177	0.063	-0.114	-64	0.063	-0.114	-64	0.063	-0.114	-64	0.248	0.071	40
QM04	Jun	0.077	0.027	-0.049	-64	0.027	-0.049	-64	0.027	-0.049	-64	0.130	0.053	70
QM04	Jul	0.103	0.037	-0.066	-64	0.037	-0.066	-64	0.037	-0.066	-64	0.170	0.067	66
QM04	Aug	0.090	0.032	-0.058	-64	0.032	-0.058	-64	0.032	-0.058	-64	0.139	0.049	54
QM04	Sep	0.077	0.027	-0.050	-64	0.027	-0.050	-64	0.027	-0.050	-64	0.140	0.063	82
QM04	Oct	0.048	0.017	-0.031	-64	0.017	-0.031	-64	0.017	-0.031	-64	0.096	0.048	101
QM04	Nov	0.006	0.002	-0.004	n/a	0.003	-0.003	n/a	0.003	-0.003	n/a	0.039	0.033	n/a
QM04	Dec	0.000	0.000	0.000	n/a	0.001	0.001	n/a	0.002	0.002	n/a	0.019	0.019	n/a
QM04	**Annual**	0.049	0.017	-0.031	-64	0.018	-0.031	-64	0.018	-0.031	-63	0.093	0.044	90
QM05	Jan	3.312	3.311	-0.001	0	3.318	0.006	0	3.318	0.006	0	3.318	0.006	0
QM05	Feb	2.766	2.774	0.008	0	2.779	0.013	0	2.778	0.012	0	2.779	0.013	0
QM05	Mar	2.264	2.278	0.014	1	2.282	0.018	1	2.280	0.016	1	2.281	0.017	1
QM05	Apr	1.860	1.871	0.011	1	1.875	0.016	1	1.873	0.014	1	1.875	0.015	1
QM05	May	4.855	4.865	0.010	0	4.870	0.014	0	4.868	0.013	0	4.869	0.014	0
QM05	Jun	12.298	12.306	0.008	0	12.311	0.013	0	12.310	0.011	0	12.311	0.012	0
QM05	Jul	12.458	12.464	0.006	0	12.470	0.012	0	12.469	0.011	0	12.470	0.011	0
QM05	Aug	6.818	6.823	0.005	0	6.829	0.011	0	6.828	0.010	0	6.828	0.010	0

Table 9B-3 MacLellan Hydrology Water Balance Model – Streamflow Results

		Average Climate Conditions													1:25 Dry Climate Conditions													1:25 Wet Climate Conditions												
	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)			Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)			Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM05	Sep	2.980	2.983	0.003	0	2.989	0.009	0	2.988	0.008	0	2.989	0.009	0	1.956	1.958	0.002	0	1.964	0.008	0	1.964	0.008	0	1.964	0.008	0	4.698	4.702	0.004	0	4.708	0.010	0	4.707	0.009	0	4.707	0.010	0
	Oct	2.708	2.711	0.003	0	2.717	0.009	0	2.716	0.008	0	2.717	0.008	0	1.837	1.839	0.002	0	1.845	0.008	0	1.845	0.008	0	1.845	0.008	0	3.972	3.976	0.004	0	3.982	0.010	0	3.981	0.009	0	3.981	0.009	0
	Nov	2.668	2.670	0.002	0	2.677	0.008	0	2.676	0.008	0	2.676	0.008	0	1.842	1.843	0.002	0	1.850	0.008	0	1.849	0.007	0	1.849	0.008	0	3.776	3.779	0.003	0	3.785	0.009	0	3.784	0.008	0	3.784	0.009	0
	Dec	2.633	2.635	0.002	0	2.641	0.008	0	2.641	0.008	0	2.641	0.008	0	1.833	1.834	0.001	0	1.840	0.008	0	1.840	0.007	0	1.840	0.007	0	3.677	3.679	0.003	0	3.685	0.009	0	3.685	0.008	0	3.685	0.008	0
	Annual	3.274	3.278	0.004	0	3.284	0.010	0	3.283	0.009	0	3.284	0.010	0	2.088	2.091	0.003	0	2.097	0.009	0	2.097	0.008	0	2.097	0.009	0	5.230	5.236	0.006	0	5.241	0.012	0	5.240	0.011	0	5.241	0.011	0
QM06	Jan	7.050	7.052	0.003	0	7.056	0.006	0	7.051	0.001	0	7.069	0.019	0	5.089	5.090	0.001	0	5.084	-0.005	0	5.088	0.000	0	5.102	0.013	0	9.611	9.616	0.005	0	9.622	0.011	0	9.614	0.003	0	9.639	0.029	0
	Feb	6.402	6.418	0.016	0	6.454	0.052	1	6.410	0.008	0	6.433	0.031	0	4.642	4.653	0.011	0	4.669	0.027	1	4.646	0.004	0	4.662	0.020	0	8.676	8.699	0.022	0	8.739	0.062	1	8.689	0.013	0	8.721	0.044	1
	Mar	5.830	5.861	0.031	1	5.927	0.097	2	5.843	0.013	0	5.869	0.039	1	4.251	4.273	0.023	1	4.324	0.073	2	4.258	0.008	0	4.276	0.025	1	7.858	7.900	0.042	1	7.967	0.109	1	7.878	0.020	0	7.914	0.056	1
	Apr	5.374	5.398	0.024	0	5.397	0.023	0	5.373	-0.001	0	5.402	0.028	1	3.966	3.982	0.016	0	3.981	0.015	0	3.959	-0.006	0	3.980	0.014	0	7.171	7.206	0.035	0	7.209	0.038	1	7.178	0.007	0	7.219	0.048	1
	May	7.684	7.636	-0.048	-1	7.639	-0.045	-1	7.587	-0.097	-1	7.714	0.030	0	5.126	5.098	-0.027	-1	5.100	-0.026	-1	5.059	-0.067	-1	5.140	0.014	0	10.354	10.282	-0.072	-1	10.367	0.013	0	10.221	-0.133	-1	10.409	0.054	1
	Jun	12.052	12.051	-0.002	0	12.111	0.059	0	12.014	-0.039	0	12.077	0.025	0	7.473	7.474	0.001	0	7.529	0.056	1	7.443	-0.030	0	7.476	0.003	0	16.111	16.104	-0.007	0	16.184	0.073	0	16.058	-0.053	0	16.163	0.052	0
	Jul	13.334	13.320	-0.013	0	13.384	0.050	0	13.278	-0.056	0	13.360	0.027	0	8.482	8.474	-0.008	0	8.530	0.048	1	8.440	-0.043	-1	8.482	0.000	0	22.126	22.108	-0.019	0	22.200	0.074	0	22.053	-0.073	0	22.189	0.063	0
	Aug	9.970	9.965	-0.006	0	10.019	0.049	0	9.926	-0.044	0	9.991	0.021	0	6.758	6.755	-0.002	0	6.804	0.047	1	6.723	-0.034	-1	6.757	-0.001	0	24.008	23.999	-0.009	0	24.074	0.065	0	23.951	-0.058	0	24.059	0.051	0
QM06	Sep	7.263	7.257	-0.006	0	7.294	0.031	0	7.225	-0.038	-1	7.298	0.035	0	5.249	5.246	-0.003	0	5.276	0.027	1	5.220	-0.029	-1	5.263	0.014	0	18.416	18.407	-0.009	0	18.471	0.055	0	18.366	-0.050	0	18.481	0.065	0
	Oct	6.237	6.226	-0.012	0	6.235	-0.003	0	6.206	-0.031	0	6.262	0.025	0	4.556	4.548	-0.008	0	4.553	-0.003	0	4.532	-0.024	-1	4.569	0.013	0	11.033	11.015	-0.018	0	11.043	0.010	0	10.992	-0.042	0	11.072	0.039	0
	Nov	6.935	6.935	0.000	0	6.935	0.000	0	6.926	-0.010	0	6.952	0.017	0	4.987	4.987	0.000	0	4.984	-0.002	0	4.979	-0.007	0	4.998	0.011	0	9.735	9.733	-0.003	0	9.735	-0.001	0	9.720	-0.015	0	9.758	0.022	0
	Dec	7.532	7.532	0.001	0	7.529	-0.002	0	7.527	-0.005	0	7.541	0.010	0	5.399	5.400	0.001	0	5.391	-0.007	0	5.395	-0.004	0	5.407	0.008	0	10.358	10.358	0.000	0	10.356	-0.003	0	10.351	-0.007	0	10.370	0.012	0
	Annual	7.972	7.971	-0.001	0	7.998	0.026	0	7.947	-0.025	0	7.997	0.025	0	5.498	5.498	0.000	0	5.519	0.021	0	5.479	-0.019	0	5.509	0.011	0	12.955	12.952	-0.003	0	12.997	0.042	0	12.923	-0.032	0	12.999	0.044	0
QM07	Jan	0.024	0.023	-0.001	-3	0.022	-0.002	-8	0.022	-0.003	-11	0.021	-0.003	-12	0.018	0.017	-0.001	-4	0.016	-0.002	-9	0.016	-0.002	-13	0.015	-0.002	-14	0.034	0.033	-0.002	-5	0.030	-0.004	-11	0.030	-0.005	-14	0.030	-0.005	-14
	Feb	0.018	0.018	0.000	0	0.017	-0.001	-4	0.017	-0.002	-8	0.017	-0.002	-9	0.014	0.014	0.000	1	0.013	0.000	-3	0.013	-0.001	-9	0.012	-0.001	-9	0.024	0.024	0.000	-1	0.023	-0.001	-5	0.022	-0.002	-9	0.022	-0.002	-9
	Mar	0.014	0.015	0.000	3	0.015	0.000	1	0.014	-0.001	-5	0.014	-0.001	-6	0.011	0.012	0.000	4	0.012	0.000	1	0.011	-0.001	-6	0.011	-0.001	-6	0.019	0.019	0.000	2	0.019	0.000	-1	0.018	-0.001	-6	0.018	-0.001	-6
	Apr	0.013	0.014	0.001	5	0.013	0.000	3	0.012	0.000	-4	0.012	0.000	-4	0.010	0.011	0.001	6	0.011	0.000	4	0.010	0.000	-4	0.010	0.000	-4	0.017	0.017	0.001	4	0.017	0.000	2	0.016	-0.001	-4	0.016	-0.001	-4
	May	0.057	0.045	-0.012	-21	0.045	-0.012	-21	0.044	-0.013	-24	0.044	-0.013	-24	0.042	0.034	-0.008	-20	0.033	-0.008	-20	0.032	-0.010	-23	0.032	-0.010	-23	0.073	0.059	-0.014	-19	0.059	-0.014	-19	0.058	-0.015	-21	0.058	-0.015	-21
	Jun	0.068	0.052	-0.016	-23	0.052	-0.016	-23	0.051	-0.017	-25	0.051	-0.017	-25	0.048	0.037	-0.011	-23	0.037	-0.011	-23	0.036	-0.012	-26	0.036	-0.012	-26	0.092	0.072	-0.020	-22	0.071	-0.020	-22	0.070	-0.021	-23	0.070	-0.021	-23
	Jul	0.036	0.028	-0.008	-23	0.027	-0.008	-23	0.027	-0.009	-25	0.027	-0.009	-25	0.022	0.017	-0.005	-24	0.017	-0.005	-25	0.016	-0.006	-28	0.016	-0.006	-28	0.066	0.050	-0.015	-23	0.050	-0.015	-23	0.049	-0.016	-25	0.049	-0.016	-25
	Aug	0.038	0.027	-0.011	-28	0.027	-0.011	-28	0.026	-0.012	-31	0.026	-0.012	-31	0.016	0.011	-0.005	-33	0.011	-0.005	-33	0.010	-0.006	-38	0.010	-0.006	-38	0.096	0.074	-0.022	-23	0.074	-0.022	-23	0.073	-0.023	-24	0.073	-0.023	-24
	Sep	0.063	0.046	-0.017	-27	0.046	-0.017	-27	0.045	-0.018	-29	0.045	-0.018	-29	0.031	0.020	-0.010	-33	0.020	-0.010	-34	0.019	-0.011	-37	0.019	-0.011	-37	0.123	0.094	-0.029	-23	0.094	-0.029	-23	0.093	-0.030	-24	0.093	-0.030	-24
	Oct	0.072	0.055	-0.017	-24	0.055	-0.017	-24	0.054	-0.018	-25	0.054	-0.018	-25	0.041	0.030	-0.012	-28	0.030	-0.012	-28	0.029	-0.013	-31	0.029	-0.013	-31	0.122	0.096	-0.026	-22	0.096	-0.026	-22	0.095	-0.027	-22	0.095	-0.027	-22
	Nov	0.054	0.045	-0.010	-18	0.045	-0.010	-18	0.044	-0.011	-20	0.044	-0.011	-20	0.034	0.027	-0.007	-20	0.027	-0.007	-20	0.026	-0.008	-23	0.026	-0.008	-23	0.090	0.073	-0.017	-19	0.073	-0.017	-19	0.071	-0.018	-21	0.071	-0.018	-21
	Dec	0.036	0.031	-0.005	-14	0.031	-0.005	-14	0.030	-0.006	-17	0.030	-0.006	-17	0.025	0.021	-0.003	-13	0.021	-0.003	-13	0.020	-0.004	-17	0.020	-0.004	-17	0.055	0.046	-0.009	-17	0.046	-0.009	-17	0.045	-0.010	-19	0.045	-0.010	-19

Table 9B-3 MacLellan Hydrology Water Balance Model – Streamflow Results

		Average Climate Conditions													1:25 Dry Climate Conditions														1:25 Wet Climate Conditions													
	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)			Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)			Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM 07	Annual	0.041	0.033	-0.008	-19	0.033	-0.008	-20	0.032	-0.009	-22	0.032	-0.009	-22	0.026	0.021	-0.005	-20	0.021	-0.005	-20	0.020	-0.006	-24	0.020	-0.006	-24	0.068	0.055	-0.013	-19	0.054	-0.013	-20	0.053	-0.014	-21	0.053	-0.014	-21
QM08	Jan	10.425	10.425	0.001	0	10.434	0.010	0	10.429	0.004	0	10.446	0.021	0	7.150	7.150	0.000	0	7.150	0.000	0	7.153	0.003	0	7.166	0.016	0	14.003	14.004	0.001	0	14.015	0.012	0	14.007	0.004	0	14.031	0.028	0
	Feb	9.273	9.300	0.026	0	9.331	0.058	1	9.293	0.020	0	9.317	0.044	0	6.414	6.432	0.018	0	6.444	0.030	0	6.428	0.014	0	6.444	0.030	0	12.387	12.424	0.037	0	12.458	0.072	1	12.414	0.027	0	12.447	0.060	0
	Mar	8.261	8.304	0.044	1	8.373	0.113	1	8.288	0.027	0	8.315	0.054	1	5.760	5.790	0.030	1	5.844	0.084	1	5.779	0.019	0	5.797	0.037	1	10.982	11.041	0.059	1	11.111	0.128	1	11.019	0.036	0	11.056	0.074	1
	Apr	7.458	7.494	0.036	0	7.506	0.048	1	7.472	0.014	0	7.502	0.043	1	5.264	5.288	0.024	0	5.300	0.036	1	5.270	0.006	0	5.291	0.027	1	9.847	9.896	0.050	1	9.909	0.062	1	9.870	0.023	0	9.911	0.064	1
	May	13.007	12.964	-0.044	0	12.971	-0.037	0	12.915	-0.093	-1	13.043	0.036	0	8.309	8.284	-0.026	0	8.290	-0.019	0	8.246	-0.064	-1	8.328	0.019	0	17.661	17.603	-0.058	0	17.689	0.028	0	17.540	-0.120	-1	17.729	0.069	0
	Jun	26.509	26.499	-0.009	0	26.561	0.052	0	26.464	-0.044	0	26.529	0.020	0	15.298	15.293	-0.005	0	15.349	0.051	0	15.265	-0.033	0	15.299	0.001	0	37.702	37.677	-0.025	0	37.760	0.058	0	37.633	-0.069	0	37.739	0.037	0
	Jul	25.101	25.086	-0.015	0	25.154	0.053	0	25.048	-0.053	0	25.128	0.027	0	12.908	12.899	-0.010	0	12.960	0.052	0	12.869	-0.039	0	12.911	0.002	0	44.801	44.775	-0.025	0	44.872	0.072	0	44.725	-0.076	0	44.859	0.059	0
	Aug	18.374	18.362	-0.012	0	18.423	0.049	0	18.328	-0.046	0	18.394	0.020	0	9.800	9.795	-0.005	0	9.850	0.050	1	9.769	-0.031	0	9.802	0.002	0	36.663	36.636	-0.026	0	36.718	0.055	0	36.593	-0.070	0	36.702	0.039	0
	Sep	13.633	13.616	-0.017	0	13.660	0.027	0	13.586	-0.047	0	13.658	0.025	0	7.679	7.670	-0.008	0	7.709	0.030	0	7.647	-0.032	0	7.688	0.009	0	27.239	27.209	-0.030	0	27.278	0.038	0	27.171	-0.069	0	27.284	0.045	0
	Oct	10.789	10.764	-0.025	0	10.780	-0.008	0	10.748	-0.041	0	10.805	0.017	0	6.965	6.948	-0.017	0	6.961	-0.004	0	6.936	-0.029	0	6.974	0.009	0	17.564	17.525	-0.039	0	17.559	-0.005	0	17.505	-0.059	0	17.587	0.022	0
	Nov	10.733	10.722	-0.010	0	10.729	-0.004	0	10.716	-0.017	0	10.746	0.013	0	7.136	7.128	-0.008	0	7.133	-0.003	0	7.124	-0.012	0	7.145	0.009	0	14.801	14.781	-0.020	0	14.791	-0.010	0	14.772	-0.029	0	14.812	0.012	0
	Dec	11.166	11.164	-0.002	0	11.167	0.001	0	11.162	-0.004	0	11.179	0.013	0	7.542	7.541	-0.001	0	7.540	-0.002	0	7.541	-0.001	0	7.555	0.013	0	15.124	15.118	-0.007	0	15.122	-0.003	0	15.114	-0.010	0	15.136	0.012	0
	Annual	13.727	13.725	-0.002	0	13.757	0.030	0	13.704	-0.023	0	13.755	0.028	0	8.352	8.352	-0.001	0	8.378	0.025	0	8.336	-0.017	0	8.367	0.014	0	21.564	21.557	-0.007	0	21.607	0.042	0	21.530	-0.034	0	21.608	0.043	0
QM09	Jan	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Feb	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Mar	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Apr	0.013	0.013	0.000	0	0.013	0.000	0	0.013	0.000	0	0.013	0.000	0	0.015	0.015	0.000	0	0.015	0.000	0	0.015	0.000	0	0.015	0.000	0	0.010	0.010	0.000	0	0.010	0.000	0	0.010	0.000	0	0.010	0.000	0
	May	0.168	0.168	0.000	0	0.168	0.000	0	0.168	0.000	0	0.168	0.000	0	0.112	0.112	0.000	0	0.112	0.000	0	0.112	0.000	0	0.112	0.000	0	0.235	0.235	0.000	0	0.235	0.000	0	0.235	0.000	0	0.235	0.000	0
	Jun	0.070	0.070	0.000	0	0.070	0.000	0	0.070	0.000	0	0.070	0.000	0	0.051	0.051	0.000	0	0.051	0.000	0	0.051	0.000	0	0.051	0.000	0	0.101	0.101	0.000	0	0.101	0.000	0	0.101	0.000	0	0.101	0.000	0
	Jul	0.100	0.100	0.000	0	0.100	0.000	0	0.100	0.000	0	0.100	0.000	0	0.072	0.072	0.000	0	0.072	0.000	0	0.072	0.000	0	0.072	0.000	0	0.136	0.136	0.000	0	0.136	0.000	0	0.136	0.000	0	0.136	0.000	0
	Aug	0.086	0.086	0.000	0	0.086	0.000	0	0.086	0.000	0	0.086	0.000	0	0.063	0.063	0.000	0	0.063	0.000	0	0.063	0.000	0	0.063	0.000	0	0.119	0.119	0.000	0	0.119	0.000	0	0.119	0.000	0	0.119	0.000	0
	Sep	0.075	0.075	0.000	0	0.075	0.000	0	0.075	0.000	0	0.075	0.000	0	0.054	0.054	0.000	0	0.054	0.000	0	0.054	0.000	0	0.054	0.000	0	0.102	0.102	0.000	0	0.102	0.000	0	0.102	0.000	0	0.102	0.000	0
	Oct	0.047	0.047	0.000	0	0.047	0.000	0	0.047	0.000	0	0.047	0.000	0	0.034	0.034	0.000	0	0.034	0.000	0	0.034	0.000	0	0.034	0.000	0	0.063	0.063	0.000	0	0.063	0.000	0	0.063	0.000	0	0.063	0.000	0
QM09	Nov	0.004	0.004	0.000	n/a	0.004	0.000	n/a	0.004	0.000	n/a	0.004	0.000	n/a	0.003	0.003	0.000	n/a	0.003	0.000	n/a	0.003	0.000	n/a	0.003	0.000	n/a	0.008	0.008	0.000	n/a	0.008	0.000	n/a	0.008	0.000	n/a	0.008	0.000	n/a
	Dec	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a	0.000	0.000	n/a
	Annual	0.047	0.047	0.000	0	0.047	0.000	0	0.047	0.000	0	0.047	0.000	0	0.034	0.034	0.000	0	0.034	0.000	0	0.034	0.000	0	0.034	0.000	0	0.065	0.065	0.000	0	0.065	0.000	0	0.065	0.000	0	0.065	0.000	0
QM11	Jan	0.694	0.692	-0.001	0	0.692	-0.002	0	0.691	-0.003	0	0.691	-0.003	0	0.172	0.172	-0.001	0	0.171	-0.002	-1	0.170	-0.002	-1	0.170	-0.002	-1	0.704	0.702	-0.002	0	0.700	-0.004	-1	0.699	-0.005	-1	0.699	-0.005	-1
	Feb	0.586	0.587	0.001	0	0.586	0.000	0	0.585	-0.001	0	0.585	-0.001	0	0.149	0.149	0.000	0	0.148	0.000	0	0.147	-0.001	-1	0.147	-0.001	-1	0.592	0.593	0.001	0	0.592	0.000	0	0.591	-0.001	0	0.591	-0.001	0
	Mar	0.498	0.501	0.003	1	0.500	0.002	0	0.499	0.001	0	0.499	0.001	0	0.129	0.130	0.001	1	0.130	0.001	0	0.129	0.000	0	0.129	0.000	0	0.502	0.505	0.003	1	0.504	0.002	0	0.503	0.000	0	0.503	0.001	0

Table 9B-3 MacLellan Hydrology Water Balance Model – Streamflow Results

Average Climate Conditions

	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM11	Apr	0.424	0.427	0.003	1	0.426	0.002	0	0.425	0.001	0	0.425	0.001	0
	May	1.086	1.077	-0.009	-1	1.076	-0.010	-1	1.075	-0.012	-1	1.075	-0.011	-1
	Jun	2.640	2.626	-0.014	-1	2.626	-0.014	-1	2.625	-0.016	-1	2.625	-0.016	-1
	Jul	1.686	1.679	-0.007	0	1.679	-0.007	0	1.678	-0.008	0	1.678	-0.008	0
	Aug	1.300	1.290	-0.010	-1	1.290	-0.010	-1	1.289	-0.011	-1	1.289	-0.011	-1
	Sep	1.413	1.397	-0.016	-1	1.397	-0.016	-1	1.395	-0.018	-1	1.396	-0.017	-1
	Oct	1.236	1.220	-0.016	-1	1.220	-0.016	-1	1.218	-0.018	-1	1.218	-0.017	-1
	Nov	1.001	0.992	-0.009	-1	0.991	-0.009	-1	0.990	-0.010	-1	0.990	-0.010	-1
	Dec	0.831	0.827	-0.004	-1	0.827	-0.005	-1	0.826	-0.006	-1	0.826	-0.006	-1
	Annual	1.116	1.110	-0.007	-1	1.109	-0.007	-1	1.108	-0.008	-1	1.108	-0.008	-1

1:25 Dry Climate Conditions

	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM11	Apr	0.114	0.115	0.001	1	0.114	0.001	1	0.113	0.000	0	0.113	0.000	0
	May	0.579	0.571	-0.007	-1	0.571	-0.008	-1	0.570	-0.009	-2	0.570	-0.009	-2
	Jun	1.496	1.485	-0.011	-1	1.485	-0.011	-1	1.484	-0.012	-1	1.484	-0.012	-1
	Jul	0.504	0.499	-0.005	-1	0.499	-0.005	-1	0.498	-0.006	-1	0.498	-0.006	-1
	Aug	0.420	0.415	-0.005	-1	0.415	-0.005	-1	0.414	-0.006	-1	0.414	-0.006	-1
	Sep	0.382	0.372	-0.010	-3	0.372	-0.010	-3	0.371	-0.011	-3	0.371	-0.011	-3
	Oct	0.305	0.293	-0.011	-4	0.293	-0.011	-4	0.292	-0.013	-4	0.292	-0.013	-4
	Nov	0.240	0.234	-0.007	-3	0.234	-0.007	-3	0.233	-0.008	-3	0.233	-0.008	-3
	Dec	0.203	0.200	-0.003	-2	0.200	-0.003	-2	0.199	-0.004	-2	0.199	-0.004	-2
	Annual	0.391	0.386	-0.005	-1	0.386	-0.005	-1	0.385	-0.006	-2	0.385	-0.006	-2

1:25 Wet Climate Conditions

	Month	Existing Conditions	Construction (year -2 to -1)			Operation (year 1 to 13)			Decommis-sion, Closure (year 14 to 19)			Post-Closure (year 20+)		
		Flow (m^3/s)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)	Flow (m^3/s)	Change (m^3/s)	Change (%)
QM11	Apr	0.428	0.431	0.003	1	0.430	0.002	0	0.429	0.001	0	0.429	0.001	0
	May	1.431	1.420	-0.011	-1	1.419	-0.012	-1	1.418	-0.013	-1	1.418	-0.013	-1
	Jun	3.872	3.853	-0.019	0	3.853	-0.019	0	3.851	-0.020	-1	3.851	-0.020	-1
	Jul	3.636	3.622	-0.014	0	3.622	-0.014	0	3.621	-0.016	0	3.621	-0.015	0
	Aug	1.776	1.755	-0.021	-1	1.755	-0.021	-1	1.754	-0.022	-1	1.754	-0.022	-1
	Sep	1.532	1.504	-0.028	-2	1.504	-0.028	-2	1.503	-0.029	-2	1.503	-0.029	-2
	Oct	1.325	1.300	-0.025	-2	1.299	-0.026	-2	1.298	-0.027	-2	1.299	-0.027	-2
	Nov	1.036	1.020	-0.017	-2	1.019	-0.017	-2	1.018	-0.018	-2	1.018	-0.018	-2
	Dec	0.851	0.842	-0.009	-1	0.842	-0.009	-1	0.841	-0.010	-1	0.841	-0.010	-1
	Annual	1.474	1.462	-0.012	-1	1.462	-0.012	-1	1.460	-0.013	-1	1.461	-0.013	-1

Notes:
Existing condition baseline data has minor variations for each Project phase due to artifacts of the modelling process, values for 2020 are reported as existing conditions. Calculations for the absolute and percent change in flow for each phase use baseline data calculated for that specific phase and may have minor disagreement with the reported baseline data.

Table 9B-4 MacLellan Hydrology Water Balance Model – Lake Level Results

		Average Climate Conditions									1:25 Dry Climate Conditions									1:25 Wet Climate Conditions								
	Month	Existing Conditions	Construction (year -2 to -1)		Operation (year 1 to 13)		Decommis-sion, Closure (year 14 to 19)		Post-Closure (year 20+)		Existing Condi-tions	Construction (year -2 to -1)		Operation (year 1 to 13)		Decommis-sion, Closure (year 14 to 19)		Post-Closure (year 20+)		Existing Condi-tions	Construction (year -2 to -1)		Operation (year 1 to 13)		Decommis-sion, Closure (year 14 to 19)		Post-Closure (year 20+)	
		Level (masl)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)	Level (masl)	Change (m)
Minton Lake	Jan	329.920	329.916	-0.004	329.911	-0.009	329.907	-0.013	329.907	-0.013	329.889	329.885	-0.003	329.881	-0.008	329.876	-0.013	329.875	-0.013	329.962	329.955	-0.007	329.947	-0.015	329.943	-0.019	329.943	-0.019
	Feb	329.890	329.890	0.000	329.887	-0.003	329.882	-0.008	329.882	-0.009	329.866	329.867	0.001	329.864	-0.002	329.858	-0.008	329.858	-0.008	329.920	329.919	-0.001	329.914	-0.006	329.910	-0.010	329.910	-0.010
	Mar	329.870	329.873	0.003	329.871	0.001	329.866	-0.005	329.865	-0.005	329.851	329.854	0.003	329.852	0.001	329.847	-0.005	329.847	-0.005	329.895	329.897	0.002	329.894	-0.001	329.889	-0.006	329.889	-0.006
	Apr	329.861	329.865	0.004	329.863	0.003	329.858	-0.003	329.858	-0.003	329.844	329.848	0.004	329.847	0.003	329.841	-0.003	329.841	-0.003	329.882	329.885	0.004	329.883	0.002	329.878	-0.004	329.878	-0.004
	May	330.028	329.994	-0.034	329.993	-0.035	329.988	-0.040	329.988	-0.040	329.981	329.954	-0.027	329.953	-0.028	329.947	-0.034	329.947	-0.034	330.071	330.036	-0.035	330.035	-0.036	330.031	-0.040	330.031	-0.040
	Jun	330.068	330.023	-0.045	330.022	-0.045	330.019	-0.049	330.019	-0.049	330.010	329.971	-0.038	329.971	-0.039	329.967	-0.043	329.967	-0.043	330.127	330.078	-0.050	330.077	-0.050	330.074	-0.053	330.074	-0.053
	Jul	329.966	329.934	-0.032	329.933	-0.032	329.929	-0.036	329.929	-0.036	329.909	329.881	-0.027	329.881	-0.028	329.877	-0.032	329.877	-0.032	330.063	330.018	-0.045	330.017	-0.045	330.014	-0.048	330.014	-0.048
	Aug	329.974	329.933	-0.042	329.932	-0.042	329.928	-0.046	329.928	-0.046	329.878	329.846	-0.032	329.845	-0.032	329.840	-0.037	329.840	-0.037	330.137	330.083	-0.054	330.083	-0.054	330.081	-0.056	330.081	-0.056
	Sep	330.055	330.003	-0.052	330.003	-0.052	329.999	-0.056	329.999	-0.056	329.947	329.901	-0.046	329.901	-0.046	329.896	-0.051	329.896	-0.051	330.196	330.134	-0.062	330.134	-0.062	330.132	-0.064	330.132	-0.064
	Oct	330.080	330.032	-0.048	330.032	-0.048	330.029	-0.051	330.029	-0.051	329.988	329.944	-0.044	329.944	-0.044	329.940	-0.048	329.940	-0.048	330.194	330.138	-0.056	330.138	-0.056	330.136	-0.059	330.136	-0.059
	Nov	330.029	329.998	-0.031	329.998	-0.031	329.995	-0.035	329.995	-0.035	329.962	329.934	-0.027	329.934	-0.027	329.930	-0.032	329.930	-0.032	330.123	330.080	-0.043	330.080	-0.043	330.077	-0.046	330.077	-0.046
	Dec	329.967	329.948	-0.019	329.948	-0.019	329.944	-0.023	329.944	-0.023	329.921	329.906	-0.015	329.906	-0.015	329.902	-0.020	329.902	-0.020	330.032	330.004	-0.029	330.004	-0.029	330.000	-0.032	330.000	-0.032
	Annual	329.976	329.951	-0.025	329.949	-0.026	329.945	-0.030	329.945	-0.030	329.920	329.899	-0.021	329.898	-0.022	329.893	-0.027	329.893	-0.027	330.050	330.019	-0.031	330.017	-0.033	330.014	-0.036	330.014	-0.037
Cockeram Lake	Jan	312.138	312.138	0.000	312.138	0.000	312.138	0.000	312.138	0.000	312.087	312.087	0.000	312.087	0.000	312.087	0.000	312.087	0.000	312.184	312.184	0.000	312.185	0.000	312.185	0.000	312.185	0.000
	Feb	312.121	312.122	0.000	312.122	0.001	312.122	0.000	312.122	0.001	312.074	312.074	0.000	312.075	0.001	312.074	0.000	312.075	0.001	312.165	312.165	0.000	312.165	0.001	312.165	0.000	312.165	0.001
	Mar	312.106	312.106	0.001	312.107	0.002	312.106	0.000	312.107	0.001	312.062	312.062	0.001	312.063	0.002	312.062	0.000	312.062	0.001	312.146	312.147	0.001	312.148	0.002	312.146	0.001	312.147	0.001
	Apr	312.093	312.093	0.001	312.093	0.001	312.093	0.000	312.093	0.001	312.052	312.052	0.001	312.052	0.001	312.052	0.000	312.052	0.001	312.130	312.131	0.001	312.131	0.001	312.130	0.000	312.131	0.001
	May	312.168	312.167	-0.001	312.167	0.000	312.167	-0.001	312.168	0.001	312.104	312.103	0.000	312.103	0.000	312.103	-0.001	312.104	0.001	312.220	312.219	0.000	312.220	0.001	312.218	-0.001	312.221	0.001
	Jun	312.307	312.307	0.000	312.307	0.000	312.306	0.000	312.307	0.000	312.199	312.199	0.000	312.199	0.001	312.198	0.000	312.199	0.000	312.391	312.391	0.000	312.391	0.000	312.391	0.000	312.391	0.000
	Jul	312.296	312.296	0.000	312.296	0.000	312.296	0.000	312.296	0.000	312.171	312.171	0.000	312.172	0.001	312.170	-0.001	312.171	0.000	312.440	312.440	0.000	312.441	0.001	312.440	0.000	312.441	0.000
	Aug	312.232	312.232	0.000	312.233	0.001	312.232	0.000	312.232	0.000	312.129	312.128	0.000	312.129	0.001	312.128	0.000	312.129	0.000	312.386	312.386	0.000	312.386	0.000	312.385	0.000	312.386	0.000
	Sep	312.180	312.180	0.000	312.180	0.000	312.179	-0.001	312.180	0.000	312.096	312.096	0.000	312.097	0.000	312.096	-0.001	312.096	0.000	312.314	312.314	0.000	312.314	0.000	312.313	-0.001	312.314	0.000
	Oct	312.143	312.143	0.000	312.143	0.000	312.142	-0.001	312.143	0.000	312.084	312.084	0.000	312.084	0.000	312.083	-0.001	312.084	0.000	312.223	312.223	0.000	312.223	0.000	312.222	-0.001	312.223	0.000
	Nov	312.143	312.142	0.000	312.142	0.000	312.142	0.000	312.143	0.000	312.087	312.087	0.000	312.087	0.000	312.087	0.000	312.087	0.000	312.194	312.194	0.000	312.194	0.000	312.194	0.000	312.194	0.000
	Dec	312.148	312.148	0.000	312.148	0.000	312.148	0.000	312.149	0.000	312.094	312.094	0.000	312.094	0.000	312.094	0.000	312.094	0.000	312.198	312.198	0.000	312.198	0.000	312.198	0.000	312.198	0.000
	Annual	312.173	312.173	0.000	312.173	0.000	312.173	0.000	312.173	0.000	312.103	312.103	0.000	312.104	0.000	312.103	0.000	312.103	0.000	312.249	312.249	0.000	312.250	0.000	312.249	0.000	312.250	0.001

Notes:
Existing condition baseline data has minor variations for each Project phase due to artifacts of the modelling process, values for 2020 are reported as existing conditions. Calculations for the absolute and percent change in flow for each phase use baseline data calculated for that specific phase and may have minor disagreement with the reported baseline data.

Appendix 9C WATER QUANTITY MODEL RESULTS FIGURES

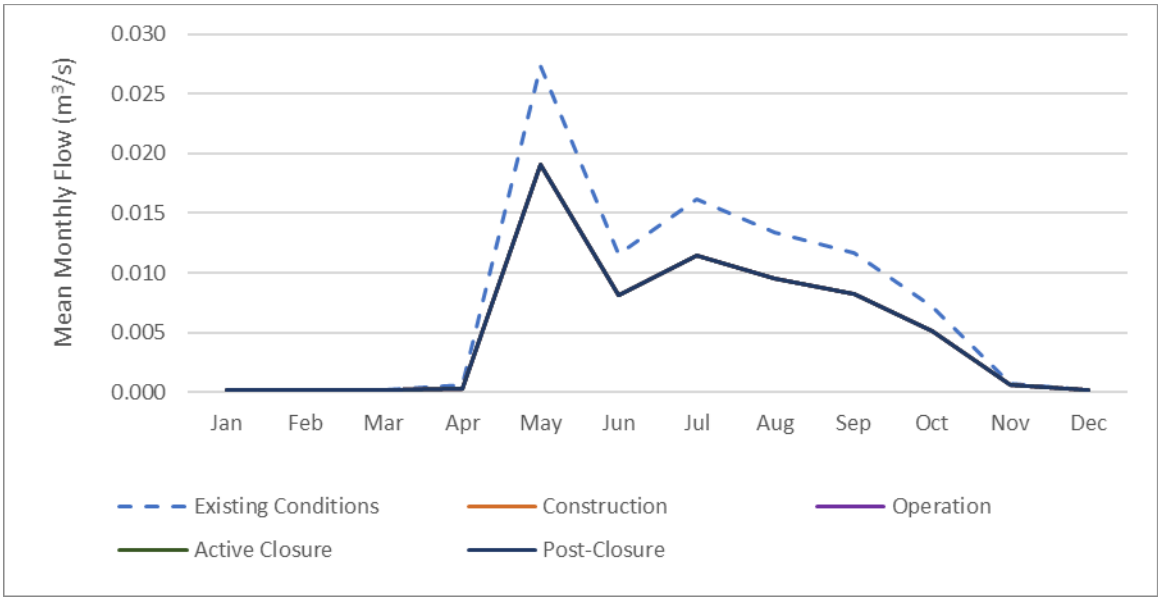


Figure 9C-1 Model Results – Average Case – Gordon Site – QF01 Southern Inlet to Gordon Lake

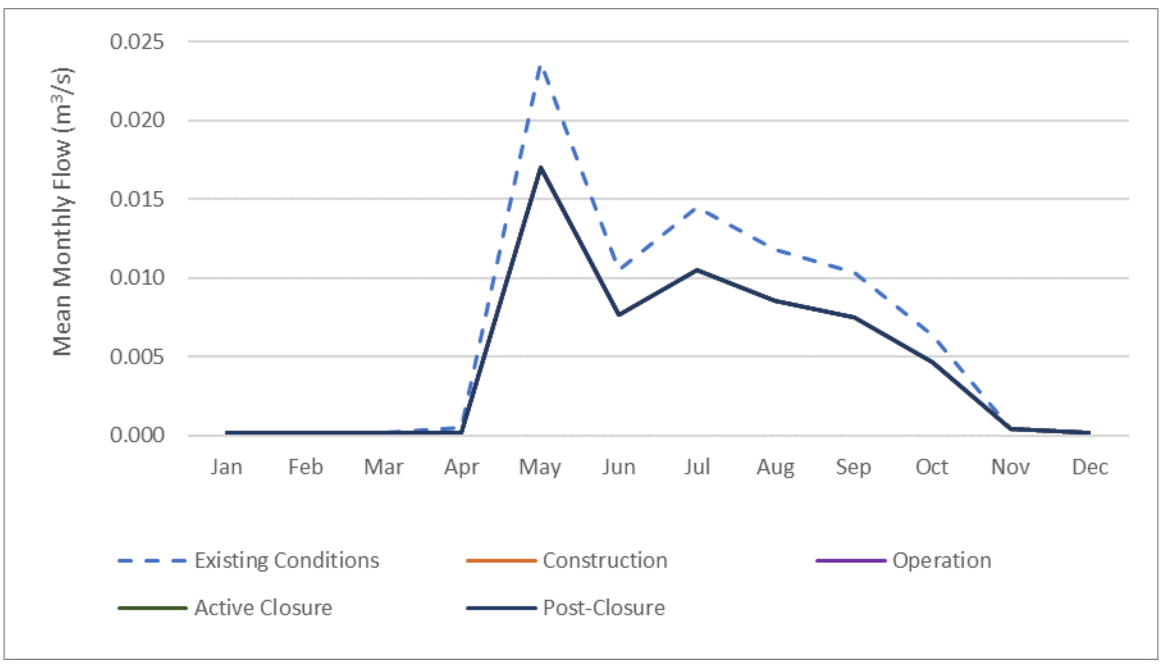


Figure 9C-2 Model Results – Average Case – Gordon Site – QF02 Southwest Inlet to Farley Lake

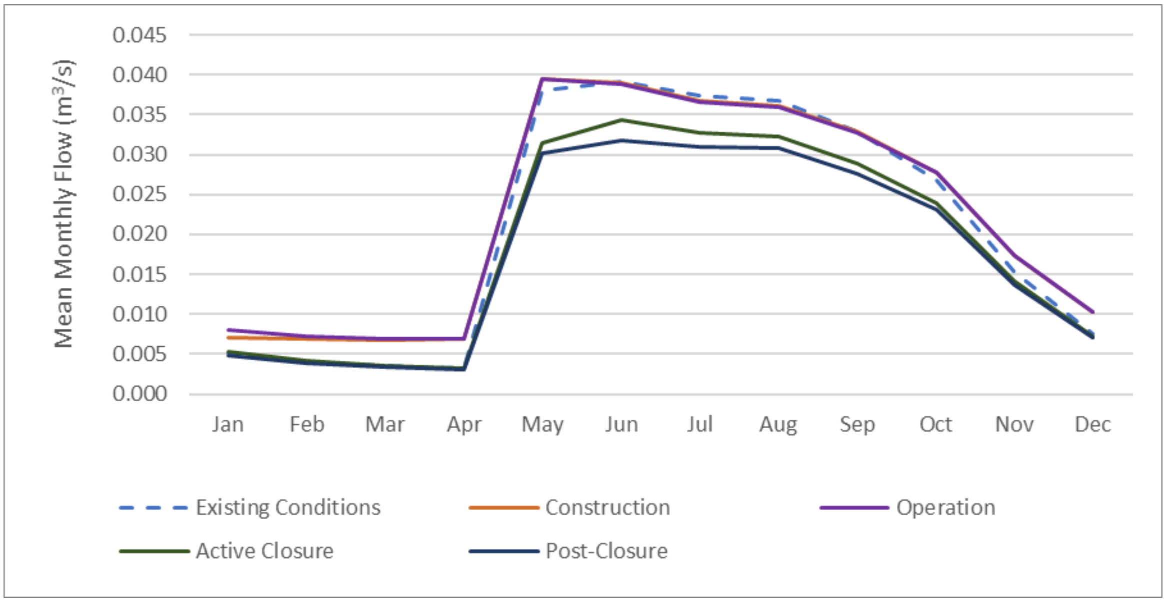


Figure 9C-3 Model Results – Average Case – Gordon Site – QF03 Gordon Lake Outlet

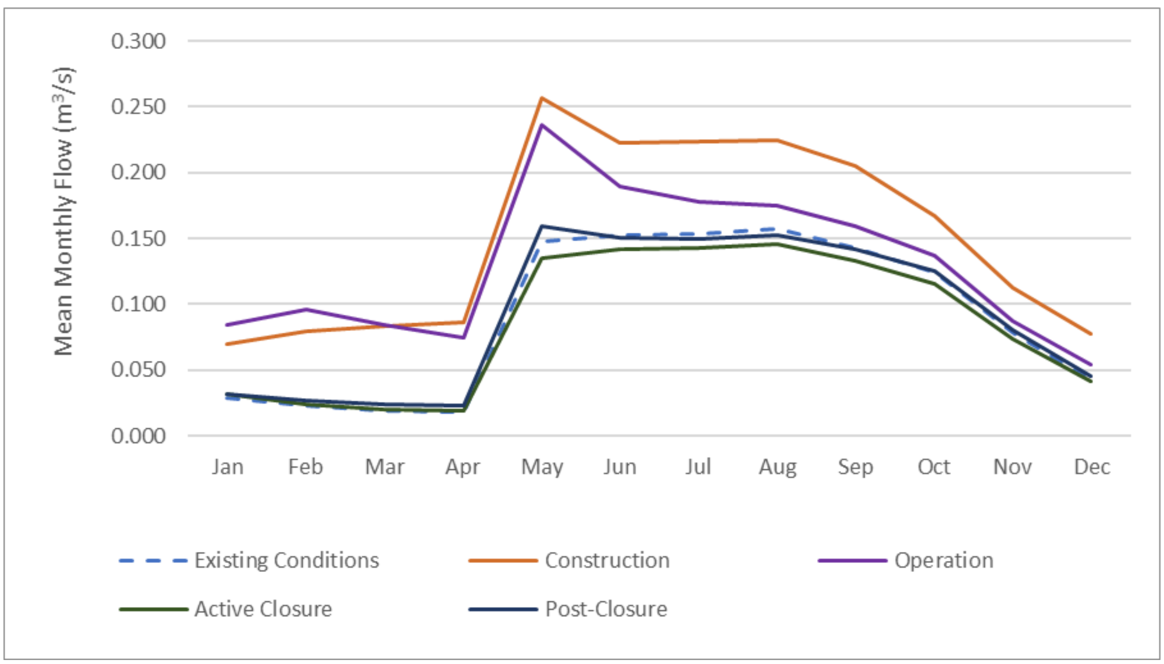


Figure 9C-4 Model Results – Average Case – Gordon Site – QF05 Farley Lake Outlet

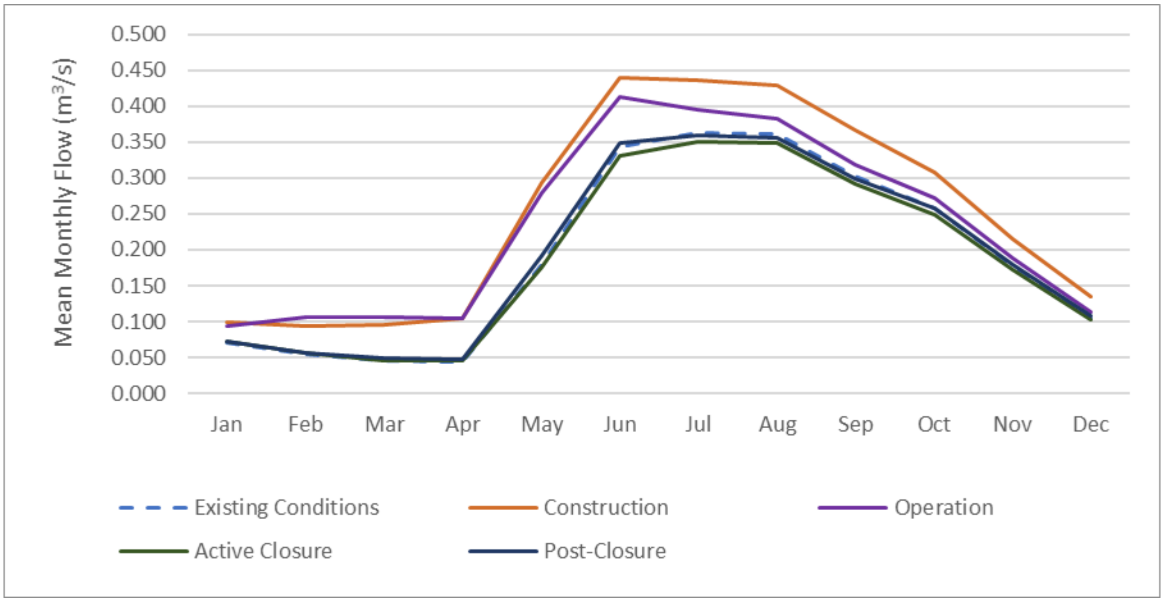


Figure 9C-5 Model Results – Average Case – Gordon Site – QF07 Swede Lake Outlet

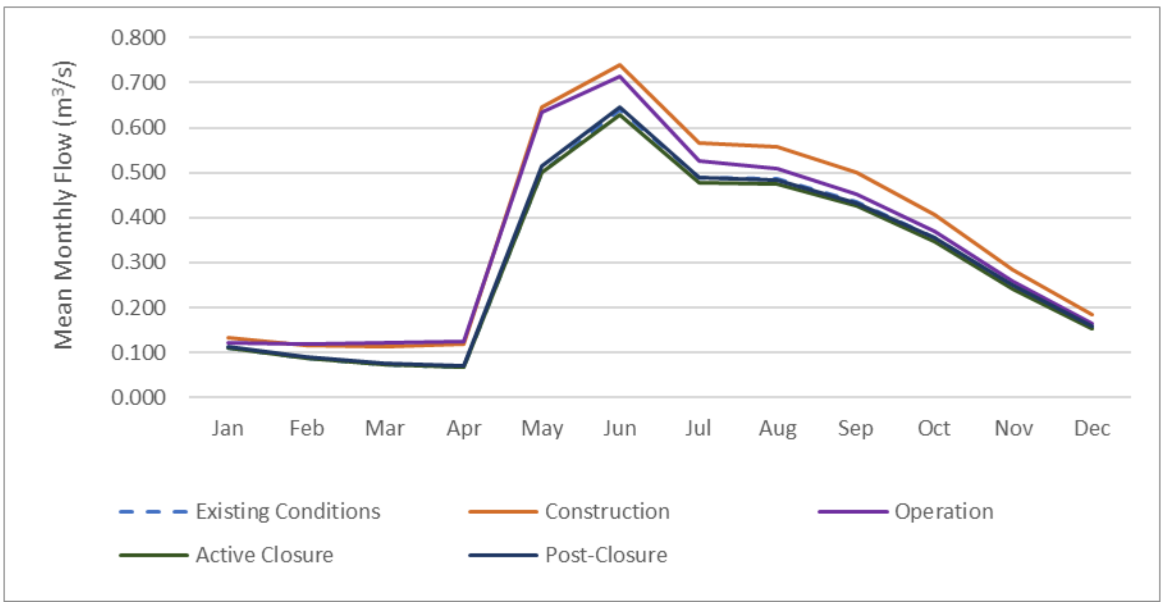


Figure 9C-6 Model Results – Average Case – Gordon Site – QF08 Ellystan Lake Outlet

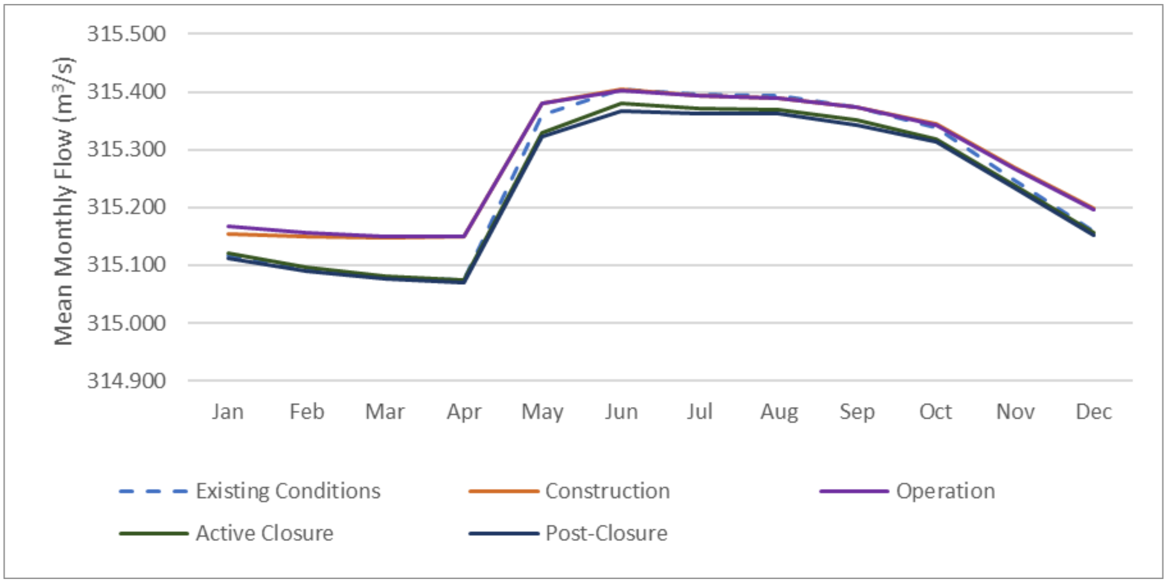


Figure 9C-7 Model Results – Average Case – Gordon Site – Farley Lake Level

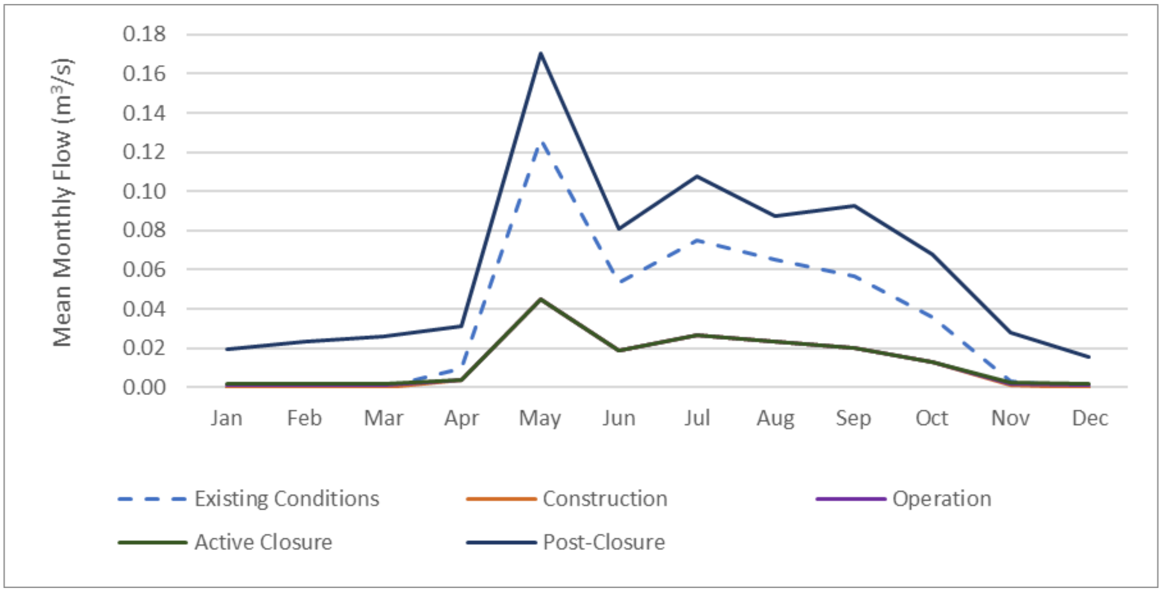


Figure 9C-8 **Model Results – Average Climate – MacLellan Site – QM04 KEE3-B1 Streamflow**

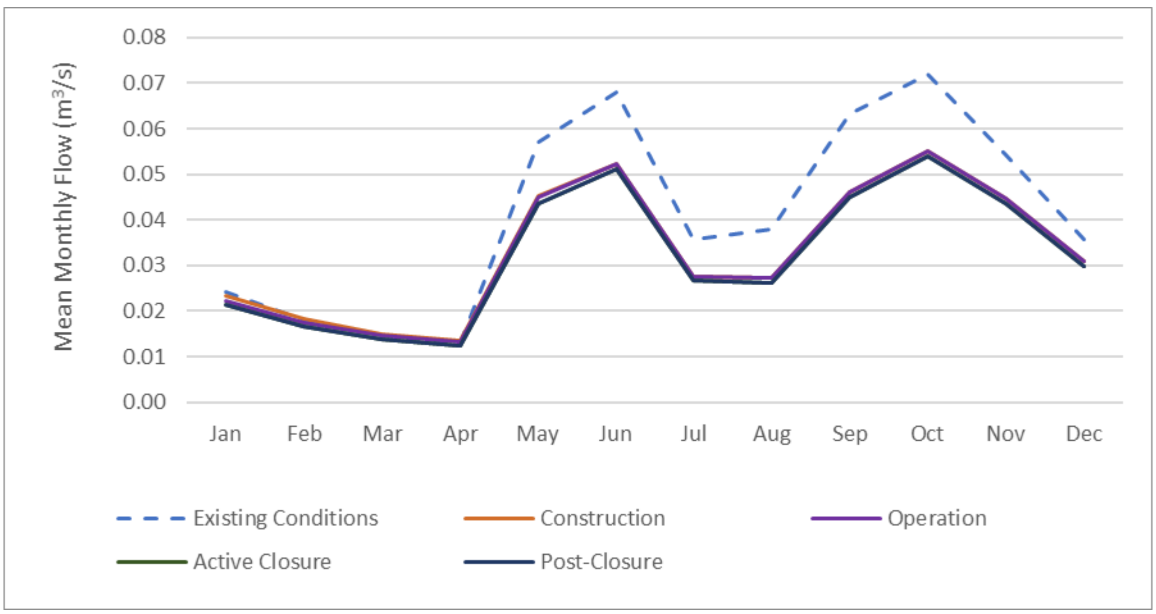


Figure 9C-9 **Model Results – Average Climate – MacLellan Site – QM07 Minton Lake Outlet Streamflow**

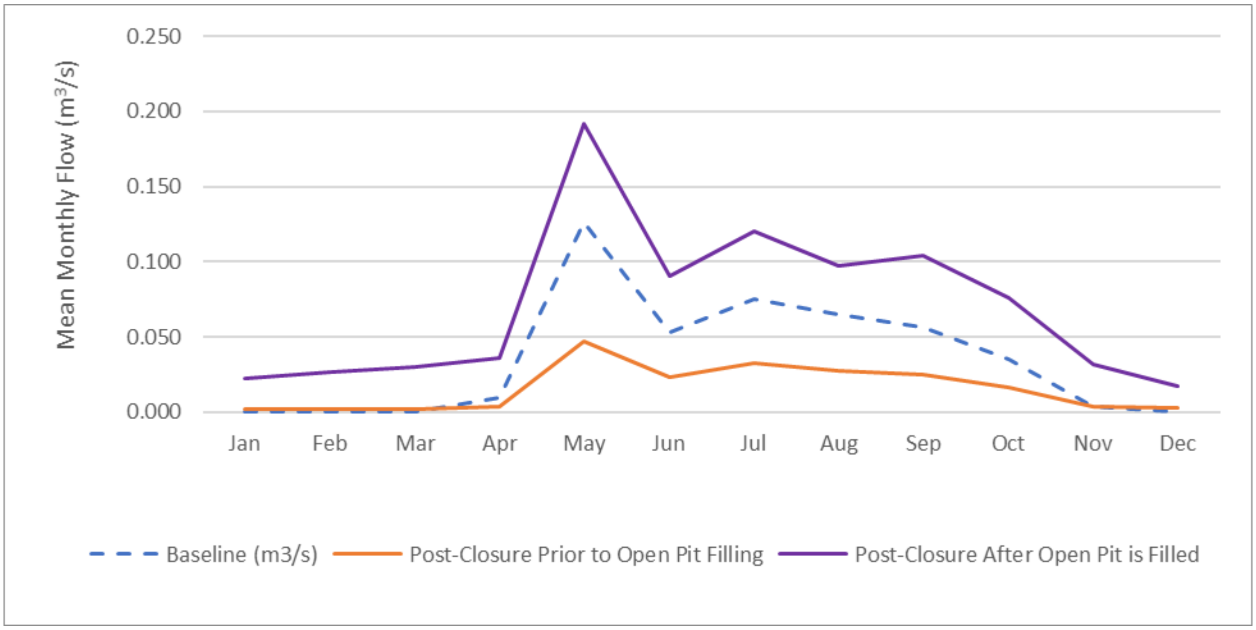


Figure 9C-10 Model Results – Average Climate - MacLellan Site – QM04 Post-Closure Streamflow

Appendix 9D WATER QUALITY FIGURES

Table 9D-1 List of Figures in Appendix 9D

Figure	Description	Project Site	Parameter of Potential Concern
9D-1	Time series (Year 1 to Year 128) in West Farley Lake	Gordon	Fluoride
9D-2	Monthly mean concentrations by phase		
9D-3	Time series (Year 1 to Year 128) in West Farley Lake		Phosphorus
9D-4	Monthly mean concentrations by phase		
9D-5	Time series (Year 1 to Year 128) in KEE3-B1	MacLellan	Aluminum
9D-6	Time series (Year 1 to Year 128) in QM06		
9D-7	Monthly mean concentrations by phase		
9D-8	Time series (Year 1 to Year 128) in KEE3-B1		Arsenic
9D-9	Monthly mean concentrations by phase		
9D-10	Time series (Year 1 to Year 128) in KEE3-B1		Total Cadmium
9D-11	Time series (Year 1 to Year 128) in Minton Lake		
9D-12	Monthly mean concentrations by phase		
9D-13	Time series (Year 1 to Year 128) in KEE3-B1		Total Copper
9D-14	Monthly mean concentrations by phase		
9D-15	Time series (Year 1 to Year 128) in KEE3-B1		Fluoride
9D-16	Monthly mean concentrations by phase		

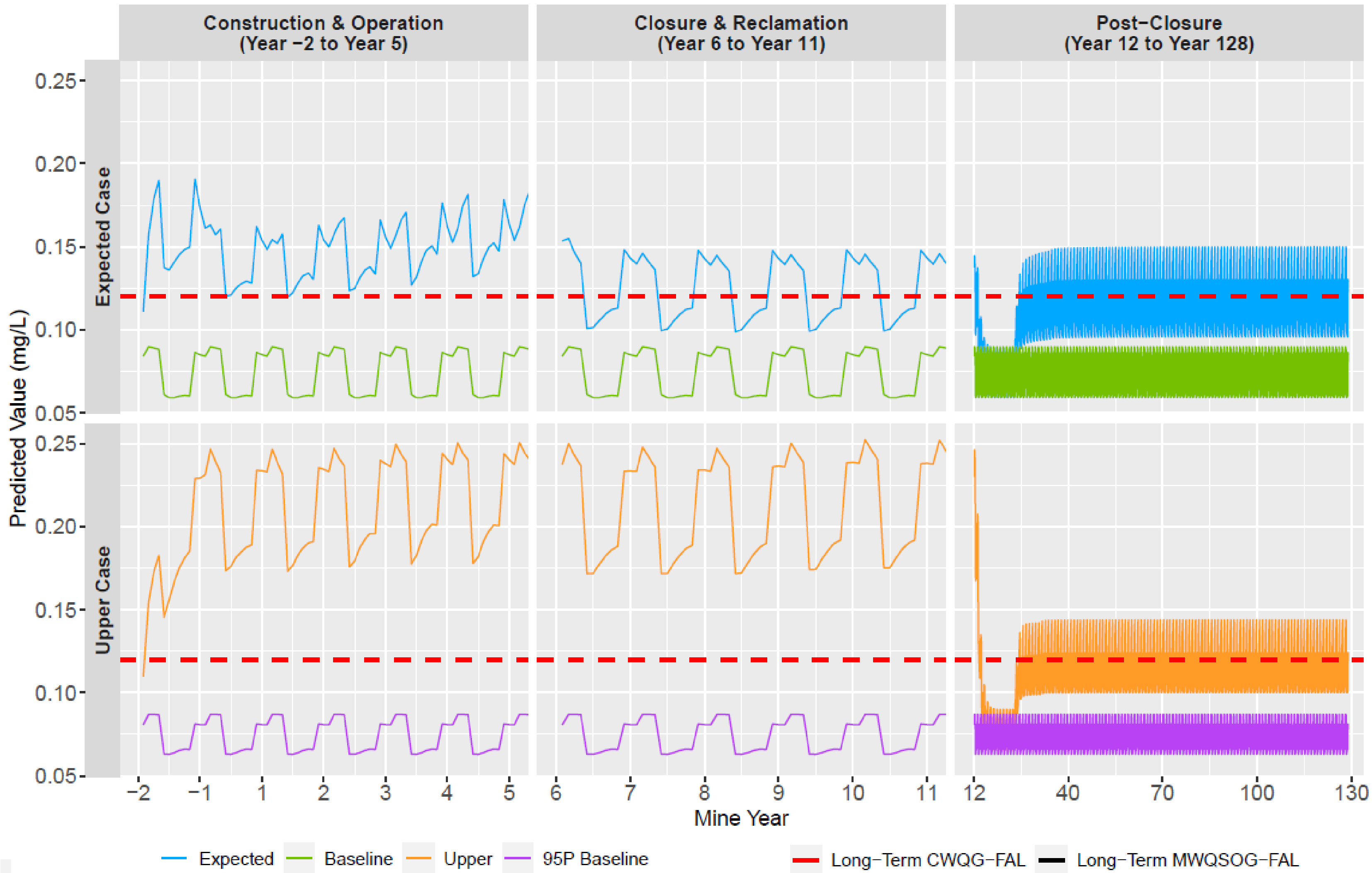


Figure 9D-1 Predicted Project vs. Baseline Concentrations of Fluoride in West Farley Lake in the Expected Case and Upper Case

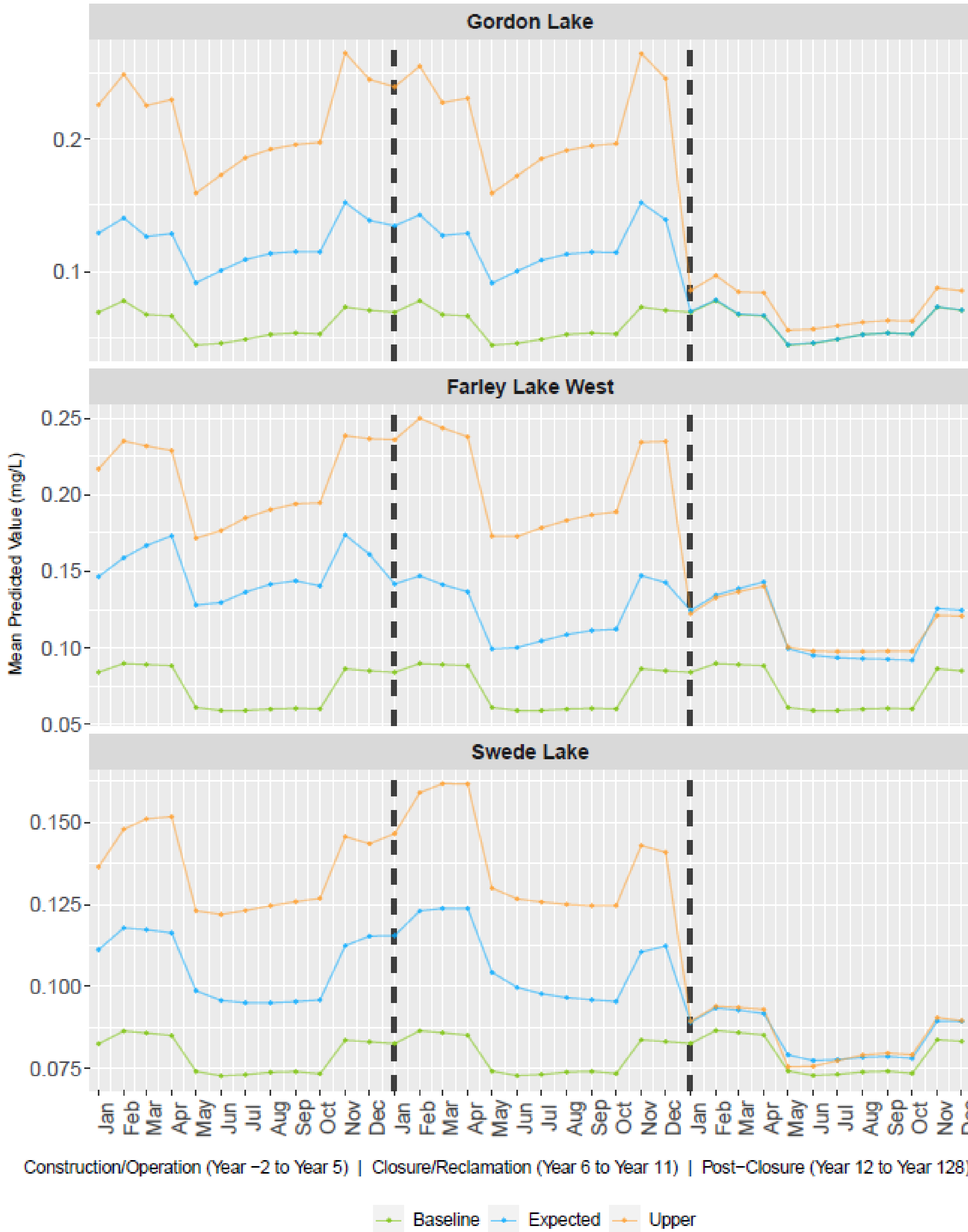


Figure 9D-2 Monthly Mean Concentrations of Fluoride in Gordon, West Farley, and Swede Lakes in Operation, Closure, and Post-Closure Phases

Figure 9D-3 Predicted Project vs. Baseline Concentrations of Phosphorus in West Farley Lake in the Expected Case and Upper Case

Alamos Gold Inc.

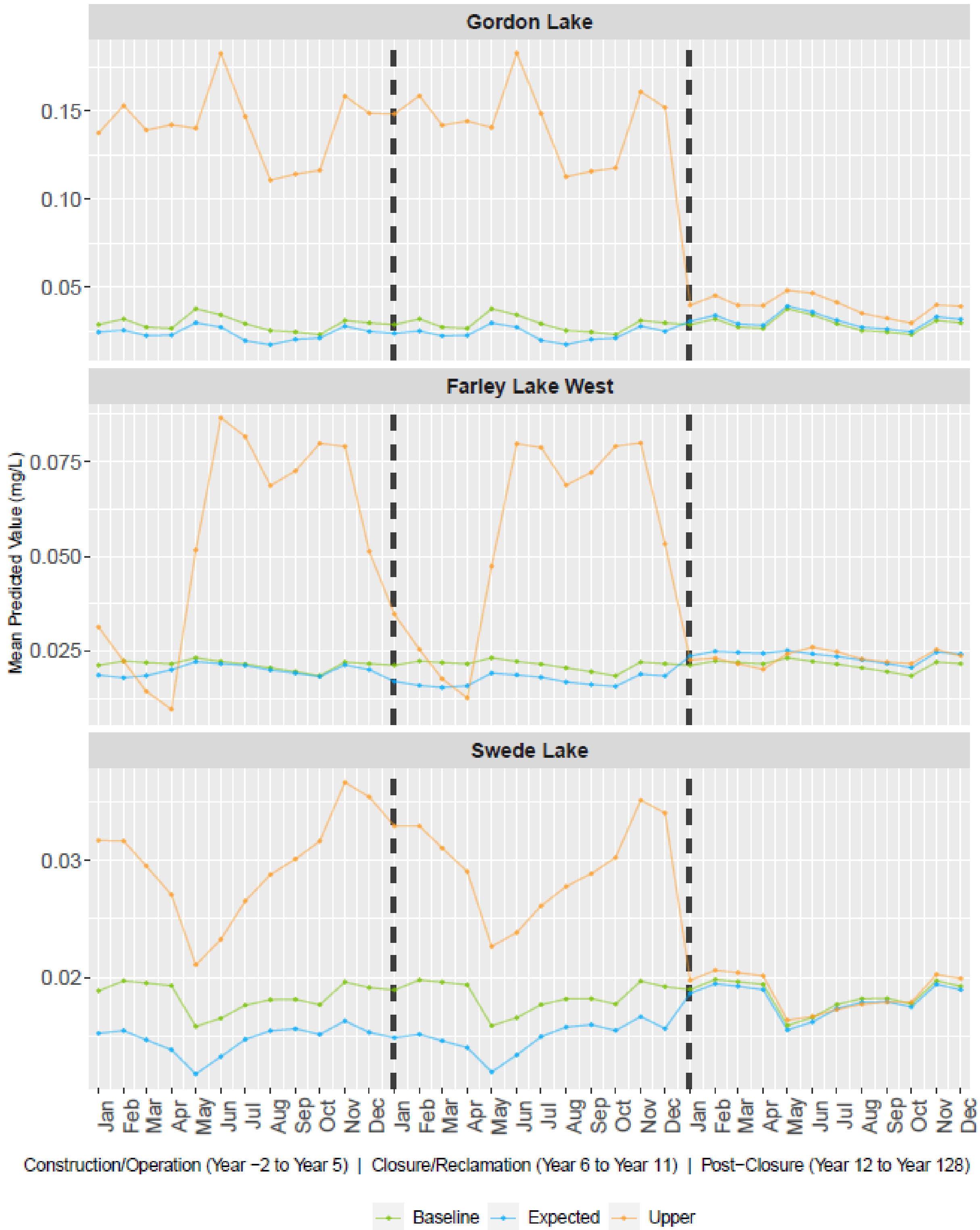


Figure 9D-4 Monthly Mean Concentrations of Phosphorus in Gordon, West Farley, and Swede Lakes in Operation, Closure, and Post-Closure Phases

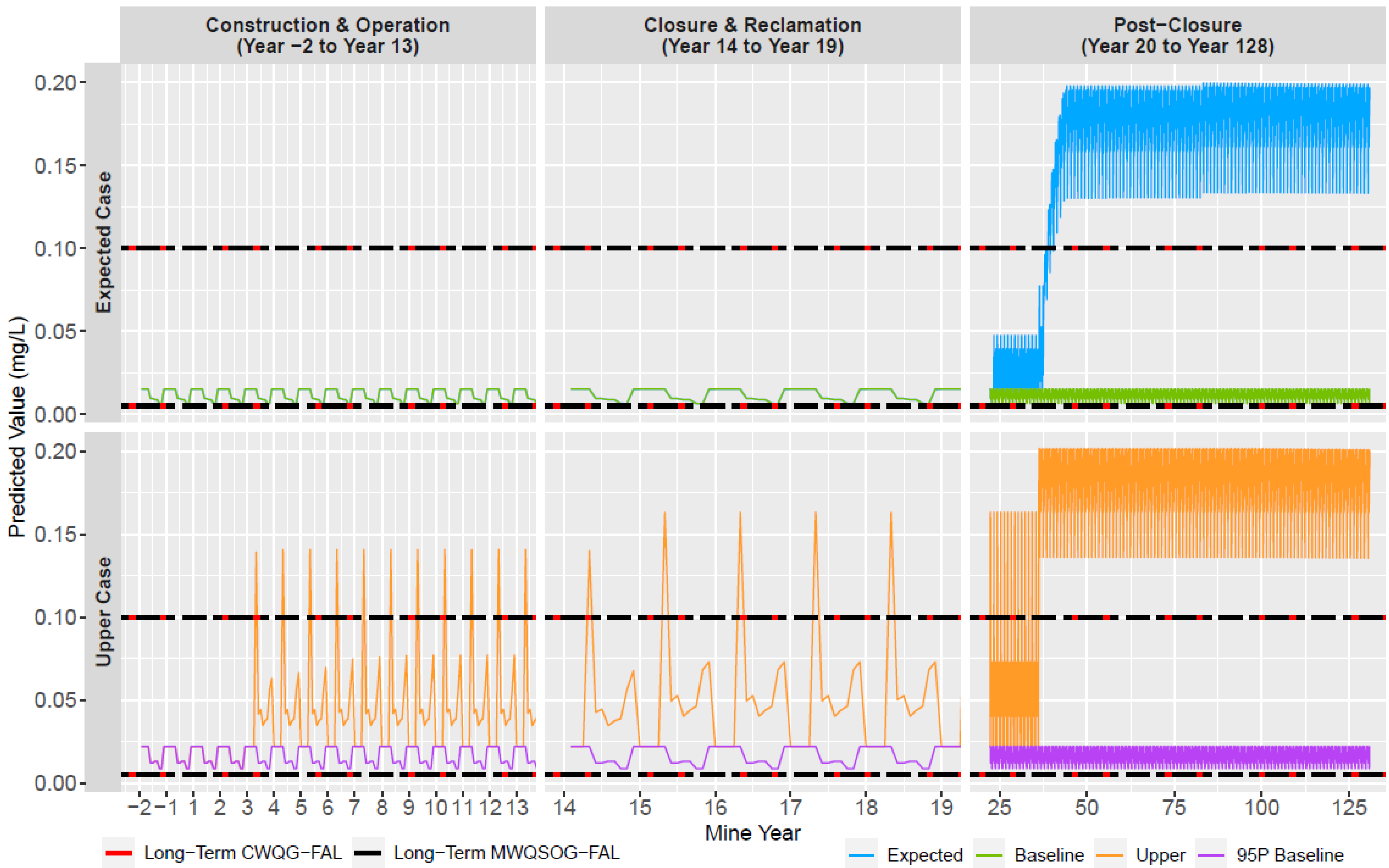


Figure 9D-5 Predicted Project vs. Baseline Concentrations of Total Aluminum at Node KEE3-B1 in the Expected Case and Upper Case

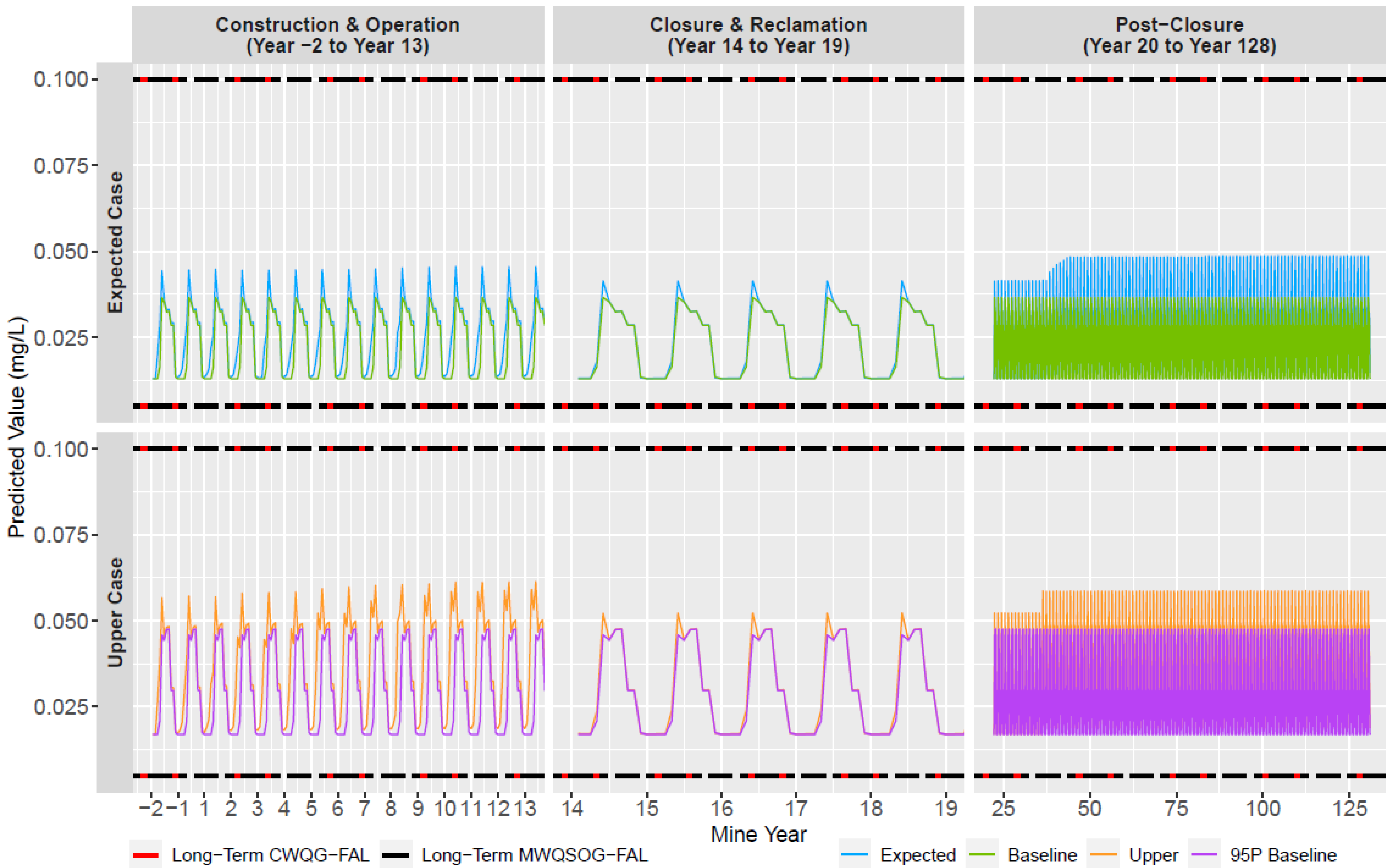


Figure 9D-6 Predicted Project vs. Baseline Concentrations of Total Aluminum at Node QM06 in the Expected Case and Upper Case

Alamos Gold Inc.

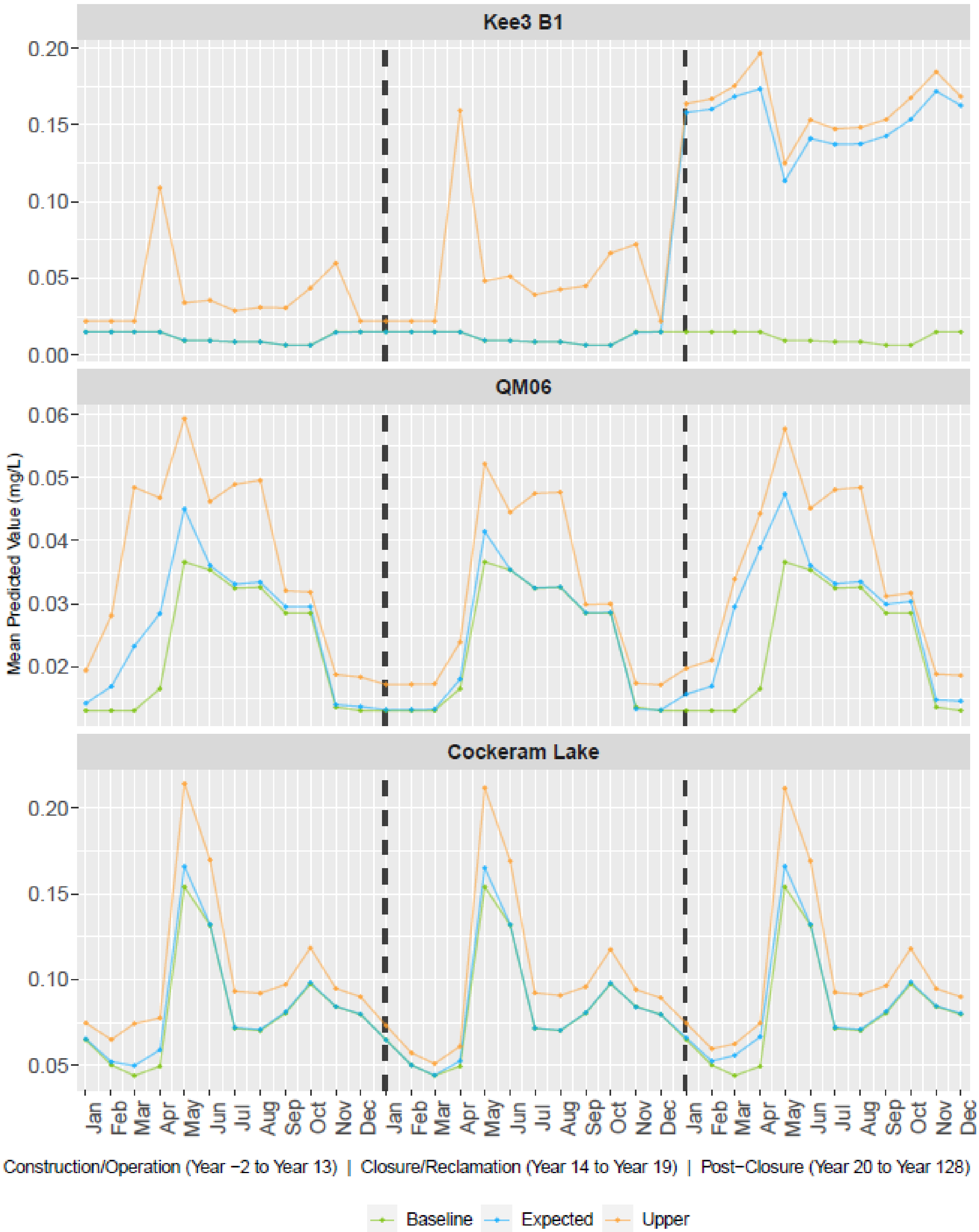


Figure 9D-7 Predicted Monthly Mean Aluminum Concentrations at KEE3-B1, QM06, and Cockeram Lake in Operation, Closure, and Post-Closure

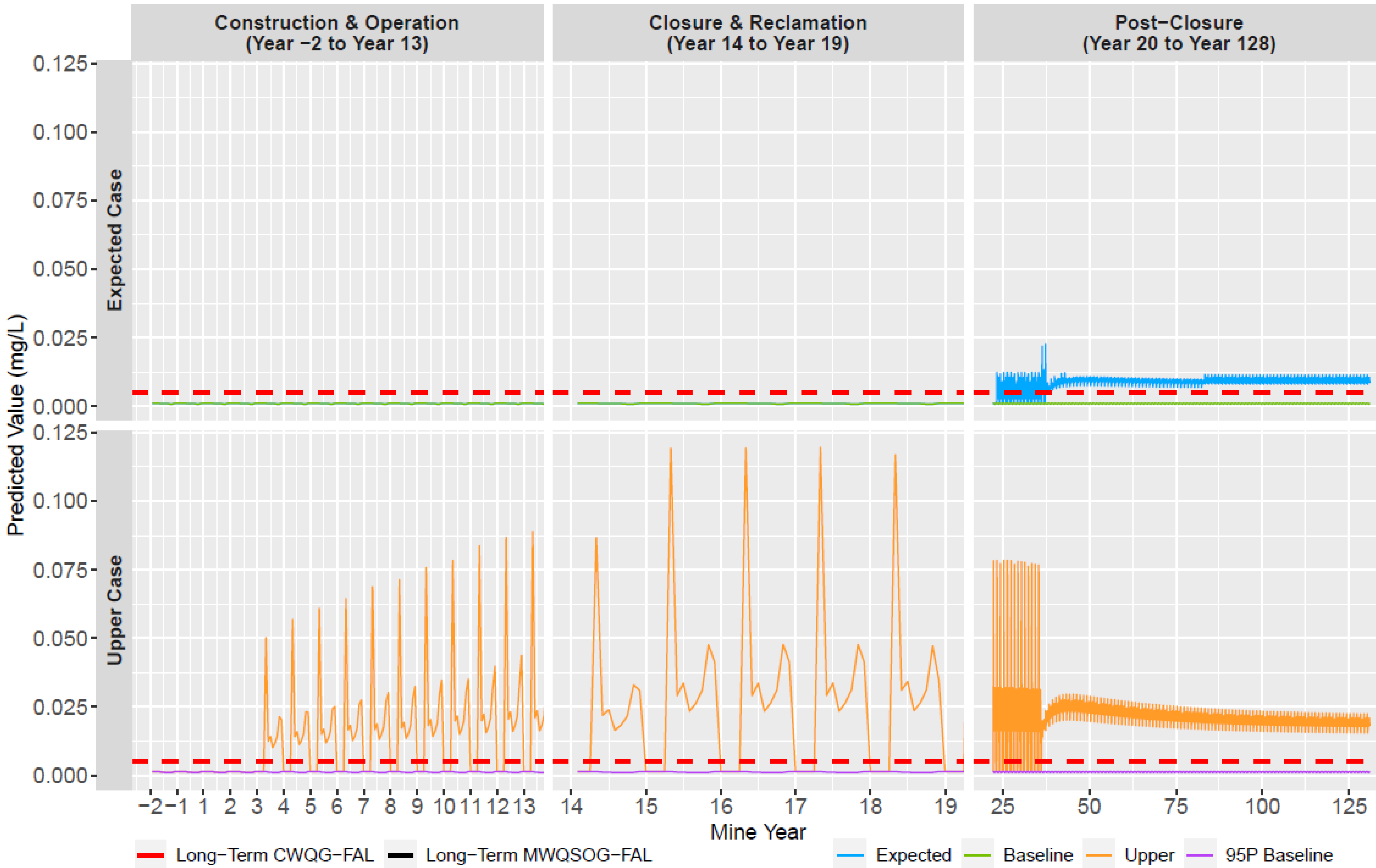


Figure 9D-8 Predicted Project vs. Baseline Concentrations of Total Arsenic at Node KEE3-B1 in the Expected Case and Upper Case

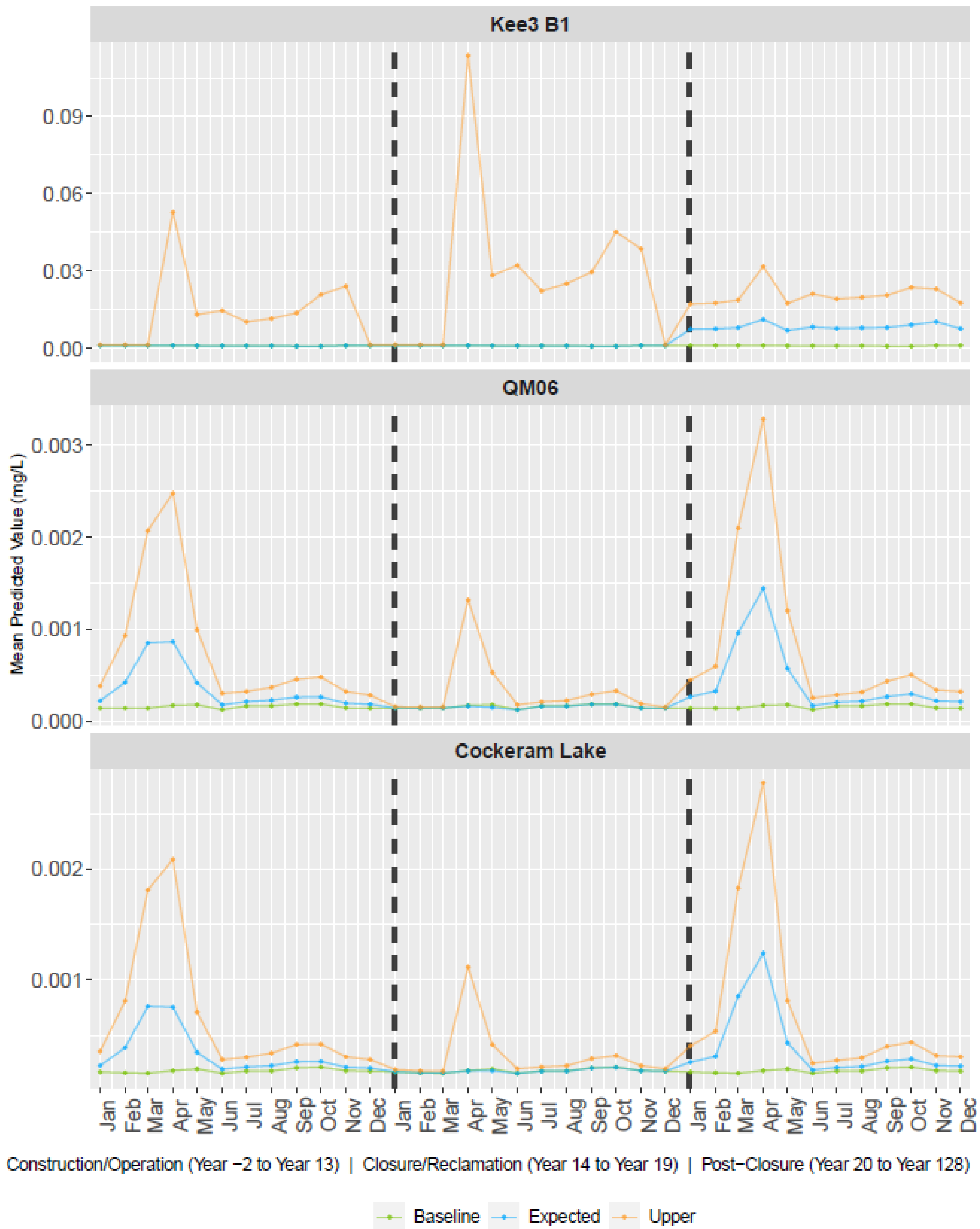


Figure 9D-9 Predicted Monthly Mean Arsenic Concentrations at KEE3-B1, QM06, and Cockeram Lake in Operation, Closure, and Post-Closure Phases

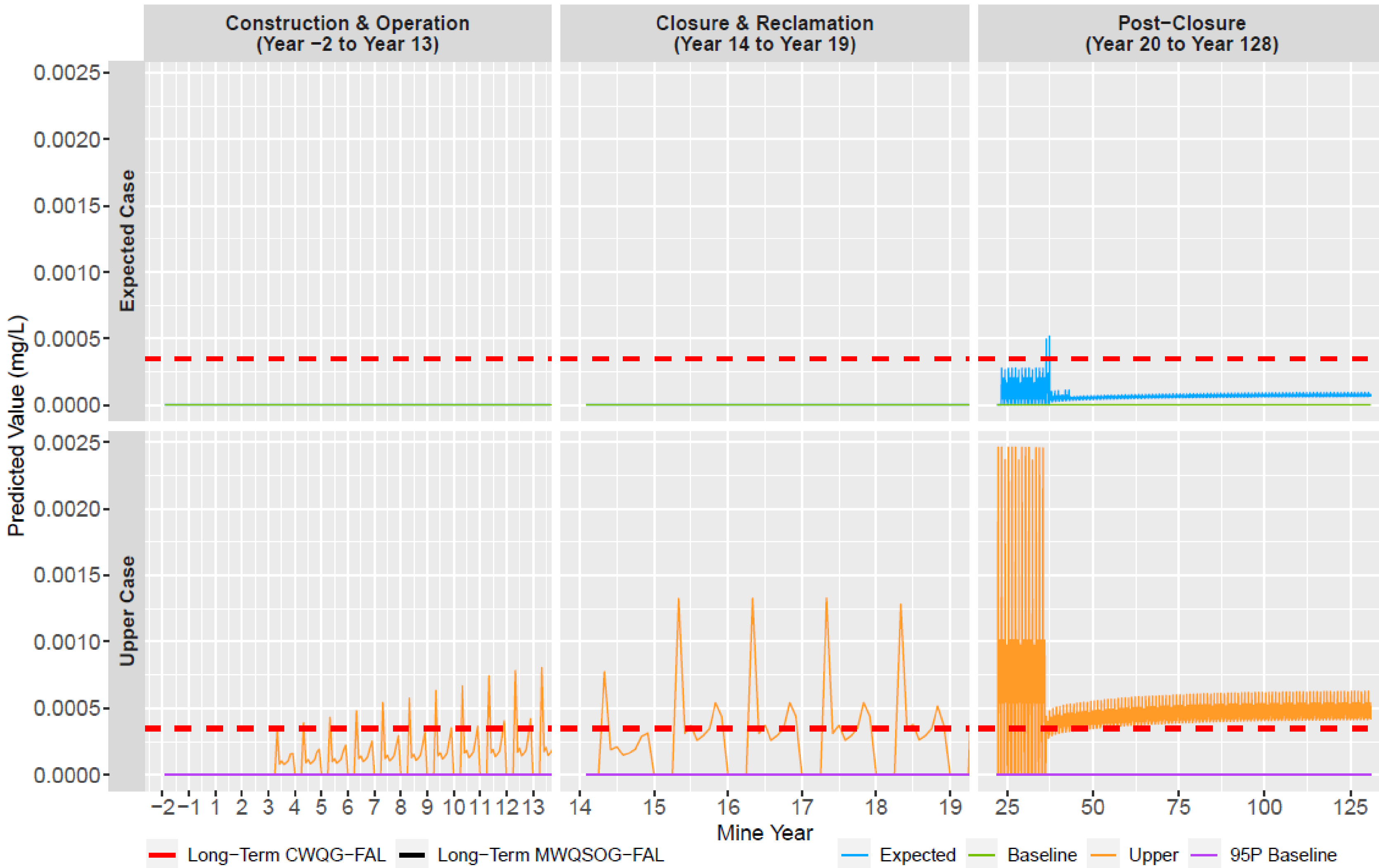


Figure 9D-10 Predicted Project vs. Baseline Concentrations of Total Cadmium at Node KEE3-B1 in the Expected Case and Upper Case

ALAMOS GOLD INC.

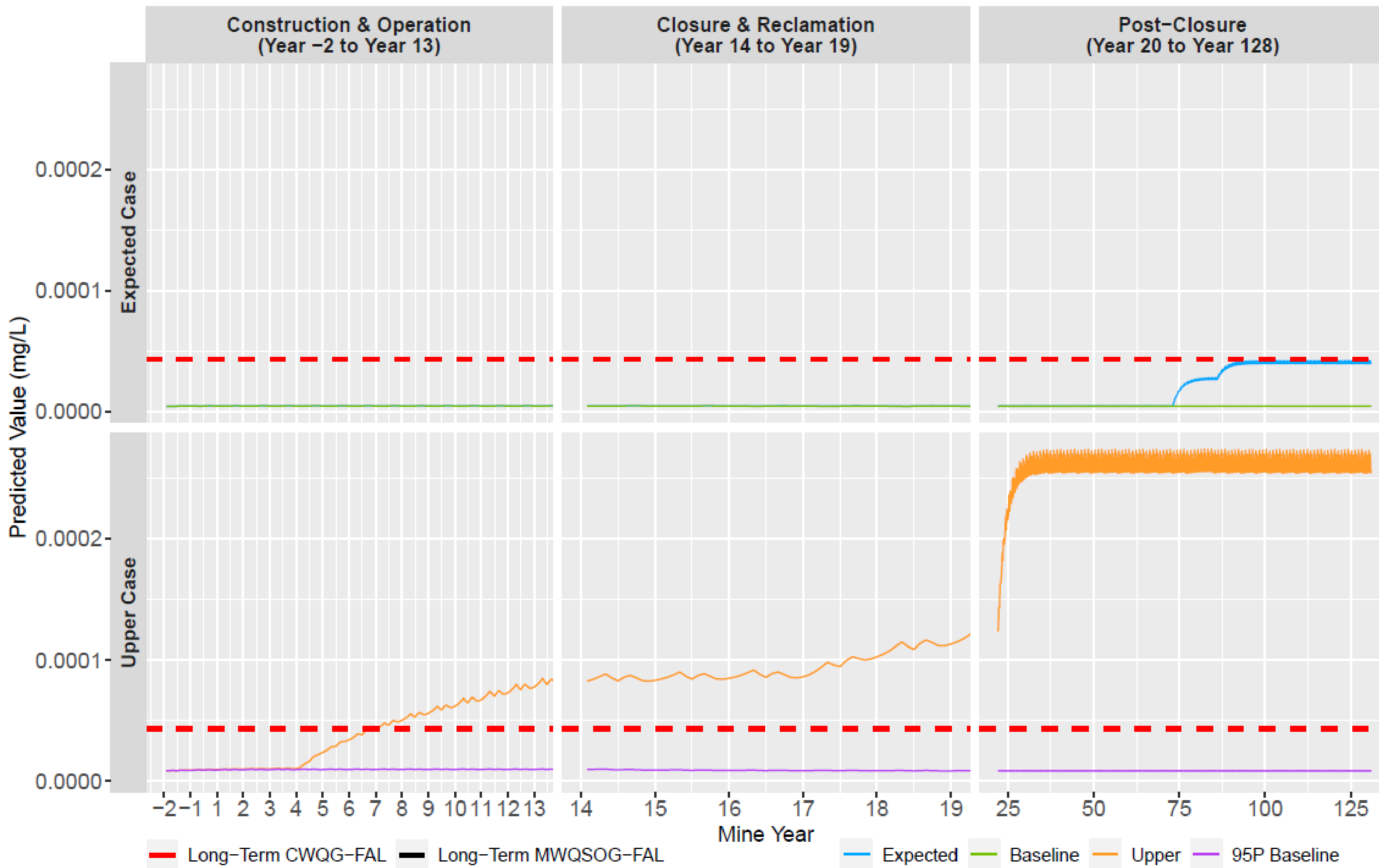


Figure 9D-11 Predicted Project vs. Baseline Concentrations of Total Cadmium at Minton Lake in the Expected Case and Upper Case

ALAMOS GOLD INC.

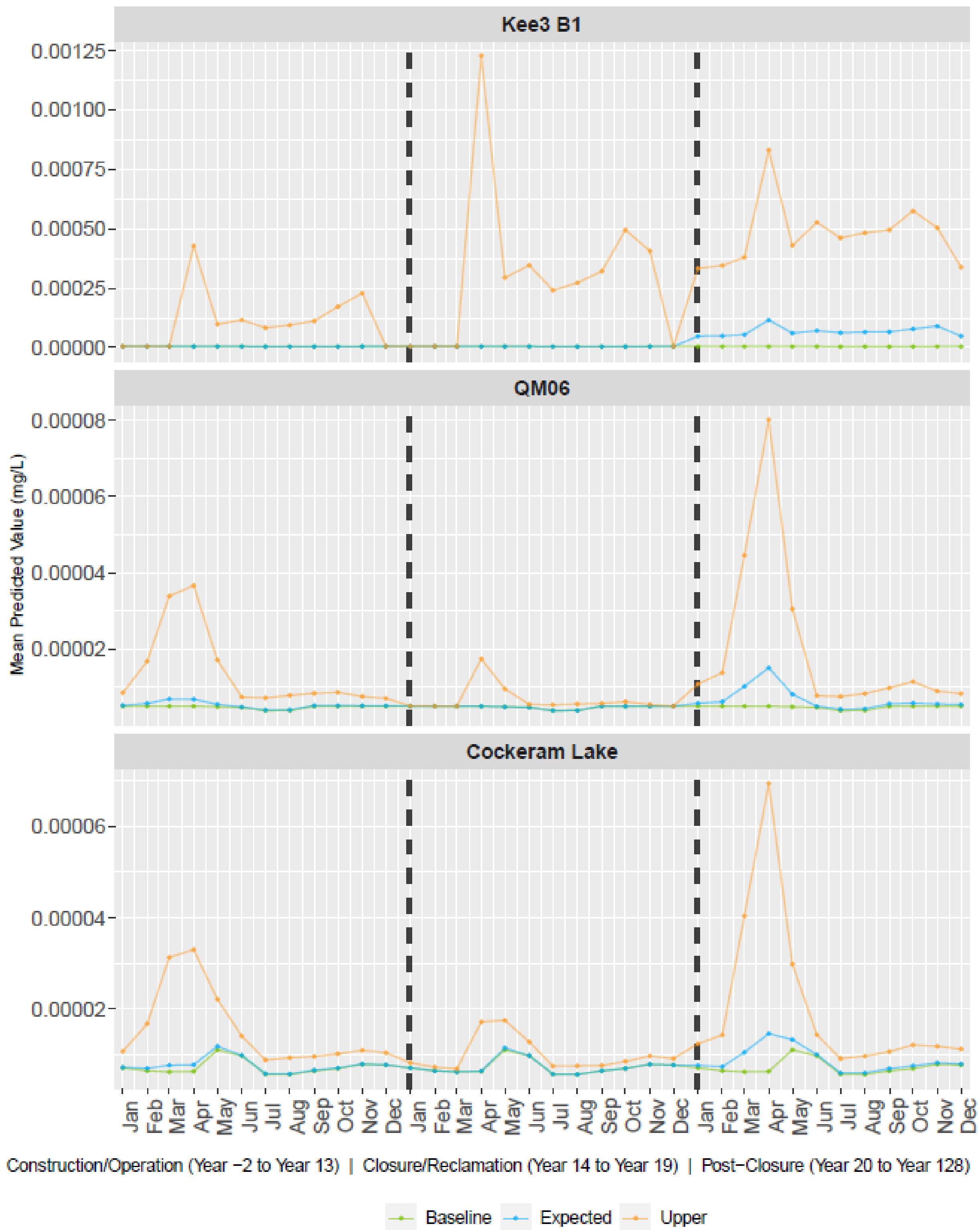


Figure 9D-12 Monthly Mean Concentrations of Total Cadmium at KEE3-B1, QM06, and Cockeram Lake in the Operation, Closure, and Post-Closure Phases

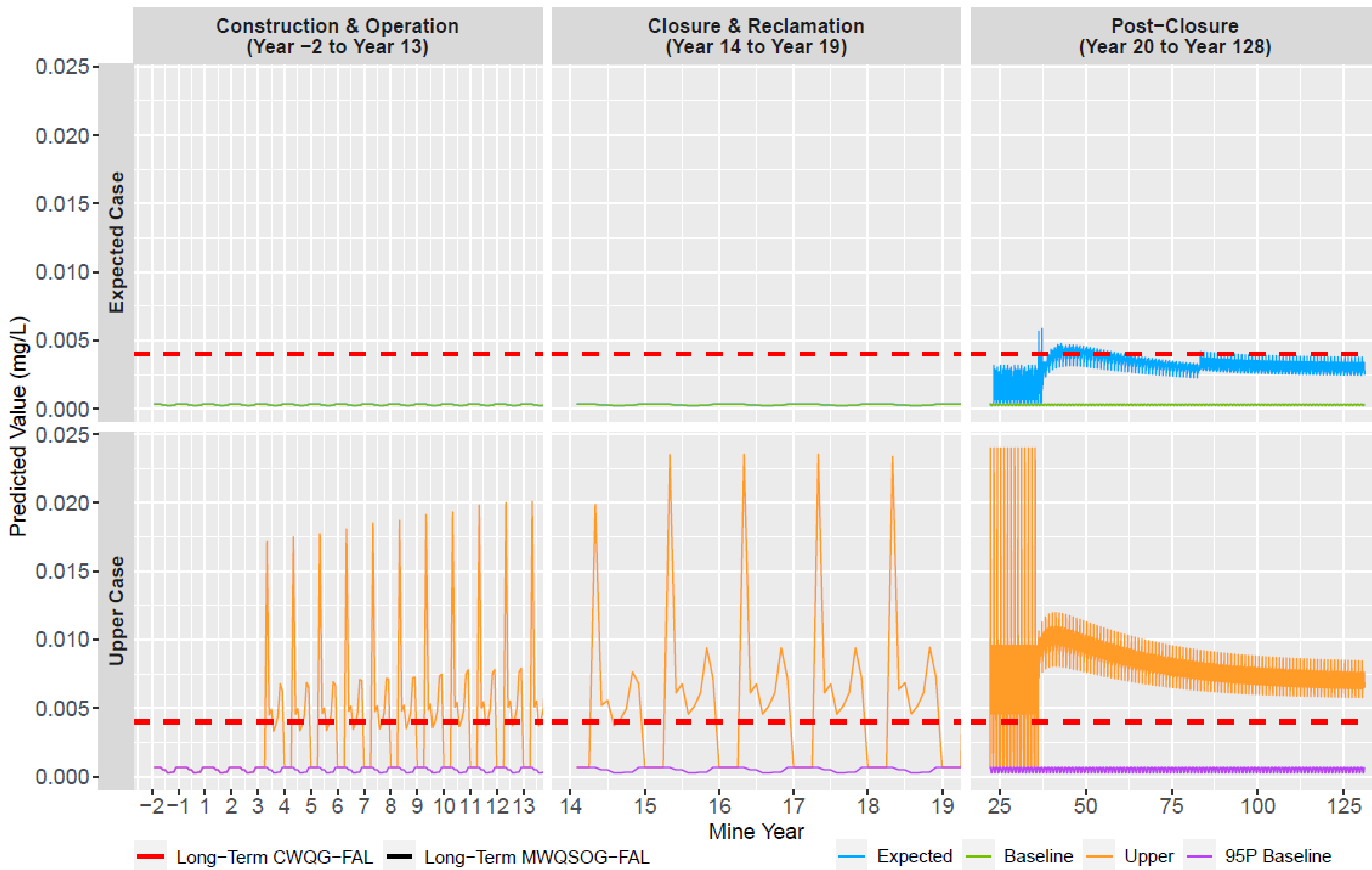


Figure 9D-13 Predicted Project vs. Baseline Concentrations of Total Copper at Node KEE3-B1 in the Expected Case

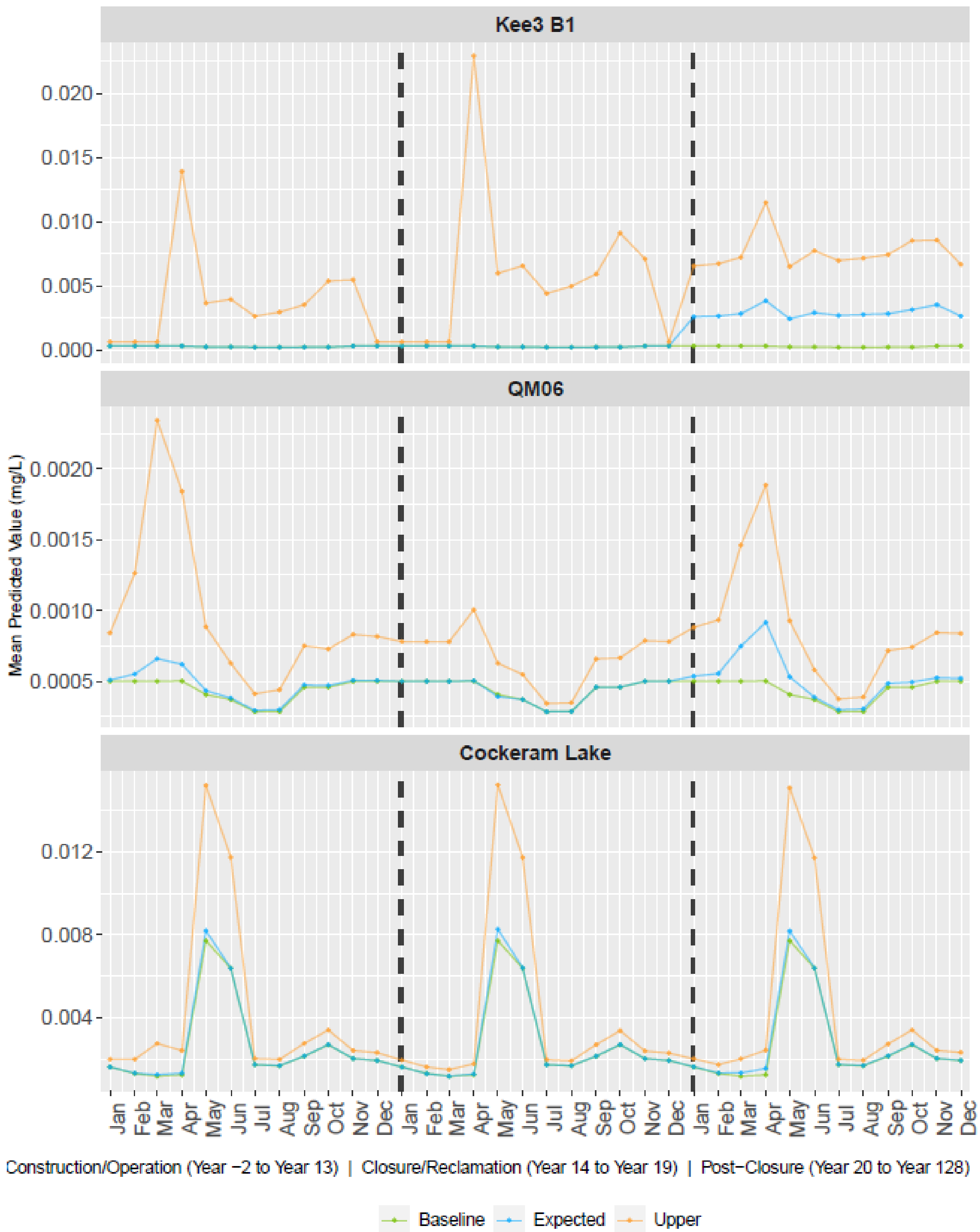


Figure 9D-14 Monthly Mean Concentrations of Total Copper at KEE3-B1, QM06, and Cockeram Lake in Operation, Closure, and Post-Closure Phases

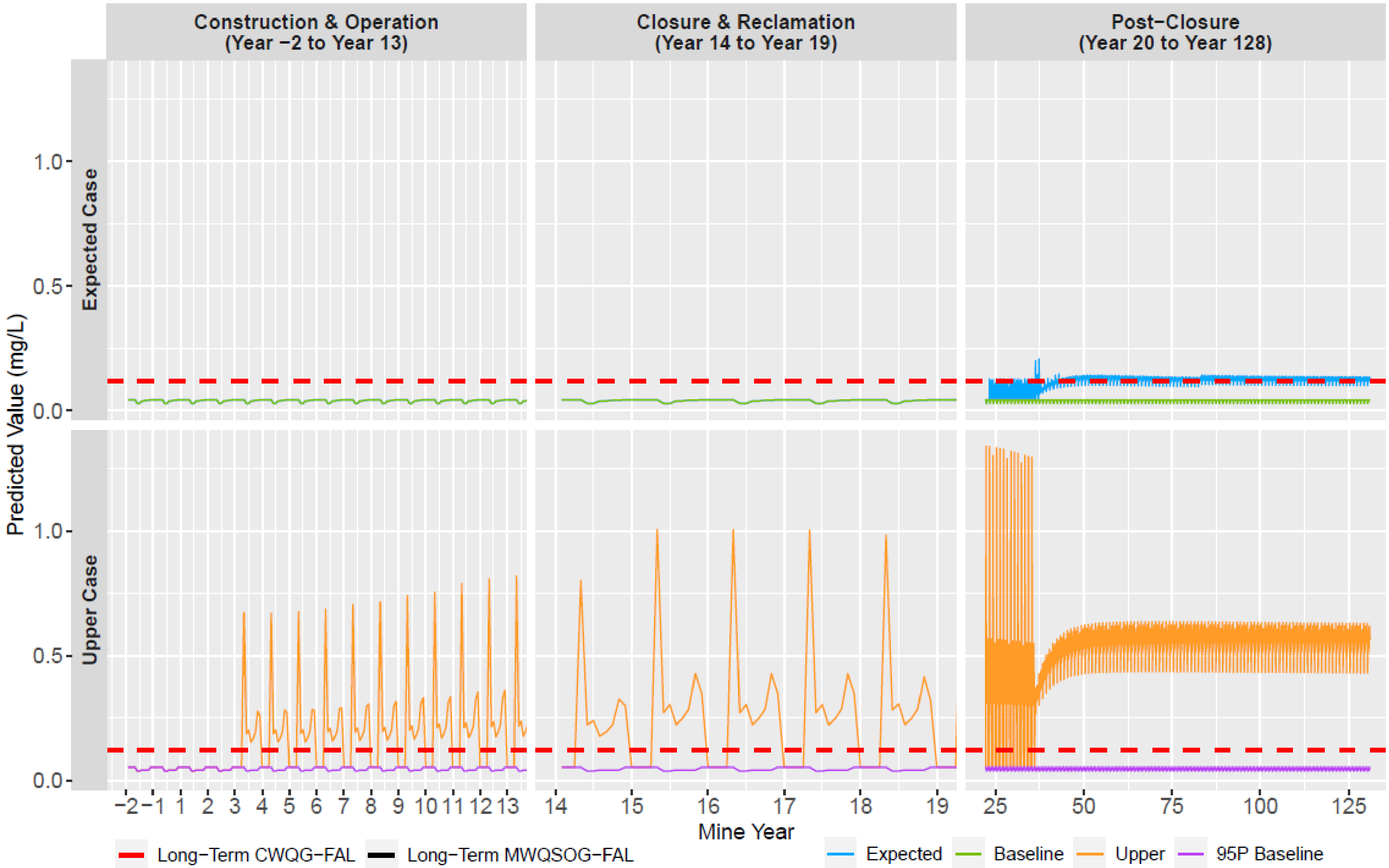


Figure 9D-15 Predicted Project vs. Baseline Concentrations of Fluoride at Node KEE3-B1 in the Expected Case and Upper Case

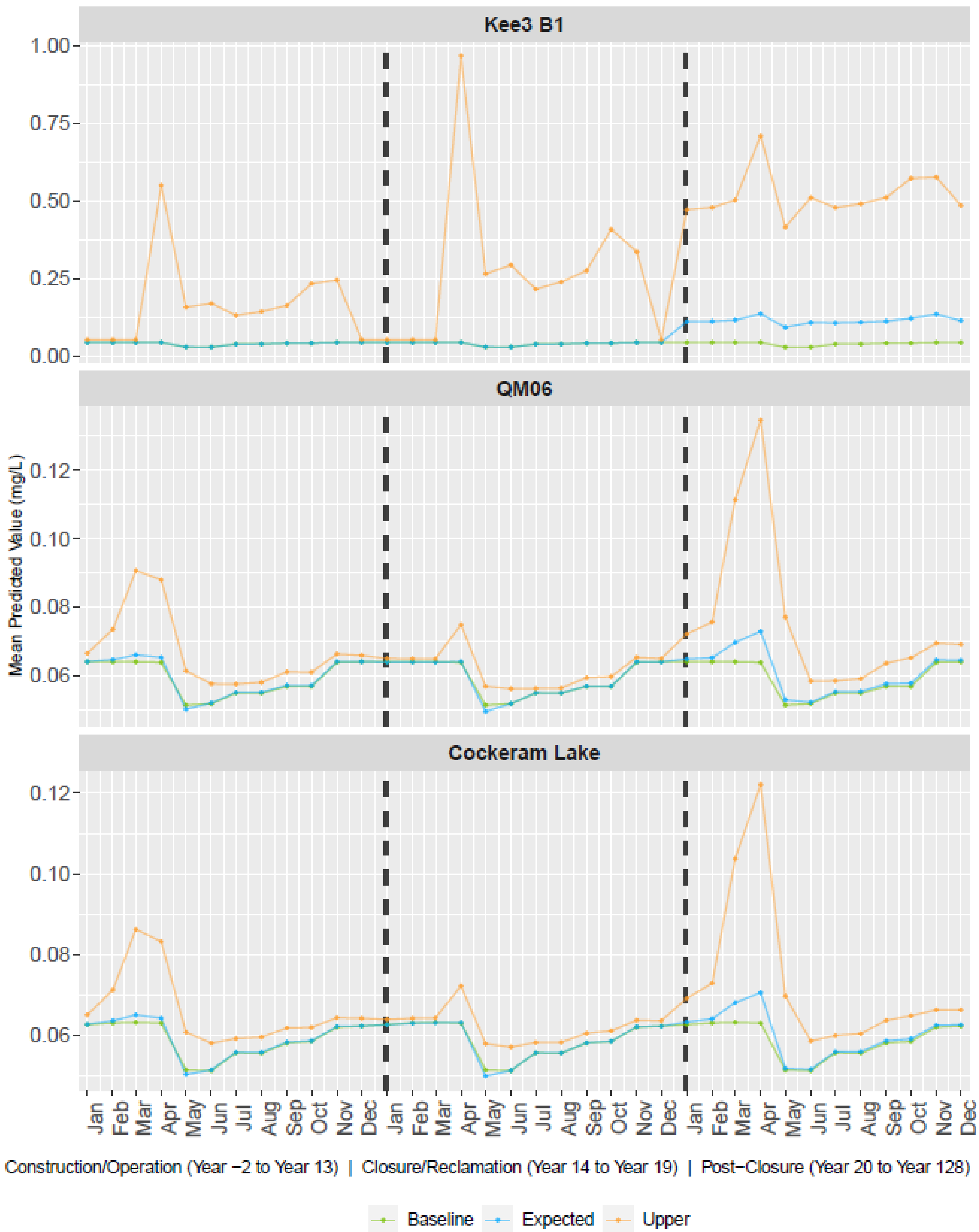
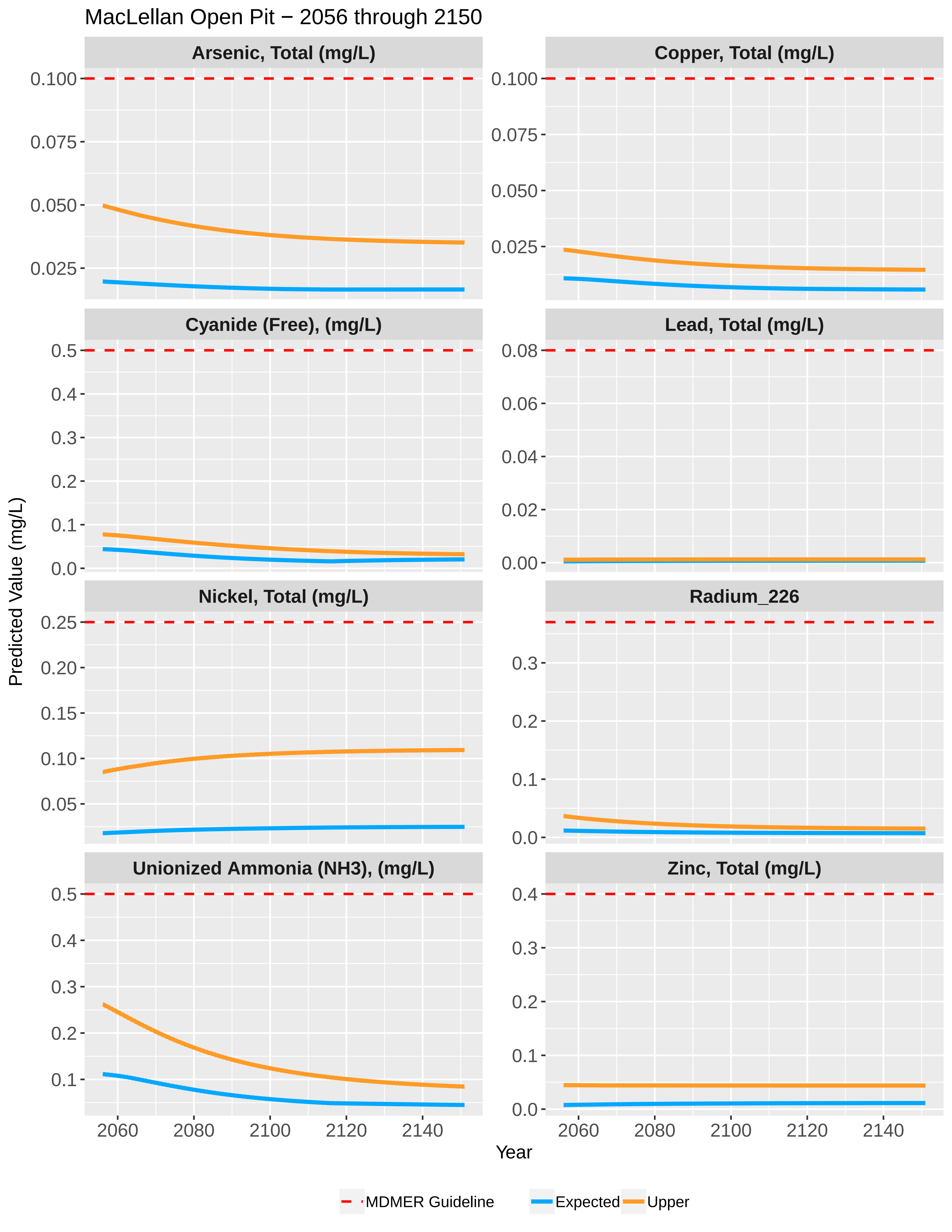
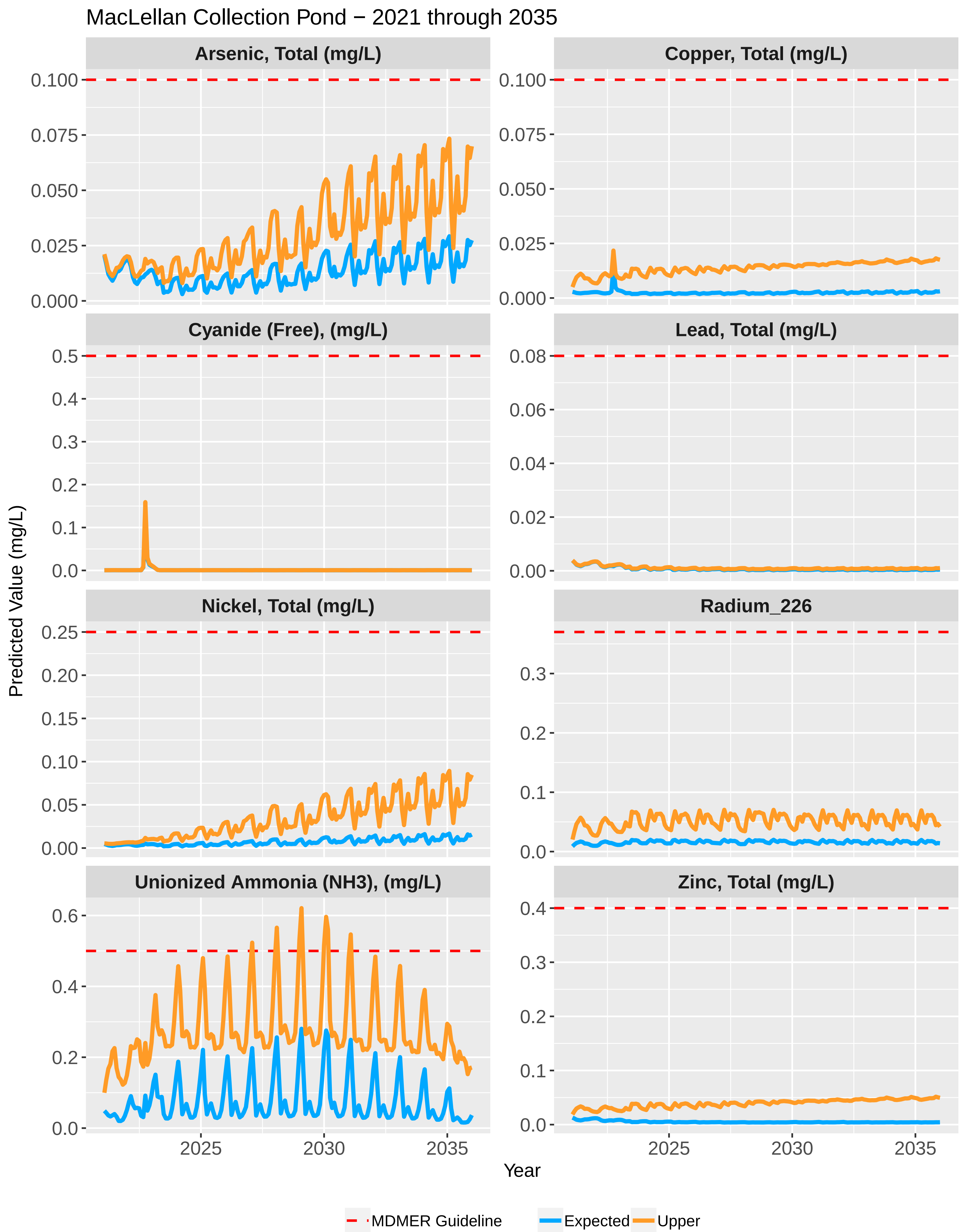


Figure 9D-16 Monthly Mean Concentrations of Fluoride at KEE3-B1, QM06, and Cockeram Lake in Operation, Closure, and Post-Closure Phases

Appendix 9E CHARACTERIZATION OF MINE DISCHARGES



MacLellan Open Pit − 2056 through 2150
Arsenic, Total (mg/L)
Copper, Total (mg/L)
Cyanide (Free), (mg/L)
Lead, Total (mg/L)
Nickel, Total (mg/L)
Radium_226
Unionized Ammonia (NH3), (mg/L)
Zinc, Total (mg/L)
Predicted Value (mg/L)
Year
MDMER Guideline
Expected
Upper



MacLellan Collection Pond − 2021 through 2035
Arsenic, Total (mg/L)
Copper, Total (mg/L)
Cyanide (Free), (mg/L)
Lead, Total (mg/L)
Nickel, Total (mg/L)
Radium_226
Unionized Ammonia (NH3), (mg/L)
Zinc, Total (mg/L)
Predicted Value (mg/L)
Year
2025
2030
2035
MDMER Guideline
Expected
Upper