TABLE OF CONTENTS

12 SUMMARY OF PROPOSED ENVIRONMENTAL AND OPERATIONAL MANAGEMENT PLANS

This section describes the components of the Environmental Management System (EMS) developed by the New Gold Inc. (Proponent) in support of the proposed Blackwater Gold Project (the Project).

Potential environmental effects and associated mitigation measures are discussed in **Section 5** (Assessment of Potential Environmental Effects) of the Application. **Section 12** (Summary of Proposed Environmental and Operational Management Plans) describes the components of the EMS and Environmental Management Plans (EMPs) that are proposed to mitigate and manage potential effects of the Project.

TABLE OF CONTENTS

List of Tables

List of Figures

12.1 Environmental Management System

This section describes the components of the Environmental Management System (EMS) developed by the Proponent in support of the Project.

Potential environmental effects and associated mitigation measures are discussed in **Section 5** (Assessment of Potential Environmental Effects) of the Application. **Section 12** (Summary of Proposed Environmental and Operational Management Plans) describes the components of the EMS and Environmental Management Plans (EMPs) that are proposed to mitigate and manage potential effects of the Project.

12.1.1 Introduction

This section of the Application describes the purpose and scope of the EMS, the proposed management structure for the proposed Project, the policies and guiding principles giving direction to the EMS, and the structural elements of the EMS. The EMS for the Project is part of the Proponent's overall corporate management system used to develop and implement its environmental policy, manage its environmental risks, and achieve its environmental performance objectives for the Project. The Project EMS consists of an interrelated set of elements, including organizational structure, planning activities, responsibilities, processes, procedures, practices, and resources.

12.1.2 Purpose and Scope

12.1.2.1 Purpose

The Project has developed an EMS to supplement the EA. This integrated management system is structured based on ISO14001 and may be developed into a certifiable EMS.

The EMS will be used to guide all activities to ensure safe, compliant, and environmentally and socially responsible operations at the Project site. The EMS identifies significant risks and ensures sufficient control of these risks through all phases of the Project.

12.1.2.2 Scope

The scope of the EMS covers all aspects of mining and processing activity:

- Mining: the design and evaluation of the ore reserve and coordinating the mining of the ore and waste. Waste will be stored on land in dumps or in the TSF; some non acid-generating waste will be used in construction of the tailings storage facility (TSF) Ore will be delivered to the stockpiles or directly to the crusher;
- Mill: crushing and processing of the ore, maintenance and deposition of tailings;
- Finance and Administration: Finance, Procurement, Warehouse, Information Technology, and Administration;
- Safety: Project site safety;
- Security: Project site security;
- Human Resources: employee recruitment and training, medical services, catering and personnel;
- Environment: monitoring, waste management, and Project site rehabilitation;
- Site Services: transmission line, freshwater supply pipeline, airstrip, and forest service roads (FSRs);
- Worker Health: workplace exposures and occupational disease; and
- Community Health: community exposures and other determinants of health and well-being.

12.1.3 Management Structure

Figure 12.1.3-1 demonstrates the proposed management structure for the Project.

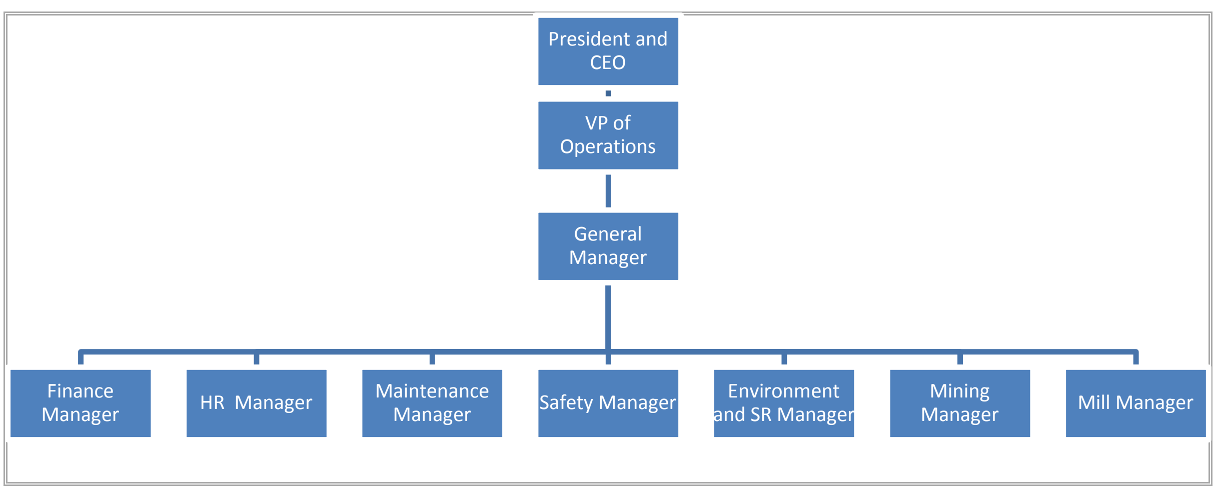


Figure 12.1.3-1: Proposed Management Structure

12.1.4 Policies and Guiding Principles

The Proponent's operations are bound by the corporate Health, Safety, Environment and Corporate Social Responsibility (HSE & CSR) Policy, and the HSE & CSR 15 Guiding Principles (Principles), which assist in developing a high level of environmental, safety, and community performance.

The Proponent's corporate HSE & CSR policy requires:

- Identifying, eliminating, or mitigating risks;
- Encouraging and supporting employees and maintaining a positive culture for health, safety, and the environment;
- Adequate preparation for emergencies or crises;
- Prepare and regularly update closure plans;
- Provide appropriate training and development;
- No tolerance for discrimination or harassment;
- Identifying Communities of Interest (COIs) and actively engaging them in an appropriate and transparent manner;
- Respecting cultures, custom, and rights of host communities; and
- Working with COIs to promote local sustainable development.

The Proponent will develop site-specific policies and procedures that will meet the requirements of corporate policies and principles.

12.1.5 EMS Structure

The Proponent has chosen an integrated management system approach because of inherent overlaps in environmental and Occupational Health and Safety (OH&S) management system elements. The EMS will be based around the Proponent's 15 Guiding Principles, Towards Sustainable Mining (TSM) standards, best practices, ISO14001 requirements, and the *Mines Act* (Government of BC, 1996) for the Occupational Health and Safety (OH&S) component. The EMS will be structured in a way that encourages continual improvement and adaptability throughout the different phases of construction, operations, and closure. The EMS would be developed before commencing construction with relevant permitting agencies, Aboriginal groups, and other stakeholders. The EMS provides a structured approach to achieving HSE standards for Project operations through a consistent system of planning, implementation, and corrective action, and continual improvement, otherwise known as a cyclical process of Plan-Do-Check-Act (PDCA), further described below:

- Planning: defining the scope of the EMS, establishing an environmental policy for the proposed Project, identifying applicable legal and other (non-regulatory) requirements, setting environmental performance objectives, and developing the EMPs;

- Implementation: resource allocation and the assignment of roles and responsibilities, environmental management training, internal and external communications, EMS documentation and records and document control, and operating controls, including emergency response activities;
- Checking and corrective action: on-going monitoring of environmental performance; inspection and evaluation of environmental management practices, including environmental compliance, and EMS audits; and
- Continual improvement: senior operational management review of the EMS and identification of improvements in environmental performance of the proposed Project.

Objectives and targets for environmental and social performance would be established and reviewed annually. Objectives are typically broader environmental goals, quantifiable where practical, whereas targets are detailed performance requirements that arise from the objectives. Where possible, the targets for environmental and social performance would be specific, measurable, achievable, realistic, and time-bound (SMART). This enables a quantitative evaluation of the effectiveness of the EMPs and the need for performance improvement.

Table 12.1.5-1 shows the elements of the EMS that fall under the Proponent's 15 Guiding Principles.

Table 12.1.5-1: Proponent's Guiding Principles and EMS Elements

Guiding Principles		EMS Elements	
1	Leadership and Accountability	1	Leadership and Accountability
2	Requirements, Commitments and Document Control	2	Legal and Other Commitments; 6 Document and Records Management
3	Risk and Change Management	3	Risk and Controls
4	Planning and Measurable Goals	4	Environmental Business Planning
5	Awareness, Competence and Behaviour	5	Training and Competence
6	Health and Hygiene	3	Risk and Controls
7	Engagement	7	Communication and Engagement
8	Business Conduct, Human Rights and Community	7	Communication and Engagement
9	Design, Construction and Commissioning	3	Risk and Controls
10	Operations and Maintenance	3	Risk and Controls
11	Suppliers and Contractors	3	Risk and Controls
12	Stewardship	8	Stewardship
13	Incident Reporting and Investigation	9	Incident, Emergency Preparedness and Response and Crisis Management
14	Crisis Management and Emergency Response Plans	9	Incident and Crisis Management
15	Monitoring, Audit, and Review	10	Monitoring, Audit, and Review

The ten elements of the EMS framework are shown on **Figure 12.1.5-1**.

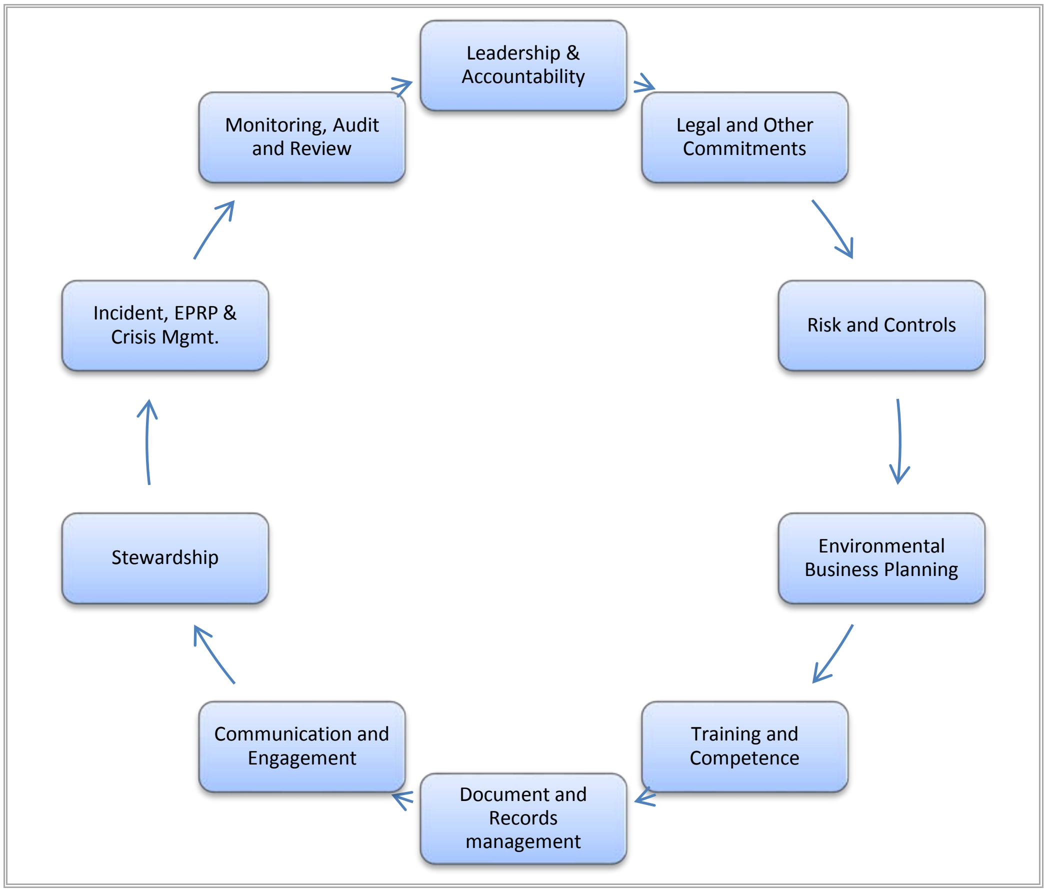


Figure 12.1.5-1: EMS Framework

12.1.5.1 Element 1: Leadership and Accountability

The intent of this element is that management and personnel understand their accountabilities and demonstrate leadership and commitment to sustainable development and a clear direction through effective environmental management.

The Proponent maintains a public HSE & CSR Policy as well as the HSE & CSR 15 Guiding Principles. These policy directives guide how the Project will be operated with respect to HSE & CSR.

The Mine General Manager will be the owner of the EMS and ensure that the corporate and site policies are well implemented. All employees and contractors will be made aware of the HSE & CSR Policy and EMS through training regular communication. All department managers will be responsible for leading by example with environmental management, performance, and continual improvement.

Environmental Leadership activities may include:

- Workplace and management environmental inspections;
- Meeting corporate targets and objectives;
- Programs to develop environmental awareness;
- Employee involvement when developing processes or procedures; and
- Opportunities for employee feedback with relation to environmental performance and the EMS.

Roles and responsibilities may include the following:

- Mine General Manager:
  - Maintain ownership and overall responsibility of the EMS;
  - Provide resources and support for the implementation of the EMS;
  - Approve all site policies and management plans; and
  - Report to VP of Operations for the Proponent.

- Department Managers:
  - Provide support and feedback to staff under their influence in order to meet EMS requirements; and
  - Participate in Management Reviews.

- Environmental and Sustainable Resources Manager:
  - Provide guidance for all managers and the Mine General Manager for requirements under the EMS;
  - Chair Environmental Management Committee meetings;
  - Coordinate legal and other compliance; and
  - Lead internal audits.

- Environmental Management Committee:
  - Develop long term strategic planning for environmental performance;
  - Identify and review significant risks;
  - Review audit results;
  - Review environmental issues and trends; and
  - Identify and review environmental best practices.

- Employees and Contractors:
  - Be aware of the HSE & CSR Policy and how it relates to their work;
  - Understand significant aspects in their work area and what to do if incidents occur; and
  - Obey regulatory and other requirements.

Policies, procedures and commitments will be added as clauses in contractor contracts as they apply to the contract. In this way, the Proponent's EMS, as discussed in this section, will be cascaded down to contractors.

12.1.5.2 Element 2: Legal and Other Commitments

The intent of this element is to ensure the Proponent identifies and controls all applicable regulatory and other requirements.

Relevant legal, regulatory, and other environmental requirements are identified, accessible, understood, and complied with. A system will be in place to identify and access all applicable environmental laws, regulations, approvals, licenses, permits, and other requirements. These will be documented through a compliance register that is reviewed and kept up-to-date by the environmental department.

The environmental department will be involved with new on-site projects and project reviews to ensure environmental requirements are considered during decision-making. Through reviewing legal and other commitments, the environmental department will be able to assess and mitigate any potential risks that may arise through all phases of the Project.

12.1.5.3 Element 3: Risk and Controls

The intent of this element is to ensure a process is developed for determination of and management of aspects and impacts. This includes establishing controls to reduce the risk to an acceptable level. Environmental Management Plans (EMPs) have been developed as administrative controls for identified significant aspects as shown in **Section 12.2.1**.

Table 12.1.5-2 and **Table 12.1.5-3** describe consequence and likelihood definitions for environment and reputation. The Proponent has established a "Risk Matrix" that is used to evaluate risks at its operations, shown on **Figure 12.1.5-2**.

Table 12.1.5-2: Consequence Definitions for Environment and Reputation Impact

E – Low	No impact on COI or reputation Limited damage to minimal area of low significance or previously disturbed areas
D – Minor	Minor impact to reputation localised to community near mine Technical divergence that may attract attention from statutory authorities Minor impact on biological or physical environment
C – Moderate	Moderate damage to reputation localised to the regional media Non-compliance with statutory requirements resulting in minor fine Minor Impact Moderate short-term effects affecting part but not affecting whole of ecosystem
B – Major	Major damage to reputation receiving provincial-wide negative media Non-compliance with statutory requirements resulting in major fine Major Impact, serious medium term environmental impact affecting whole ecosystem
A – Catastrophic	Major damage to reputation receiving national or international negative media Production to cease as a result of statutory body concerns Irreparable damage, very serious long-term impairment of ecosystems

Table 12.1.5-3: Likelihood Definitions for Environment and Reputation

5 – Rare	Conceivable but only in extreme circumstances Less than 1 event per 100 years (within the life of the Proponent)
4 – Unlikely	Has not happened yet but could 1 event per 10 to 100 years (within a single mine life)
3 – Possible	Could happen and has happened here or elsewhere 1 event per 1 to 10 years
2 – Likely	Could easily happen More than 1 event per year
1 – Almost Certain	Happens often More than 1 event per month

		CONSEQUENCE				
		A	**B**	**C**	**D**	**E**
Likelihood	**1**	1 (Ex)	2 (Ex)	6 (H)	10 (H)	15 (M)
	2	3 (Ex)	5 (Ex)	9 (H)	14 (M)	19 (M)
	3	4 (Ex)	8 (H)	13 (H)	18 (M)	22 (L)
	4	7 (H)	12 (H)	17 (M)	21 (L)	24 (L)
	5	11 (H)	16 (M)	20 (M)	23 (L)	25 (L)

Note: Ex = Extreme; H = High; L = Low; M = Medium

Figure 12.1.5-2: Risk Matrix

Severity and consequence are assessed to achieve a risk level by reading off the assigned level on the Risk Matrix (**Figure 12.1.5-2**). A corresponding rating of either “Low”, “Medium”, “High”, or “Extreme” is then assigned to the risk.

Risks that have either a “High” (yellow) or “Extreme” (red) ranking will be deemed significant. **Table 12.1.5-4** shows the breakdown of the risk matrix.

Table 12.1.5-4: Risk Matrix Breakdown

Risk Ranking	Colour	Numerical Score
Extreme (significant)	RED	1-5
High (significant)	YELLOW	6-13
Medium	BLUE	14-20
Low	GREEN	21-25

12.1.5.4 Element 4: Environmental Business Planning

Environmental improvements, objectives, and targets will be driven through annual business planning. Performance goals as well as improvements to the management system and risk controls will be set.

In setting objectives, targets, strategies, and initiatives utilizing a planned documented systematic process, the EMS will facilitate the continual improvement process. Environmental Business Plans will outline the targets and objectives along with the roles, responsibilities, accountabilities, and authorities to action these objectives. Where possible, the objectives and targets will be SMART.

The Proponent's corporate office will additionally set objectives and targets as part of the annual sustainability reporting with overall 5-year performance goals. These objectives and targets and previous year's results will be published publicly.

12.1.5.5 Element 5: Training and Competence

Training will be an essential aspect of the EMS and overall environmental management as it will ensure employees and contractors will understand their responsibilities with respect to environmental management.

General Orientation

All employees and contractors will receive a general orientation prior to commencing work on site. If employees or contractors are away from site for a set period, they will be required to repeat the orientation.

An environmental component will be included in the orientation to provide employees and contractors with the required information in the EMPs provided in **Section 12.2**. The environmental training will also include details on the New Gold's Corporate Policy (the Policy) and their responsibilities under it, major aspects in their workplace and potential consequences for non-compliances with internal and external requirements.

Job Task Requirements

A documented system will be developed that allows the easy identification for training requirements for specific jobs. This process will cover all training aspects, including those outside environmental management.

Some job positions will require additional environmental training as identified by the job task requirements. These specific training requirements will be discussed in relevant management plans (**Section 12.2**).

Drills and Exercises

The Project will carry out regular drills to ensure response in the case of emergencies will be efficient and effective. Drills with environmental risks associated, such as chemical spills, will be performed annually at a minimum. Environmental staff will work in conjunction with the emergency response team to ensure drills are beneficial and lead to improvements to the management system.

12.1.5.6 Element 6: Document and Records Management

Documents will be managed so that employees have access to the most up-to-date policies, procedures, and forms. A change management process will be established to allow operational changes to be reflected in documents, legal requirements, risk assessments, and job tasks on site.

The Proponent will maintain records for all elements associated with the EMS. These will include monitoring, inspections, and incidents and associated actions.

Documented training records will be kept for all employee training that is relevant to their job position. This system will be auditable and will ensure all employees and contractors are performing their jobs with an adequate level of training.

12.1.5.7 Element 7: Communication and Engagement

The Project will provide for key stakeholder engagement through open and transparent engagement with all levels of COIs including, Aboriginal groups, regulatory bodies, other local communities, contractors, suppliers, and employees.

Communication and COI engagement processes will be established to clearly define the responsibilities as they pertain to the communication of internal and external environmental matters and concerns. A feedback procedure will be developed to ensure COIs have an avenue for voicing any concerns or comments about the operation. The procedure will cover requirements for publishing of the feedback process, maintaining records of feedback, and response requirements from Project staff.

Annually, the Project will contribute to the Proponent’s Corporate Sustainability Report. The Global Reporting Initiative (GRI) G4 Guidelines will be used to determine what reporting requirements will be set, in an effort to ensure “sustainable reporting.”

12.1.5.8 Element 8: Stewardship

Stewardship focuses of the entire lifecycle of environmental impacts associated with resources, materials, processes, and products. Blackwater will identify and implement programs to minimize the impact of its operations on the environment and community.

The Project will implement EMPs based on those provided in **Section 12.2** and specifically designed for the Project as it will be constructed and operated. These management plans include the following:

- Mine Waste Management;
- Mine Water Management;
- Hazardous Materials Management;
- Air Quality and Emissions Management;
- Water Quality and Liquid Discharges Management;
- Industrial and Domestic Waste Management;
- Transportation and Access Management;
- Construction Management;
- Cyanide Management;
- Emergency and Spill Preparedness and Response;
- Landscape, Soils and Vegetation Management and Restoration;
- Sediment and Erosion Control;
- Aquatic Resources Management;
- Fish Habitat Compensation Plan;
- Invasive Species Management;
- Wetlands Management;
- Wildlife Management;
- Occupational Health and Safety Management;
- Recruitment, Training, and Employment Plan;
- Visual Resources Management;
- Archaeology and Heritage Resources Management; and
- Wildfire Management.

These EMPs will serve to ensure environmental, community, and safety issues are considered across all phases of Project development. New programs will be developed when required which may be based on review of risk register, change in legal requirements, corporate initiatives, or management review process.

As a member of the Mining Association of Canada (MAC), the Proponent will work to achieve an 'A' level for TSM reporting. TSM requires annual third party verification for MAC members and high levels of performance in areas including:

- Crisis management;
- Tailings management;
- Energy and greenhouse Gases;
- Biodiversity;
- Health and Safety; and
- Aboriginal and COIs.

12.1.5.9 Element 9: Incident, Emergency Preparedness and Response, and Crisis Management

The Proponent will establish continual improvement through reporting and managing all incidents to ensure protection of health, safety, and the environment. Incidents and hazards will be managed through an incident reporting procedure, which will include non-conformities, corrective and preventive actions. Incident investigation will be carried out for all incidents above a designated risk rating.

Tracking and reporting lead indicators such as management inspections, preventive actions, training hours, and hazard reporting will be required. Tracking of lead indicators enables issues to be corrected before they turn into incidents.

The Proponent's corporate office will maintain a Crisis Management Plan that is updated and relevant to the Project operations. The Crisis Management Plan will be established and tested throughout all phases of Project development and operations.

12.1.5.10 Element 10: Monitoring, Audit, and Review

The Proponent will effectively and efficiently monitor, measure, audit, assess, and review its EMS performance on a regular basis. A procedure will be developed to include roles and responsibilities, frequency of activities, and the scope of the areas covered.

Environmental monitoring, auditing, and review activities will be planned and implemented relative to the needs of the organization as well as legal and corporate requirements to ensure an accurate accounting of the adequacy, suitability, and effectiveness of the EMS.

Environmental monitoring programs are designed to provide early warning of changes in environmental media that may be of future concern. Mitigation measures that will be evaluated as part of the Environmental Risk Register can be implemented in order to minimize environmental damage.

Compliance audits will be carried out at a designated schedule in order to ensure the Project complies with all legal and other commitment or has programs in place to achieve compliance. These audits provide assurance to COIs and corporate management.

Management reviews and internal audits of the EMS will be completed on a designated schedule. Department managers will complete management reviews, with minutes and actions reported to the General Manager. Management will review results of any audits, communication, environmental objectives and targets, environmental performance, and any changes in operating circumstances.

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

List of Tables

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

List of Figures

TABLE OF CONTENTS (cont.)

List of Appendices

12.2.1 Construction and Operations Management Plan

12.2.1.1 Introduction

New Gold Inc. (the Proponent) is developing a comprehensive EMS for the Project, based on prevention, mitigation, and management of impacts identified in the EA. The EMS will guide implementation of the Proponent's environmental policy throughout the life of the Project.

The Construction and Operations Management Plan (CMP) is a key component of the EMS through which the Proponent will ensure protection of the environment and application of regulatory compliance for the duration of the construction and operations phases The CMP in not referenced in the Closure Management Plan (CLMP) because this plan will be implemented before the CLMP. At the start of the closure phase, the CLMP **Section 12.2.2** will supersede the CMP and will be based largely on the Reclamation and Closure Plan (RCP) (**Section 2.6**).

EMPs are a core component of the CMP and subsequent management plans. EMPs provide documentation for verifying Project effects identified in the EA, and for managing, monitoring, and auditing Project effects mitigation. In some cases, most of the strategy, design, and mitigation presented in the EMP sections applies to other phases of the Project, and thus will be incorporated into the CLMP accordingly. Prior to the start of construction, elements of the EMPs specifically related to construction will be extracted, reviewed, and expanded as required to develop the final CMP. EMPs will be designed to provide an integrated, systematic approach to environmental management and will help deliver assurance to interested parties regarding the phases and activities of the Project. The EMPs will be based on the principle of adaptive management, will implement best management practices, and will include appropriate environmental management practices described in the Environmental Code of Practice for Metal Mines (EC, 2009).

This ISO 14001 compliant document will be used to organize and guide all activities during the construction and operations phases of the Project to ensure orderly, safe, compliant, and environmentally and socially responsible operations at the mine site and the execution of environmental compliance requirements associated with Project work. The processes and procedures within the CMP, while based on regulatory and the Proponent's requirements and standards, have also been developed to leverage lessons learned from previous and currently active exploration activities as well as improvements in overall environmental management processes.

The Project EMS will conform to ISO 14001 requirements.

An overall Project Execution Plan (PEP) has been prepared using feasibility-level engineering information, quantities, productivities, data, cost estimates, schedules, and other assumptions developed for the Feasibility Study (FS). The PEP will be updated prior to construction. The environmental CMP will form a key part of the PEP. Overall Project objectives, organizational and execution aspects of the PEP are included in the sections below to provide context.

12.2.1.2 Planning

Planning for the CMP started with the development of the EA, which identified existing (baseline) conditions, assessed potential effects of the Project, and developed conceptual mitigation strategies and the measures through which they will be implemented. Conceptual strategies and measures will continue to evolve and will be executed throughout the construction, operations, and closure phases. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the CMP.

The CMP will be updated after the EA phase of project development to support Project permitting and subsequently again upon receipt of Project permits. The purpose of the updates is to align the plan with commitments, permit conditions and regulatory approvals. Notwithstanding conditions attached to EA approvals, this document provides guidance to future development of the CMP and is not intended as the final CMP.

12.2.1.3 Scope and Objectives

The scope of the CMP encompasses all Project construction activities, including construction of mine site facilities, off-site infrastructure, and development of the mine waste and water management systems including Erosion and Sediment Control (ESC) measures. Mine site facilities include mine site buildings, and the Project design elements (earthworks and infrastructure) through which mine site waste and water management requirements will be implemented. **Section 12.2.1.14** includes a construction schedule and sequence for construction and operations activities.

The CMP will be reviewed and updated as necessary prior to the start of construction. This is necessary because, although the scope of future construction activities is defined, the execution schedule for each activity is not defined. Moreover, the construction management (CM) team has not yet been assembled and needs to review the draft CMP. Review and update will include Project-wide contracting/mobilization arrangements.

The objectives of the CMP are to:

- Describe the processes that the Proponent will use to administer its environmental responsibilities in a manner that complies with regulatory requirements, corporate commitments and policies, contractual obligations and terms and conditions attached to permits, approvals, authorizations, and licences;
- Describe the processes that the Proponent will implement to monitor and verify Construction Contractor environmental compliance and performance;
- Set the standard by which further, more detailed activity-specific plans and procedures will be reviewed and endorsed; and
- Define the processes that the Proponent will implement to track and report environmental data.

The following overall key performance indicators (KPIs) have been established in the PEP for the construction and operations phases:

- Safety – Zero harm to all employees and workers employed on the Project;
- Environment – Meet all environmental approval and permit conditions and have no serious environmental incidents during completion of the Project;
- Aboriginal Groups and Community – Satisfy agreements with, and maintain good relations with, First Nations and local communities;
- Capital Cost – Complete within the approved capital cost estimate;
- Schedule – Complete within the approved Project Schedule; and
- Quality – Achieve a fit-for-purpose design to support ramp-up and operation of the completed facilities.

Health, Safety, and Security (HS&S) will take priority over all other Project objectives and will form an integral component of all Project planning and execution strategies.

The Proponent, in consultation with local communities, Aboriginal groups, and local, provincial, and federal government agencies, will ensure that the ongoing development and construction of the Project is in compliance with all governmental and regulatory requirements and Aboriginal groups and community agreements.

12.2.1.4 Policies

The Proponent makes it a priority to act as a responsible mining company, from management practices to health and safety standards to stewardship of the environment. The Proponent understands that business activities have an effect on the people who work in the Proponent's operations, their environment, and on their communities. The Proponent's growth and success as a company depends on the long-term economic, social, and environmental sustainability of each of the communities in which the company works and lives.

The Proponent is committed to maintaining the highest health and safety standards in company mines and development projects. The Proponent seeks to minimize and mitigate the impacts of mining on the environment, and to practice effective, progressive rehabilitation of mined areas.

To ensure that communities benefit from company activities, the Proponent makes significant contributions to local social and economic growth. As part of its existing operations the Proponent runs support and development programs ranging from infrastructure initiatives including roads and housing, to local educational facilities improvements, community medical and dental services and extensive land reclamation programs. At all times, the Proponent strives to demonstrate our respect for local cultural and environmental values. For the construction and operations phases, the Project Management Team (PMT) will develop and implement Project Policies in the year before construction activities commence and will be founded on the Proponent's corporate policies.

These Project policies will include:

- HS&S;
- Environmental Protection;
- Human Resources;
- Labour Relations;
- Fit for Duty including Alcohol and Drug Testing;
- First Nations and Community Relations; and
- Other Legislative/Regulatory Requirements.

The PMT, with input from the Engineering, Procurement, and Construction Management (EPCM) consultant, other consultants, and contractors, will develop and implement the following execution and management plans:

- HS&S;
- Environmental Management;
- Project Management;
- Project Controls;
- Document Control;
- Engineering Management;
- Procurement Management;
- Contracts Management;
- Construction Management;
- Human Resources and Labour Relations;
- Quality Assurance;
- Commissioning and Start-up;
- Operational Readiness; and
- Transportation and Logistics.

12.2.1.5 Integration of Traditional Knowledge

Traditional Knowledge/Traditional Land Use (TK/TLU) refers to the unique knowledge held by Aboriginal peoples about the local environments in which they live. TK/TLU is often difficult to define; BC EAO defines it as “a body of knowledge built up over time, mainly through oral history. It includes an understanding of plants and animals, the functioning and management of ecosystems, and may entail knowledge of uses of certain species of flora and/or fauna for food, medicines, fuel or shelter”. Although it is not required, BC EAO encourages proponents to consider TK/TLU in EA Applications. **Figure 12.2.1-1** illustrates how TK/TLU will be integrated into environmental management planning for the Project.

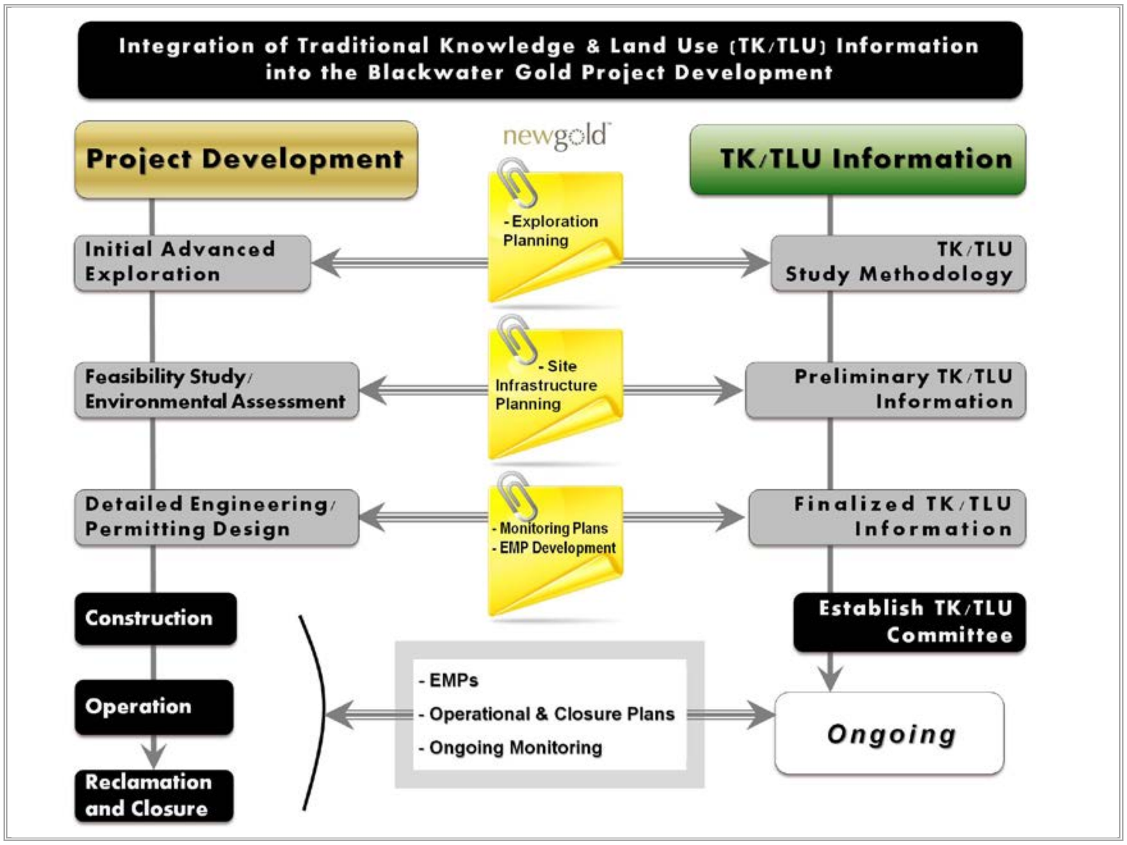


Figure 12.2.1-1: TK/TLU Integration Into the Blackwater Project

The Proponent understands the importance of collecting TK/TLU information and ensuring it is considered. Individuals and families most dependent on local resources for spiritual, cultural, and basic needs are best positioned to articulate the importance of places, areas, and activities but also to share knowledge that is grounded in learned experience. With this in mind, the Proponent has implemented the following approaches to consider TK/TLU information:

- Funding TK/TLU-related studies for Aboriginal groups and collecting associated TK/TLU information directly where possible;
- Literature reviews;
- Focus groups and one-on-one interviews with knowledge holders;
- Interviews with Aboriginal trapline holders;
- Site tours with key community representatives including knowledge holders;
- Community meetings; and
- Informal discussions.

The collection and integration of TK/TLU information into the Project design, EMPs, Project permitting and ongoing monitoring during construction, operations, and closure is considered integral to Project development by the Proponent.

While the Proponent has endeavoured to gather TK/TLU information from all potentially affected Aboriginal groups, negotiations on sharing this information are at different stages. The Proponent has provided funding to the Lhoosk'uz Dené Nation (LDN), Saik'uz First Nation (SFN), Stellat'en First Nation (StFN), Ulkatcho First Nation (UFN), and Skin Tyee Nation (STN) to complete TK/TLU studies. Information from ongoing TK/TLU studies will be integrated when completed into the Project design, execution, management plan development, Project permitting and monitoring in subsequent stages of the Project development, including the Application review phase, the permitting phase, and the Project construction, operations, closure, and post-closure phases.

The Proponent proposes to establish a TK/TLU Committee with participation of the Aboriginal groups on which territories the Project is located. The main goal of this committee will be to monitor Project development to ensure that the Proponent complies with the commitments made in regards to TK/TLU. Some of these commitments involve, but are not limited to, facilitating access to areas of the mine site and reviewing the Project design and permits to avoid or minimize effects on sensitive areas. In addition, the Proponent will implement a Country Food Monitoring Program (CFMP) to ensure that baseline levels of contaminants in country foods are understood, and that possible changes in these levels are monitored and reported over the life of the Project. Results of the CFMP will help prevent any Project-related human health risks from consumption of country foods obtained from the study area. If metal concentrations increase to levels of concern, further consultation and planning to address necessary mitigation measures will be undertaken with regulators and Aboriginal groups (**Appendix 9.2.2B**).

Consultation activities with Aboriginal groups have been another valuable source for TK/TLU. Since 2011, the Proponent has provided site tours, attended numerous meetings with leadership, held/encouraged community meetings, and participated in one-on-one meetings with key community members (e.g., Elders and knowledge holders, land users such as trappers and harvesters). These activities have helped to identify issues, rights, and interests that are of traditional and cultural importance for Aboriginal groups. The information obtained has been disseminated regularly to the scientists and researchers involved in the Application. In addition, numerous workshops have been held with key Application chapter authors to review relevant TK/TLU information (e.g., plant and wildlife species important to Aboriginal groups) as well as other comments and concerns raised by Aboriginal groups.

Secondary information on TK/TLU has also been considered (**Section 14**). Sources utilized include ethnographic studies, land and resource management plans, memoirs, and working papers. These sources have provided key TK/TLU information on traditional fishing, hunting, and plant food harvesting activities.

The Proponent treats TK/TLU information garnered through consultation activities carefully. Information that is not deemed confidential is captured in a formal information management system—the Stakeholder and Issues Information Management System (SIIMS). Confidential information was not shared publically but Project specialists reviewed and considered the information in the development of the effects assessments and mitigation and monitoring, as well as in other aspects of the Application.

This database system allows for tracking and monitoring of contact information, types of contact/meetings held, the dates and times of contact, and a detailed summary of what was discussed. Information was distributed to appropriate scientific and research teams and was carefully considered and where appropriate incorporated into baseline studies, effects assessments, and mitigation and monitoring strategies.

Section 7.2.7 includes an assessment of potential Project effects on current land and resource uses for traditional purposes, and provides information on mitigation and avoidance methods. **Section 15** and **Section 16** identify potential effects on Aboriginal rights and other interests, respectively. They also include information regarding how those potential effects may be mitigated or avoided.

12.2.1.6 Related Documents

The CMP describes how the Proponent will comply with environmental requirements associated with the Project during the construction and operations phases. However, major Construction Contractors will also have their own plans for implementation, which will describe specific procedures that adhere to the Proponent's plans and standards. The contractor's plans will be consistent with the Proponent and Project policies, EMS and EMPs. Updates to management plans will be made based on conditions associated with environmental approvals.

12.2.1.7 Project Construction Organization

As defined in the FS PEP, the Proponent will employ a PMT to manage and deliver the Project (**Figure 12.2.1-2**).

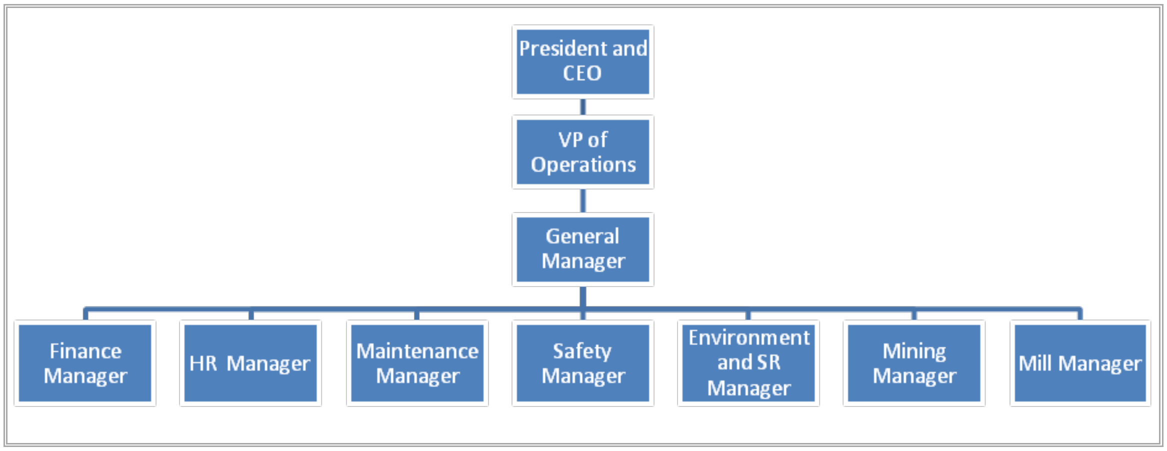


Figure 12.2.1-2: Corporate and Management Structure for the Project

The roles and responsibilities of the various groups required to ensure the successful completion of the Project include:

- New Gold Corporate – Will provide corporate approvals, funding, governance, and legal services. In addition, provides the Mine General Manager, Mill Manager, Operations, and Maintenance;
- Project Steering Committee – Will consist of the Proponent's senior management personnel, the EPCM consultant, possibly other consultants, and key contractors. The committee will ensure commitment and compliance and will provide a dispute-resolution mechanism for those disputes that cannot be handled at the Project level;
- PMT – Responsible for overall management of the Project. The team will implement and manage the Project controls and Project management systems, oversee and manage all engineering activities, procure engineered purchases and specified bulks, enter into and manage construction contracts, and CM and commissioning activities;
- PMT HS&S Management – Overall responsibility for developing and implementing the HS&S plans for the Project, reporting to the PMT Project Director;
- EPCM Consultant, Other Engineering Consultants, Contractors, Vendors, and Service Providers – Will designate an HS&S Manager or lead HS&S representative who will report to the PMT HS&S Manager in all matters;
- PMT Environmental Sustainability Team – Will ensure that all Project development and construction activities are performed in accordance with the Project environmental approvals and permits requirements;

- Fish Compensation Consultant – Will work with regulatory agencies and develop plans, engineering, and design for pond / lake stream creation and fish habitat enhancement;
- Environmental Consultant – Will work with the PMT, its consultants, and regulatory agencies to develop the final CMP for the Project;
- Tailings Storage Facility (TSF)/Water Management Consultant – Will develop an overall site water management plan and provide engineering and detail design of the TSF and its associated infrastructure, facilities, and services: tailings pipelines, return water pipelines, in-pit reclaim water systems, and temporary infrastructure, facilities, and services required during construction;
- New Gold Operations and Maintenance – Responsible for the mine preproduction development, procurement of mine and service equipment, and construction of mine haul roads, access roads, and dumps. In addition, will provide resources during engineering, construction, commissioning and start-up, and will approve purchase of operational spares;
- EPCM Consultant – Will provide engineering, detail design, procurement, CM, commissioning, start-up and hand-over of specified on-site infrastructure, coarse ore crushing and handling equipment, process plant, and temporary construction infrastructure facilities; utilities and services; freight and logistics; and pre-commissioning spares and first fills;
- Access Corridor Consultant – Will provide engineering and detail design of the required upgrades to the Kluskus Forest Service Road (FSR) and the mine access road;
- Off-Site Facilities Consultants – Will provide engineering and detail design for the freshwater supply pipeline, power line right-of-way (ROW) access roads, airstrip, and utilities and services required during construction;
- Mining Consultant – Will continue to work with operations in optimizing the mine plan;
- 230 kV Power Line Consultant – Will provide engineering and detailed design of the transmission line, including any temporary facilities and services required during its construction, details of all river crossings, and construction access road routing;
- Labour Consultant – Will work with the PMT, its EPCM consultant, and contractors to develop and implement a construction supervision and trade labour strategy for the Project;
- Vendors, Engineered Purchases – Will be contracted by the Proponent to provide engineered process equipment or major components to the Project. Purchase will generally include vendor engineering and detail design including close interaction with the PMT, the EPCM consultant, or other consultants to finalize the engineering and detail design for the Project;
- Construction Contractors – Will be contracted by the Proponent to provide construction services and materials to the Project;

- Vendors, Bulk Materials – Will be contracted by either the Proponent and/or construction contractors to provide bulk materials for the Project; and
- Service Providers – Will include camp rentals, camp catering, security, medical services, hazardous waste / garbage disposal, etc.

The PMT CM Team will provide overall management of construction and pre-commissioning activities at the Project site. In addition, the PMT CM Team will have direct responsibility for CM of the Kluskus FSR upgrade, mine access road, TSF, 230 kV power line, freshwater supply system, airstrip, fish habitat compensation works, and specified buildings at the process plant site. The team will also provide oversight and management of the EPCM consultant, who is responsible for CM of all process plant construction and related on-site infrastructure and temporary construction facilities, utilities, and services.

The PMT Construction Manager will report directly to the PMT Project Director and will interface with mining and mill operations and maintenance.

Upon receipt of the Proponent's Board Project Approval and Notice to Proceed, a small team of CM personnel will be mobilized to the Project site to manage the early works program.

The primary responsibilities of the CM Team include:

- Support the engineering team through detail design to de-risk the Project, including:
  - Provide constructability and value input during engineering and detail design and the preparation of construction work packages; and
  - Investigate means to displace construction labour hours from the Project site through modularization, prefabrication, and pre-assembly strategies;
- Participate with Labour Relations in developing the labour strategy for the Project site;
- Manage and administer all on-site construction and service contracts awarded for the Project;
- Coordinate on-site contractor, service provider, vendor, and supplier activities;
- Coordinate all construction activities with mining, operations, and maintenance;
- Keep engineering and procurement apprised of any changes to engineering and requirements for procurement deliverables;
- Manage the pre-commissioning activities with operations and maintenance;
- Provide and coordinate commissioning and start-up support to operations and maintenance;
- Implement and manage:
  - On-site HS&S program;
  - On-site Quality Assurance Program; and
  - On-site Environmental Sustainability Program;

- Provide periodic construction status reporting to other members of the PMT for inclusion in the Project reporting; and
- Manage the Project hand-over, including delivery of all documentation to operations and maintenance.

Construction of the Project will be performed by construction contractors and service providers contracted to the Proponent. Construction execution plans will be developed for each major area of the Project.

Pre-commissioning and installation activities will be completed at Mechanical Completion. Upon achievement of Mechanical Completion, the completed facility or separable portion will be turned over to operations for commissioning.

12.2.1.8 Management Review

The Proponent's senior management will carry out periodic documented reviews of the CMP with the Environmental and Sustainability Manager to ensure its continuing relevance and effectiveness and to address opportunities for improvement. Management will define the minimum requirements for conducting annual, independent management assessments of the ISO 14001-based EMS established for the Project.

Reviews will take into account changing circumstances and will include consideration of:

- Results of internal and external audits;
- Permit and other regulatory requirements and compliance records;
- Safety records;
- Environmental incident and response records;
- Continue to incorporate traditional knowledge, to help redefine plans;
- Concerns of stakeholders, including complaints;
- Company commitments to continual improvement and pollution prevention; and
- Environmental and socio-economic performance including progress towards achieving objectives and targets.

Once the review is concluded, the Environmental and Sustainability Manager will monitor progress to ensure that action items raised during the management review are promptly addressed. Areas needing improvement will be reviewed during the next internal audit.

12.2.1.9 Continuous Improvement

A mine site is a dynamic environment with changing environmental and personnel conditions. The CMP and supporting documents will be reviewed and updated on an ongoing basis to predict and if necessary manage potential changes that could affect the Project.

The Proponent's corporate staff will continue to audit performance of this CMP, and future revisions as scope changes throughout the construction period, and will make adjustments as required. Continuous improvement will also be ensured through the management review process (**Section 12.2.1.8**).

12.2.1.10 Legislative and Policy Context

The Project will be constructed and operated within a mature regulatory framework. Federal, and provincial requirements are well defined in statutes and guidelines and will be executed through permits and approvals issued to the Project.

The CMP has been developed in accordance with the policies and regulatory requirements of federal and provincial regulatory agencies and anticipated permits and approvals, as they are currently known, and with the Proponent's policies. The Proponent seeks to implement and maintain ethical business practices and meet or exceed applicable environmental and community standards and legal requirements. **Table 12.2.1-1** provides a summary of key acts and regulations related to this CMP.

A registry database of all acts, regulations, and other applicable legislative requirements (e.g., codes, permits and licenses, emission and discharge limits, permit requirements and other legal matters) affecting any aspect of Project activities will be maintained by the Environmental and Sustainability Manager. Information from the registry will then be used in the significance evaluation of environmental and social aspects. All aspects to which legal requirements are applicable are compliance issues and are therefore significant.

Table 12.2.1-1: Acts and Regulations

Provincial Acts and Regulations

Environmental Management Act [SBC 2003] Chapter 53
- 375/96: Contaminated Sites Regulation
- 63/88: Hazardous Waste Regulation
- 129/99: Municipal Sewage Regulation
- 263/90: Spill Reporting Regulation
- 250/98: Spill Cost Recovery Regulation
- 67/89: Sulphur Content of Fuel Regulation
- 320/2004: Waste Discharge Regulation

Mines Act [RSBC 1996] Chapter 293
- Health, Safety and Reclamation Code for Mines in British Columbia
- 257/88: Workplace Hazardous Materials Information System Regulation (Mines)

Motor Vehicle Act [RSBC 1996] Chapter 318
- 274/2000: Exhaust Emission Standards Regulation
- 108/99: Heavy Vehicle Diesel Emission Standards Regulation

Transport of Dangerous Goods Act [RSBC 1996] Chapter 458
- 203/85: Transport of Dangerous Goods Regulation

Heritage Conservation Act [RSBC 1996] Chapter 187

Water Act [RSBC 1996] Chapter 483
- 204/88: Water Regulation
- 299/2004: Ground Water Protection Regulation

Drinking Water Protection Act [RSBC 2001] Chapter 9

Water Protection Act [RSBC 1996] Chapter 484

Wildfire Act [SBC 2004] Chapter 31
- 38/2005: Wildfire Regulation

Wildlife Act [RSBC 1996] Chapter 488

Workers Compensation Act [RSBC 1996] Chapter 492
- 71/99: Occupational Disease Recognition Regulation
- 296/97: Occupational Health and Safety Regulation
- 713/74: Reports of Injuries Regulations

Federal Acts and Regulations

Canadian Environmental Protection Act, 1999 [SC 1999, Chapter 33]
- Benzene in Gasoline Regulations [SOR/97-493]
- Contaminated Fuel Regulations [SOR/91-486]
- Environmental Emergency Regulations [SOR/2003-307]
- Off-Road Compression-Ignition Engine Emission Regulations [SOR/2005-32]
- Off-Road Small Spark-Ignition Engine Emission Regulations [SOR/2003-355]
- On-Road Vehicle and Engine Emission Regulations [SOR/2003-2]
- Sulphur in Diesel Fuel Regulations [SOR/2002-254]
- Sulphur in Gasoline Regulations [SOR/99-236]

Explosives Act [RSC 1985, Chapter E-17]

Fisheries Act [RSC 1985, Chapter F-14]
- Metal Mining Effluent Regulations [SOR/2002-222]

Transportation of Dangerous Goods Act, 1992 [SC 1992, Chapter 34]
- Transportation of Dangerous Goods Regulations [SOR/2001-286]

Species at Risk Act [SC 2002, Chapter 29]

Canada Wildlife Act [RSC 1985, Chapter W-9]

12.2.1.11 Master Commitments Table

As permits and approvals are received, the Proponent's environmental personnel will review the attached terms and conditions of compliance requirements. These will be tracked, e.g., through a Master Commitments Table (MCT) or other tracking system as a repository for all Project compliance requirements. The MCT will be maintained by the Environmental and Sustainability Manager or designate. The table will be reviewed at an appropriate frequency based on stage of Project development to update status, incorporate new conditions, and edit or remove conditions that have changed or no longer apply.

The MCT can be filtered to display conditions that are specific to timing (i.e., Project phase), type of condition, or responsible party. **Table 12.2.1-2** provides a template for the MCT.

Table 12.2.1-2: Master Commitments Table Template

Administering Agency	Legislation	Permit Type and No.	Commitment	Status	Responsibility

12.2.1.12 Management of Change

Changes in environmental conditions, regulatory requirements, and construction personnel will be managed to ensure the continuity of the Project in a sustainable and environmentally sound manner. The steps in the management of change (MOC) process will include:

- Identify the change;
- Assess the risk associated with the change;
- Establish responsibility to manage the change; and
- Develop a plan of action.

The process used for managing changes related to environmental regulatory requirements, expectations, obligations and commitments will follow the Proponent's MOC process. This process will be implemented in consultation with the PMT, Mine Manager, Environmental and Sustainability Manager (with support from the Environmental Coordinator) and senior Proponent management. Once the CMP is approved, a decision to depart from it in any material way will first require the initiation of the MOC process and requisite documentation, followed by approval at an appropriate level of authority depending on the nature of the variance. If an MOC is approved, then the CMP will be revised, or an addendum added to reflect the agreed-upon MOC.

12.2.1.13 Document Control

The CMP and all associated documents will be controlled to ensure that appropriate responsible persons always follow all of the information and instructions laid out in the CMP. All documents will be marked "Controlled Document, not to be Reproduced," and will have a number, date of issue, and recipient to whom the document has been assigned. Distribution of uncontrolled versions of any documents will be discouraged except in exceptional circumstances. Uncontrolled documents will not be tracked or automatically updated but will be stamped with the warning that they are uncontrolled and may be out of date.

Environmental performance records issuing from implementation of the CMP will provide information on the history of performance including incidents, non-conformance, near misses (accident or environmental incident related), and compliance records. These records will provide the data for monitoring performance and for continual improvement.

Environmental performance records may be maintained on a variety of media. To facilitate management and access to the information, the CMP will be stored on a secure server with a master documents list consisting of a reference list of all environmental policies, procedures, work instructions, and forms. The master documents list will indicate the current version of each document.

12.2.1.14 Schedule and Sequence

The schedule and sequence of construction and operations for the mine site facilities, off-site infrastructure projects, and development of the waste and water management systems are described below. Mine site facilities include mine site buildings and the Project design elements (earthworks and infrastructure) for implementing mine site waste and water management objectives. Project design elements for implementing mine site waste and water management objectives are:

- Construction erosion prevention and control through minimizing disturbance and sediment control ponds at strategic locations;
- Site contact water drainage containment;
- Two-pond TSF to permanently store process plant tailings;
- Seepage control for all dams;
- Segregation and subaqueous disposal of potential acid generating (PAG) and non-acid generating (NAG3) waste rock with the tailings in the TSF; and
- Freshwater supply system, consisting of pump station on Tatelkuz Lake, pipeline and freshwater reservoir to provide instream flow needs for Davidson Creek, supplemental water for the process plant and flooding of PAG rock in the TSF as required.

Off-site infrastructure components are:

- Freshwater Supply System;
- Transmission Line;
- Mine Access Road;
- Airstrip; and
- Kluskus-Ootsa FSR Upgrade.

Limited construction will be initiated in pre-construction together with detailed design of the Project. Major construction will occur in Years -2, -1, and 1. Construction in Year 1 primarily related to TSF Site D will be conducted in parallel with mine and process plant operations. As described in the Water Quality and Liquid Discharges Management Plan (WQLDMP) (**Section 12.2.1.18.4.10**) the sequence of activities for development of wastewater management is staged to match workforce estimates, which will reach a total capacity of about 1,500 persons during the construction phase. The sequence for construction is presented below.

12.2.1.14.1 Early Construction Activities

- Kluskus-Ootsa FSR – June through July; and
- Wastewater management:
  - Expansion of existing 250-person camp to 400-person camp, with modification of the existing in-ground wastewater system.

12.2.1.14.2 Construction in Year -2

- TSF Dam C starter dam, two associated sediment control ponds (SCPs) in Davidson Creek, and east and west coffer dams;
- 1,000-person construction camp;
- 500-person operations camp, clearing and start of construction (completion Year -1);
- Process plant site clearing and SCP downslope to the south;
- Construction laydown;
- Truck shop;
- Overburden stockpile;
- Sand and gravel borrow areas (two at the mine site);
- A diversion berm will be constructed on the tributary to Creek 661 east of the open pit to divert headwaters that drain the pit area prior to pit and East Waste Rock Dump construction;
- Freshwater supply reservoir and berm, and pipeline service road;

- Off-site infrastructure:
  - Airstrip – March through August;
  - Mine access road – March through September; and
  - Transmission line – January through April Year -1;
- Wastewater management:
  - Installation of two Rotating Biological Contactor (RBC) packaged treatment plants to meet construction workforce estimates;
  - Construction of parallel aerated lagoons to provide service for 500 person operations camp when completed; and
  - Construction of Rapid Infiltration Basins (RIBs) for discharge of Class C effluent to ground.

12.2.1.14.3 Construction in Year -1

- TSF Dam C completion;
- TSF Site C West Dam augments the West coffer dam;
- Reverse flow of Davidson Creek headwater Lake 16 to Creek 705;
- Increase the level of Creek 705 headwater Lake 14;
- Reclaim barge installed in Pond C to supply process plant;
- TSF Dam D foundation construction;
- Low Grade Ore Stockpile drainage collection system and compacted till pad;
- Commence pit pre-stripping;
- West Waste Rock Dump;
- Wastewater management:
  - Start of reclaimed water reuse system; and
  - Relocation of RBCs from exploration camp to mine plant site. These will discharge Class C effluent (with disinfection) into RIB.

12.2.1.14.4 Construction in Year 1

- Complete Dam D starter dam;
- Process plant operations and tailings deposition in TSF Site C commences;
- Continue building of West Waste Rock Dump;
- Commence construction of the East Waste Rock Dump; and
- 1,000-person construction camp decommissioning (completion mid-year).

12.2.1.14.5 Construction in Year 2

- Complete initial Dam D section including downstream seepage control; and

- Environmental Control Dam (ECD) constructed.

12.2.1.14.6 Operations in Year 1 to 17

- Open pit mining (Years 1 to 13); and
- Milling of low-grade ore (Years 14 to 16-partial year).

Following completion of open pit mining, reclamation of mine areas no longer active will commence, such as waste rock dumps. Reclamation activities are detailed in the CLMP.

12.2.1.14.7 Water Management for Construction

Description of, and mitigation for water management during construction for, the mine site facilities is found in the Mine Water Management Plan (MWAMP) (**Section 12.2.1.18.4.18**) and Sediment and Erosion Control Plan (SECP) (**Section 12.2.1.18.4.1**). The Aquatic Resources Management Plan (ARMP) (**Section 12.2.1.18.4.2**), focuses on mitigation specific to fish and fish habitat during all phases of the Project. The ARMP includes a description of and mitigation during construction for the off-site infrastructure components. Development of the wastewater management system is described in **Section 12.2.1.18.4.10**.

12.2.1.15 Environmental Management Team

12.2.1.15.1 Accountability

The Proponent will ensure that standards for safety, health, and environmental management are applied during all phases of the Project. This will be achieved by implementing a rigorous management system that integrates safety, health, and community engagement with environmental management. This goal will be supported through implementation of all strategy, design, and mitigation identified in the EMPs contained in this document.

The PMT Environmental Sustainability Team (PMT EST) is accountable for the oversight and verification of environmental compliance during the execution of the work. In particular, the PMT EST will be familiar with objectives, procedures, and requirements of the EMS and permit requirements and the Environmental Assessment Certificate. The PMT EST will have authority to implement remedial actions as necessary to ensure maintenance of environmental standards and permit requirements.

12.2.1.15.2 Implementation and Operational Control

The Proponent has a management structure in place to provide the resources necessary to implement the CMP (refer to **Section 12.2.1.7** for further discussion).

The Proponent's overall corporate management structure for the Project (**Figure 12.2.1-2**) is based on existing operating sites. Corporate Vice Presidents and Directors report to the President and CEO. The Vice-President (VP) of Operations provides direction to the site General Managers for disbursement throughout the site. Senior Project staff will be appointed prior to and during construction to assist the construction team in delivering a Project that meets the Proponent's requirements.

12.2.1.15.3 Key Elements of the Proponent's Environment, Health and Safety Management System

The Project's Environment, Health, and Safety Management System will be based on the Proponent Health, Safety, Environment, and Social Responsibility 15 Guiding Principles. **Figure 12.2.1-3** shows this structure.

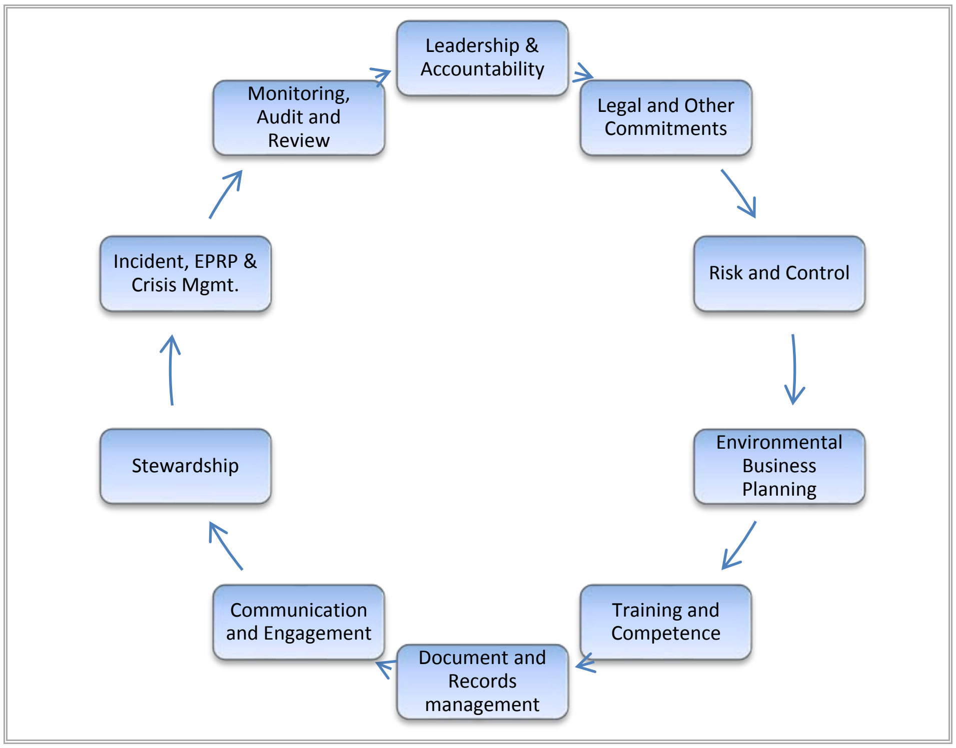


Figure 12.2.1-3: Health, Safety, Environment, and Social Responsibility Guiding Principles

12.2.1.15.4 Owner and Construction Contractor Roles and Responsibilities

A summary of the key roles and responsibilities associated with environmental management during the construction phase is provided below.

12.2.1.15.5 Construction Contractor SOPs

The Construction Contractor will develop a project specific program that includes SOPs where best management practices (BMPs) related to specific activities are not sufficient. All SOPs will be written to ensure compliance with all federal, provincial and local codes. Where conflict exists between codes or between clauses in another SOP, a formal review procedure will be established. If SOPs conflict with regulatory requirements, the SOPs will be revised to reflect the more stringent requirements.

The Proponent will review the project specific program and SOPs prepared by Construction Contractors, and ensure their adherence to the Proponent's environmental objectives prior to approving them.

12.2.1.16 Compliance Monitoring and Verification

Project environmental personnel are responsible for the oversight and verification of Construction Contractor environmental compliance. Key responsibilities and strategies for environmental compliance involve both planning and disciplined field execution. Project environmental personnel will monitor Construction Contractor compliance through several mechanisms and structures. These include:

- Ongoing field monitoring and inspections conducted by dedicated, qualified personnel such as the Environmental Coordinator and designates;
- Periodic assessments by the Environmental Coordinator and/or Environmental and Sustainability Manager of Construction Contractor work areas and contract deliverables to verify compliance and confirm corrective actions are being implemented for any areas identified for improvement;
- Monitoring and tracking of regulatory deliverables (data, reports, etc.) and environmental reporting by environmental personnel;
- Tracking leading indicators and KPIs;
- Benchmarking against comparable Projects where information is available; and
- Implementing and leading auditing and assurance programs.

Checking will be accomplished through formal and informal monitoring. Formal monitoring will follow a structured schedule and will result in periodic reporting to the Environmental and Sustainability Manager and the Environmental Coordinator, and incident logging as necessary. Informal monitoring will be accomplished through day-to-day routine vigilance for correct application of procedures and timeliness in corrective action.

Environmental Monitors are responsible for verifying that field activities are executed in compliance with the Proponent standards and guidelines and regulatory requirements. Field inspections will be conducted regularly, and will focus on newly initiated and higher risk activities using this CMP, supporting documents, and forms or checklists as verification tools. Inspections will document and photograph to support the inspection process. Inspection results will be summarized in environmental reports. The frequency of reporting will be determined based on the activity and maybe as frequent as daily. Identified deficiencies will be communicated in a timely manner so that they can be corrected promptly.

12.2.1.16.1 Construction Monitoring and Inspections

Project environmental personnel are responsible for monitoring field activities to verify that they are executed in compliance with regulatory requirements as well the site-specific project plans prepared by the Proponent and the Construction Contractors. The staffing level of construction environmental personnel will increase as the scale of construction increases. At the initiation of the construction phase, environmental personnel will likely consist of the following:

- One field-based Environmental Coordinator;
- A team of field-based Environmental Monitors; and
- Environmental specialist consultants retained as necessary, reporting to the Environmental and Sustainability Manager, or designate.

Environmental Monitors will inspect work sites and assess whether these are in compliance with applicable regulatory requirements and provisions of the CMP. An example would be an inspection of the correct implementation of ESC procedures on road alignments near watercourses. All environmental staff will have the authority to stop work, if required, to ensure environmental protection.

In addition to construction site monitoring, monitoring programs will be conducted to verify predictions in the EA and to support adaptive management practices as required (e.g., monitoring of clearings for invasive plant species). Monitoring will include but not be limited to; air quality, water quality, fish, wildlife, vegetation and wetlands. Detailed monitoring programs are found in respective EMPs in **Section 12.2.1.18.4** of this plan and in the monitoring section of the EA. Monitoring commitments are summarized in **Section 13**. The first table applies to fish, wildlife, vegetation and wetlands.

12.2.1.16.2 Site Environmental Reporting

Environmental Monitor(s) will complete reports that are kept on file and form the basis for weekly reports as well as exception reports. Monitors are assigned water quality sampling duties and may be asked to perform other technical monitoring such as quantifying noise levels. Environmental Monitor(s) are expected to not only serve as “eyes in the field” but also to undertake formal and informal training of Project staff to ensure that Project personnel are aware of and comply with regulatory and environmental requirements.

12.2.1.16.3 Site Environmental Interfaces

The Environmental Coordinator communicates with the PMT and Mine Manager and has a direct reporting relationship to the Environmental and Sustainability Manager. These individuals will interact on a daily basis. The Environmental Coordinator will also regularly interact with Construction Contractor personnel, primarily the PMT and their Environmental Monitor(s).

Two communication links at site are particularly critical to ensure effective CMP implementation. The first is the interface between the Environmental Coordinator, the Mine Manager and PMT.

Through formal and informal meetings and updates, the Environmental Coordinator, supported by the Environmental Monitor, will apprise the Mine Manager and PMT of any regulatory or environmental issues or concerns associated with work underway or planned. The PMT will then ensure that the construction personnel are taking appropriate steps to comply with the approvals and CMP. Conversely, through discussions with the Site PMT, the Environmental Coordinator will be informed of planned work and any practical construction issues that may impact environmental performance.

The second key link is the communication between Construction Contractor personnel and site environmental personnel. These employees, primarily Environmental Monitor(s), will meet with the relevant Construction Contractor representatives to review outstanding issues and discuss any new or near-term items. Minutes will be taken and action items noted and followed up in subsequent meetings.

Site kick-off meetings and readiness reviews, including pre-job risk assessments, will be held prior to the initiation of work. The meetings will include a review of regulatory and environmental requirements and commitments. The Environmental Coordinator, Environmental Monitor(s), applicable Construction Contractor personnel and Project Management representatives will attend these sessions as appropriate. Any issues or discrepancies between the planned work and the environmental requirements are to be discussed and resolved prior to the start of work.

Environmental Monitor(s) may be asked to provide environmental input to the Construction Contractor superintendents, and to help them develop and implement work processes where environmental issues or concerns associated with a planned activity are evaluated, and necessary mitigation measures are developed and approved. This may take the form of attendance at a pre-activity Job Safety Assessment (JSA), or other process prearranged by the Project and the Construction Contractor. Documentation of any JSA, or equivalent process, will be made available by the Construction Contractors to the Proponent for evaluation upon request.

Other communications include the following:

- The Environmental Coordinator and/or Environmental and Sustainability Manager will host a teleconferences; which will include site environmental personnel and other Project and Construction Contractor representatives, as needed;
- The Environmental Coordinator and Environmental Monitor will participate in routine site construction progress meetings and report on incidents and other matters of significance from the previous week;
- The Environmental Coordinator interacts on a daily basis with site CM to ensure that environmental and regulatory issues are understood and effective systems and approaches are in place to address them; and
- The Environmental Coordinator is also consulted frequently when Construction Contractor staff encounters specific environmental issues during planning or field operations.

12.2.1.16.4 Specialty Monitoring

The Proponent will retain specialist consultants to provide supportive environmental services (e.g., monitoring or conducting investigations), where necessary to supplement the disciplinary expertise or experience of the Project environmental personnel. Specialist consultants may provide services in the following areas: fisheries and aquatics, water quality, wildlife, vegetation, archaeology, cultural heritage, and ARD/ML. The Proponent will incorporate results of specialist consultants' work into its environmental planning and report results to regulatory agencies as appropriate.

12.2.1.16.4.1 Inspection and Verification Tools

The Proponent's environmental personnel will produce field inspection forms and checklists to guide environmental field monitoring activities. These documents will be populated according to the conditions of the required activity and will continue to be generated to facilitate inspections of high priority environmental activities.

12.2.1.16.4.2 Potential or Actual Non-Compliance Findings

If a potential or actual non-compliance event is discovered during monitoring or inspection, the Environmental Coordinator will address the issue (verbally) with the Construction Contractor representatives and corrective action will be determined. If the issue is either recurring or significant, the Environmental Coordinator or designate will deliver written notification to the Site PMT and a copy of the notification to the Environmental and Sustainability Manager. All items will be recorded in daily site environmental logs and used as a lagging indicator of environmental performance.

The Environmental Coordinator will also ensure that the non-compliance is reported in accordance with Project and Proponent procedures, and that appropriate and timely investigation and follow up activities are executed. The Environmental Coordinator may also participate in spill incident investigations and the development, execution and close-out of follow up actions.

12.2.1.16.4.3 Spill Reporting

The Construction Contractor employees using the spill notification procedure described in the ESPRP will communicate all spill and environmental incidents verbally.

12.2.1.16.4.4 Regulatory Excursions

The Construction Contractor will immediately notify the Proponent of any verbal/written communication received from governmental agencies regarding violations of regulatory requirements and provide the Proponent with copies of all written communications from governmental agencies related to the project. The Construction Contractor will report to the Proponent all permit and regulatory excursions/incidents, even if only administrative in nature. These include:

- Excursions related to permits, notifications, authorizations, approvals, licenses, agreements or any other approval issued by a regulating authority, or any controlling body. Violations of any applicable local, provincial, national, or international law or regulation regardless of whether or not it is cited in a permit;
- Violations of legally binding variances, compliance/exemption orders; and
- Any fines.

12.2.1.16.4.4.1 Internal/External Audits

CMP performance will be confirmed through conducting periodic audits. Regular internal audits will be conducted annually; additional audits may be conducted upon request by the Proponent senior management, particularly following any significant actual or potential environmental or safety incident. In addition to conformance, internal audits also function to assess the effectiveness of the CMP and identify opportunities for improvements.

Third parties at the request of the Environmental and Sustainability Manager will conduct external audits. The purpose of these audits is to give senior management an independent assessment of the effectiveness of the internal system, and a report card on compliance with legal requirements, corporate policies and operating procedures and controls at the Project.

Government regulators or other third parties with regulatory responsibilities for Project operations may, at their discretion, also conduct external audits.

12.2.1.16.4.4.2 Key Performance Indicators

Project KPIs will be developed prior to the start of construction. The Proponent will commit environmental personnel to track and analyze leading and lagging KPIs throughout the duration of the Project as a means of measuring and communicating environmental performance to internal and external stakeholders. The Proponent's environmental personnel together with the PMT and Mine Manager will determine appropriate KPIs for each phase of construction. Examples of KPIs that the Proponent may use are provided below:

- Leading KPIs:
  - Number of JSAs per 50,000 labour hours;
  - Environmental field reporting/near miss cards;
  - Work plans reviewed and comments provided to construction contractor; and
  - Number of completed daily environmental monitoring forms/checklists received;
- Lagging KPIs:
  - Regulatory excursions;
  - Spills (L) per 50,000 labour hours;
  - Number of environmental incidents per 50,000 labour hours; and
  - Monitoring results compared to permit conditions.

12.2.1.17 Environmental Data Collection and Reporting

Environmental records will document environmental performance history, which may include incidents, non-conformance, near misses (accident or environmental incident-related) and compliance records. These records will provide the data for monitoring performance and for continual improvement.

Environmental metrics are required for both proponent and regulatory agency tracking and reporting. Environmental personnel will report environmental metrics to the Environmental Coordinator, and the Environmental Coordinator will compile and distribute results via a weekly environmental report to the Environmental and Sustainability Manager. The report will include a mechanism to document ongoing issues, e.g. incident tracking log to be discussed regularly with the Environmental and Sustainability Manager.

Examples of reports, records, and statistics to be collected and held by the Proponent are:

- Inspection reports and records of corrective actions taken;
- Incident investigation reports and corrective actions;
- Records of meetings and crew meetings;
- Supervisors' notes and logs of safety contacts;
- Records showing use of progressive discipline to enforce safety rules and written safe procedures;
- First aid records, medical certificates, and hearing tests;
- Forms and checklists showing requirements for safe work procedures;
- Records of spill response drills and any resulting improvement;
- Sampling and monitoring records for work around harmful substances; and
- Records of supervisor and worker orientations and training.

The Environmental and Sustainability Manager will apprise the Environmental Coordinator of any new conditions with respect to permits, regulatory notifications, authorizations, approvals, and agreement clauses issued by a regulatory authority or any controlling body.

12.2.1.17.1 Environmental Incident Reporting

An environmental incident is a symptom of non-conformance events. It is not a breach of any specific requirement in the CMP, but rather represents deviation from principles in the CMP and/or proponent policies. Examples of environmental incidents are on-site spills, wildlife strikes, and clearing excursions.

Reporting procedures for spills are found in the ESPRP, and reporting procedures for wildlife incidents are found in the TAMP. However, environmental incidents can be complex and involve more than one Valued Component (VC). A clearing excursion, for example, could represent deviation from any of several EMPs (e.g., Archaeology and Heritage Resources Management, Visual Resources Management, Aquatic Resources Management could all be affected through improper site clearing procedures described in the CMP).

A tracking log will be used to record environmental incidents. The log will support the process for tracking, communication and investigation so that the cause and effect is determined, appropriate corrective action taken and the incident is closed off.

The primary incident reporting responsibilities of site environmental personnel will include:

- Verifying that incidents are reported in a timely manner, using the correct procedures and tools;
- Reviewing Construction Contractor incident reports for completeness and accuracy;
- Providing comments and guidance, as necessary, to Construction Contractors concerning any information missing from reports; and
- Completing the environmental incident tracking log for tracking and closure.

The PMT, in consultation with the Environmental Coordinator, will disseminate the findings of incident investigations to others in the Project.

12.2.1.17.2 Environmental Communications

The Proponent will communicate openly and in a timely manner with stakeholders and government agencies regarding its health, safety, environmental and sustainability performance. The Proponent will employ a process of public consultation through the established Public Liaison Committee to communicate its performance in these areas and incorporate feedback into improving its management systems. The Proponent envisions the following as part of its environmental communication process:

- Official reporting of environmental incidents to government agencies will be facilitated by the Environmental and Sustainability Manager on behalf of the Mine Manager;
- The Proponent and Construction Contractor personnel will interact in a respectful and professional manner with local or regional governments regarding an environmental incident;
- The Proponent mine environmental staff will be available to escort regulatory agency staff through the portions of the site they wish to inspect;
- If the Project personnel receive an environmental concern from the public, they will provide the details of the concern to the Environmental Coordinator or Environmental and Sustainability Manager. Details of any substantive concern will be documented and immediately reported to the Environmental and Sustainability Manager;
- Sustainability reporting as part of voluntary initiatives e.g., Global Reporting Initiative (GRI) or Toward Sustainable Mining (TSM); and

- Use of TK and interactive reporting with Aboriginal groups is discussed in **Section 12.2.1.5**.

12.2.1.17.3 Data Management, Recordkeeping and Retention, Quality Assurance/Quality Control

The Proponent will maintain copies of relevant environmental records, including incident reports. The Environmental Coordinator will keep these records on site and an electronic copy will be accessible to the company management team offsite. Construction Contractors will also retain their own environmental records in a secure location. The Proponent will have access to Construction Contractor environmental records.

Records are to be kept electronically (using a scanner if necessary) The Environmental and Sustainability Manager will retain these records for audit purposes and to track trends in environmental performance. Records will be archived in an organized manner for the duration of the Project using a secure document management system consistent with that used by Project management. A Quality Assurance/Quality Control (QA/QC) process will be in place to ensure high quality data are maintained. In cases where legislation, licences or approvals dictate, retention requirements may be adapted. Records will be stored in an area which:

- Is accessible to designated personnel only;
- Is protected from the elements; and
- Is not at significant risk of fire.

As a back-up, duplicate copies of key environmental records shall be stored in an area separate from the main storage location. The Environmental and Sustainability Manager or designate will periodically check the quality of environmental records completed by Construction Contractors. The Environmental and Sustainability Manager as required shall address any quality issues.

12.2.1.17.4 Training and Awareness

The Proponent and/or the Construction Contractor will deliver project training and awareness to all personnel on their arrival to the Project, and prior to start of work. Most EMP sections within the CMP contain their own training and awareness components that will need to be delivered as applicable (e.g., archaeology chance finds procedure). Environmental and social content of training and awareness includes, but is not limited to:

- Proponent's environmental policy;
- Emergencies: medical, fire, spill prevention, response and reporting;
- Construction camp rules;
- Water quality protection;
- Wildlife protection, avoidance and reporting;
- Housekeeping at all work areas and waste storage areas;

- Environmental sensitivities and restricted activity periods;
- Restricted activities (e.g., recreation rules);
- Prohibited activities such as hunting and fishing;
- Environmental incident and near miss reporting;
- Storage of domestic waste;
- Disposition of hazardous wastes (e.g., used lube oil);
- Construction Contractors' training and qualification of individuals with specific waste management responsibilities (e.g., transportation);
- Cultural sensitivity; and
- Workplace behaviour policies and standards (e.g., harassment).

Additional environmental training will be provided depending on the requirements of an individual's specific assignment and the work to be performed, as will be indicated in EMP sections within the CMP. Environmental topics will be discussed in the daily health, safety and environment meetings, tailgate meetings, kick-off meetings and during work plan development.

12.2.1.18 Environmental Management Plans Structure

The EMP structure for the construction, operations, closure, and post-closure phases is described below; specifics on management plans for closure and post-closure are detailed in the CLMP. EMPs have been developed in conjunction with environmental risk management and activity restrictions. EMP monitoring commitments are consolidated in **Section 13**.

12.2.1.18.1 Valued Components

VCs are defined as any part of the environment (natural or human) that is considered important by the Proponent, Aboriginal groups, public, scientists, and governments involved in the assessment process. Importance may be determined based on values as identified by Aboriginal groups' interests, scientific literature, and regulatory standards or requirements, biodiversity, and sensitivity to project effects. VCs include valued environmental components, valued economic components, valued social components, valued heritage components, and valued health components. VCs are key indicators of issues surrounding development. VCs identified for the EA are listed in **Table 12.2.1-3**.

Table 12.2.1-3: Selected Valued Components and Indicators and/or Factor by Assessment Pillar

Pillar	Valued Components	Indicators and/or Factors for Assessment
Environmental	Noise and Vibration	• Overall sound levels
	Climate Change	• Greenhouse gas emissions
	Air Quality	• Measured parameters (e.g., particulate matter and combustion gases)
	Surface Water Flow	• Water flow • Lake level
	Surface Water Quality	• Measured parameters (e.g., pH and heavy metals) • Acid Rock Drainage/Metal Leaching (ARD/ML) • Geochemistry
	Sediment Quality	• Measured parameters (e.g., pH and heavy metals) • Acid Rock Drainage/Metal Leaching (ARD/ML) • Geochemistry
	Groundwater Quantity	• Groundwater level • Groundwater flow
	Groundwater Quality	• Measured parameters (e.g., pH and heavy metals) • ARD/ML • Geochemistry
	Wetlands	• Hydrological function • Biochemical function • Ecological function • Habitat function
	Fish Habitat	• Surface water flow • Surface water and sediment quality • Ecological health • Riparian habitat
	Fish	• Rainbow trout • Kokanee
Environmental	Physiography and Topography	• Terrain stability
	Surficial Geology and Soil Cover	• Soil availability and depth
	Soil Quality	• Reclamation suitability
	Ecosystem Composition	• Ecosystem distribution • Riparian • Old growth • Sparsely vegetated ecosystems • Traditional use plants
	Plant Species and Ecosystems at Risk	• *SARA* listed whitebark pine • Ecosystems at risk
	Amphibians	• Western toad • Western toad habitat

Pillar	Valued Components	Indicators and/or Factors for Assessment
	Water Birds	• Ring-necked duck • Ring-necked duck habitat • Yellow rail • Yellow rail habitat
	Forest and Grassland Birds	• Olive-sided flycatcher (songbird) • Olive-sided flycatcher habitat • Clark's nutcracker (songbird) • Clark's nutcracker habitat • Red-tailed hawk (raptor) • Red-tailed hawk habitat
	Moose	• Moose • Moose habitat
	Caribou	• Caribou • Caribou habitat
	Grizzly Bear	• Grizzly bear • Grizzly bear habitat
	Furbearers	• Marten • Marten habitat • Beaver • Beaver habitat
	Bats	• Little brown myotis • Little brown myotis habitat
Environmental	Invertebrates	• Jutta arctic (butterfly) • Jutta arctic habitat • American emerald (dragonfly) • American emerald habitat
Economic	Provincial Economy	• Provincial economy activity (gross domestic product) • Provincial employment and labour income • Provincial government revenues
	Regional and Local Employment and Businesses	• Direct employment of local and regional residents • Contract and business opportunities (Project purchasing from local contractors and businesses) • Changes in regional unemployment • Local and regional labour income and costs • Training and education
	Regional and Local Government Finance	• Municipal tax revenues • Costs to regional and local governments
Social	Demographics	• Population

Pillar	Valued Components	Indicators and/or Factors for Assessment
	Regional and Community Infrastructure	• Regional and municipal infrastructure (freshwater supply, water/sewage treatment, landfills, communications, electricity, and recreational facilities) • Community housing and temporary accommodation • Regional transportation (road, rail, air)
	Regional and Local Services	• Regional and local services and conditions (educational, health, social, and protective services)
	Family and Community Well-being	• Economic hardship • Crime (including drug and alcohol abuse) • Family relationships
Social	Non-traditional Land and Resource Use	• Protected areas and parks • Recreation/tourism use (e.g., all-terrain vehicle use) • Mining, exploration, and mineral tenures • Forestry and timber resource use • Hunting/trapping/guide outfitting • Fishing and aquaculture • Agriculture and grazing • Range use • Land ownership and tenures • Recreational and commercial use of waterways • Groundwater resource use • Surface water resource use
	Current Land use for Traditional Purposes	• Hunting and trapping • Fishing • Plant gathering • Other cultural and traditional uses of the land (e.g., cultural and spiritual places, trails, navigation)
	Visual Resources	• Visual record • Demonstrated aesthetic value
	Archaeological Sites	• Landmarks • Buildings • Religious features • Human remains • Culturally modified trees • Subsistence features
Heritage	Historic heritage Sites	• Landmarks • Buildings • Religious features • Human remains • Culturally modified trees • Subsistence features
	Paleontological Resources	• Fossil sites

Pillar	Valued Components	Indicators and/or Factors for Assessment
Health	Environmental Exposures	• Noise and vibration • Air quality • Surface water and sediment quality • Groundwater quality • Fish • Soil quality • Contamination of country foods
	Workers Health and Safety	• Occupational exposures • Safety in the workplace • Noise when workers are at rest (construction and operations)

12.2.1.18.2 Environmental Risk Management

The Proponent acknowledges the management of risks and preparation for unexpected events (accidents and malfunctions) are integral to the effective governance of the organization. The Proponent's corporate Health, Safety, Environment and corporate Social Responsibility Committee is responsible for ensuring that principal areas of health, safety, environmental, and community risk and impacts are identified and that sufficient resources are allocated to ensure that environmental and social impacts are moderated for the entire company.

In addition to EMPs, the Accidents and Malfunctions section (**Section 10**) forms part of the EMS. Accidents and Malfunctions addresses specific potential events that could have a significant environmental effect and that have a reasonable probability of occurring during the life of the Project. It describes the measures the Project will implement in order to minimize the risk to employees, adjacent communities, and the environment from accidents and malfunctions during the construction, operations, closure, and post-closure phases of the Project. The potential events (accidents and malfunctions) are described under the categories Structural Failures, Accidents, and Other Malfunctions, and methods by which they will be managed are described under Design and Operations Safeguards, and Contingency and Emergency Response Procedures. The Project will adopt a proactive and systematic Risk Management process whereby all material Project decisions are based on judgements realized through a structured and documented analysis process that manages, mitigates, or transfers the risk exposure in accordance with the Project management and governance processes. A risk registry will be established prior to the start of construction based in part on the Accidents and Malfunctions document. Other risks identified through the permitting and detailed design will be added to the registry.

12.2.1.18.3 Restricted Activity Periods

Restricted work periods will be followed to ensure the protection of fish and wildlife. These restrictions will be incorporated into all work planning. **Table 12.2.1-25** presents the restricted activity periods identified for the Project.

12.2.1.18.4 Environmental Management Plans Application to Mine Phases

As mentioned previously, EMPs provide documentation for verifying Project effects identified in the EA, and for managing, monitoring and auditing Project effects mitigation. A variety of mitigation measures will be implemented during the construction and operations phases to ensure effective environmental management of all Project components. Mitigation consolidates proven guidelines (e.g., BMPs.) with Project design elements, and with mitigation identified in the effects assessment sections of the Application.

EMPs are also provided for activities related to construction (e.g., transportation and access, emergency and spill preparedness and response), social procedures (e.g., occupational health and safety, recruitment, training and employment), and for VCs (e.g., wildlife, wetlands). EMPs may be interlinked due to shared management concern (e.g., ESC has its own EMP but is also described in other EMPs). Linkage, if applicable, is described in individual EMPs.

EMP mitigation measures will be incorporated as applicable into SOPs, work planning, and execution activities. Required environmental contents of construction work plans include:

- A list of the environmental permits, approvals, licences and authorizations required to execute and support the work;
- A general summary of the terms and conditions attached to the above;
- References to applicable sections of supporting plans; and
- Specific elaboration, if required by permit conditions, on general mitigation principles referenced in the EMP.

These sections will continue to be developed and used for the following purposes:

- Identify safety, health and environment concerns and develop appropriate protection measures for such concerns;
- List all required permits, approval and authorization terms and conditions;
- Provide concise and clear written instructions for procedures that protect the environment; and
- Provide a reference for personnel when planning and/or conducting specific activities.

Project EMPs include:

- Sediment and Erosion Control Plan (SECP) (**Section 12.2.1.18.4.1**);
- Aquatic Resources Management Plan (ARMP) (**Section 12.2.1.18.4.2**);
- Wetlands Management Plan (WMP) (**Section 12.2.1.18.4.3**);
- Landscape, Soils and Vegetation Management and Restoration Plan (LSVMRP) (**Section 12.2.1.18.4.4**);

- Invasive Species Management Plan (ISMP) (**Section 12.2.1.18.4.5**);
- Wildlife Management Plan (WLMP) (**Section 12.2.1.18.4.6**);
- Archaeology and Heritage Resources Management Plan (AHRMP) (**Section 12.2.1.18.4.7**);
- Visual Resources Management Plan (VRMP) (**Section 12.2.1.18.4.8**);
- Air Quality and Emissions Management Plan (AQEMP) (**Section 12.2.1.18.4.9**);
- Water Quality and Liquid Discharges Management Plan (WQLDMP) (**Section 12.2.1.18.4.10**);
- Industrial and Domestic Waste Management Plan (IDWMP) (**Section 12.2.1.18.4.11**);
- Hazardous Material Management Plan (HMMP) (**Section 12.2.1.18.4.12**);
- Emergency and Spill Preparedness and Response Plan (ESPRP) (**Section 12.2.1.18.4.13**);
- Transportation and Access Management Plan (TAMP) (**Section 12.2.1.18.4.14**);
- Occupational Health and Safety Management Plan (OHSMP) (**Section 12.2.1.18.4.15**);
- Recruitment, Training and Employment Plan (RTEMP) (**Section 12.2.1.18.4.16**);
- Mine Waste Management Plan (MWMP) (**Section 12.2.1.18.4.17**);
- Mine Water Management Plan (MWAMP) (**Section 12.2.1.18.4.18**);
- Cyanide Management Plan (CYMP) (**Section 12.2.1.18.4.19**);
- Wildfire Management Plan (**Section 12.2.1.18.4.20**);
- Fish Salvage Plan (**Section 12.2.1.18.4.21**); and
- Reclamation and Closure Plan (RCP) (**Section 2.6**).

Table 12.2.1-4 shows parts of most of these EMP's that apply to the construction and operations phases. Primary application is shown by a dark brown box and secondary by a light brown box.

Table 12.2.1-4: Application of Environmental Management Plans to Mine Phases

Environmental Management Plans	Primary and Secondary Application of EMP			
	Construction	**Operations**	**Closure**	**Post-Closure**
Sediment and Erosion Control Plan (**Section 12.2.1.18.4.1**)				
Aquatic Resources Management Plan (**Section 12.2.1.18.4.2**)				
Wetlands Management Plan (**Section 12.2.1.18.4.3**)				
Landscape, Soils, and Vegetation Management and Restoration Plan (**Section 12.2.1.18.4.4**)				
Invasive Species Management Plan (**Section 12.2.1.18.4.5**)				
Wildlife Management Plan (**Section 12.2.1.18.4.6**)				
Archaeology and Heritage Resources Management Plan (**Section 12.2.1.18.4.7**)				
Visual Resources Management Plan (**Section 12.2.1.18.4.8**)				
Air Quality and Emissions Management Plan (**Section 12.2.1.18.4.9**)				
Water Quality and Liquid Discharges Management Plan (**Section 12.2.1.18.4.10**)				
Industrial and Domestic Waste Management Plan (**Section 12.2.1.18.4.11**)				
Hazardous Materials Management Plan (**Section 12.2.1.18.4.12**)				
Emergency and Spill Preparedness and Response Plan (**Section 12.2.1.18.4.13**)				
Transportation and Access Management Plan (**Section 12.2.1.18.4.14**)				
Occupational Health and Safety Management Plan (**Section 12.2.1.18.4.15**)				
Recruitment, Training, and Employment (**Section 12.2.1.18.4.16**)				
Mine Waste Management Plant (**Section 12.2.1.18.4.17**)				
Mine Water Management Plan (**Section 12.2.1.18.4.18**)				
Cyanide Management Plan (**Section 12.2.1.18.4.19**)				
Reclamation and Closure Plan (Project Description **Section 2.6**, **Appendix 2.2A**)				

The EMPs are presented in **Section 12.2.1.18.4** beginning with those with primary application to construction followed by the MWAMP, MWMP, and CYMP. The construction related plans also include management aspects applicable to operations, closure, and post-closure phases. As mentioned previously the RCP is in **Section 2.6** of the EA.

12.2.1.18.4.1 Sediment and Erosion Control Plan

12.2.1.18.4.1.1 Introduction

ESC management is designed to minimize and mitigate the potential for accelerated erosion, sedimentation, and loss of salvaged materials throughout all phases of the Project.

The SECP will be implemented during the construction and operations phases in conjunction with the MWAMP and the RCP (**Section 2.6**). The MWAMP describes the primary ESC strategy of surface water containment through Project design. The Project is designed to operate with no surface water discharge throughout its operating life and for approximately 18 years into closure. The RCP describes a multi-year program of progressive reclamation measures that will significantly contribute to erosion control throughout the Project footprint.

Additional discussion of the facilities that will be constructed to control sediment and erosion can be found in the Project Description, **Section 2.2.3.5.2**, particularly with respect to sediment control ponds and coffer dams, which will be key structures to mitigate against sediment release to receiving waterbodies during the construction phase.

12.2.1.18.4.1.2 Regulatory Requirements

The *Mines Act* (Government of BC, 1996c) requires the development of an SECP as part of the mine design. A standard requirement of environmental assessments is the presentation of a broad SECP to indicate how the general practices of erosion control will be integrated into the Project.

Erosion and sediment mitigation and SOPs developed for specific activities will be incorporated into the detailed engineering Project design, for each major physical component of the Project. This approach will apply the general principles presented here to Project specific design considerations. SOPs will be reviewed annually and updated as required.

12.2.1.18.4.1.3 Permitting

Mines Act and *Environmental Management Act (EMA)* will principally regulate ESC permits for the Project.

12.2.1.18.4.1.4 Objectives

The objectives for ESC are taken from the principles described in the MWAMP for maintaining the year-round water balance for the Project. ESC objectives include:

- Prevention of uncontrolled runoff during construction to minimize suspended sediment export to surface waterbodies;
- Protection of the operations from flooding, erosion, interference from groundwater, precipitation, and runoff; and
- Control, collection, and treatment of water that comes into contact with the Project's facilities in an environmentally sound manner.

12.2.1.18.4.1.5 Planning and Implementation

The implementation of erosion control measures (e.g., proper ditching, reducing slopes, and placement of soil salvage piles) is considered more effective than sediment control measures. While erosion control measures also control sedimentation, the opposite is rarely true since sedimentation is not a major cause of erosion. As such, Project components will be designed with erosion control as the primary focus.

ESC strategies will include establishing diversion and runoff collection ditches, constructing SCPs, and stabilizing disturbed land surfaces to minimize erosion. Where possible sediment control ponds will discharge to ground (e.g., permeable surficial glaciofluvial deposits) rather than to receiving waters. Of the 7 SCPs to be built during construction only three will discharge directly to receiving waters. All surface drainage during operations and early closure until the pit lake fills will be directed to the TSF. ESC monitoring and adaptive mitigation will be conducted during all Project phases to ensure the effectiveness and functionality of ESC measures.

Activities with the potential to require ongoing erosion control include vegetation clearing, topsoil and overburden stripping, stockpiling and storage of topsoil and overburden, constructing and operating site access roads and long-term infrastructure. Potential hazards from these activities, in the absence of planned mitigation measures, include increased surface erosion at disturbed areas and increased sediment load to downstream receiving environments.

Erosion and sediment mobilization and will be managed throughout the site by:

- Minimizing surface disturbance to the extent practicable;
- Installing sediment controls prior to and maintaining during construction activities;
- Constructing surface drainage controls to intercept surface runoff and to reduce water velocity across the ground, particularly on exposed surfaces and in areas where water concentrates;
- Protecting natural drainages and watercourses by constructing appropriate on-site sediment control devices (such as collection and diversion ditches, sediment traps, and sediment ponds) prior to any off-site water release;
- Progressive reclamation of disturbed areas, following measures described in the RCP, including:
    - Constructing drainage controls for improving stability of reclaimed area;
    - Ripping to promote infiltration throughout reclaimed area; and
    - Restricting access to reclaimed area.

Installation of temporary ESC structures and implementation of SECP practices is the first step in controlling erosion and sediment during construction. All temporary ESC measures will require regular and ongoing maintenance and will be reclaimed after achieving soil and sediment stabilization. Temporary ESC measures will be replaced with permanent features where pervasive erosion issues are identified.

12.2.1.18.4.1.5.1 Environmental Commitments

Table 12.2.1-5 presents the Proponent's commitments to control and mitigate all erosion and sediment mobilization related to the Project.

Table 12.2.1-5: Proponent Erosion and Sediment Control Commitments

Control Commitment	Phase
Construction of sediment control facilities prior to surface disturbance	All phases; particularly during the construction and operations phases
Continuous implementation of ESC measures	All phases will include regular maintenance of erosion control infrastructure
Development of SOPs for mitigating the typical erosion related conditions	Detailed Project design
Monitoring of erosion control success and implementation of adaptive management techniques	All phases

Note: ESC = Erosion and Sediment Control; SOP = standard operating procedure

12.2.1.18.4.1.5.2 Construction Phase Mitigation

During the construction phase, the potential for erosion is considered high given the level of new disturbance and the presence of construction equipment. For all construction sites, both permanent and temporary ESC measures will be established prior to site disturbance as found in the Construction Sediment and Erosion Control Plan prepared by Knight Piésold Ltd. (**Appendix 2.2A-5**). In situations where site preparation would disturb ESC measures, the measures will be removed and re-established immediately following site preparation. Where erosion is considered a risk during construction activities, established measures will be monitored and improved as necessary, so that no adverse effects are left unmitigated. Throughout the construction phase of the Project, ESC activities will include:

- Development of surface water diversion ditches;
- Directing temporary point discharge (i.e., discharge pumped from construction site sump) into vegetated area, away from any water course (with Approval);
- Placing soil salvage stockpiles in locations where they will have no impact on natural drainages; and
- Use of sediment captures systems, including silt fences and containment structures.

12.2.1.18.4.1.6 Compliance Monitoring and Verification

ESC success will be monitored on a continual basis and reported annually in the Project's operating reports to the Chief Inspector of Mines. Monitoring and other performance data will be reported to the Ministry of Environment as per permit requirements. Performance of the system will be reviewed after major rainfall events and following spring freshet by construction and mine staff as an aid to adaptive management of activities at the site. The Proponent will continue to monitor and identify potential sediment sources and implement appropriate control measures.

Monitoring will be conducted according to provincial and federal regulations and guidelines, and in accordance with regulatory permits and best practice (e.g., during major works, following storm events, and at systematic intervals). During construction and operations, weekly inspections of temporary and permanent ESC facilities may be conducted, if required by site conditions. Weekly inspections will be conducted during the decommissioning of Project facilities, and will decrease to periodic as required by site conditions during post-closure.

12.2.1.18.4.1.7 Site Environmental Reporting

The Environmental Coordinator will maintain all ESC records on file at the mine office for all phases of mine life. Records will identify erosion locations and techniques installed to control erosion and sedimentation as well as maintenance efforts.

12.2.1.18.4.1.8 Non-Compliance Events

In the case where non-compliance events are observed, immediate corrective actions will be implemented. Those actions may include repair of non-compliance conditions, cessation of construction activities in affected areas, or an engineering response. Regardless of the mitigation implemented, records will be maintained to document the corrective mitigation. In keeping with adaptive management, the corrective action will be pre-emptively applied wherever similar conditions are observed.

12.2.1.18.4.1.9 Training and Awareness

ESC training and awareness will be part of new employee and contractor orientation. A key part of ESC awareness training will be the message that environmental protection is everyone's responsibility, and that effective environmental protection requires recognition of environmental consequences of actions. Specific training will be provided for staff directly involved in erosion control, and will include component-specific SOPs.

ESC procedures will be an integral part of employee and contractor orientation. Employees and contractors will be required to report any unusual conditions related to erosion or sedimentation including seeps, accelerated erosion, and observations of sediment plumes of runoff into diverted clean water drainage.

12.2.1.18.4.2 Aquatic Resources Management Plan

Aquatic resources include water quantity and quality and all plant and animal species that support fish and fish habitat in the Local Study Area (LSA), including periphyton and benthic macroinvertebrates in streams and phytoplankton, zooplankton, and benthic macroinvertebrates in lakes. Aquatic resources do not include amphibians and water birds. Fish includes all life stages of all species of fish that are present in the LSAs and their habitat. Consistent with the *Fisheries Act*:

- Fish habitat is defined as spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes; and

- Serious harm to fish is defined as the death of fish or any permanent alteration to, or destruction of fish habitat.

12.2.1.18.4.2.1 Regulatory Requirements

The ARMP was developed in accordance with the policies and regulatory requirements of federal and provincial regulatory agencies, and with the proponent's environmental policies. A summary of key legislation and policy considered in the development of this plan is provided below.

12.2.1.18.4.2.1.1 Federal Legislation

The federal *Fisheries Act* requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada (DFO). Guidance for ensuring compliance with the *Fisheries Act* is provided through the Fisheries Protection Policy Statement (Government of Canada, 2013). The Fisheries Protection Policy Statement includes description of:

- Sections 20 and 21, which provide for unimpeded flow and fish passage;
- Section 35, which prohibits serious harm to fish, which is defined in the Act as "the death of fish or any permanent alteration to, or destruction of, fish habitat; and
- Section 36, which prohibits deposition of deleterious substances in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

It is anticipated that the Project will be subject to the *Metal Mining Effluent Regulations (MMER)* (Environment Canada, 2013). The regulation prescribes conditions on the deposit of deleterious substances in waters frequented by fish, states the requirement for monitoring where effluent is released, and provides a guide to developing an aquatic effects monitoring plan for the Project, when required.

Other relevant federal legislation and guidelines applicable to the ARMP include:

- The *Canada Water Act* (defines waste, in context of detriment to animal, fish or plant, resulting from degradation or alteration of water quality);
- The federal *Canadian Environmental Protection Act* (regulates for disclosure of information regarding any substance that could potentially cause damage to fish or fish habitat); and
- Canadian water quality guidelines (CCME, 2007, 2012) (science-based targets for the protection of aquatic life).

12.2.1.18.4.2.1.2 Provincial Legislation

The *Water Act* regulates the flow of water within BC. Section 9 of the *Water Act* requires that a person may only make "changes in and about a stream" under an Approval; in accordance with Part 7 of the *Water Regulation*, including Notification where required; or under a Water Licence or Order.

Under the *Water Act*, "changes in and about a stream" means:

- Any modification to the nature of the stream including the land, vegetation, natural environment or flow of water within the stream; or
- Any activity or construction within the stream channel that has or may have an impact on a stream.

Fish are defined as wildlife for the provisions of the *Wildlife Act* (Government of BC, 1996f), which includes provision for the designation of wildlife management areas and their protection.

The *Fish Protection Act* (Government of BC, 1997a) provides authority to consider impacts to fish and fish habitat before approving new or renewing existing water licenses, and before issuing approvals for working in or near a stream. The *Fish Protection Act* also ensures sufficient water for fish when making decisions about licenses or approvals under the *Water Act*, allows the listing of streams with recognized fish values as being sensitive to water withdrawals, and protects riparian areas through provisions of the *Riparian Areas Regulation* (*RAR*) (Government of BC, 2004a).

The *Forest and Range Protection Act* (Government of BC, 2002b) provides guidance on discretionary and mandatory Riparian Management Areas (RMAs) around fish bearing streams, lakes, and wetlands, provides guidance on size of harvestable forest areas and the rate at which wood can be removed from a watershed, and provides regulations on road building.

Other relevant provincial legislation and guidelines applicable to the ARMP include:

- *Mines Act*;
- *EMA*;
- *Water Protection Act*; and
- BC approved Water Quality Guidelines (BC MOE 2006a, 2006b, 2008, 2009a, 2012a, 2013).

12.2.1.18.4.2.2 Basis for Fish and Aquatic Resources Management

The proposed mine and associated processing facilities will occupy a surface area of approximately 33 km^2, primarily in the upper portion of the Davidson Creek Watershed. Davidson Creek is a tributary to Chedakuz Creek, which drains Tatelkuz Lake and flows into the Nechako Reservoir.

12.2.1.18.4.2.2.1 Summary of Potential Effects

Potential effects of the Project on fish and aquatic resources include:

- Direct footprint effects;
- Downstream flow effects due to impoundment of some Davidson Creek flows within the TSF; and
- Isolation upstream of the TSF of Lake 01682LNRS (Lake 16) in the Davidson Creek drainage.

These potential Project effects on fish and aquatic resources are addressed via mitigation including consideration in Project design where possible, and by habitat offsetting where mitigation is not possible or does not completely eliminate the effect. Mitigation and offsetting concepts are described in this document (ARMP) and in the (Fisheries Mitigation and Offsetting Plan (FMOP) (**Appendix 5.1.2.6C**).

The Project is designed to operate with a no surface water discharge tailings impoundment during operations and at closure until the open pit fills with water. This will be accomplished by recycling tailings supernatant water and directing contact water to the TSF. By the start of the operations phase, Project design elements will have isolated the mine site from the surrounding environment with respect to water quality and quantity. Isolation of Davidson Creek with respect to water quantity is the primary singular management concern for the ARMP.

Design and operation of the Project will result in the residual loss of fish habitat in the upper Davidson Creek and tributaries in the Creek 661 watersheds. The proponent will require a *Fisheries Act* section 35(2) Authorization from DFO for residual habitat losses, and issuance of that Authorization will require a fish habitat mitigation and offset plan. In addition, construction of the TSF and waste rock piles in waters “frequented by fish” will require a Schedule 2 amendment under the *MMER* and separate accounting of fish habitat offsetting.

12.2.1.18.4.2.2.2 Mitigation Concept

Key projects to mitigate these potential effects to fish and fish habitat include:

- Recycling of tailings supernatant water during operations and capturing all contact water during construction, operations, and closure phases such that there is no discharge from the tailings impoundment;
- Institution of flow maintenance in Davidson Creek, i.e., active pumping of freshwater into the creek to maintain the ecological function of reaches downstream of Project infrastructure. Flow maintenance will be achieved through the Temperature and Flow Control System (TFCS), a component of the mine’s freshwater supply system (FSS), whereby water pumped from Tatelkuz Lake via pipeline to a reservoir on the mine site will be discharged from the reservoir into Davidson Creek. Flow maintenance will

commence immediately prior to the start of Project-induced flow reductions and will operate thereafter through the operations and closure phases of mine life; and

- Diversion of Lake 16 through a newly constructed stream channel to Lake 01538UEUT (Lake 15) in the adjacent Creek 705 watershed within the same Nechako watershed (Catchment A3, described in **Appendix 5.1.2.6C**). The intent of diversion is to maintain a self-sustaining population of rainbow trout in Lake 16 by providing connectivity and access to spawning habitat required by this headwater lake population.

Unavoidable residual effects to fish habitat, including habitat lost under waste rock dumps, the TSF, and other mine infrastructure, will be offset by habitat creation, enhancement, and rehabilitation projects included in the section 35(2) authorization offsetting plan and the section 27.1 *MMER* offsetting plan as described in the following section.

12.2.1.18.4.2.2.3 Offsetting Concept

Proposed offsetting projects for the unavoidable loss of fish habitat are focused on rehabilitating, enhancing, and creating habitat for rainbow trout. This is because rainbow trout are the fish species most directly affected by the unavoidable habitat losses and because rainbow trout are a species valued by recreational anglers, by the general public, and by local Aboriginal groups. Offsetting projects included in the section 35(2) and section 27.1 *MMER* offsetting plans include:

- Enlarging Lake 16 and diverting it from the Davidson Creek watershed to Lake 15 in the Creek 705 watershed;
- Creating a new spawning/rearing channel for fish in the Lake 16/Lake 15 complex that will divert the inlet tributary to Lake 15 to Lake 16;
- Constructing off-channel overwintering ponds in the Davidson and Creek 661 watersheds immediately downstream of the mine site;
- Rehabilitating agriculturally degraded instream and riparian habitat and creating new off-channel habitat in the Mathews Creek watershed immediately southwest of the Davidson Creek watershed; and
- Restoration of fish passage within the Vanderhoof Forest District.

The enlarged Lake 16 will increase littoral and pelagic habitats that support juvenile summer rearing, adult summer foraging, and overwintering for rainbow trout. The diversion channel between Lake 16 and Lake 15 will allow fish to move between the two lakes and will also provide summer rearing habitat for juvenile fish. The new spawning/rearing channel will provide new spawning habitat to replace stream habitat flooded by the enlargement of Lake 16 as well as providing additional spawning and rearing habitat needed to sustain a larger population of fish in the larger lake complex.

Off-channel ponds will enhance juvenile rainbow trout overwintering habitats in Davidson and Creek 661 watershed. They will also provide summer rearing habitat for adults and juveniles.

Availability of overwintering habitat has been identified as a factor likely limiting fish productivity in headwater streams near the Project area.

Contingency options are also available off-site to replace or increase fish productivity should monitoring show that any of the proposed projects are not functioning as intended, not being used by the fish species and life stages for which they were built, or are producing less fish than anticipated. These contingency options include restoration of fish passage at abandoned, problem culverts within the Vanderhoof Forest District, restoration of agriculturally impacted streams and riparian areas in the Murray Creek watershed, and restoration/creation of habitat to enhance production of Chinook salmon in Swanson Creek. This latter project has been identified by the Sai'kuz First Nation given their harvest of Chinook salmon.

12.2.1.18.4.2.3 Linked Environmental Management Plans

The ARMP is one of the most extensively linked EMPs developed for the Project, either through shared focus on control of water quality and quantity, or habitat protection and reclamation. Most of the linkages are through overlap of operational requirements related to freshwater supply, or overlap of environmental values being managed. The scope of linked EMPs and other management plans includes but is not limited to:

- FMOP requisite for *Fisheries Act* section 35(2) Authorization and for *Schedule 2 amendment* under the *MMER* (**Appendix 5.1.2.6C**);
- MWAMP (**Section 12.2.1.18.4.18**);
- SECP (**Section 12.2.1.18.4.1**);
- WMP (**Section 12.2.1.18.4.3**);
- LSVMRP (**Section 12.2.1.18.4.4**);
- ISMP (**Section 12.2.1.18.4.5**);
- ESPRP (**Section 12.2.1.18.4.13**);
- MWMP (**Section 12.2.1.18.4.17**);
- TAMP (**Section 12.2.1.18.4.14**);
- Construction Management Plan (CMP) (**Section 12.2.2**); and
- Reclamation and Closure Plan (RCP) **Section 2.6**).

12.2.1.18.4.2.4 Objectives and Scope

12.2.1.18.4.2.4.1 Objectives

The objectives of the ARMP are to:

- Protect fish and aquatic resources, including aquatic habitat, throughout the Project footprint and for all phases of the Project;

- Prescribe effective management practices for activities in and around waterbodies. Regulatory agencies have issued best management practices (BMPs) that have proven effective as mitigation measures. The ARMP integrates them into the execution of the Project; and
- Avoid the permanent alteration to, or destruction of, fish habitat.

The objectives of the FMOP, in conjunction with the ARMP, are to provide for the sustainability and ongoing productivity of commercial, recreational and Aboriginal fisheries in accordance with DFO Policy.

12.2.1.18.4.2.4.2 Scope

As with the MWAMP, the ARMP temporal scope covers all mining phases from construction through post-closure. The Project will require two years for initial construction followed by 17 years of operations. Initial closure will take approximately two years to remove infrastructure. Once the open pit is mined out at Year 15, it will begin to fill. Filling is estimated to require 18 years. At that point, the pit will overflow to a constructed channel where the water will join with discharge of tailings supernatant into Davidson Creek. Water is forecast to meet receiving environment guidelines or site-specific objectives at the permitted compliance point. Until this time of reinstatement of natural flow in Davidson Creek, flow will be augmented through pumping of freshwater from Tatelkuz Lake.

The spatial scope of the ARMP includes:

- Davidson Creek and its tributaries, between the mine site and Tatelkuz Lake, including the riparian and littoral zone of Tatelkuz Lake in the footprint of the water supply pipeline and pump intake;
- All riparian and fish habitat potentially affected within the mine site catchment area (described in **Section 5.3.9**) excluding that which is in the scope of the FMOP (residual loss in the upper Davidson Creek and Creek 661 watersheds); and
- All riparian and fish habitat potentially affected by infrastructure projects outside the mine site catchment area, i.e., airstrip, mine access road, Kluskus-Ootsa FSR upgrade, freshwater supply line, and transmission line.

12.2.1.18.4.2.4.3 ARMP Source Documents and Scope of Detail

In addition to overlap with EMPs discussed above, the ARMP integrates mitigation information directly from the MWAMP, fish habitat effects assessment section (**Section 5.3.9**) of the Application, and technical reports presented in **Appendix 2.2A**. The selection of mitigation information is discussed in this section.

12.2.1.18.4.2.4.3.1 MWAMP and Project Design

The primary reference for mitigation in the ARMP is the MWAMP. As described above (**Section 12.2.1.18.4.2.2**), the Project is designed to operate with a no surface water discharge tailings impoundment throughout the life of the mine, by recycling tailings supernatant water and capturing all contact water in the mine site. The MWAMP describes the strategies incorporated into Project design elements for achieving the objectives of site wide water management.

Project design elements are:

- Construction erosion prevention and control through minimizing disturbance and sediment control ponds at strategic locations;
- Site contact water drainage containment;
- Two-pond TSF to permanently store process plant tailings;
- Seepage control for tailings dams;
- Segregation and subaqueous disposal of PAG and NAG3 waste rock within 1 and 5 years respectively; and
- Freshwater supply system, consisting of pump station on Tatelkuz Lake, pipeline and freshwater reservoir to supply the process plant, flooding of PAG rock in TSF and instream flow needs for Davidson Creek.

Detail for strategies incorporated by these Project design elements is organized under the following Sections of the MWAMP:

- Construction Mine Water Management Plan:
    - Construction Sediment and Erosion Control;
    - Design Criteria;
    - Early Sediment Control Activities;
    - TSF Construction; and
    - Open Pit Sediment Control;
- Operations and Closure Mine Water Management Plan;
- Water Management Systems:
    - Environmental Control Dam;
    - Water Reclaim System:
    - Pit Dewatering System;
    - Low-grade Ore Stockpile;
    - NAG Disposal Areas; and
    - Freshwater supply System.

MWAMP Strategies Excluded from the ARMP - Although all of the MWAMP strategies (in sections listed above) ultimately comprise fish and aquatic resources mitigation, not all are replicated from the MWAMP into the ARMP, specifically those Water Management Systems that function entirely within the mine site boundary within which all contact water will be captured during operations. This exclusion is done to limit the amount of duplication between the two plans. MWAMP Water Management Systems not further duplicated in the ARMP are:

- Water Reclaim System;
- Pit Dewatering System;
- Low-grade Ore Stockpile; and
- NAG Disposal Areas.

Rationale for Exclusion - The two-pond TSF, strategically located sediment control ponds, and seepage control for all dams contribute to a larger body of strategies that function by isolating the mine site from the surrounding environment with respect to water quality, i.e., they establish and maintain a boundary within which all contact water in the mine site will be captured (referred to elsewhere in this plan as the mine site catchment area). However, segregation and subaqueous disposal is a strategy that functions within the isolating boundary once established, as does the tailings storage function of the TSF. Description of water management systems supporting these (storage) functions, or otherwise relating to the control of contact water *within* the isolating boundary, is not replicated from the MWAMP into the ARMP.

12.2.1.18.4.2.4.3.2 MWAMP Strategies Carried Forward into the ARMP

All other sections of the MWAMP listed above are carried forward into the ARMP. They contain strategies that support fish and aquatic resource mitigation functions other than the storage and control functions that operate within the mine site catchment area. From the MWAMP *Water Management Systems* in particular, only the following are carried forward:

- ECD; and
- FSS.

Rationale for Inclusion - Sediment control ponds and seepage control for tailings dams contribute to the interface of the mine site and surrounding environment with respect to water quality and are thus carried forward from the MWAMP into the ARMP. Construction ESC operate throughout the Project extent and are likewise carried forward into this plan. These design elements are described in the ARMP under **Section 12.2.1.18.4.2.7**, Mitigation by Phase and Activity.

The freshwater supply system includes the TFCS, which is a key mitigation concept of the ARMP. Accordingly, the freshwater supply system is given prominence in the organization of mitigation in the ARMP (organization is explained in **Section 12.2.1.18.4.2.5**).

12.2.1.18.4.2.4.3.3 Fish Habitat Effects Assessment and Technical Reports

The ARMP integrates mitigation information from the fish habitat effects assessment section (**Section 5.3.9**) of the Application and from technical reports presented in **Appendix 2.2A**, for infrastructure projects outside (in whole or in part) of the mine site catchment area (hereafter referred to in the ARMP as off-site infrastructure projects). Off-site infrastructure projects are:

- FSS Design;
- Airstrip;
- Mine Access Road;
- Freshwater supply line ROW;
- Transmission Line; and
- Kluskus-Ootsa FSR Upgrade.

12.2.1.18.4.2.5 Organization of Mitigation in this Plan

Mitigation in the ARMP is organized under Flow Maintenance in Davidson Creek, and Mitigation by Phase and Activity. The following describes how mitigation is organized under these headings:

- Flow Maintenance in Davidson Creek:
  - o Describes the background, design basis, and operating criteria for the Project's freshwater supply system. This includes the TFCS, which is a key mitigation concept of the ARMP; and
- Mitigation by Phase and Activity:
  - o Mitigation by phase includes temporary and permanent mitigative Project design elements such as ESC BMPs and strategically placed sediment control ponds. Mitigation by activity includes mitigation specific to off-site infrastructure projects, such as mine access road bridge specifications.

12.2.1.18.4.2.6 Flow Maintenance in Davidson Creek

As discussed earlier in the Mitigation Concepts section (**Section 12.2.1.18.4.2.2.2**), flow maintenance in Davidson Creek is a key mitigation concept of the ARMP. Flow maintenance will be regulated through the TFCS, which is a component of the FSS. This section describes aspects of the FSS and flow maintenance principles that will be used to develop the FSS operating plan. Descriptions in this section are summarized from relevant sections of the Application. This section includes:

- Freshwater supply system overview;
- Rationale for selection of intake location in Tatelkuz Lake and selected pipeline route;
- Balancing water requirements to sustain fish habitat in Davidson Creek, Chedakuz Creek and Tatelkuz Lake;
- Prescriptive flow regime for fish and aquatic resources in Davidson Creek;

- Potential water temperature considerations;
- Freshwater supply system components and general layout; and
- FSS Operating Plan.

Four aspects of the freshwater supply system that might require physical and procedural mitigation and that are not included in this section are:

- Footprint of the intake at Tatelkuz Lake;
- Change in elevation of Tatelkuz Lake due to water withdrawal;
- Pipeline water crossings from Tatelkuz Lake to the Project site; and
- Footprint of the freshwater reservoir and dam.

Description of and mitigation (as required) for these aspects is presented in **Section 5.3.9** and is carried forward into this plan, under Mitigation by Phase and Activity, in the Freshwater Supply Line section (**Section 12.2.1.18.4.2.7**).

12.2.1.18.4.2.6.1 Freshwater Supply System

12.2.1.18.4.2.6.1.1 Overview

Freshwater for the Project will be sourced from Tatelkuz Lake, 20 km northeast of the proposed mine site. Water from the lake will be pumped, via a pipeline, to a freshwater reservoir in Davidson Creek immediately downstream of the TSF. The FSS includes the following major components:

- Tatelkuz Lake intake;
- Freshwater supply pipeline;
- Booster pump stations;
- Freshwater reservoir; and
- TFCS.

The FSS was designed to provide constant freshwater supply from Tatelkuz Lake to mitigate flow reductions in lower Davidson Creek and for any make-up water needed in the mine plant during operations that recycled water from the TSF cannot provide. Additionally, freshwater from Tatelkuz Lake may be used as contingency to supplement to saturate PAG and NAG3 rock within the TSF, if required.

12.2.1.18.4.2.6.1.2 Lake and Route Selection

The feasibility study included a trade-off study conducted in August 2012, to identify potential long-term freshwater sources for the Project. Tatelkuz Lake was identified as the most practical option, with the lowest potential environmental impact, and the lowest risk of freshwater supply failure.

The selected water intake location on Tatelkuz Lake was based primarily on areas of existing disturbance, presence of an existing road and a pre-existing forestry clear-cut that approaches the lake.

The pipeline route from Tatelkuz Lake to the freshwater reservoir follows existing forestry roads/existing disturbance to the maximum practical extent; the route from the freshwater reservoir to the plant site will be along a pipeline service corridor adjacent to the mine access road.

12.2.1.18.4.2.6.1.3 Freshwater Supply System for Davidson Creek Flow Maintenance

Surface runoff from the upper Davidson Creek Watershed (46 km^2) and mine process water will be collected and routed to the TSF[1], where it will be used to cover tailings, PAG waste rock and for ore processing at the mill. There will be no discharge of water from the TSF to Davidson Creek during operations and closure.

To maintain flows in lower Davidson Creek, water will be pumped from Tatelkuz Lake and piped approximately 16 km to a reservoir in Davidson Creek. The freshwater discharged into Davidson Creek will flow for approximately 12 km before returning to Chedakuz Creek, less than 1 km downstream from the lake.

The proposed FSS will consist of a submerged appropriately screened water intake in Tatelkuz Lake, in-line variable speed pumps, and two 0.6 m-diameter pipelines, each capable of delivering a maximum of 170 m^3/hr (**Appendix 2.2A-6**); system components are described below. The system will supply water to a 400,000 m^3 freshwater storage reservoir located immediately downslope of the TSF Site D Dam. Discharge to Davidson Creek will be either via the storage reservoir or via a direct pipe to the creek.

Water will be stored in the freshwater storage reservoir and released as needed to supplement flows in Davidson Creek. The water supply system is intended to provide the desired capacity and operational flexibility to accommodate the instream flow needs (IFN) of target species discussed further in this section.

12.2.1.18.4.2.6.1.4 Water Balance Considerations

Three primary water bodies were considered during the design of the water supply system: Tatelkuz Lake, Davidson Creek, and Chedakuz Creek. The flows in all three are interrelated and essential to the system design. The general arrangement of the FSS is shown in **Figure 12.2.1-4**.

Tatelkuz Lake is fed by a watershed of approximately 395 km^2. The lake outlet flows to the northwest via Chedakuz Creek. Davidson Creek flows from the upper reaches of the mine site area northeast to its confluence with Chedakuz Creek, less than 1 km downstream of Tatelkuz Lake.

[1] Less the portion of the flows that would be diverted into the adjacent Creek 705 drainage as part of the Lake 16 enlargement and diversion project included in the FHMOP

The mine site and TSF development will temporarily reduce the contributing watershed area to Davidson Creek from approximately 76 km^2 to 32 km^2 at the confluence with Chedakuz Creek. The runoff generated in the lost upstream catchment area is needed to support mine operations.

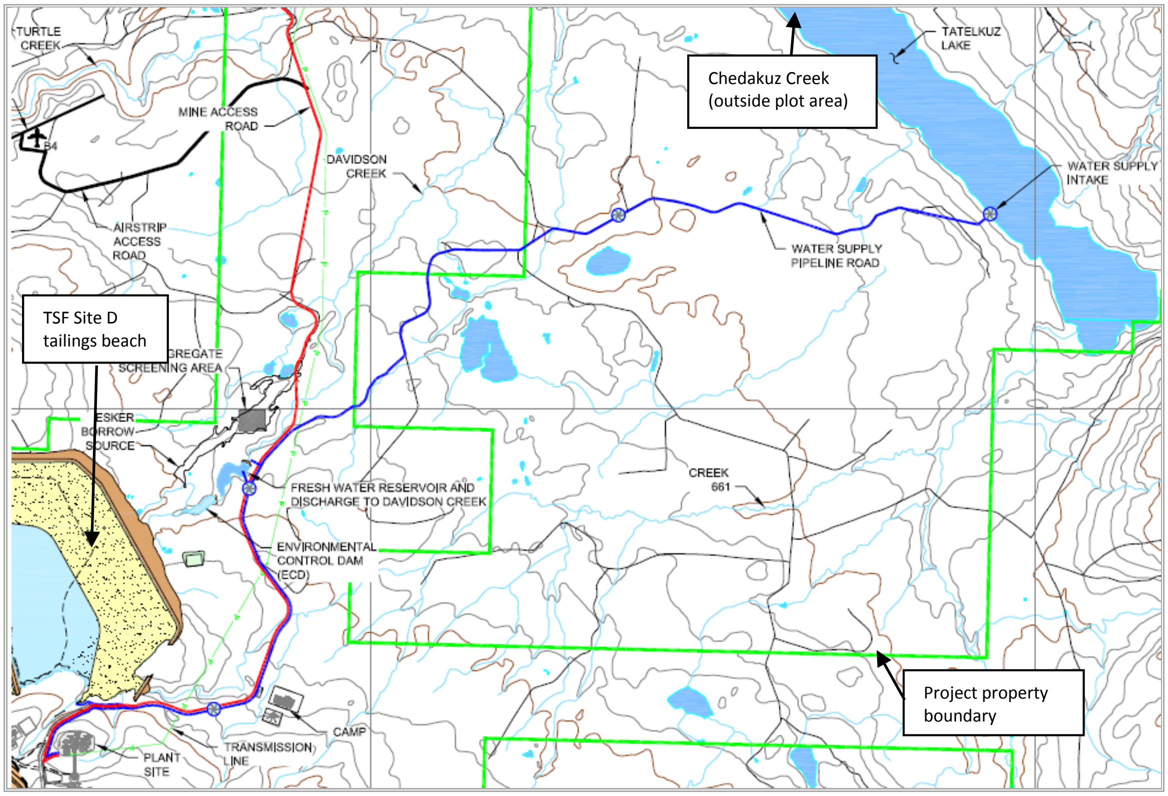


Figure 12.2.1-4: Freshwater Supply System Layout

A lake withdrawal model was created to assess the potential effects of withdrawing water from Tatelkuz Lake to augment Davidson Creek on flows in lower Chedakuz Creek (i.e., the Tatelkuz Lake outlet) and lake levels in Tatelkuz Lake. Results of this model indicated that sufficient water could be withdrawn from Tatelkuz Lake to provide flows in Davidson Creek without creating significant adverse effects in Tatelkuz Lake or in lower Chedakuz Creek.

12.2.1.18.4.2.6.1.5 Design Basis and Operating Criteria

The mine freshwater supply requirements include the following:

- Flow requirements of target fish species in Davidson Creek;
- Plant and site freshwater needs (gland water, etc.);
- Reclaim water to support processing in extreme dry conditions (minimum surplus capacity); and
- Additional water for flooding PAG waste rock in the TSF, if required.

The design and operating criteria for the FSS are outlined in **Table 12.2.1-6**.

A design flow rate of 2,400 m^3/h was selected to minimize the required storage capacity for normal operation of the system. It is also at the upper end for the sustainable velocity of a standard pipe size of 24 inch (610 mm) steel or 30 inch (750 mm) high density polyethylene (HDPE).

Storage is needed in the freshwater reservoir to ensure that the system can effectively balance the needs of both Davidson and Chedakuz creeks and provide a contingency in the event of system repair or maintenance. Minimum surplus capacity has been sized to ensure the system has additional pumping capacity and availability to provide an additional 3 Mm^3 of water per year as a contingency against a series of extremely dry years. The derivation of the required minimum surplus capacity is discussed in **Section 2.2.4.3**.

Davidson Creek Instream Flow Needs and Prescribed Flow Regime - An Instream Flow Study (IFS) was completed between 2011 and 2013 to define IFN for Davidson Creek and to support evaluation of potential flow-related effects in Davidson Creek and other potentially affected streams. IFN are flows required to protect aquatic values to an appropriate standard. The complete IFS is presented as **Appendix 5.1.2.6D** to the Application. Results of the IFS were used to develop a mitigated flow regime for Davidson Creek designed to avoid potential adverse effects to Davidson Creek, Tatelkuz Lake and Chedakuz Creek.

The prescribed flow regime consists of:

- IFN for biologically-relevant time periods, designed to protect habitat for each life stage of rainbow trout and kokanee present in Davidson Creek;
- Spring flushing flows to provide short-term flow pulses that mobilize and transport fine sediment and organic material, and provide the environmental cues and hydraulic conditions necessary for fish to migrate and gain access to critical habitat; and
- Transitional flows between the flow levels defined above. Transitional flows ensure that flow changes do not cause undue stress or other impacts to fish and other aquatic biota.

Table 12.2.1-6: Freshwater Supply System Design Criteria

Item	Design Criteria
1.0 General	
Site Coordinates	Tatelkuz Lake: 53.3 Latitude, 124.73 Longitude, Elevation - 914 m
Climate	Estimated Mean Annual Precipitation = 636 mm
	Average Annual Lake Evaporation = 443 mm
2.0 Production	
Pre-production	System Operation during Pre-production = 1 year (April 2016 - April 2017)
Mine Production	Mine Life = 17 years (nominal throughput = 60,000 t/d)
Closure	System Operating during Closure Phase = 18 years
3.0 Water Management	
Water Requirements	Davidson Creek minimum IFN = 198 – 2,329 m^3/h (55 – 647 L/s)
	Mill freshwater requirements at 60,000 t/d production rate = 120 m^3h (33 L/s)
	Davidson Creek flushing flows = 4,030 m^3/h for 3 days (1,120 L/s) plus 3 days ramping up/down
	Minimum surplus capacity allowance (allowance for extreme dry) = 3,000,000 m^3/yr (340 m^3/h)
	PAG saturation water (as required to meet saturation time steps)
Water Supply	Source: Tatelkuz Lake
	Intake system: submerged appropriately screened intake with onshore wet well
Freshwater Reservoir	Minimum storage capacity: seven days max flow demand
	Maximum storage capacity: 400,000 m^3
	Maximum embankment height = 19 m
TSF Supernatant Ponds	Minimum storage capacity: N/A
	Maximum storage capacity- 20,000,000 m^3 (10 Mm^3 allowance per pond)
4.0 Water Pipeline	
Pipeline Design	Material - Combination of Steel and HDPE
	Alignment: Adjacent to access/maintenance road and buried 0.6 m for fire protection only
Pump Design	Maximum TDH lift per pump station: 300 m
	One standby unit at each pump station
Pipeline Elevations	Tatelkuz Lake = 927 m
	Freshwater Reservoir = 1,169 m
	TSF = 1,320 m (highest elevation on pipe route = 1,350 m)
	Plant Site = 1,420 m
Pipeline Lengths (horizontal length)	Pressure pipeline: Tatelkuz Lake to Freshwater Reservoir = 13,600 m
	Pressure pipeline: Freshwater Reservoir to Plant 6,790 m
	Pressure pipeline: Freshwater Reservoir to TSF = 6,830 m
	Gravity discharge: Freshwater Reservoir = 100 m
	Gravity discharge: TSF Site D = 750 m

For each biologically relevant time period ('stanza'), IFN were calculated independently for each life stage of rainbow trout and kokanee, and for middle Davidson Creek (near the TSF Site D dam) and for lower Davidson Creek (near Chedakuz Creek). The highest flow requirement was used to define the final IFN for each time period (**Appendix 5.1.2.6D**).

Spring flushing flows displace fine-grained sediment and organic material from the interstitial voids of spawning substrates, leading to improved intragravel flow, which is associated with higher incubation survival and increased production of benthic invertebrates. Spring flushing flows also serve as an environmental cue for sexually mature rainbow trout to commence their spawning migration. Flushing flows of 400% of mean annual discharge (MAD) are recommended for Davidson Creek in years with average or better water availability; flushing flows of 200% MAD are recommended for years with below average water availability (**Appendix 5.1.2.6D**).

Transitional flows ensure a smooth and gradual progression from one flow level to the next over extended periods of time, so that survival is maximized as fish transition between life stages. For example, it is important that salmonid redds remain covered with water as long as eggs and alevins are in the gravel. Incubation flows for rainbow trout and kokanee were defined as flows required to maintain water surface elevations within 10 cm of water depths during rainbow trout spawning, and within 4 cm of water depths during kokanee spawning (**Appendix 5.1.2.6D**).

Target Flow Regime - The mitigation target flow regime to mirror natural conditions is defined for Davidson Creek at the FSS outfall (**Table 12.2.1-7**). Provision is included to reduce freshet flows in years with reduced water availability, to avoid the potential for an effect from water withdrawal on Tatelkuz Lake and lower Chedakuz Creek, as well as to introduce flushing flow variability, as occurs naturally (**Table 12.2.1-8**).

Table 12.2.1-7: Target Flow Regime for Davidson Creek at FSS Outfall for Average or Above Average Water Years

Date	Type of Flow	Flow (L/s)	Implementation
7 - 9 May	Transitional (72 h)	375, 624, and 874	Ramp up incrementally to flushing flow over 72-hour period; target rate is 13.9 L/h; maximum rate is 27.8 L/h
10 - 12 May	Channel Flushing Flow	1,123	400% mean annual discharge (MAD = 281 L/s)
13 - 15 May	Transitional (72 h)	982, 842, and 701	Ramp down to rainbow trout spawning flow over 72-hour period; target rate is 7.8 L/h; maximum rate is 16.3 L/h
16 May - 30 Jun	Rainbow Trout - Spawning	560	Rainbow Trout spawning IFN
1 - 3 Jul	Transitional (72 h)	473, 387, and 300	Ramp down to rainbow trout incubation flow over 72-hour period; target rate is 3.6 L/h; maximum rate is 10.8 L/h
4 - 15 Jul	Rainbow Trout – Incubation and Rearing	300	Maintains redds constructed at depths of 10 cm or greater at rainbow trout spawning flows (560 L/s)
16 - 18 Jul	Transitional (72 h)	263, 225, and 188	Ramp down to kokanee spawning flow over 72-hour period; target rate is 2.1 L/h; maximum rate is 6.3 L/h

Date	Type of Flow	Flow (L/s)	Implementation
19 Jul - 31 Aug	Rainbow Trout – Rearing Kokanee - Spawning	150	Kokanee spawning IFN
1 Sep	Transitional (24 h)	130	Ramp down to Kokanee incubation flow over 24-hour period; target rate is 0.8 L/h; maximum rate is 5.0 L/h
2 Sep - 30 Nov	Rainbow Trout – RearingKokanee - Incubation	115	Rainbow trout rearing IFN; Maintains redds constructed at depths of 4 cm or greater at kokanee spawning flows (150 L/s)
1 Dec	Transitional (24 h)	120	Ramp up to overwintering flow over 24-hour period; target rate is 0.4 L/h; maximum rate is 2.5 L/h
2 Dec - 6 May	Rainbow Trout - Overwintering	125	Minimum of monthly mean annual flows for winter period

Table 12.2.1-8: Target Flow Regime for Davidson Creek at FSS Outfall for Period 2 December to 30 June during Below Average Water Years

Date	Type of Flow	Flow (L/s)	Implementation
2 Dec - 9 May	Rainbow Trout - Overwintering	125	Minimum of monthly mean annual flows for winter period
10 - 12 May	Transitional (72 h)	270, 415, and 560	Ramp up incrementally to flushing flow over 72-hour period; target rate is 6.0 L/h; maximum rate is 18.1 L/h
13 - 15 May	Channel Flushing Flow	560	200% mean annual discharge (MAD = 281 L/s)
16 May - 30 Jun	Rainbow Trout – Spawning	560	Rainbow Trout spawning IFN

Note: Decrease in flushing flows from 400% MAD (1,123 L/s) to 200% MAD (560 L/s)

The target flow regime, for average conditions, is presented in **Figure 12.2.1-5**.

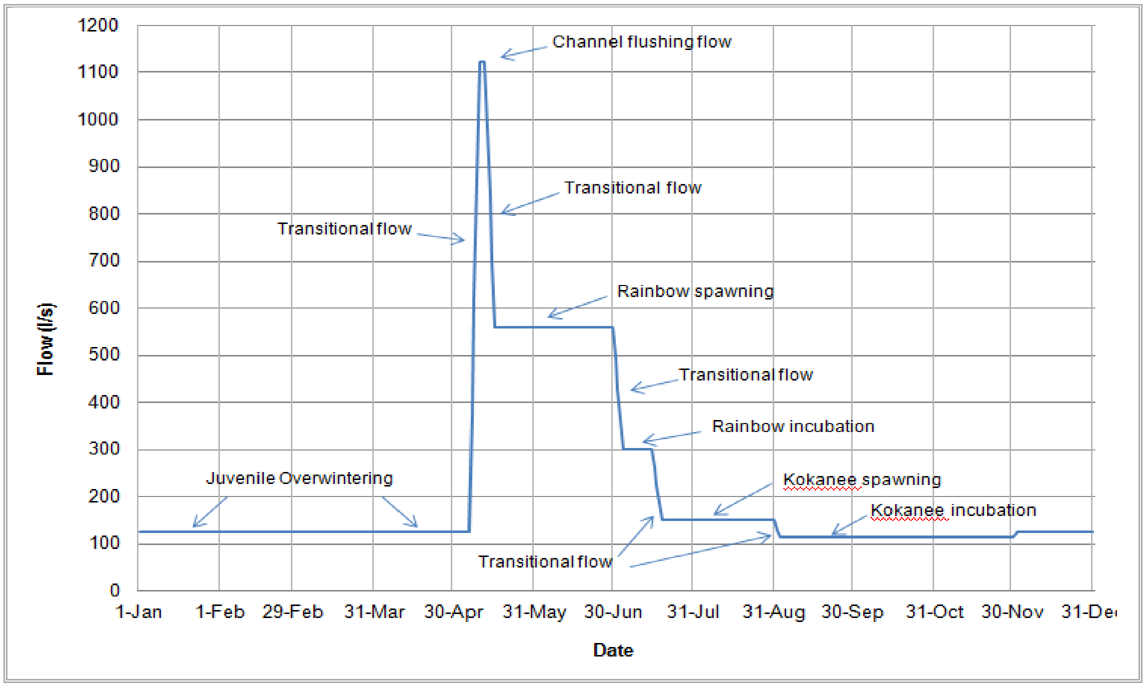


Figure 12.2.1-5: Mitigation Flow Regime for Middle Davidson Creek at FSS Outfall, for Average and Wetter Water Years

Channel Maintenance Flows - Channel maintenance, or channel forming, flows are strong enough to cause significant scour or alter channel alignment or morphology (Milhous, 1998; Wald, 2009). Flushing flows, as defined above, exert enough tract force to remove fine organic matter and sediment from gravel and transport it downstream, but are generally not sufficient for channel maintenance.

Flushing flows will be implemented in Davidson Creek to maintain suitable conditions for fish spawning and food production. Channel maintenance flows are not recommended during the operational phase of the Project. The TSF will intercept coarse sediment that would normally be transported during high flow events to downstream reaches of Davidson Creek. Flows of sufficient magnitude to mobilize and transport bedload in the lower reaches of the stream are undesirable because, with reduced sources of new material, the channel may erode as smaller particles are transported out of the lower reach. Adverse effects on habitat in Davidson Creek are not anticipated as a result of deferring high magnitude floods to the post-closure phase.

Monitoring during operational, closure and post-closure periods will determine whether TSF construction adversely affects coarse sediment availability. If a reduction in sediment supply with the potential to adversely affect fish or fish habitat is observed, coarse sediment will be added to the channel downstream of the TSF.

12.2.1.18.4.2.6.1.6 Water Temperature Considerations

Tatelkuz Lake - As discussed above, Tatelkuz Lake water is proposed as makeup water to maintain fish instream flow needs in Davidson Creek. Because water temperature is a critical factor influencing the growth, survival and community composition of periphyton, benthic macro-invertebrates and fish in streams, temperature of water withdrawn from Tatelkuz Lake was considered during the design of the FSS.

Tatelkuz Lake stratifies in summer creating a warmer epiliminion on top of a colder hypoliminion separated by a thermocline. The lake also stratifies in winter when colder, less dense water overlies water at or near 4°C, the temperature at which water density is greatest. Summer and winter stratification are eliminated in spring and fall when water temperatures throughout the water column equilibrate and the lake over-turns during strong wind events.

Because temperature varies with water depth at different times of the year, particularly in summer when the temperature difference between the epiliminion and hypoliminion is greatest, depth of the water intake for the FSS was selected to best appropriate the natural temperature regime of Davidson Creek at different times of the year. To do this, a mass-balance model was used. Output from the model was compared to regression-derived seasonal water temperatures in Davidson Creek and the intake water depth that best approximately Davidson Creek water temperatures was selected. Based on this analysis, an intake depth of 10 m was selected.

Table 12.2.1-9 shows the predicted water temperatures in Davidson Creek using the 10 m intake depth. Provision for monitoring to test against predicted temperatures will be included with the FSS Operating Plan.

Table 12.2.1-9: Baseline Temperatures in Davidson Creek and Predicted Changes with Tatelkuz Lake Water Addition – Operations and Closure (°C)

			Measured Temperature Relationship				Regression-Derived Temperature Relationship			
	WQ10		WQ26		WQ7		WQ26		WQ7	
Month		With Tatelkuz Lake		With Tatelkuz Lake		With Tatelkuz Lake		With Tatelkuz Lake		With Tatelkuz Lake
	Baseline	10 m Intake	Baseline	10 m Intake	Baseline	10 m Intake	Baseline	10 m Intake	Baseline	10 m Intake
Jan	0.1	3.0	-0.2	2.5	-0.04	2.3	-0.2	3.0	-0.04	2.9
Feb	0.2	3.0	0.3	2.7	0.1	2.4	0.3	3.0	0.08	3.0
Mar	-0.1	3.0	0.03	2.6	0.0	2.3	0.0	3.1	0.03	3.0
Apr	0.3	4.0	0.0	2.5	-0.2	2.1	0.0	4.3	-0.2	4.1
May	3.1	6.0	5.3	5.9	3.5	5.5	2.7	6.2	3.5	6.1
Jun	6.8	9.2	7.6	9.0	7.3	8.9	6.4	9.4	7.3	9.2
Jul	9.0	8.8	10.2	9.1	10.7	9.2	9.7	9.1	10.7	8.9
Aug	9.6	9.2	10.7	9.4	9.7	9.3	10.1	9.4	9.7	9.2
Sep	6.5	11.6	7.9	10.9	5.0	10.0	7.4	11.8	5.0	11.6
Oct	2.8	7.0	4.1	6.4	2.8	5.8	-0.2	7.1	2.8	7.0
Nov	0.5	5.0	-0.2	3.9	0.02	3.5	0.3	5.1	0.02	4.9
Dec	0.1	4.0	0.1	3.3	0.04	3.1	0.1	4.0	0.04	3.9

Note: red = Estimated; blue = Based on averaged hourly data

12.2.1.18.4.2.7 Mitigation by Phase and Activity

This section of the ARMP builds on MWAMP strategies that include mitigation for potential effects to fish and fish habitat during the construction, operation, closure, and post-closure phases. This section includes all phases and all Project facilities, both within and outside of the mine site catchment area.

12.2.1.18.4.2.7.1 Organization of Phase and Activity Mitigation

Mitigation measures apply primarily to the construction phase for all projects; however, many of the measures included in this section are not limited to the construction phase (e.g., measures for operation of machinery in riparian areas). Construction phase mitigation for the off-site infrastructure projects is also included in sections Airstrip Off-Site Infrastructure Project through Transmission Line, which describe each of the off-site infrastructure projects and which include tables of phase-specific mitigation and maintenance measures reproduced from the MWAMP. Additional operation and closure phase measures for off-site infrastructure projects are included in the Operation Phase – Off-Site Infrastructure Projects and Closure Phase – All Projects Sections. For all works within or which establish the mine site catchment area, mitigation measures for the operation, closure and post-closure phases are included in the Operation Phase – Mine Site, Closure and Post-Closure Phases – Mine Site, and Closure Phase – All Projects sections.

12.2.1.18.4.2.7.2 Water Balance

Mine site water management strategies and mitigation are developed upon understanding of the mine water balance model described in the MWAMP. The MWAMP describes the monthly operational and closure water balance developed for the Project. The model estimates the magnitude and extent of any water surplus and/or deficit conditions in TSFs based on a range of possible climatic conditions. The model period included one year of preproduction (Year -1) and 17 years of operations, at a nominal milling rate of 60,000 t/d dry, and 18 years of closure until the TSF discharges to Davidson Creek. (The Project layout and catchment areas used in the model are shown in **Figure 12.2.1-9**). The model incorporates the following major project components:

- Open pit;
- Mill;
- Low Grade (LG) stockpile;
- TSF Site D;
- TSF Site C; and
- East and West waste rock and overburden dumps.

The water balance model is presented in detail in the MWAMP and is not further reproduced here. The model is the basis for development of the Closure and Post-Closure Mine Water Management Plan, which is copied from the MWAMP into the ARMP.

12.2.1.18.4.2.7.3 MWAMP Major Elements and Strategies

The following sections outline the major elements of the MWAMP and the strategies by which the objectives of site wide water management will be achieved.

12.2.1.18.4.2.7.3.1 MWAMP Major Elements

- Detailing and implementing the construction water management plan (CWMP) described in the Project Construction Sediment and Erosion Control Plan (PCESCP); **Section 2.2.3.5.2**; **Appendix 2.2A-5**);
- Monitoring site water flows and pond levels, seepage and groundwater quality and flow, and receiving stream flows and water quality (seepage and control are discussed in MWAMP);
- Calibrating and verifying the site water balance model, site ground water model and drainage basin watershed model (**Appendix 2.2A-2**);
- Implementing contingency measures, including additional seepage recovery if required (MWAMP);
- Ensure compliance with *EMA* and *Fisheries Act* permits and authorizations;
- Ensure the Project mine remains a no surface discharge during operations and closure;
- Verifying predictions of post-mining water quality (**Section 5.3.3**) and implementing the closure phase of the water management plan; and
- An Operations, Maintenance and Surveillance Manual (OMS Manual) for the TSF will be developed and implemented prior to use.

12.2.1.18.4.2.7.3.2 MWAMP Strategies Overview

- Operational water management strategy:
  - Utilise the water within the mine site area to the maximum practicable extent by collecting and managing site runoff from disturbed areas, maximising the recycle of process water, and storing surplus water within the TSF;
  - Operate the TSF with no surface water discharge during operations; and
  - Collect TSF seepage downstream of the main dam during operation and post-closure until the pit overflows or acceptable for direct discharge to Davidson Creek;
- ESC strategies:
  - Manage sediment mobilization and erosion by installing sediment controls prior to land disturbance, limiting land disturbance to the minimum practicable extent, reducing water velocities across the ground, progressively rehabilitating disturbed land, ripping areas to promote infiltration, and restricting access to rehabilitated areas; and

- Install appropriate temporary ESC measures or BMP prior to, and during, construction activities;
- Additional environmental protection strategies:
  - Monitor groundwater quality, maintaining fish habitat, developing compensatory fish habitat, and reclaiming disturbed areas; and
  - Monitor surface and groundwater quality and quantity to verify EA predictions.

12.2.1.18.4.2.7.4 Construction Mine Water Management Plan

Major construction will occur in Years -2, -1 and 1. Facilities and schedule for construction are listed in **Table 12.2.1-10**.

Figure 12.2.1-6 to **Figure 12.2.1-8** provide conceptual site layouts for construction years.

12.2.1.18.4.2.7.4.1 Mitigation for Potential Interaction with Fish and Fish Habitat

Off-Site Infrastructure Projects Construction Phase - The following are mitigation measures for specific infrastructure projects outside of the mine site catchment area. These measures pertain to the Airstrip through the Transmission Line Sections of the ARMP, which describe the infrastructure projects and the rationale for these measures, and which provide figures showing locations.

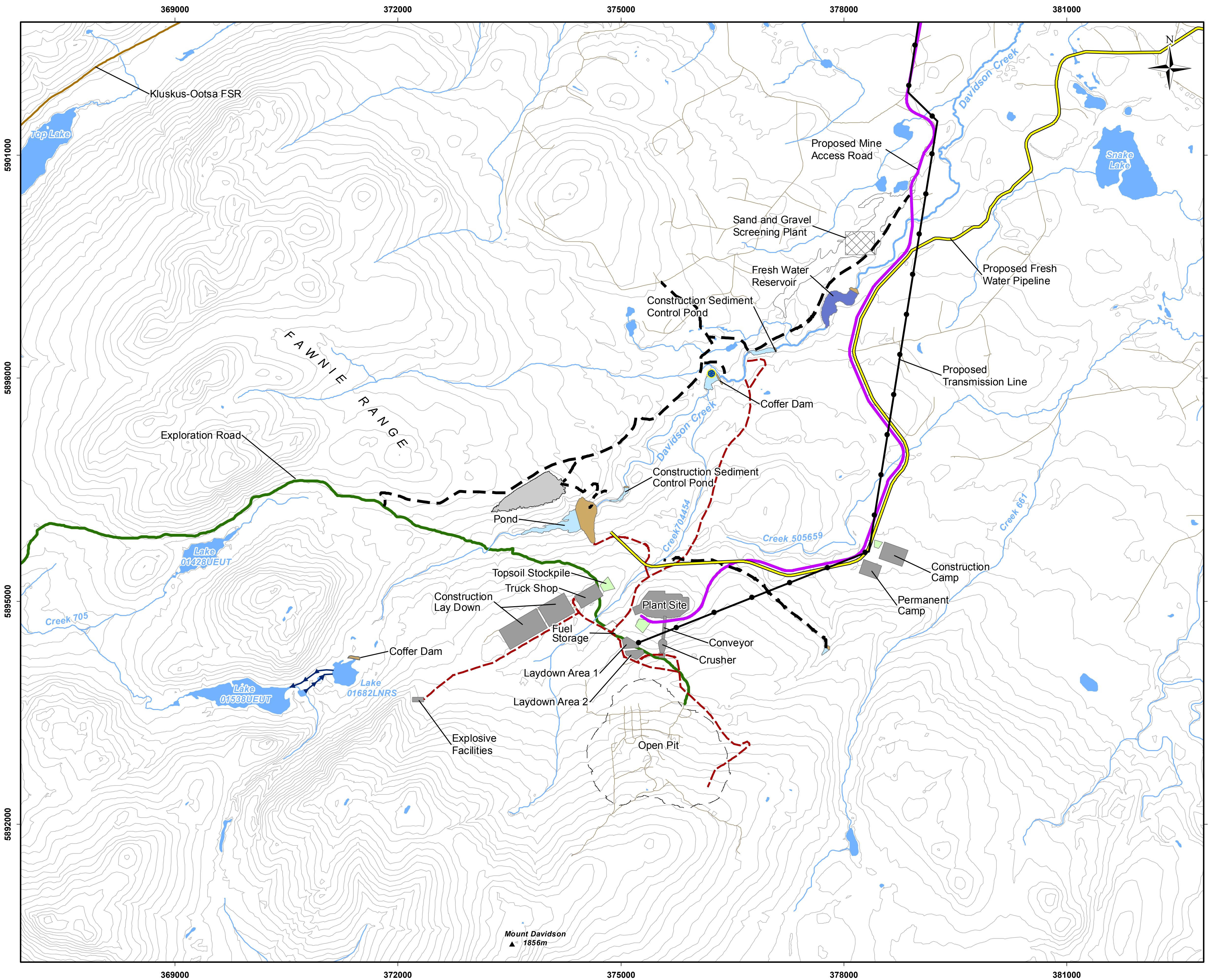
Airstrip, Mine Access Road, Water Supply Pipeline and Access Road, Transmission Line - The existing S4 watercourse culvert along the airstrip site access road acts as a barrier to fish passage and prevents access to upstream fish habitat. The culvert is not sufficiently embedded and is undersized. Replacement of the existing culvert at the S4 watercourse with a crossing structure consistent with DFO guidelines will therefore be required.

Stream crossing structures will be built that meet DFO guidelines on crossing of stream and will be tailored based on the characteristics of the watercourse being crossed e.g., fish bearing status, presence of permanent channel. Proposed bridges for the mine access road will be clear span bridges. ESC measures, including rip-rap armouring, erosion control matting, and hydro seeding, will be used as appropriate to protect erodible soils. Cross drains will typically be placed in seepage zones and in areas of low elevation in order to minimize disruption to local drainage patterns.

Table 12.2.1-10: Mine Site Facilities and Year of Construction

Year(1)	Facility
-2	TSF Dam C starter dam, associated sediment control ponds (2) in Davidson Creek, and east and west coffer dams
-2	Construct Freshwater Reservoir and berm
-2	Process Plant site clearing and sediment control pond downslope to the south
-2	Construction laydown
-2	Truck shop
-2	Overburden stockpile
-2	Construction camp
-2	Permanent camp clearing and start of construction
-2	Sand and gravel borrow areas (two at the mine site)
-2	Water supply pipeline service road and new mine access road
-2	A diversion berm will be constructed on the tributary to Creek 661 east of the open pit to divert headwaters that drain the pit area prior to pit and East non PAG Dump construction
-1	TSF Dam C completion
-1	TSF Site C West Dam augments the West coffer dam
-1	Reverse flow of Davidson Creek headwater Lake 1682 to Creek 705
-1	Increase the level of Creek 705 headwater Lake 1428
-1	Reclaim barge installed in Pond C to supply Process Plant
-1	TSF Dam D foundation construction
-1	Low Grade Ore Stockpile
-1	Commence pit pre-stripping
-1	West NAG Dump
1	Complete Dam D starter dam
1	Tailings deposition in Pond C commences
1	Continue building of West NAG Dump
1	Commence construction of the East NAG Dump
2	Complete Dam D including downstream seepage control
2	Environmental Control Dam constructed (or Year 3)

Note: Sewage and grey water management and treatment is described in the Water Quality and Liquid Discharges Management Plan (Section 12.2.1.18.6.9) and are not considered in the MWAMP or ARMP.



Legend

- Kluskus-Ootsa FSR
- Existing Road
- Exploration Road
- Contour (20 m)
- Stream
- Waterbody

Project Components

- Proposed Mine Access Road
- Proposed Transmission Line
- Pumpstation
- Construction Haul Road
- Flow Diversion
- Mine Haul Road
- Proposed Fresh Water Pipeline
- Borrow Area (Zones S, C, and Rockfill)
- Embankment Fill
- Construction Site
- Fresh Water Reservoir
- Open Pit
- Pond
- Sand and Gravel Screening Plant
- Topsoil

Scale:1:50,000

0 0.5 1 2
Kilometres

Reference
BC Government GeoBC Data Distribution
Knight Piésold Consulting Engineers

CLIENT: newgold

PROJECT: Blackwater Gold Project

General Arrangement End of year -2 Plan

DATE: April, 2014	ANALYST: WR	**Figure 12.2.1-6**
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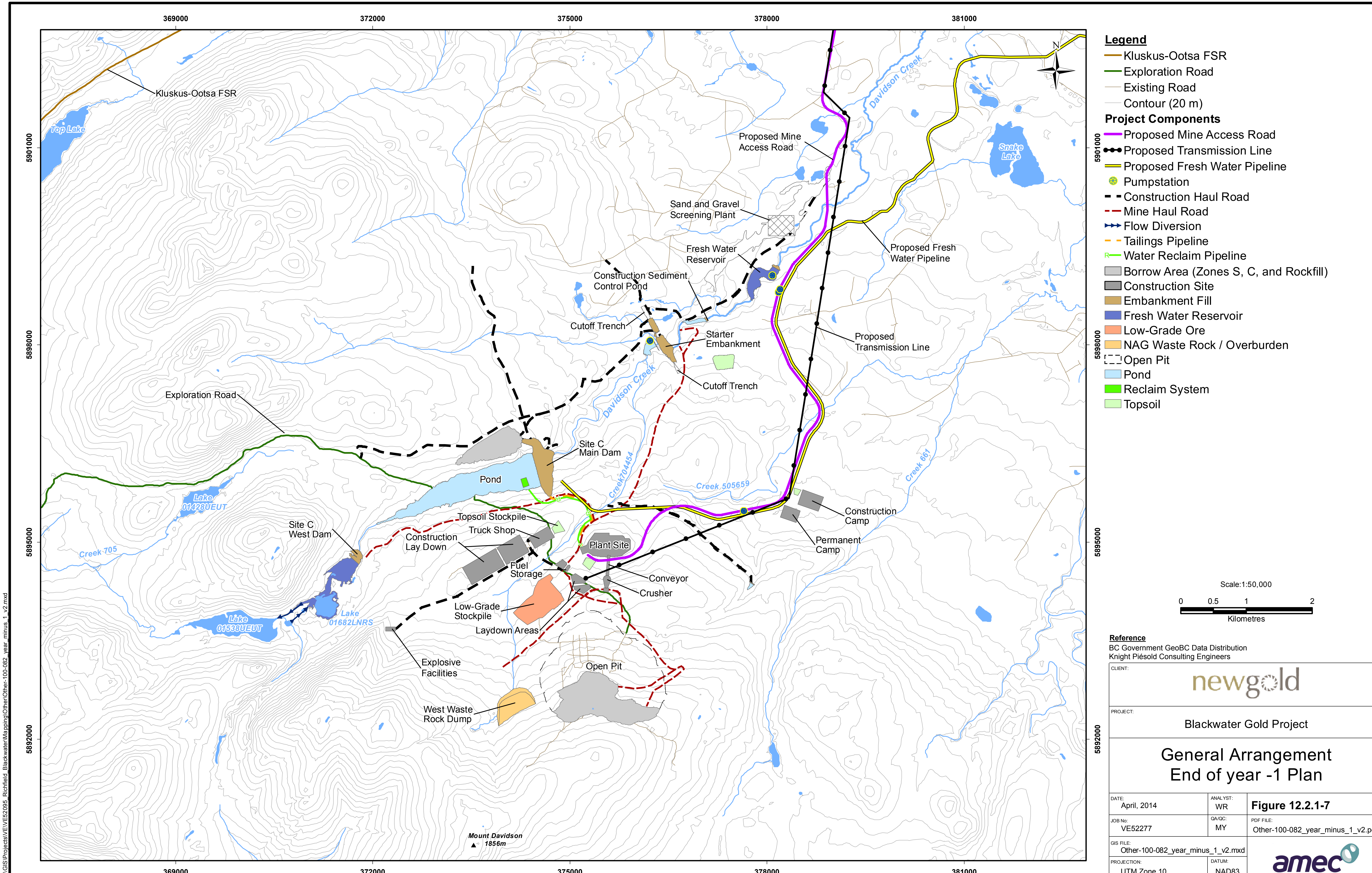
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372000
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Legend
Kluskus-Ootsa FSR
Exploration Road
Existing Road
Contour (20 m)
Project Components
Proposed Mine Access Road
Proposed Transmission Line
Proposed Fresh Water Pipeline
Pumpstation
Construction Haul Road
Mine Haul Road
Flow Diversion
Tailings Pipeline
Water Reclaim Pipeline
Borrow Area (Zones S, C, and Rockfill)
Construction Site
Embankment Fill
Fresh Water Reservoir
Low-Grade Ore
NAG Waste Rock / Overburden
Open Pit
Pond
Reclaim System
Topsoil
Kluskus-Ootsa FSR
Top Lake
Snake Lake
Davidson Creek
Proposed Mine Access Road
Sand and Gravel Screening Plant
Fresh Water Reservoir
Proposed Fresh Water Pipeline
Construction Sediment Control Pond
Cutoff Trench
Starter Embankment
Proposed Transmission Line
Cutoff Trench
Exploration Road
Site C Main Dam
Pond
Creek 704454
Creek 505659
Creek 661
Lake 01428UEUT
Site C West Dam
Creek 705
Topsoil Stockpile
Truck Shop
Construction Lay Down
Plant Site
Construction Camp
Permanent Camp
Fuel Storage
Conveyor
Crusher
Low-Grade Stockpile
Laydown Areas
Lake 01538UEUT
Lake 01682LNRS
Explosive Facilities
Open Pit
West Waste Rock Dump
Mount Davidson 1856m
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Kilometres
Reference
BC Government GeoBC Data Distribution
Knight Piésold Consulting Engineers
CLIENT:
newgold
PROJECT:
Blackwater Gold Project
General Arrangement
End of year -1 Plan
DATE: April, 2014
ANALYST: WR
Figure 12.2.1-7
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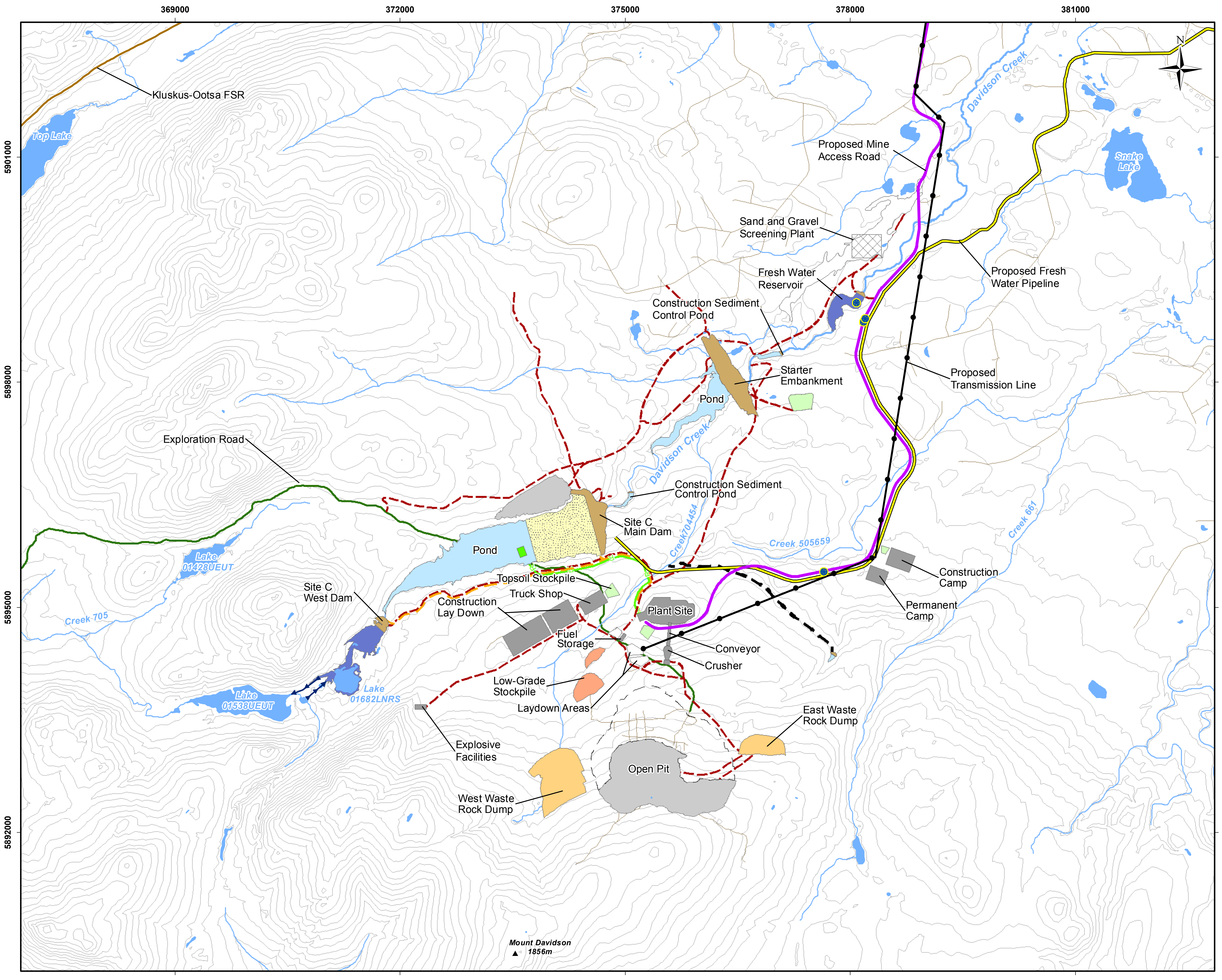

Legend

- Kluskus-Ootsa FSR
- Exploration Road
- Existing Road
- Contour (20 m)

Project Components

- Proposed Mine Access Road
- Proposed Transmission Line
- Proposed Fresh Water Pipeline
- Pumpstation
- Construction Haul Road
- Mine Haul Road
- Flow Direction
- Tailings Pipeline
- Water Reclaim Pipeline
- Borrow Area (Zones S, C, and Rockfill)
- Construction Site
- Embankment Fill
- Fresh Water Reservoir
- Low-Grade Ore
- NAG Waste Rock / Overburden
- Open Pit
- Pond
- Reclaim System
- Tailings Beach
- Topsoil

Scale:1:50,000

0 0.5 1 2

Kilometres

Reference
BC Government GeoBC Data Distribution
Knight Piésold Consulting Engineers

CLIENT: newgold

PROJECT: Blackwater Gold Project

General Arrangement End of year 1 Plan

DATE: April, 2014	ANALYST: WR	Figure 12.2.1-8	
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To minimize changes to fish habitat the freshwater supply pipeline will follow established transportation corridors. The road parallels the pipeline for a total of 13.3 km, of which 1.6 km is new construction and 11.7 km is upgrades to existing roads. Culverts exist at stream crossing PL-3, PL-4 and PL-8. PL-1 and PL-2 are decommissioned bridge crossings. Clear span bridges or crossings structures meeting DFO guidance for stream crossings will be built. Where bridges are used the pipeline will cross the creek adjoined to the bridge. Slopes of the freshwater reservoir will be protected to prevent sediment-laden water from being released downstream. Appropriate sediment control BMPs (described further in this section) will be implemented on natural drainages entering the reservoir.

For the transmission line, existing crossing structures will be used during construction to cross the Stellako and Nechako Rivers and the majority of other watercourses. New crossings for the temporary access roads will be required at a total of 35 watercourses following applicable guidelines. Riparian vegetation clearing will be required at transmission line and access road crossing sites.

Kluskus and Kluskus-Ootsa FSRs - For the Kluskus-Ootsa FSR upgrades, if watercourses to be crossed by the realigned road sections are fish-bearing, crossings structures meeting applicable guidelines e.g., DFO guidance will be followed. Cross drains will be installed where required. Typical locations for cross drainage culverts will be in natural seepage zones, low elevation areas, or near steep gradients to minimize disruption to local drainage patterns.

Of the two existing culverts in the section to be aligned, one is on an S4 stream and is perched and acts as a barrier to fish passage, another is on a non-classified ditch. Replacement of these culverts with new crossing structures will eliminate any barriers and improve fish access upstream of the existing culvert.

General Mitigation for all Projects - All construction projects described in this plan result in potential interaction with fish and fish habitat. In addition to any specific mitigation all projects will conform to federal and provincial guidelines in this section.

Provincial Guidelines - Sources for provincial guidelines include:

- BC MOE A Users Guide to Working In and Around Water (BC MOE, 2009);
- BC MOE Terms and Conditions For Changes In And About A Stream Specified By Ministry of Environment Habitat Officer, Vancouver Island Region (updated June 2007) (BC MOE, 2007); and
- BC MOE Best Management Practices to Protect Water Quality (BC MOE, 2013).

Stream Crossings – All proposed stream-crossing techniques will follow guidelines set out in the Fish-Stream Crossing Guidebook (BC MOF, 2012) under the *Forest and Range Practices Act* (formerly the *Forest Practices Act*). Fish-bearing stream protection practices will be implemented during all phases of construction in accordance with Section 5 of this guidebook.

All instream construction for each crossing will abide by Reduced Risk Timing Windows (July 15 to August 31) for Fish and Wildlife in Region 7- Omineca (BC MOE, 2004).

Federal Guidelines - Projects carried out near water will follow all applicable Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO, 2013). The following is a copy of DFO Measures to Avoid Causing Harm to Fish and Fish Habitat.

12.2.1.18.4.2.7.4.2 Project Planning

Timing:

- Time work in water to respect timing windows to protect fish, including their eggs, juveniles, spawning adults, and/or the organisms upon which they feed unless a salvage has been conducted and the area isolated;
- Minimize duration of in-water work;
- Conduct instream work during periods of low flow to reduce further the risk to fish and their habitat or to allow work in water to be isolated from flows; and
- Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation where possible.

Site Selection:

- Design and plan activities and works in waterbody such that loss or disturbance to aquatic habitat is minimized and sensitive spawning habitats are avoided;
- Design and construct approaches to the waterbody such that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation;
- Avoid building structures on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in erosion and scouring of the stream bed or the built structures; and
- Undertake all instream activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.

Contaminant and Spill Management:

- Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, or other chemicals do not enter the watercourse;
- Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit on site; and

- Ensure that building material used in a watercourse has been handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish.

Erosion and Sediment Control:

Develop and implement an SECP for the site that minimizes risk of sedimentation of the waterbody during all phases of the Project. ESC measures should be maintained until all disturbed ground has been permanently stabilized, suspended sediment has resettled to the bed of the waterbody or settling basin and runoff water is clear. The plan should, where applicable, include:

- Installation of effective ESC measures before starting work to prevent sediment from entering the water body;
- Measures for managing water flowing onto the site, as well as water being pumped/diverted from the site such that sediment is filtered out prior to the water entering a waterbody. For example, pumping/diversion of water to a vegetated area, construction of a settling basin or other filtration system;
- Site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required;
- Measures for containing and stabilizing waste material (e.g., construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry;
- Inspection and maintenance of ESC measures and structures during the course of construction to assess effectiveness;
- Repairs to ESC measures and structures if damage occurs; and
- Removal of non-biodegradable erosion and sediment control materials once site is stabilized.

Shoreline Revegetation and Stabilization:

- Clearing of riparian vegetation should be kept to a minimum: use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. When practicable, prune or top the vegetation instead of grubbing/uprooting;
- Minimize the removal of natural woody debris, rocks, sand or other materials from the banks, the shoreline or the bed of the waterbody below the ordinary high water mark. If material is removed from the waterbody, set it aside and return it to the original location once construction activities are completed;
- Immediately stabilize shoreline or banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through revegetation with native species suitable for the site;

- Restore bed and banks of the waterbody to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage should be restored;
- If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, then ensure that appropriately-sized, clean rock is used; and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment; and
- Remove all construction materials from site upon project completion.

Fish Protection:

- Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows;
- Ensure applicable permits for relocating fish are obtained and to capture any fish trapped within an isolated/enclosed area at the work site and safely relocate them to an appropriate location in the same waters. Fish may need to be relocated again, should flooding occur on the site;
- Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself:
  - o In freshwater, follow these measures for design and installation of intake end of pipe fish screens to protect fish where water is extracted from fish-bearing waters:
    - The screen face should be oriented in the same direction as the flow;
    - Ensure openings in the guides and seals are less than the opening criteria to make “fish tight”;
    - Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area;
    - Screened intake depth will be adjusted so as to match as closely as practical the seasonal temperature regime in Davidson Creek (tentatively 8 to 12 m below the surface in Tatelkuz Lake);
    - Structural support should be provided to the screen panels to prevent sagging and collapse of the screen;
    - Large cylindrical and box-type screens should have a manifold installed in them to ensure even water velocity distribution across the screen surface. The ends of the structure should be made out of solid materials and the end of the manifold capped;

- Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where there is debris loading (woody material, leaves, algae mats, etc.). A 150 mm (6 in.) spacing between bars is typical;
- Provision should be made for the removal, inspection, and cleaning of screens;
- Ensure regular maintenance and repair of cleaning apparatus, seals, and screens is carried out to prevent debris-fouling and impingement of fish; and
- Pumps should be shut down when fish screens are removed for inspection and cleaning.

- Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae:
  - If explosives are required as part of a project (e.g., preparation of a lake bottom for installation of a structure such as a dam or water intake if required), the potential for impacts to fish and fish habitat should be minimized by implementing the following measures:
    - Time in-water work requiring the use of explosives to prevent disruption of vulnerable fish life stages, including eggs and larvae, by adhering to appropriate fisheries timing windows;
    - Isolate the work site to exclude fish from within the blast area by using bubble/air curtains (i.e., a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose), cofferdams or aqua dams;
    - Remove any fish trapped within the isolated area and release unharmed beyond the blast area prior to initiating blasting;
    - Minimize blast charge weights used and subdivide each charge into a series of smaller charges in blast holes (i.e., decking) with a minimum 25 millisecond (1/1000 seconds) delay between charge detonations;
    - Back-fill blast holes (stemmed) with sand or gravel to grade or to streambed/water interface to confine the blast;
    - Place blasting mats over top of holes to minimize scattering of blast debris around the area;
    - Do not use ammonium nitrate based explosives in or near water due to the production of toxic by-products; and
    - Remove all blasting debris and other associated equipment/products from the blast area.

Operation of Machinery:

- Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds;

- Whenever possible, operate machinery on land above the high water mark, on ice, or from a floating barge in a manner that minimizes disturbance to the banks and bed of the waterbody;
- Limit machinery fording of the watercourse to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, construct a temporary crossing structure;
- Use temporary crossing structures or other practices to cross-streams or waterbodies with steep and highly erodible (e.g., dominated by organic materials and silts) banks and beds. For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g., swamp mats, pads) if minor rutting is likely to occur during fording; and
- Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.

Supervision of Instream Work - No in-stream works will be carried out without the authorization and supervision of the Environmental Coordinator. The Environmental Coordinator will be responsible for, but not limited to:

- Providing copies of relevant authorizations and BC MOE permits to be available on-site;
- Applying appropriate erosion and sediment control measures;
- Keeping stocked spill kits on-site at all times;
- Ensuring that work is carried out and completed as quickly as possible;
- Where possible ensure that machinery does not enter the watercourse; if machinery needs to cross an existing watercourse a single crossing is made to support installation of crossing structures; and
- Ensuring that fish salvages are conducted.

Fish Salvage - Fish salvage and monitoring will be conducted by a QEP under the direction of the Environmental Coordinator. Typical measures for fish salvages will include, but not be limited to:

- Isolation of channels using fish stop nets;
- Using appropriate fish sampling equipment for the habitat to be salvaged;
- Monitoring during cofferdam dewatering to relocate stranded fish and amphibians missed by the advance fish salvage;
- Isolating channel-using steel plates and/or rip rap reinforced berms, where required, following completion of fish salvage and prior to dewatering;
- Implementing DFO end-of-pipe fish screen guidelines on pumps used for dewatering to prevent fish passage into pumps; and

- Positioning pump outlet to discharge into a filtering vegetated area, sufficiently far from the source as to prevent re-entry of sediment laden water into the source or any other watercourse.

Spills - Emergency and spill response will be implemented primarily through the ESPRP (**Section 12.2.1.18.4.13**). During construction, contractors will use BMPs that will prevent the entrance or accidental spillage of solid matter, contaminants, debris, and other pollutants into streams, dry watercourses, lakes, and ponds. Machinery will be inspected periodically and as frequently as necessary during periods of high run-off. Repairs will be carried out as soon as possible.

Direct Fish Mortalities - A no fishing policy will be implemented for workers and visitors while staying and accommodations provided by the Project or when travelling to/from the site on mine business.

12.2.1.18.4.2.7.4.3 Mine Site Construction Erosion and Sediment Control

The PCESCP (**Section 2.2.3.5.2**; **Appendix 2.2A-5**) describes the objectives and strategies that will be implemented to manage water and mitigate erosion throughout the construction phase of the Project between Years -2 and 1. Key objectives of the PCESCP are the following:

- Reduce the extent of land disturbance, where practical;
- Isolate disturbed areas and contain the sediment; and
- Collect water for storage within the TSF for use during operations.

Six discrete areas of development have been identified within the Project boundary for the PCESCP. These areas include:

1. Construction laydown, truck shop, and earthworks contractor laydown and offices.
2. Plant site and crusher.
3. Construction camp.
4. Aggregate screening area.
5. TSF.
6. Open pit and waste dumps.

Specific surface water control elements and measures will be implemented to minimize erosion and prevent sediment discharge into surrounding areas. Surface water sediment mobilization and erosion will be managed throughout the site as required and appropriate for each area by:

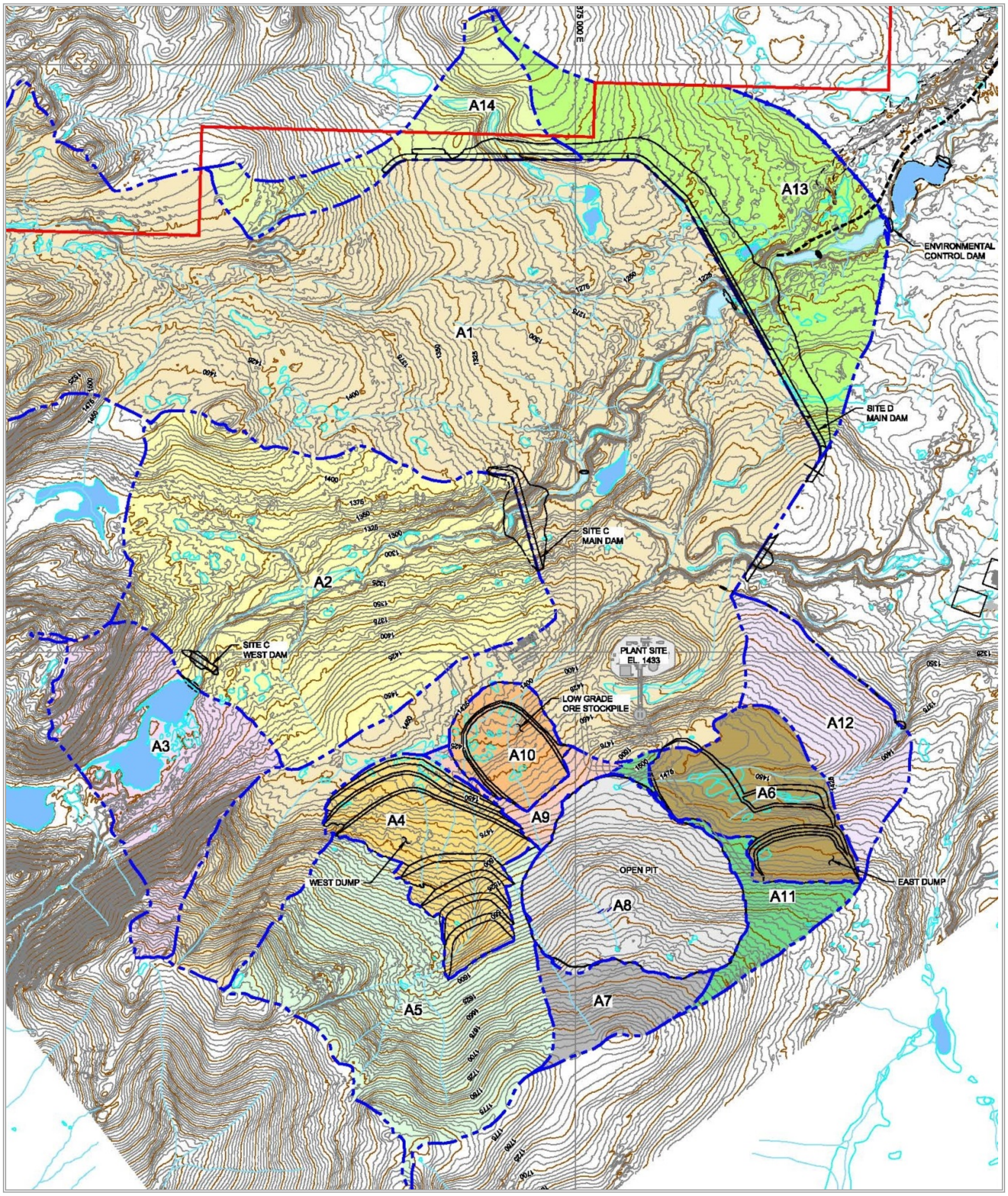
- Installing sediment controls prior to construction activities;
- Limiting the disturbance to the minimum practical extent;
- Reducing water velocity across the ground, particularly on exposed surfaces and in areas where water concentrates;

- Progressively rehabilitating disturbed land and constructing drainage controls to improve the stability of rehabilitated land;
- Scarifying (applying slope roughening to the surface) in rehabilitation areas to promote infiltration;
- Protecting natural drainages and watercourses by constructing appropriate sediment control devices such as collection and diversion ditches, sediment traps, and sediment ponds;
- Installing rock rip-rap, rock channel lining, sediment filters or other suitable measures on steep gradients, as required;
- Restricting access to rehabilitated areas;
- Directing all surface runoff from plant site grading, open pit development, TSF construction, and waste rock storage area development to the TSF basin;
- Implementing soils bioengineering techniques where practical to contain sediment and enable disturbed surfaces to recover; and
- Constructing appropriate temporary ESC BMPs downslope of disturbed sites where more permanent sediment control measures are not appropriate, or in combination with more permanent measures.

Subsurface water will be controlled by the use of sump pits, wells, or removable pumping stations to draw down the natural water table and provide dry, stable construction areas. Excavations will be kept stable and workable by pumping water collected in the excavation sump pits to sediment control devices such as temporary holding ponds, sediment basins, or sediment filter bags where required.

12.2.1.18.4.2.7.5 Operation Phase – Mine Site

The construction, operations, and closure water management strategies for the Project have been developed by identifying the size and position of the planned mine site facilities, and establishing estimated catchment area boundaries based on the mine site development concept. All site drainage during operations and closure will drain by gravity to the TSF. Virtually all the seepage from the TSF and waste rock dumps will also be collected and directed to the TSF. This simplifies water management, spill control, and closure in addition to as well as providing water for the process. The proposed facilities and resulting catchment boundaries are shown in **Figure 12.2.1-9**.



Source: Knight Piésold

Figure 12.2.1-9: Mine Site and Facilities Catchment Area Boundaries

The TSF Site C Main Dam will be constructed in the upper Davidson Creek catchment and capture runoff from the upstream catchment A2, as shown in **Figure 12.2.1-9**. Catchment A3, upstream of the TSF Site C West Dam will be redirected to Creek 705 to the southwest, away from TSF Site C, by a cofferdam built in Year -2, which will permanently change the natural catchment divide in this area. Catchment A3 does not contribute to the water balance for the mine site.

A cofferdam will be constructed on Davidson Creek within the TSF Site D Main Dam footprint in Year -1 to capture runoff from catchments A1 and A14. The accumulated water behind the TSF Site D cofferdam will then be pumped to the TSF Site C start-up pond beginning in the second quarter of Year -1.

The starter dam for the TSF Site D Main Dam will be completed at the start of operations in Year 1, and will begin to capture catchment runoff from the contributing areas of the West Dump (A4), East Dump (A6), and low-grade ore (LGO) stockpile (A10), as well as the corresponding upstream catchment areas (A5, A9, and A11) and area downstream of the East Dump (A12). The ECD will be constructed in Year 1 to capture seepage and surface runoff (A13) from the TSF Site D Main Dam. Unless of acceptable quality for direct discharge, the recoverable seepage (about 96% of TSF seepage by the end of operations) and surface runoff will be collected at the ECD and pumped back to TSF Site D during mine operations and into closure until the open pit is full and TSF Site D spills to Davidson Creek via the closure spillway and discharge channel.

The water stored in the TSF Site C start-up pond will serve as the primary process water source at the start of mill operations until the end of Year 2, with additional water being drawn from the TSF Site D pond (via the pump system at the cofferdam), as necessary. Once tailings deposition in TSF Site D commences in Year 3, and until the end of mining operations in Year 17, the TSF Site D pond will be the primary source of process water. Additional make-up water, if required during that time, will be provided by the TSF Site C pond. The pond in TSF Site C, as of Year 3, will be allowed to accumulate naturally to the closure spillway elevation at or below 1,343 m, and until then overflow into the pond of TSF Site D in approximately Year 27. Freshwater required for the mill (e.g., gland and reagent mixing water) and any additional process water to ensure PAG waste rock in the TSF remains inundated will be supplied by the freshwater supply pipeline from Tatelkuz Lake.

Groundwater inflow and surface runoff to the open pit, including water from the vertical depressurization wells, will be collected and discharged to TSF Site D and will be recycled for use in the milling process until the cessation of open pit mining in Year 15. The pit dewatering system will be decommissioned in Year 15 and the pit will begin to fill with water while the low-grade ore is processed through the mill from Year 15 to 17. Once mill operations cease in Year 17, the surplus inflow to TSF Site D (inflow minus losses) will be pumped to the open pit to accelerate pit filling and associated flooding of PAG rock exposed in the ultimate pit walls. Once the open pit is full, predicted in Year 35, it will overflow via a spillway to the TSF Site D pond. Subsequently, the TSF Site D pond will overflow via the closure spillway and discharge channel to a plunge pool in Davidson Creek downstream of the ECD.

12.2.1.18.4.2.7.6 Closure and Post-Closure Phases – Mine Site

During closure, passive treatment wetlands will be constructed in the sediment pond, ECD, and water reservoir downstream of TSF Dam D to polish TSF seepage. Additional passive treatment wetlands will also be constructed on the surface of TSF Site C in Years 4 and 5 and on the surface of TSF Site D in Years 18 and 19.

Changes in water management will occur at mine closure (after Year 17) and post-closure when the pit overflows and the TSF discharges (approximately Year 35). Pumping of water from Tatelkuz Lake will continue to maintain instream flow needs in Davidson Creek unless seepage quality is acceptable for direct discharge as determined by water quality monitoring and meeting site water quality objectives. A spillway will be constructed in the south side of Dam D to allow water to discharge to a constructed channel leading to Davidson Creek downstream of the dam. The Dam D spillway will be sized to carry the probable maximum flood event to protect dam integrity at post-closure when there is no longer continuous active water management at the site.

Figure 12.2.1-10 is a conceptual site arrangement at the time of pit overflow.

A wetland will be constructed in Pond D to augment tailings supernatant water polished in Pond C. An overflow spillway will be constructed on the southeast side of Pond D. Between the constructed wetlands and the residual pond in D emergent vegetation will be planted to assist in supernatant water polishing. A 30 cm overburden layer is proposed for the TSF as cover material for tailings and PAG waste rock. The purpose of this layer is to provide physical separation of underlying metal leaching materials from the pond water column, thereby minimizing contamination to surface water discharges from the TSF. A 30 cm thick overburden layer will provide an effective means to minimize the influences from tailings and PAG waste rock on water cover chemistry. Firstly, hydraulic gradients through the TSF are predicted to be vertically downward (Lorax, 2013). This will promote the downward transport of tailings and waste rock porewaters through the bottom of the TSF, with the discharge reporting as seepage. Secondly, a 30 cm thick overburden layer will provide an effective barrier to the upward migration of dissolved solutes from underlying tailings and waste rock porewaters via molecular diffusion. Since diffusional transport is only relevant over short pathways (few centimetres), a 30 cm barrier will effectively curtail the potential for diffusive loadings into the water cover. The vertically-downward hydraulic gradients will also serve to minimize the potential for upward diffusional transport.

Selenium and mercury bioaccumulation are not expected given the very low concentrations in the ore. Should either prove to be problematic during mine operations, contingencies such as use of the open pit for treatment will be explored well in advance of mine closure.

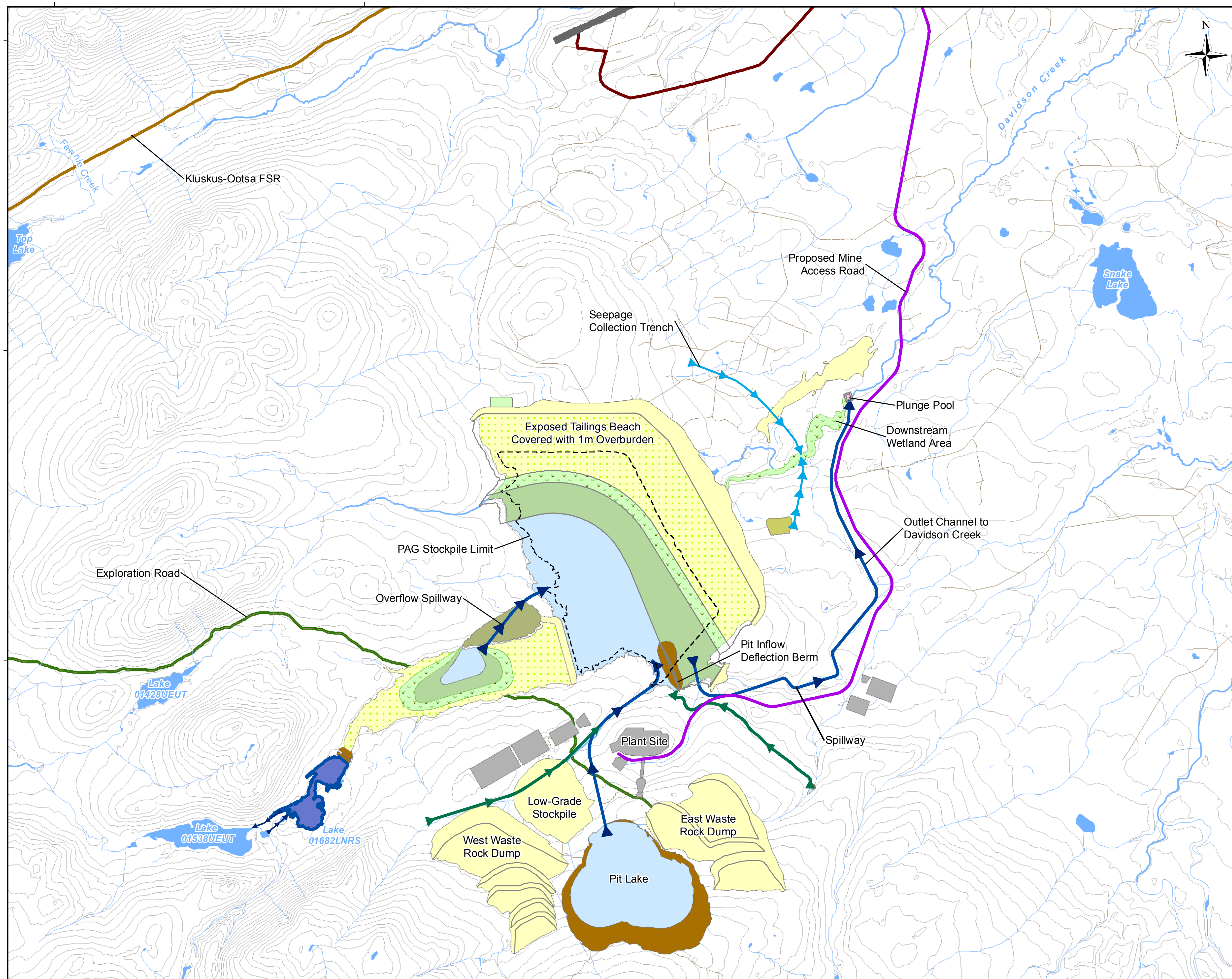
Prior to pit overflow a channel will be constructed between the north end of the open pit and the south side of Pond D. A channel will also be constructed (or upgraded for permanent unmonitored operation) from the berm on the headwaters of Creek 661 tributary to the southeast side of Pond D (diversion channel northeast of the non PAG East Waste Rock Dump in **Figure 12.2.1-10**). Finally, a channel will be constructed from the Pond D spillway to Davidson Creek downstream of a contingency constructed wetland in Davidson Creek downstream of Dam D after closure. The channel will, to the extent possible, follow natural drainage courses thereby assuring minimal maintenance requirements. Erosion potential of this TSF discharge drainage channel will be evaluated as part of closure engineering and rip-rap or other erosion protection such as willow cuttings added where necessary. The system will be designed so that the discharge from the closed mine site will satisfy instream flow needs for Davidson Creek. Again, this potential need will be evaluated at the time of closure engineering.

In the event water quality monitoring in the TSF and filling pit indicate the potential need for further polishing of the discharged tailings supernatant water, an additional wetland could be constructed in Davidson Creek downstream from the TSF discharge channel outfall. Should selenium or mercury bioaccumulation prove problematic other treatment options such as in-pit or in TSF pond treatment for sequestering of selenium and/or mercury in the solid (precipitated) phase, or a separate treatment plant upstream of the TSF discharge could be considered. Other treatment options may be available at the time of post-closure.

An amendment to, or new, *EMA* discharge permit may be required for the Project to allow discharge from the TSF post-closure and permit-level construction details for all diversion structures will be required to support permit application.

Closure water balance calculations (MWAMP) indicate that instream flow needs to maintain fish habitat will be provided by TSF discharge on post-closure, pumping from Tatelkuz Lake will cease, and the water supply line will be removed including all appurtenances and the right-of-way reclaimed following the RCP (**Section 2.6**). Should discharge from the TSF prove inadequate to maintain natural (preconstruction) flows in Davidson Creek active water manage measures for the TSF spillway will be implemented, e.g., installing removable stop logs to increase or decrease flows.

The section of the MWAMP that corresponds to this section of the ARMP is followed by description of open pit closure water management, and includes operation of the TSF, contingencies and flow process details within the mine site catchment area. As discussed for MWAMP Water Management Systems that function within the mine site catchment area, these MWAMP sections are not reproduced in the ARMP.



Legend

- Kluskus-Ootsa FSR
- Existing Road
- Contour (20 m)
- Stream
- Waterbody

Project Components

- Exploration Road
- Proposed Mine Access Road
- Proposed Airstrip Access Road
- Proposed Airstrip Extent
- Diversion Channel
- Flow Diversion
- Seepage Collection Trench
- Spillway
- Bog / Wetland Area
- Emergent Vegetation Wetland
- Flooded Lake
- Plunge Pool
- Pond
- Rock Slope
- Upland Beach
- Upland Slope

Scale:1:50,000

0 0.5 1 2

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT:

newgold

PROJECT:

Blackwater Gold Project

General Arrangement
Closure End of Year 35 Plan

DATE: April, 2014	ANALYST: MY	**Figure 12.2.1-10**
JOB No: VE52095	QA/QC: AP	PDF FILE: Other-100-049_year32_v3.pdf
GIS FILE: Other-100-049_year32_v3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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12.2.1.18.4.2.7.7 Off-Site Infrastructure Projects

Off-site infrastructure projects are:

- Airstrip;
- Mine access road;
- Kluskus-Ootsa FSR upgrade;
- Water supply line; and
- Transmission line.

Construction and maintenance of off-site infrastructure projects will involve land disturbance and stream crossings needing management of site runoff to prevent sediment entering surface water bodies. Construction of the freshwater supply line will also require mitigation for lake habitat disturbances.

Description of streams associated with the projects in this section is based on the Fish and Fish Habitat Inventory, which includes detailed discussion and maps.

As described earlier, a mitigation for potential interaction with fish and fish habitat will be implemented for all construction projects; it includes specific mitigation developed for off-site infrastructure projects. Operation and closure phase measures are included in individual project sections. Sediment and erosion control BMPs will be implemented as described previously in this section.

These project sections will be used to develop project-specific construction water management plans. The construction water management plans will be developed prior to commencement of construction.

12.2.1.18.4.2.7.7.1 Airstrip

Description – A new airstrip is proposed to be used for the transportation of personnel to and from the Blackwater mine site. The airstrip will be built to allow use of Boeing 732-200 or turboprop aircraft of similar capacity, including Dash 8-type aircraft. Components of the airstrip development will include upgrading the airstrip access road, construction of a new airstrip and taxiway, and installation of aerodrome facilities.

The proposed airstrip will be located on the site of a previously logged forestry cutblock. The airstrip site will be located approximately 18.5 km by road from the Blackwater mine camp, as shown in **Figure 12.2.1-11**.

The runway surface will be 1,675 m long and 30 m wide with an additional 7.5 m wide graded area will be constructed at each side of the runway and a 60 m long graded area located at both ends of the runway. A taxiway will be constructed with a width of 18 m with 6 m wide graded areas at each edge. Overall, the airstrip site will be approximately 1.7 km long and 90 m wide, with a total area of approximately 15.5 ha.

An existing forestry cutblock road will be upgraded to serve as the airstrip access road. The airstrip access road extends approximately 5.6 km from km 1.8 of the proposed mine access road to the airstrip site. Re-ditching and vegetation clearing will be required to allow for vehicle access to the airstrip.

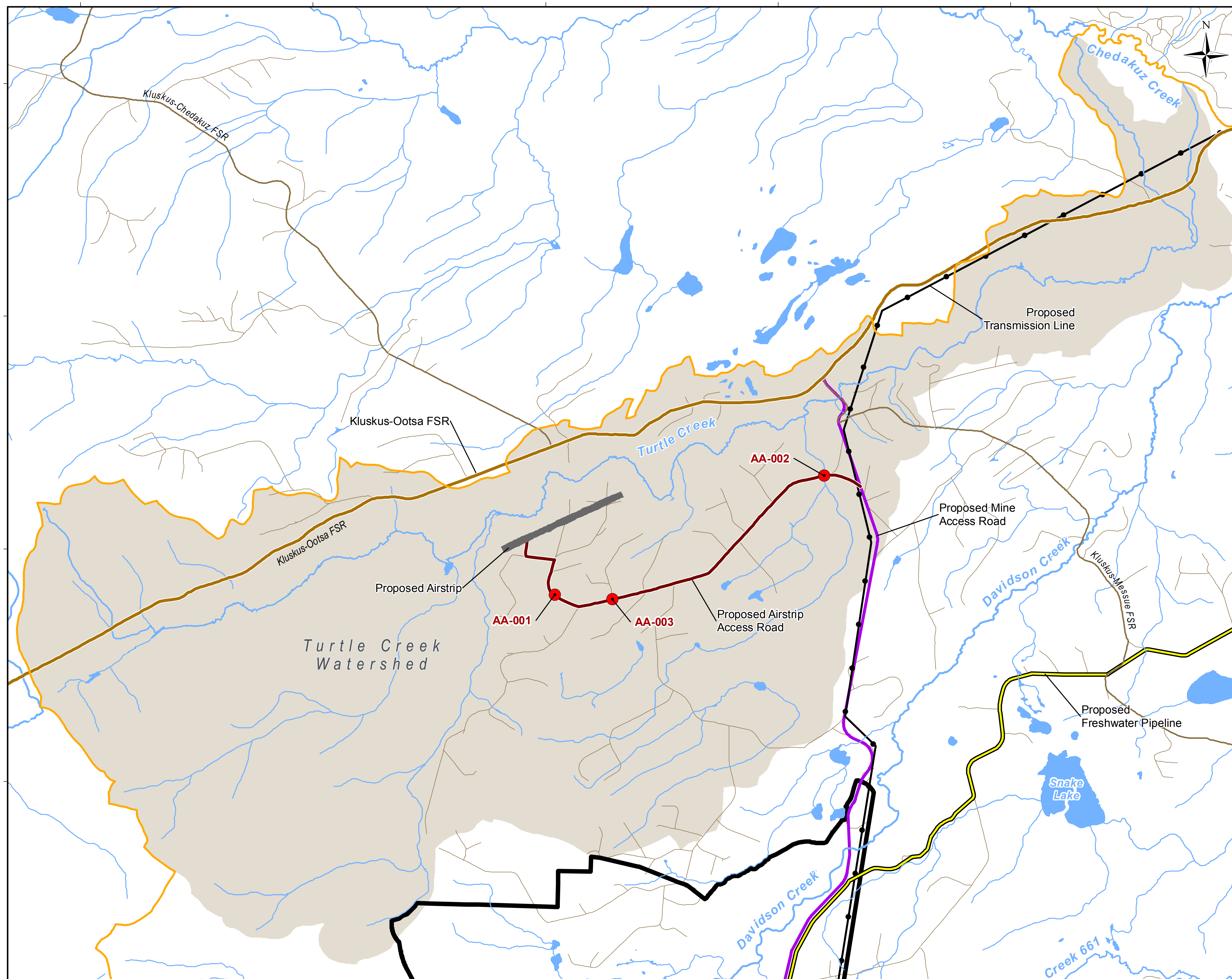
The proposed construction timing is in Y-2 with construction expected to last 6 months.

Potential Interaction with Fish Habitat – The airstrip access road crosses three tributary watercourses to Turtle Creek (all three are shown on **Figure 5.3.8-3**; **Figure 12.2.1-11** only shows the larger two). One watercourse was classified as S4 (the eastern-most crossing on **Figure 12.2.1-11**) (fish-bearing streams with channel widths of <1.5 m), in accordance with the Riparian Management Area Guidebook (BC MOF 1995). The remaining two watercourses were assessed as NCD. The S4 watercourse has the potential to support rainbow trout habitat and fish presence at the crossing site has been confirmed. Upgrading the existing access road at all three crossing sites could impact fish habitat. The existing S4 watercourse culvert acts as a barrier to fish passage and prevents access to upstream fish habitat. The culvert is not sufficiently embedded and is undersized.

The proposed airstrip will be located on a site with no existing fish-bearing watercourses. Site investigations conducted by GeoNorth Engineering Ltd. found generally well-drained soils, although several low-lying areas on the site may temporarily hold or convey water during spring freshet. No evidence of flowing water or drainage channels at the airstrip site was observed (GeoNorth Engineering Ltd., 2013). No watercourse crossings or cross drains are planned to be installed at the airstrip site.

Potential interaction with fish habitat will result from construction, operation, and closure activities at the airstrip and access road. Potential effects on fish habitat are discussed in **Section 5.3.9** of the Application.

Mitigation Measures – All applicable mitigation measures in described Mitigation for Potential Interaction with Fish and Fish Habitat and Mine Site Construction Erosion and Sediment Control will be implemented.



Legend

- Kluskus-Ootsa FSR
- Other FSRs
- Existing Road
- Stream
- Waterbody
- Turtle Creek Watershed

Project Components

- Proposed Mine Access Road
- Proposed Transmission Line
- Proposed Fresh Water Pipeline
- Proposed Mine Site

Fish and Aquatic Resources

- Local Study Area
- Stream Crossing

Scale:1:50,000

0 1 2 3

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Location of Blackwater Project Airstrip Access Road and Associated Stream Crossings

DATE: April, 2014	ANALYST: WR	**Figure 12.2.1-11**
JOB No: VE52277	QA/QC: MY	PDF FILE: 10-200-160_Airstrip_v3.pdf
GIS FILE: 10-200-160_Airstrip_v3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

In addition, specific mitigation measures incorporated into the Project design to minimize or eliminate effects to fish habitat are provided in **Table 12.2.1-11**. Measures also include operation and closure phases.

Table 12.2.1-11: Potential Interactions by Project Phase with Fish Habitat and Mitigation Measures

Environmental Effect	Project Phase	Mitigation/Enhancement Measure[1]	Mitigation Success Rating
Increased surface erosion from areas disturbed during construction and increased sediment transport from constructed gravel road surfaces and airstrip	Construction	Erosion and sediment control measures, including erosion control matting and hydro seeding, will be used to protect erodible soils.	High
Deposition of dirt or gravel from road surfaces into watercourses during road grading	Operation	Grader operators will follow guidelines to prevent sediment deposition in accordance with the road grading environmental management plan (EMP).	High
Decreased overstream cover for fish due to disturbance to riparian vegetation	Construction	Disturbance to riparian vegetation will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Decreased drop-in nutrient supply and increased stream water temperatures resulting from losses of overhanging riparian vegetation	Construction	Disturbance to riparian vegetation will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Spills or leakage of fuels or deleterious substances into watercourses.	Construction/ Closure	An emergency spill response kit will be kept on-site during construction. Fuels will be stored and refuelling will be conducted outside of riparian areas.	High

Note: [1]·Mitigation/enhancement measures found in Fish-Stream Crossing Guidebook (BC MOF, 2012a)

MWAMP Maintenance Measures – The airstrip will be graded to facilitate runoff of precipitation which is expected to infiltrate the ground surrounding the strip and apron. The airstrip will be located in a flat area and erosion from precipitation is not expected to be problematic. Effects of runoff will be monitored and ditches constructed if necessary to carry water away from the strip but not directly into surface water bodies. It was not known at the time of writing whether aircraft would be de-iced at the airstrip. De-icing is not likely, except in an emergency, given aircraft will normally have a relatively short turn around. Should de-icing be anticipated, de-icing will be carried out in a contained area where de-icing chemicals can be collected and disposed of as waste.

All general maintenance practices in Operation Phase – Off-Site Infrastructure Project, will be implemented. In addition, during winter snow will be ploughed from the strip and piled up where melt water will infiltrate the ground in spring. Due to the high effectiveness of proposed mitigation measures, no residual impacts to fish habitat are expected to result from the proposed upgrades to the airstrip access road. Implementation of appropriate mitigation measures, including establishing appropriate erosion and sediment control measures at watercourse crossing sites will prevent any impacts to fish habitat.

12.2.1.18.4.2.7.7.2 Mine Access Road

Description – Access to the mine site will be via a new mine access road. The new mine access road will be approximately 14 km long and will connect the Kluskus-Ootsa FSR and the mine site. Current access to the Project site via the existing exploration road will be closed.

A total of five permanent watercourses and one drainage with no visible channel will be crossed by the mine access road. The five permanent watercourses will be crossed by clear-span bridges ranging in length from 12.0 m to 18 m. Rip-rap will be placed around the bridge abutments adjacent to the watercourses to prevent erosion and scour of stream banks. A corrugated steel pipe (CSP) crossing structure will likely be installed at the undefined drainage to maintain flows across the mine access road.

Cross drains will be installed at intervals determined by site conditions but typically ranging from 75 m to 300 m along the entire length of the mine access road.

The minimum road right of way width will vary from 30 m to 55 m. The right of way may be expanded where the proposed transmission line or freshwater pipeline routes will be located adjacent to the mine access road.

Construction of the mine access road is scheduled to be completed in Y-2.

Potential Interaction with Fish Habitat – The proposed mine access road will involve five crossings of permanent watercourses and one crossing of a drainage with no visible channel. Permanent watercourse crossings will be labelled as Crossings 1 to 5 sequentially from the Kluskus-Ootsa FSR. The watercourses at all of the permanent crossings are either confirmed or assumed to be fish-bearing. The drainage with no visible channel does not support fish or fish habitat and is not discussed further.

Crossing 1 is located over an unnamed tributary to Turtle Creek. No data on fish species presence in this watercourse was available. However, the crossing site is located near the confluence of the unnamed tributary with Turtle Creek, a rainbow trout-bearing watercourse.

Crossings 2 and 5 are located on an unnamed tributary to Davidson Creek and on Creek 505659, respectively. These watercourses are both classified as S4 (fish-bearing streams with channel widths of <1.5 m; BC MOF, 1995). Rainbow trout are suspected to be present at both crossing sites based on habitat suitability, although their presence has not been confirmed.

Crossings 3 and 4 are located on Davidson Creek and on Creek 505659, respectively. Both of these watercourses are classified as S3 (fish-bearing streams with channel widths between 1.5 m and 5 m) and rainbow trout are known to be present at both watercourse crossing sites.

Potential interaction with fish habitat will result from construction, operation, and closure activities at the five bridge crossing sites. Potential effects on fish habitat are discussed in **Section 5.3.9**.

Mitigation Measures – All applicable mitigation measures described in Mitigation for Potential Interaction with Fish and Fish Habitat and Mine Site Construction Erosion and Sediment Control, will be implemented.

In addition, specific mitigation measures incorporated into the Project design to minimize or eliminate effects of habitat losses on fish habitat are provided in **Table 12.2.1-12**. Measures also include operation and closure phases.

Due to the high effectiveness of proposed mitigation measures, no residual impacts to fish habitat are expected to result from the construction of the mine access road. Implementation of appropriate mitigation measures, including establishing appropriate erosion and sediment control measures at watercourse crossing sites will prevent any impacts to fish habitat.

MWAMP Maintenance Measures – All general maintenance practices described below in Operation Phase – Off-Site Infrastructure Projects, will be implemented. In addition:

- Any problematic surface areas causing erosion and sedimentation will be repaired as soon as practical;
- If practical, considering the access road will not be paved, sand rather than de-icing chemicals will be used to improve traction during winter freezing; and
- If road watering is required to control dust, only clean, non-contact water will be used.

Maintenance of the mine access road will be carried out during the mine operation phase. Maintenance activities will include inspections and repairs of roadside ditches, culverts, and bridges. Road grading will be carried out to maintain the driving surface of the road. Road surfaces will also be monitored for increased erosion and sedimentation and repairs will be made if needed.

Table 12.2.1-12: Potential Interactions by Project Phase with Fish Habitat and Mitigation Measures (Mine Access Road)

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measures[1]	Mitigation Success Rating
Increased surface erosion from areas disturbed during construction and increased sediment transport from constructed gravel road surfaces	Construction/ Operation/Closure	Erosion and sediment control measures, including rip-rap armouring, erosion control matting, and hydro seeding, will be used to protect erodible soils.	High
Deposition of dirt or gravel from road surfaces into watercourses during road grading	Operation	Deflectors will be installed at bridge sites to prevent sediment from entering watercourses. Grader operators will follow guidelines to prevent sediment deposition in accordance with the road grading environmental management plan (EMP).	High
Temporary loss of fish habitat during watercourse crossing construction	Construction	Instream works will be avoided or minimized. Temporary single span bridges requiring no instream construction will be installed.	High
Alteration of stream substrates where rip-rap placement extends below the high water level	Construction/ Operation	Placement of rip-rap within the active channel will be avoided.	High
Confinement of the floodplain during high flows due to rip-rap placement on stream banks at crossing sites	Construction/ Operation	Placement of rip-rap within the active channel will be avoided.	High
Hardening of the riparian zone due to rip-rap installation	Construction/ Operation	Placement of rip-rap within the active channel will be avoided. Disturbance to vegetation in the riparian area will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Decreased overstream cover for fish due to disturbance to riparian vegetation	Construction/ Operation/Closure	Disturbance to riparian vegetation will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Decreased drop-in nutrient supply and increased stream water temperatures resulting from losses of overhanging riparian vegetation	Construction/ Operation/Closure	Disturbance to riparian vegetation will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Spills or leakage of fuels or deleterious substances into watercourses.	Construction/ Closure	An emergency spill response kit will be kept on-site during construction. Fuels will be stored and refuelling will be conducted outside of riparian areas.	High

Note: [1]. Mitigation/enhancement measures found in Fish-Stream Crossing Guidebook (BC MOF, 2012a)

12.2.1.18.4.2.7.7.3 Kluskus-Ootsa FSR

Description – The Kluskus-Ootsa FSR will be used year-round operations for mine site access. Portions of the FSR must be upgraded and realigned to allow for use during spring break up, which typically occurs between the middle of March to the end of May (**Figure 12.2.1-12**).

The proposed road upgrades will involve:

- Re-gravelling the road from 101+650 km to 123+973 km;
- Realigning the road from 104+900 km to 106+738 km;
- Improving existing ditch lines or constructing new ditch lines where required; and
- Replacing damaged culverts or establishing new culverts where required.

Re-gravelling works will involve first grading the existing road surface and ditches to remove large rocks and debris. Gravel surfacing will then be placed and compacted on top of the existing road surface to a thickness of 200 mm.

Road realignments will be carried out on a 1.8 km long section of the FSR. Construction of the realigned road sections will involve timber clearing along a 30 m wide right of way. Gravel subgrade construction and gravel surfacing will then be carried out along the realigned sections.

Roadside ditches will be excavated along the realigned sections and along the FSR where no ditch line exists. Existing ditches will be cleared of debris along the remainder of the FSR Project area.

The conditions of existing cross drain culverts are unknown. Existing cross drainage culverts will be replaced if damaged. New cross drain culverts will be installed where required.

Potential Interaction with Fish Habitat – The proposed FSR route will cross two watercourses along the realigned section of the road. One watercourse was rated as S4 (fish-bearing streams with channel widths of <1.5 m) and one was rated as NCD, in accordance with the Riparian Management Area Guidebook (BC MOF, 1995). The existing culvert at the S4 watercourse crossing is perched and acts as a barrier to fish passage.

The FSR includes 100 watercourse crossings, of which 31 were rated as fish bearing (S1-S4), 4 were rated as non-fish bearing (S6), and 65 were rated as NCD. Ditch construction, road surface grading, and bridge or culvert maintenance may be carried out near existing watercourse crossings.

Thirteen additional crossing structures located on the Kluskus FSR were determined as preventing access to upstream fish habitat and acting as barriers to fish passage. Barriers were created by perched, undersized, and insufficiently embedded culverts.

Potential interaction with fish habitat will result from construction, operation, and closure activities along the Kluskus and Kluskus-Ootsa FSRs and at any watercourse crossing sites. Potential effects on fish habitat are discussed in **Sections 5.3.9**.

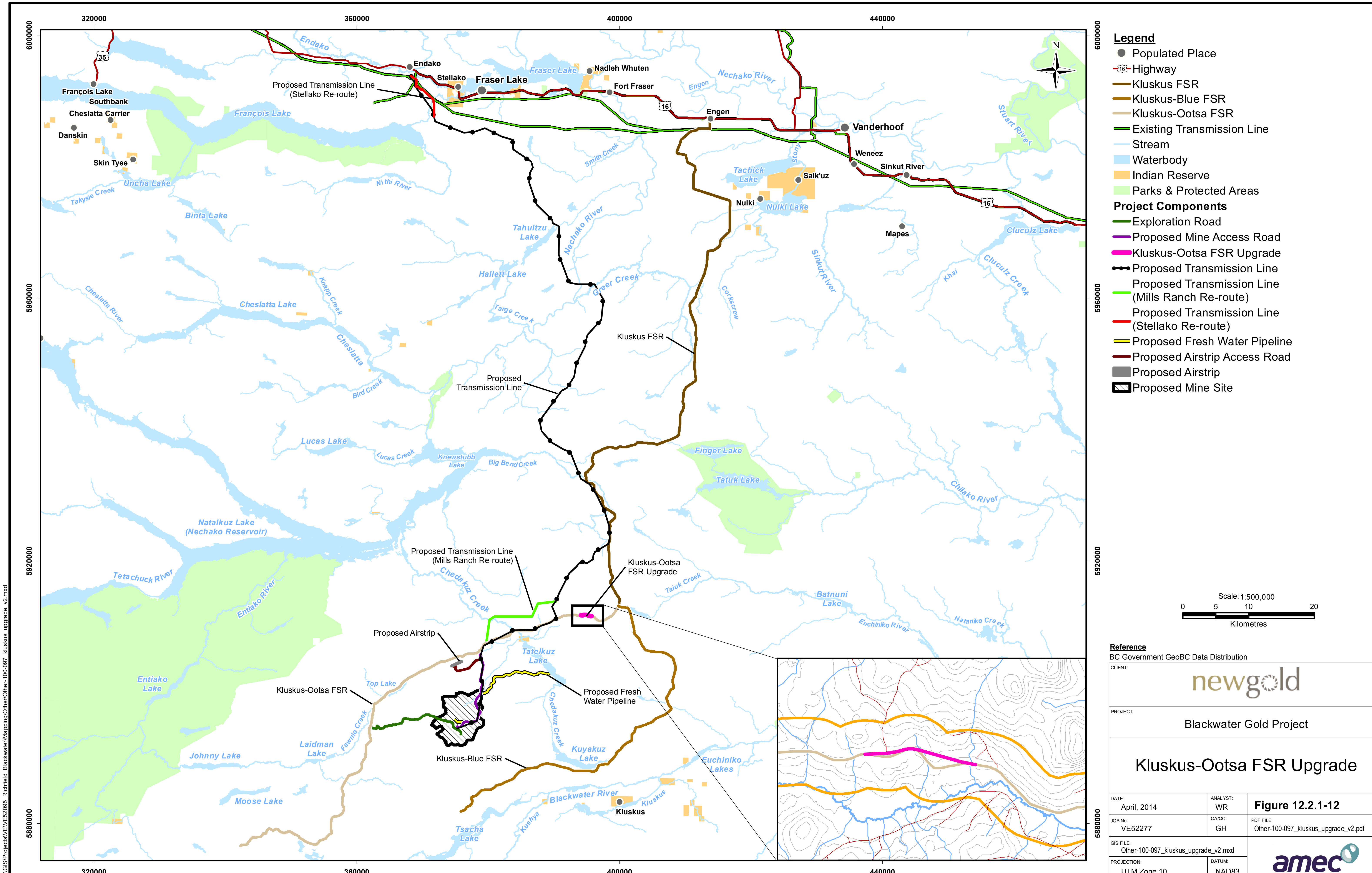
Mitigation Measures – All applicable mitigation measures described above in Mitigation for Potential Interaction with Fish and Fish Habitat and Mine Site Construction Erosion and Sediment Control, will be implemented.

In addition, specific measures incorporated into the Project design for minimizing or avoiding effects of habitat losses on fish are provided in **Table 12.2.1-13**. Measures also include operation and closure phases.

Table 12.2.1-13: Potential Interactions by Project Phase with Fish Habitat and Mitigation Measures (Kluskus-Ootsa FSR)

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measures[1]	Mitigation Success Rating
Increased surface erosion from areas disturbed during construction and increased sediment transport from constructed gravel road surfaces.	Construction/ Operation/Closure	Erosion and sediment control measures, including erosion control matting and hydro seeding, will be used to protect erodible soils.	High
Deposition of dirt or gravel from road surfaces into watercourses during road grading.	Operation	Grader operators will follow guidelines to prevent sediment deposition in accordance with the road grading environmental management plan (EMP).	High
Temporary/permanent loss of fish habitat due to watercourse crossing construction.	Construction	Instream works will be avoided or minimized. Structures meeting DFO guidelines for stream crossing which may include clear-span bridges requiring no instream construction will be installed.	High
Confinement of the floodplain during high flows due to channel constriction by the crossing structures.	Construction/ Operation	Structures meeting DFO guidelines for stream crossing which may include clear-span bridges requiring no instream construction will be installed.	High
Decreased overstream cover for fish due to disturbance to riparian vegetation.	Construction/ Operations/Closure	Disturbance to riparian vegetation will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Decreased drop-in nutrient supply and increased stream water temperatures resulting from losses of overhanging riparian vegetation.	Construction/ Operation/Closure	Disturbance to riparian vegetation will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Spills or leakage of fuels or deleterious substances into watercourses.	Construction/ Closure	An emergency spill response kit will be kept on-site during construction. Fuels will be stored and refuelling will be conducted outside of riparian areas.	High

Note: [1]. Mitigation/enhancement measures found in Fish-Stream Crossing Guidebook (BC MOF, 2012a)



Legend
Populated Place
Highway
Kluskus FSR
Kluskus-Blue FSR
Kluskus-Ootsa FSR
Existing Transmission Line
Stream
Waterbody
Indian Reserve
Parks & Protected Areas
Project Components
Exploration Road
Proposed Mine Access Road
Kluskus-Ootsa FSR Upgrade
Proposed Transmission Line
Proposed Transmission Line (Mills Ranch Re-route)
Proposed Transmission Line (Stellako Re-route)
Proposed Fresh Water Pipeline
Proposed Airstrip Access Road
Proposed Airstrip
Proposed Mine Site
Scale: 1:500,000
0 5 10 20
Kilometres
Reference
BC Government GeoBC Data Distribution
CLIENT:
newgold
PROJECT:
Blackwater Gold Project
Kluskus-Ootsa FSR Upgrade
DATE: April, 2014
ANALYST: WR
Figure 12.2.1-12
JOB No: VE52277
QA/QC: GH
PDF FILE: Other-100-097_kluskus_upgrade_v2.pdf
GIS FILE: Other-100-097_kluskus_upgrade_v2.mxd
PROJECTION: UTM Zone 10
DATUM: NAD83
amec
Y:\GIS\Projects\VE\VE52095_Richfield_Blackwater\Mapping\Other\Other-100-097_kluskus_upgrade_v2.mxd
320000
360000
400000
440000
6000000
5960000
5920000
5880000
Endako
Stellako
Fraser Lake
Nadleh Whuten
Fort Fraser
Engen
Vanderhoof
Weneez
Sinkut River
Saik'uz
Nulki
Mapes
François Lake
Southbank
Cheslatta Carrier
Danskin
Skin Tyee
Kluskus
Proposed Transmission Line (Stellako Re-route)
Proposed Transmission Line
Proposed Transmission Line (Mills Ranch Re-route)
Kluskus FSR
Kluskus-Ootsa FSR Upgrade
Proposed Airstrip
Kluskus-Ootsa FSR
Proposed Fresh Water Pipeline
Kluskus-Blue FSR
Nechako River
Fraser Lake
François Lake
Uncha Lake
Binta Lake
Tahultzu Lake
Hallett Lake
Cheslatta Lake
Lucas Lake
Knewstubb Lake
Natalkuz Lake (Nechako Reservoir)
Tetachuck River
Entiako River
Entiako Lake
Johnny Lake
Laidman Lake
Moose Lake
Tatelkuz Lake
Top Lake
Kuyakuz Lake
Euchiniko Lakes
Blackwater River
Tsacha Lake
Batnuni Lake
Finger Lake
Tatuk Lake
Cluculz Lake
Nulki Lake
Tachick Lake
Chilako River
Stuart River

Due to the high effectiveness of proposed mitigation measures, no residual impacts to fish habitat are expected to result from the upgrades to the Kluskus-Ootsa FSR. Implementation of appropriate mitigation measures, including establishing appropriate erosion and sediment control measures at watercourse crossing sites will prevent any impacts to fish habitat.

MWAMP Maintenance Measures - An access road sharing agreement will be negotiated with the forest companies operating on the Kluskus-Ootsa FSR and maintenance will be carried out under that agreement. All general maintenance practices in will be implemented. In addition:

- Any problematic surface areas causing erosion and sedimentation will be repaired as soon as practical;
- If practical, considering the access road will not be paved, sand rather than de-icing chemicals will be used to improve traction during winter freezing; and
- If road watering is required to control dust, only clean, non-contact water will be used.

12.2.1.18.4.2.7.7.4 Freshwater Supply Line

Tatelkuz Lake Intake Description – Selection of Tatelkuz Lake for the mine's freshwater supply is discussed earlier in Freshwater supply System. Description of the freshwater supply system components is also provided in the same section.

This section includes the following four aspects of the freshwater supply system requiring physical and procedural mitigation:

- Tatelkuz Lake Intake;
- Lake Elevation Changes;
- Pipeline and Pipeline Access Road; and
- Freshwater reservoir.

Potential Interaction of Tatelkuz Lake Intake with Fish Habitat – During construction a lay down area will be required for construction equipment and materials. The pump station will have a concrete foundation and steel superstructure with an opening in the roof to lift the pumps in and out with a mobile crane.

Potential interaction with fish habitat will result from construction, operation, and closure activities for the Tatelkuz Lake Intake. Potential effects on fish habitat are discussed in **Section 5.3.9.3**.

Mitigation Measures – All applicable mitigation measures discussed in Mitigation for Potential Interaction with Fish and Fish Habitat and Mine Site Construction Erosion and Sediment Control, will be implemented. In addition, specific measures incorporated into the project design for minimizing or avoiding effects of habitat losses on fish are provided in **Table 12.2.1-14**. Measures also include operation and closure phases.

Table 12.2.1-14: Potential Interactions by Project Phase with Fish Habitat and Mitigation Measures (Freshwater Supply Line)

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measures	Mitigation Success Rating
Change in flow around pipe intake	Operation	Passive intake screen that admits water at a low, uniform velocity	High
Change in sediment composition around intake pipe	Construction/ Operation/Closure	Passive intake screen that admits water at a low, uniform velocity Placement of intake away from critical littoral habitat	High
Decreased littoral habitat for fish by the intake pipes	Construction/ Operation/Closure	Placement of intakes pipelines underground and intake screens in areas and depth where fish habitat concentrations are low Placement of intake away from critical littoral habitat	High
Increase sedimentation during construction of pipeline and housing structure	Construction	Installation of effective erosion and sediment control measures before work to prevent sediment from entering the lake	High
Change to aesthetics of lake shoreline	Construction/ Operation/Closure	Constructed at a location identified as preferred by local stakeholders	High

No residual impacts to fish habitat are expected to result from the construction, operation and closure of the Tatelkuz Lake intake. Implementation of the appropriate mitigation measures at each crossing will prevent any impacts to fish habitat.

Potential Interaction Due to Lake Elevation Changes – Tatelkuz Lake is known to support 10 species of fish, including, rainbow trout, mountain whitefish, kokanee, northern pikeminnow, slimy sculpin, longnose sucker, brassy minnow, largescale sucker, white sucker, and burbot. Based on the baseline hydroacoustic program in 2013 (AMEC, 2013), Tatelkuz Lake is estimated to support 864 fish/ha. Draw-down of Tatelkuz Lake could result in the loss of fish habitat that is used by fish for cover and forage.

The use of littoral areas of the lakes by fish depends on time of day, the availability of cover, presence of piscivorous fish in the lake and their size. Irresponsible water extraction from Tatelkuz Lake could result in indirect and direct effects to fish habitat. These include dewatering of lower Chedakuz Creek resulting in obstruction of fish passage, change in migration or stranding of fish. Within Tatelkuz Lake the potential effects are reduction in littoral habitat for rearing and foraging fish and reduction in available nutrients provided by littoral habitat. Changes in aquatic vegetation could result in changes in light penetration, in nutrient inputs and in habitat cover and structure. These changes can alter water temperature, food supply, and dissolved oxygen. High water temperatures can encourage microbial breakdown of organic matter, leading to a depletion of dissolved oxygen in the water body.

Potential interaction with fish habitat will result from construction, operation, and closure activities at the five bridge crossing sites. Potential effects on fish habitat are discussed in **Section 5.3.9.3**.

Mitigation Measures – As introduced in Lake and Route Selection Section, Tatelkuz Lake was selected from other lakes in the Project area because the projected withdrawal rate would result in the least effect on flows, lake volumes and associated environmental conditions (New Gold, 2014). Withdrawal rates will be limited from Tatelkuz Lake and will be based on the difference between the predicted monthly outflow of Tatelkuz Lake and the IFN needs for Chedakuz Creek at Tatelkuz Lake outlet. The difference between the predicted monthly outflow of Tatelkuz Lake and the IFN needs in Chedakuz Creek were set as a water withdrawal limit for the system (the Design Basis and Operating Criteria section includes discussion of design flow rate selection.) The freshwater supply system will be allowed to withdraw from the system up to this limit which changes monthly (New Gold, 2014).

Mitigation measures are presented in **Table 12.2.1-15**. Measures also include operation and closure phases.

As the mill and the IFN requirements for Davidson Creek require water consistently, the change in littoral habitat during operations and closure is unavoidable, and will result in residual effects as discussed in the fish habitat effects assessment of the Application.

Table 12.2.1-15: Potential Interactions by Project Phase with Fish Habitat and Mitigation Measures (Instream Flow Needs)

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measures	Mitigation Success Rating
Change in water temperature	Construction/ Operation/Closure	Limit monthly withdrawal of water to conform to monthly variations	Medium
Change in suitable rearing habitat for juvenile fish	Construction/ Operation/Closure	Limit monthly withdrawal of water during low seasonal months when fish habitat is limiting	Medium
Change in nutrient supply in the littoral zone	Construction/ Operation/Closure	Limit withdrawal of water to conform to monthly variations	Medium
Erosion of banks	Construction/ Operation/Closure	Limit monthly withdrawal of water based on natural fluctuations to satisfy mill and Davidson Creek IFN needs	Medium
Changes to flow at outlet of Chedakuz Creek	Construction/ Operation/Closure	Limit withdrawal of water monthly to ensure Chedakuz Creek IFN needs	Medium

Pipeline and Pipeline Access Road Description – Pipeline and access road stream crossings are described earlier in the Freshwater supply System Components section.

12.2.1.18.4.2.8 Potential Interaction of Pipeline and Access Road on Fish Habitat

Potential interaction with fish habitat will result from construction, operation and closure of the activities at the eight pipeline crossings considered fish bearing. Potential effects on fish habitat are discussed in **Section 5.3.9.3**.

12.2.1.18.4.2.9 Mitigation Measures

All applicable mitigation measures discussed in Mitigation for Potential Interaction with Fish and Fish Habitat and Mine Site Construction Erosion and Sediment Control, will be implemented.

In addition, specific measures incorporated into the Project design for minimizing or avoiding effects of habitat losses on fish are provided in **Table 12.2.1-16**. Measures also include operation and closure phases.

Successful implementation of these mitigation measures will ensure that there is no residual impact to fish habitat as a result of the construction of the pipeline.

12.2.1.18.4.2.10 Potential Interaction of the Freshwater Reservoir on Fish Habitat

The freshwater reservoir is described earlier in the Freshwater supply System Components section.

The result of the freshwater reservoir and dam is the loss of habitat in Reaches 6 to 8 of Davidson Creek and some tributaries that flow into these reaches. Total length of stream lost in Davidson Creek in estimated to be 3,891.14 m and related tributaries is 3,342.51 m (**Table 12.2.1-17**).

Potential interaction with fish habitat will result from construction, operation and closure activities of the reservoir dam. Potential effects on fish habitat during construction and operations are discussed in **Section 5.3.9.3**.

Mitigation Measures – All applicable mitigation measures discussed earlier Mitigation for Potential Interaction with Fish and Fish Habitat and Mine Site Construction Erosion and Sediment Control, will be implemented.

Table 12.2.1-16: Potential Interactions by Project Phase with Fish Habitat and Mitigation Measures

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measures	Mitigation Success Rating
Change to riparian habitat from construction of bridge or trenching.	Construction/Operation/Closure	Disturbance to riparian vegetation will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Change to stream banks from heavy equipment and during construction.	Construction/Operation/Closure	Placement of rip-rap within the active channel will be avoided. Disturbance to vegetation in the riparian area will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Loss of fish habitat under culverts or obstruction to fish passage.	Construction/Operation/Closure	Placement of rip-rap within the active channel will be avoided.	High
Increased sedimentation during construction of bridges and trenches.	Construction	Erosion and sediment control measures, including rip-rap armouring, erosion control matting, and hydro seeding, will be used to protect erodible soils.	High
Introduction of deleterious substances into streams.	Construction /Closure	An emergency spill response kit will be kept on-site during construction. Fuels will be stored and refuelling will be conducted outside of riparian areas. Equipment arrives clean and in good working condition.	High
Alteration of stream hydrology during construction of crossing.	Construction	Locate crossings as straight sections of stream, perpendicular to banks whenever possible. Trenching designed at appropriate depth to prevent pipeline exposure due to natural scouring of the stream bed.	High
Alteration of substrates during trenching.	Construction	Make effort to backfill the trench so that the first layer excavated is the last to be replaced. Restore original streambed contours. Avoid construction where there are known spawning habitats.	High

Table 12.2.1-17: Stream Segments between TSF and Freshwater Reservoir

Stream Name	Reach Number	Stream Classification	Length (m)
Davidson Creek	6	S3	1,805.71
	7	S2	231.48
	7.1	S2	788.40
	8	S3	1,065.55
Tributary 6367163-214958	1	-	361.74
Tributary 636713	1	S3	1,164.86
Tributary 616152	1	NVC	1,815.91

Note: m = metre; S3 = fish-bearing with channel width between 1.5- 5 m; S2 = fish bearing with channel width between 5 and 20 m; NVC = no visible channel

In addition, specific measures incorporated into the Project design for minimizing or avoiding effects of habitat losses on fish are provided in **Table 12.2.1-18**. Measures also include operation and closure phases.

Lost stream segments between the TSF and the reservoir will be included in the FHMOP. Loss of fish habitat under the reservoir and dam structure will be permanent and are carried forward into the residual effects assessment section of the Application.

MWAMP Maintenance Measures – Once the freshwater supply line is constructed and disturbance reclaimed by revegetating the site, no further maintenance is expected to be required. General maintenance practices for bridge maintenance and riparian area maintenance as discussed below in Operation Phase – Off-Site Infrastructure Projects, will be implemented.

Table 12.2.1-18: Potential Interactions by Project Phase with Fish Habitat and Mitigation Measures

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measures	Mitigation Success Rating
Increased sedimentation from construction of the dam.	Construction	Erosion and sediment control measures including rip-rap armouring, erosion control matting and hydro seeding.	High
Change to habitat structure and nutrient inputs from changes in riparian drop-in supply during construction of the dam and freshwater reservoir.	Construction	Minimize clearing of riparian vegetation and immediately stabilize banks disturbed by construction of the dam.	High
Changes in water temperature in lower Davidson Creek.	Construction/ Operation/Closure	TFCS will enable desired water temperatures into Davidson Creek.	Moderate
Changes in water chemistry in Lower Davidson Creek.	Construction/ Operation/Closure	TFCS will enable desired water temperatures into Davidson Creek.	Moderate

12.2.1.18.4.2.11 Transmission Line Description

A pole-mounted transmission line is proposed to supply power for the Project (**Figure 12.2.1-13**). The transmission line will carry electricity at 230 kV from the BC Hydro Glenannan substation near Fraser Lake, BC approximately 139.5 km to the Project site. The incoming transmission line will terminate at a substation adjacent to the mine process facilities.

The transmission line will be supported by wooden H-frame or steel monopole structures placed approximately every 250 m along the route. A right of way ranging from 30 to 50 m in width will be cleared along the proposed route.

The proposed transmission line route will follow existing road infrastructure wherever possible. Access to the proposed transmission line alignment will be possible from existing roads for the majority of the route. The construction of temporary and permanent access tracks will be required where the transmission line route deviates from existing roads. A total of 117 km of access roads will constructed, with 15 km of permanent roads and 98 km of temporary roads. An additional 41 km of existing roads will be upgraded to allow for Project use.

The proposed transmission line will cross 197 watercourses. Temporary crossing structures for the proposed access roads will be required for construction at 35 watercourse-crossing sites.

Once construction of the transmission line is complete and when the roads are no longer required, all temporary access roads will be deactivated (using methods that support any applicable recreational access limitations described in the TAMP (**Section 12.2.1.18.4.14**). Deactivation will include removal of any culvert and bridge structures, installations of water bars and ditch blocks, and revegetation in accordance with mitigation described in the LSVMRP (**Section 12.2.1.18.4.4**) and the ISMP (**Section 12.2.1.18.4.5**).

The transmission line corridor and ROW will be reclaimed to pre-mining conditions during the post-closure phase. The majority of power line poles will be removed, although poles near creeks or wetlands may be retained and augmented to provide nesting habitat for raptors.

Construction of the transmission line is scheduled to start in Year -2 and expected to take approximately 16 months.

Potential Interaction with Fish Habitat – The proposed transmission line will cross 143 watercourses. A total of 50 of these watercourses are classified as fish-bearing (S1 to S4) while the remaining 93 were either NCD or S6 watercourses in accordance with the Riparian Management Area Guidebook (BC MOF, 1995).

Potential interactions with fish habitat will result from construction, operation, closure, and post-closure activities at the proposed temporary watercourse crossing sites. Potential effects on fish habitat are discussed in **Section 5.3.9.3** of the Application.

Mitigation Measures – All applicable mitigation measures discussed in Mitigation for Potential Interaction with Fish and Fish Habitat and Mine Site Construction Erosion and Sediment Control, will be implemented.

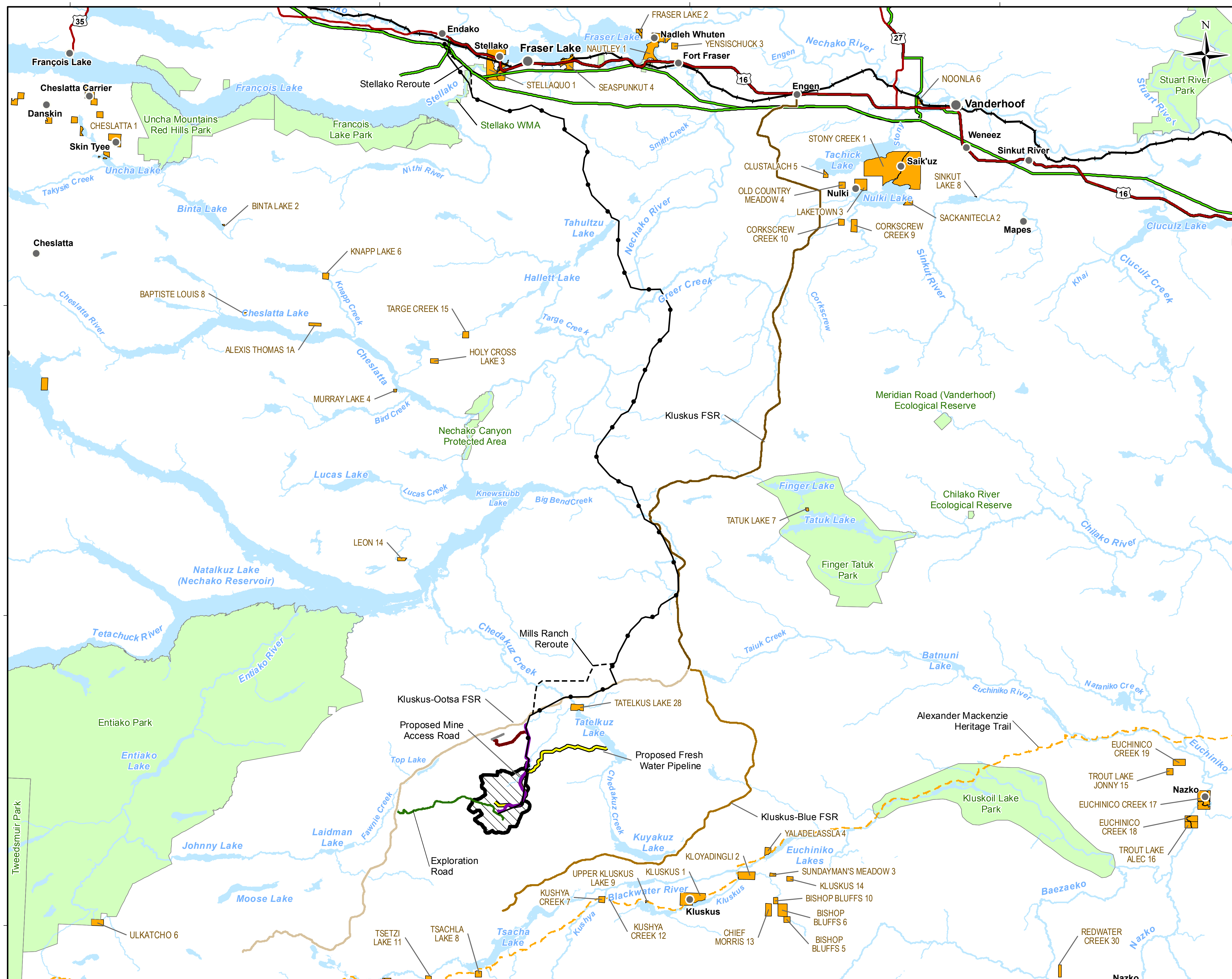
Riparian vegetation management will also meet Approved Work Practices for Managing Riparian Vegetation (BC Hydro et al., 2003). Vegetation retention within the 15 m Riparian Vegetation Management Area (RMVA) will be maximized to reduce impacts to fish.

In addition, specific measures incorporated into the Project design for minimizing or avoiding effects of habitat losses on fish are provided in **Table 12.2.1-19**. Measures also include operation and closure phases.

Table 12.2.1-19: Potential Interactions by Project Phase with Fish Habitat and Mitigation Measures

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measures(1)	Mitigation Success Rating
Increased surface erosion from areas disturbed during construction and increased sediment transport from constructed gravel road surfaces	Construction/ Operation/Closure	Erosion and sediment control measures, including erosion control matting and hydro seeding, will be used to protect erodible soils.	High
Temporary loss of fish habitat during watercourse crossing construction	Construction	Instream works will be avoided or minimized. Temporary single-span bridges requiring no instream construction will be installed.	High
Decreased overstream cover for fish due to disturbance to riparian vegetation	Construction/ Operation/Closure	Disturbance to riparian vegetation will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Decreased drop-in nutrient supply and increased stream water temperatures resulting from losses of overhanging riparian vegetation	Construction/ Operation/Closure	Disturbance to riparian vegetation will be minimized. Disturbed areas will be stabilized, vegetated, and/or seeded as soon as possible after construction.	High
Spills or leakage of fuels or deleterious substances into watercourses.	Construction/ Closure	An emergency spill response kit will be kept on-site during construction. Fuels will be stored and refuelling will be conducted outside of riparian areas.	High

Note: (1) Mitigation/enhancement measures found in Fish-Stream Crossing Guidebook (BC MOF, 2012a)



Legend

- Populated Place
- Highway
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Railway
- Existing Transmission Line
- Alexander Mackenzie Heritage Trail
- Stream
- Waterbody
- Parks and Protected Areas
- Indian Reserve

Project Components

- Exploration Road
- Proposed Mine Access Road
- Proposed Transmission Line
- Proposed Transmission Line Reroute
- Proposed Fresh Water Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip Extent
- Proposed Mine Site

KEY MAP

Scale: 1:500,000

0 5 10 20
Kilometres

Reference
BC Government GeoBC Data Distribution

CLIENT:	newgold
PROJECT:	Blackwater Gold Project

Proposed Mine Site Location with Mine Access Road, Transmission Line, and Fresh Water Pipeline

DATE: April, 2014	ANALYST: WR	Figure 12.2.1-13
JOB No: VE52277	QA/QC: AP	PDF FILE: Other-100-028_v14_Overview.pdf
GIS FILE: Other-100-028_v14_Overview.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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Due to the high effectiveness of proposed mitigation measures, no residual impacts to fish habitat are expected to result from the construction of the transmission line. Implementation of appropriate mitigation measures, including establishing appropriate erosion and sediment control measures at watercourse crossing sites will prevent any impacts to fish habitat.

MWAMP Maintenance Measures – Transmission line maintenance, other than repair or replacement of the line or poles due to storm or ice damage, will consist of vegetation management where required. Vegetation management will be minimized by planting the right of way with shrubs or relatively low growing trees. In addition, as discussed earlier, general mitigation for maintenance of riparian areas will be implemented (Mitigation for Potential Interaction with Fish and Fish Habitat), and the BC Hydro Approved Work Practices for Managing Riparian Vegetation will be implemented.

12.2.1.18.4.2.11.1.1 Operation Phase – Off-Site Infrastructure Projects

Operation and closure phase measures are also included in individual off-site infrastructure project sections (in tables and in MWAMP Maintenance Measures subsections). DFO *Measures to Avoid Causing Harm to Fish and Fish Habitat* (refer to *Federal Guidelines*) will be followed for general maintenance practices for all infrastructure projects including the following:

- Ditches will be inspected to assure proper functioning and repaired as required; additional armouring, beyond that anticipated during construction, will be added if indicated;
- Bridges and abutments will be inspected and repaired if required as soon as practical;
- Culverts will be inspected to ensure they are not blocked, or otherwise rendered non-functional; and
- Riparian areas will be protected as previously discussed.

12.2.1.18.4.2.11.1.2 Training

The Proponent's corporate policy and the overall approach to training are discussed in **Section 12.2.1.18.4.16**, Recruitment, Training, and Employment Plan. This section provides a brief summary specific to management of aquatic resources.

All employees will undergo an environmental orientation prior to working on site. The orientation will include basic aspects of water management and responsibilities for water management for all personnel.

Experienced personnel will be engaged in senior supervisory positions at the Project. A formalized training program will be developed for mine employees requiring specific water management training. Safety and environmental awareness will be key components of all mine training.

For water management, specific training will be provided in operation of the facilities discussed in this plan. Personnel that will require specific water management training may include equipment and facility operators, mine engineers, environmental staff, surface crews and management. Emphasis will be placed on the correct operating parameters and the early recognition and reporting of problems and emergency procedures to initiate should accidents or malfunctions be encountered.

12.2.1.18.4.2.12 Aquatic Effects Monitoring and Reporting

Trained environmental personnel will be employed to carry out environmental monitoring during construction, operations, closure, and post-closure. The location of monitoring sites, the variables to be monitored, frequency of monitoring, and the manner in which the data are to be compared to baseline conditions will be determined in consultation with regulatory agencies.

Environmental monitoring will include but will not be limited to:

- Stream flows and temperatures in the Davidson Creek;
- Water quality in streams and lakes of the LSA as stipulated in the mine's *EMA* permit;
- Biomass and taxonomic diversity of periphyton or benthic macroinvertebrates at sites in streams of the LSA and in reference streams;
- Vertical profiles of temperature and dissolved oxygen in Tatelkuz Lake;
- Biomass and taxonomic diversity of phytoplankton, zooplankton, and benthic macroinvertebrates at sites in lakes of the LSA and in reference lakes as stipulated in the mine's *EMA* permit;
- Relative abundance, species composition, and biological characteristics (i.e., length, weight, age, diet, and tissue metals concentrations) of fish communities in streams and lakes of the LSA and of reference streams and lakes; and
- Any other regulatory compliance monitoring.

Environmental staff will be responsible for compiling regulatory reports as required, reviewing baseline data against monitoring data, communicating those results to regulatory agencies, Aboriginal groups, and the public, and reacting to unexpected changes in monitoring results in an adaptive manner.

12.2.1.18.4.2.13 Consultation

An environmental review board is proposed as a venue to review monitoring plans, their implementation and communicate results. Notwithstanding reporting requirements associated with environmental approvals, this is expected to include regulatory agencies and Aboriginal groups.

12.2.1.18.4.2.14 Audit and Review

Review of environmental monitoring results, and comparison with baseline data, will assist in identifying trends and potential areas of concern, leading to continual improvement. An audit of controls in place for water management will be conducted, which will include review of this plan. The frequency and scope of the review will depend on the results of monitoring programs. Other incidents may trigger a review of this plan including:

- Significant change in water use or process;
- Reduction of stream flows in Davidson Creek and lower Chedakuz Creek below instream flow requirements of fish;
- Regulatory non-compliance; and
- Flooding, dewatering, or other significant incidents.

Corrective and preventative actions may be assigned after an incident or inspection, which may also trigger a review of this plan.

12.2.1.18.4.2.15 Contact Details

Site and updated corporate head office contact details will be provided in the Plan prior to construction when the mine manager and environmental staff have been engaged and amine satellite phone and data system have been installed.

Current (at the time of submission of this Application) corporate contact details are provided in the Proposed Project Overview, **Section 2.1**.

12.2.1.18.4.3 Wetlands Management Plan

12.2.1.18.4.3.1 Introduction

Wetlands management is designed to minimize and prevent potential effects to wetland functions during the construction, operations, and closure phases of the Project. Soil disturbances, vegetation clearing, grading, and facility installation activities caused by construction activities can reduce wetlands' ability to provide biochemical functions, habitat functions, and hydrological functions. Wetlands management provides information on implementing an adaptive management strategy based on wetland monitoring, establishing wetland buffers, and following BMPs that protect wetland functions. This section presents the WMP for the construction and operations phase.

12.2.1.18.4.3.2 Objectives

An objective of the Federal Policy on Wetland Conservation is to "promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future" (Government of Canada, 1991). Due to the nature of the Project and resultant direct and indirect loss of wetland functions within the Project boundaries, management and protection of remaining existing wetlands will be sustained throughout the construction, operations, and closure phases of the Project. Wetland creation on site will also be monitored for success in establishing the target wetland ecosystems during the closure, and post-closure phases. Monitoring of off-site wetland restoration areas is addressed in the Conceptual Wetlands Compensation Plan (**Appendix 5.3.7A**) for the Project.

The objectives of the WMP are to:

- Maintain ecological function by minimizing the loss of wetland extent;
- Maintain wetland hydrological function;
- Maintain wetland biochemical function; and
- Maintain wetland habitat function.

To achieve these objectives, the scope of the WMP comprises:

- Identifying Project activities that have the potential to reduce wetland functions;
- Training staff to enable identification of wetland areas and wetland buffer zones;
- Implementing BMPs during construction activities;
- Establishing wetland monitoring stations to identify changes in remaining wetlands and to track the establishment of created wetlands around the TSF; and
- Establishing buffer zones around wetlands that have been avoided by the mine site footprint.

12.2.1.18.4.3.3 Scope

Project activities during the construction, operations, and closure phases of the Project have the potential to affect wetland functions. Planning to prevent effects to wetlands during these activities can prevent and reduce the effects on wetlands. **Table 12.2.1-20** describes the Project activities potentially affecting wetlands.

Table 12.2.1-20: Activities with Potential to Affect Wetland Functions

Project Phase	Project Component	Project Activity
Construction	Mine Site	Site clearing, grading, soil salvage, borrow pit development, construction of main and ancillary facilities, water diversion/collection/treatment systems, storage and management of construction materials and waste, construction of work camp.
	Mine Access Road	Site clearing, grading and road construction, stream crossings.
	Freshwater Supply System	Site clearing, grading and road construction, stream crossings, construction of intake, installation of water pipeline and freshwater reservoir.
	Airstrip	Site clearing and grading, construction of runway and ancillary facilities.
	Transmission Line	Site clearing and grading, construction of access roads, stream crossings, construction of towers.
	Kluskus FSR	Road upgrades, clearing, grading.
Operations	Mine Site	Drilling, blasting, ore and waste rock loading, hauling and dumping, ore crushing, ore processing, tailings deposition, maintenance of equipment, management of materials, work camp maintenance, waste and sewage treatment.
Closure	Mine Site	Decommissioning and demolition of facilities, recontouring and revegetation, reclamation of TSF.
	Airstrip	Decommissioning and demolition of facilities, recontouring and revegetation.
	Transmission Line	Decommissioning and demolition of facilities, recontouring and revegetation.
	Freshwater Supply System	Decommissioning and demolition of water pipeline and freshwater reservoir, recontouring and revegetation.

Note: FSR = Forest Service Road; TSF = Tailings Storage Facility

12.2.1.18.4.3.4 Linked Environmental Management Plans

The WMP will be implemented in conjunction with several other Project EMPs. The aims of this linked approach are to meet provincial and federal regulatory requirements for wildlife, vegetation, and aquatic resources relating to the conservation of species and ecosystems at risk; to control invasive plant species; and to protect in-stream resources. For example, the LSVMRP and SECP are related to the WMP through the topsoil storage and stabilization activities that will reduce erosion and sedimentation in wetlands and streams during the construction and operations phases. Linked EMPs include:

- MWAMP (**Section 12.2.1.18.4.18**);
- WLMP (**Section 12.2.1.18.4.6**);
- ARMP (**Section 12.2.1.18.4.2**);
- SECP (**Section 12.2.1.18.4.1**);
- LSVMRP (**Section 12.2.1.18.4.4**);
- ISMP (**Section 12.2.1.18.4.5**); and

- Reclamation and Closure Plan (RCP **Section 2.6**).

12.2.1.18.4.3.5 Regulatory Requirements

There are several federal and provincial policy statements and legislative acts pertaining to wetland functions in regards to maintaining productive habitats to support the conservation and protection of plant, fish, and wildlife species. The Government of BC does not yet have a specific wetlands policy, but several existing provincial laws may apply to wetlands on a case-by-case basis, including *Forests and Range Practices Act* (Government of BC, 2002b), *Water Act* (Government of BC, 1996d), and *Wildlife Act* (Government of BC, 1996f). Federally, the Federal Policy on Wetland Conservation (Government of Canada, 1991) promotes the protection of wetland ecological functions, and the main laws that affect wetlands include the *Fisheries Act* (Government of Canada, 1985d), *Canada Wildlife Act* (Government of Canada, 1985b), *Species at Risk Act* (Government of Canada, 2002b), and *Migratory Birds Convention Act* (Government of Canada, 1994).

12.2.1.18.4.3.6 General Practices – Prevention

Preventing negative effects to wetland functions is integral to the successful implementation of the WMP. Prevention includes three aspects: employee training and awareness; BMPs during multiple Project phases; and the establishment of wetland buffer zones.

12.2.1.18.4.3.6.1 Training and Awareness

Employee orientation will be tailored based on the level of interaction likely by job position. This will range from awareness, identification of wetlands to more specific information relating to requirements when working around wetlands.

12.2.1.18.4.3.6.1.1 BMPs and Mitigation

Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia (Cox and Cullington, 2009) was written primarily for activities in and near wetlands for the mining industry, providing a series of recommended BMPs to protect the functions these ecosystems provide. Additional BMPs have been developed by Welsch et al. (1995) for work in forested wetlands. These BMPs are applicable during the construction and operations phases for all Project components; during the operations phase for the mine site; and during the closure phase for the mine site, airstrip, transmission line, and freshwater supply system. This list will not be considered a checklist for mandatory practices, as there will seldom be a situation when all of these practices will be needed on the same area at the same time. Specific wetland BMPs for the Project comprise of the following.

12.2.1.18.4.3.6.1.2 Planning

- Protect remaining wetlands by minimizing erosion and sedimentation through the retention of 30 m buffers;

- Design roads and other linear features to avoid and minimize wetland impacts;
- Minimize the number of wetland and stream crossings for all linear features; and
- Minimize noise and other disturbances during sensitive times for wildlife, particularly for birds during the breeding season, and refer to the WLMP for information on respective fish and wildlife timing windows for construction.

12.2.1.18.4.3.6.1.3 Access/Construction

- Use low ground pressure equipment or tracked equipment when possible for work in areas with saturated soils;
- Use timber mats, driving mats, or log corduroys as ground protection to minimize disturbances to vegetation and prevent rutting; and
- Maintain existing drainage connections and water flows when designing and installing culverts for cross drainage, and do not create outlets that either drain wetlands or constrict the natural outlet.

12.2.1.18.4.3.6.2 Establishment of Wetland Buffer Zones

Buffer zones are established around wetlands to protect and minimize effects on wetland function from adjacent land uses. Buffer zones are vegetated areas that can reduce these impacts through various physical, chemical, and/or biological processes, and also provide terrestrial habitats necessary for wetland-dependant species that require both aquatic and terrestrial habitats during their life cycles (Hruby, 2013). Buffer zones also prevent the loss of wetland extent, which is the primary method of minimizing the loss of wetland functions from the development of the Project.

The main purpose for wetland buffers in the mine site is sediment removal in order to protect wetland biochemical and hydrological functions. It is not the intention of the WMP to manage wildlife in the wetlands in the mine site that have been avoided by the mine site footprint because it would not be compatible with mine operations. As such, metals and nutrients attach to sediments, which are then suspended in surface flows. The vegetated buffer functions to slow the velocity of the surface flows that allow the suspended solids to settle on the surface and filter through the soil (Environmental Law Institute, 2008). The efficiency of buffers to effectively remove sediment from the surface flows also decreases as slope increases. Buffers with steep slopes may require wider widths to achieve the same level of functioning as buffers with less of a gradient.

Hruby (2013) and the Environmental Law Institute (2008) suggest wetland buffer widths of 9.1 m to 30 m for sediment removal depending on the slope of the buffer. Because the mine site has relatively steep terrain, 30 m wetland buffers will be employed where possible.

These 30 m buffer zones will be preserved where possible around mapped wetlands in the mine site that have been avoided by the mine site footprint by establishing limits of disturbance during construction. Light activities with temporary impacts, such as temporary access routes, invasive plant species management, sediment and erosion controls, and targeted vegetation clearing, will be allowed on a case-by-case basis within the wetland buffer zone as necessary to accommodate construction activities.

12.2.1.18.4.3.6.2.1 General Practices – Monitoring for Effects

The purpose of wetland monitoring programs is to identify potential negative effects to wetland functions from site construction and operations and to systematically address changes in wetland functions that may trigger the need for mitigating actions to prevent further negative effects. A separate wetland monitoring program associated with off-site wetland restoration activities prior to construction will be implemented under the Conceptual Wetland Compensation Plan (**Appendix 5.3.7A**). The goal of the monitoring program under the WMP will be to measure potential changes in existing wetlands in terms of hydrological, habitat, and biochemical functions over the life of the mine. Details about monitoring the created wetlands around the TSF during operations and closure phases are provided in the management plans specific to those phases.

12.2.1.18.4.3.6.3 Monitoring Methods

The wetland monitoring program will utilize the baseline sampling data from wetlands within the mine site not impacted by the mine site footprint. The data collected at these locations will be used to compare wetland characteristics before and during mine construction and during operations. Additional monitoring locations will be established around the mine site as necessary. Data on water quality, hydrologic regime, and vegetation species and habitat will be recorded through photographic documentation, in situ water quality monitoring, and visual inspections. A monitoring network will be established to document changes to wetlands at sites that are proximate to development and are reference locations utilized during baseline studies.

12.2.1.18.4.3.6.4 Photographic Documentation

Photographic documentation will be used to monitor wetland habitat and hydrological functioning. Photo-points will be established to obtain representative photographs of specific wetlands during each monitoring event. Photographs will be taken from the same location, at the same height, and in the same direction each time from year to year. The photo-points will be used to evaluate changes in vegetation composition and structure, and general site characteristics over time. Photo-point monitoring will occur approximately the same time each year allowing for interannual variance in the timing of seasonal changes in vegetation cover.

12.2.1.18.4.3.6.5 Water Quality Monitoring

Water quality monitoring will be used to monitor wetland biochemical functioning. Water quality in wetlands will be monitored using both in situ and surface water sample collection methods. Water quality monitoring will be conducted in concert with the ARMP as necessary to monitor for effects to water quality in aquatic resources beyond the Project footprint. Water collection guidelines and laboratory protocols will follow those described in the Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MOE, 2012b). The following water quality parameters will include, but not be limited to: turbidity, major ions, nutrients (e.g., ammonia, nitrogen, phosphorous), total and dissolved metals, cyanide, organic carbon, pH, conductivity, dissolved oxygen, and temperature. All site water quality monitoring efforts will be coordinated with the ARMP and other management plans, which will determine the number and timing of sampling events.

12.2.1.18.4.3.6.6 Visual Inspections

Visual inspections will occur with each monitoring event to monitor wetland ecosystems, including hydrological conditions and wetland extent. Visual inspections will include meandering transects through wetlands and within wetland buffers to identify accidental filling, pollutant discharges, or other stresses on wetland ecosystem functioning and vegetation cover. Visual inspections of wetland buffers are intended to identify developing threats or sources of pollution to prevent impacts to wetlands before they occur, such as:

- Erosion and rill formation;
- Materials storage;
- Active construction or operations; and
- Invasive species establishment.

Transects through wetland interiors will identify existing impacts to wetlands and wetland functions, such as:

- Stressed or “burned” vegetation;
- Sediment runoff;
- Invasive species establishment;
- Changes in hydrologic regime (e.g., seasonal flooding, drawdown); and
- Litter.

Plant species will be recorded along transects through wetland interiors and buffers to identify invasive species. Visual monitoring will occur at least every other year.

12.2.1.18.4.3.6.7 Data Analysis, Reporting, and Adaptive Management Process

Data collected during wetland monitoring will be documented and the results assessed in annual monitoring reports. The results will be compared between monitoring years and the baseline report, and recommendations regarding management practices, monitoring frequency, and corrective actions will be provided, if necessary. The reports will address any adverse effects to wetland habitat, biochemical, hydrological, and ecosystem functions.

Data analysis and reporting is the first step in the adaptive management process. Adaptive management includes monitoring, assessing the results, identifying adverse effects to wetland functions, and developing corrective measures to stop the disturbance or restore wetland functioning to pre-disturbance levels. This approach is consistent with the overall EMS for the site, which promotes responsible environmental management and continual improvement.

12.2.1.18.4.3.6.7.1 Environmental Commitments

Environmental commitments associated with implementation of the WMP relate to the protection and conservation of wetland extent and functions within the mine site. Environmental commitments generated from the WMP to protect and reduce impacts to wetland extent and functions comprise:

- Implement wetland BMPs to reduce overall wetland impacts and protect the functions of wetlands avoided during mine construction and operations;
- Implement the WLMP to protect wildlife species by reducing noise and other disturbances during breeding season;
- Implement the SECP to prevent sediment from being discharged into wetlands;
- Implement the ISMP to prevent establishment of invasive plant species and loss of wetland habitat functions;
- Implement the LSVMRP to conserve native soils and revegetate with indigenous plant species;
- Implement the ARMP to protect wetland drainage patterns and reduce water quality impacts at all stream crossings;
- Implement the RCP to restore wetland functions to the maximum extent practicable following mine operations; and
- Implement the wetland monitoring program in conjunction with the monitoring and reporting protocols specified in the ISMP, ARMP, SECP, WLMP, and LSVMRP.

12.2.1.18.4.4 Landscape, Soils, and Vegetation Management and Restoration Plan

12.2.1.18.4.4.1 Introduction

Landscape, soils and vegetation will be managed throughout all phases of mine life. Management during the construction and operations phases will include maximizing opportunities for progressive reclamation, to support the objectives of the RCP (**Section 2.6**). This section presents the LSVMRP for the construction and operations phase. Management of identified plant species at risk is included, including reference to whitebark pine management.

12.2.1.18.4.4.2 Scope

Landscaping includes the alteration of baseline contours with development of the open pit, and with the shaping of waste rock, overburden, and salvaged soil stockpiles. Soil management includes the salvage and storage of suitable reclamation material, primarily from the locations of landscape work. Vegetation management ranges from salvage of merchantable timber and revegetation for erosion and sediment control, to reclamation and closure objectives that include restoration of the endangered whitebark pine (*Pinus albicaulis*) (COSEWIC, 2010).

12.2.1.18.4.4.3 Linked Environmental Management Plans

12.2.1.18.4.4.3.1 Plans Linked through Vegetation Management

Throughout the LSVMRP, the management of vegetation is referenced to the ISMP, which provides for the protection of existing plant communities and ecosystems during all phases of mine life. The ISMP works in conjunction with the LSVMRP to meet provincial and federal regulatory requirements for control of invasive plant species in relation to timber harvesting, conservation of species and ecosystems at risk.

Other EMPs linked to the vegetation management objectives of the LSVMRP include:

- AQEMP (**Section 12.2.1.18.4.9**);
- SECP (**Section 12.2.1.18.4.1**)*;*
- WMP (**Section 12.2.1.18.4.3**);
- WLMP (**Section 12.2.1.18.4.6**);
- MWMP (**Section 12.2.1.18.4.17**); and
- TAMP (**Section 12.2.1.18.4.14**).

Vegetation management for species at risk will reference whitebark pine management, and the WMP for the identified species at risk that are associated with wetlands habitat. For exploration activities in the Ungulate Winter Range (UWR), the WMP references measures for conservation of terrestrial and arboreal lichens.

12.2.1.18.4.4.3.2 Plans Linked through Landscape and Soils Management

EMPs linked to the landscape and soils management objectives of the LSVMRP include:

- AQEMP (**Section 12.2.1.18.4.9**);
- SECP (**Section 12.2.1.18.4.1**)*;*
- WQLDMP (**Section 12.2.1.18.4.10**);
- ESPRP (**Section 12.2.1.18.4.13**);
- VRMP (**Section 12.2.1.18.4.8**); and
- RCP (**Section 2.6**).

12.2.1.18.4.4.4 Regulatory Requirements

Regulatory requirements relating to soil salvaging, handling, and management are established under the BC *Mines Act* and the Health, Safety and Reclamation Code for Mines in BC (BC

MEMPR, 2008). A standard requirement for EAs is a conceptual RCP. The LSVMRP is directly related to the required reclamation plan.

The disposal of unmerchantable trees and vegetation debris is regulated by the *Forest and Range Practices Act* and in accordance with the *Wildfire Act*. A review of the regulatory background for invasive species management is provided in the ISMP.

The *Species at Risk Act (SARA)* (Government of Canada, 2002b) lists plant species at risk. The five at risk plant species observed in the Project footprint are not legally protected within the Project site but will be managed, as described in this plan).

12.2.1.18.4.4.5 Construction Phase – Landscape

Construction in support of the Project will be accompanied by disturbance to soil and landscape. Landscape changes will include the re-grading and alteration of baseline contours for development of the proposed mine site. The Project will require a transmission line with service roads, haul roads, sites for facilities infrastructure, and a network of general vehicle access roads to access facilities.

Project design elements that will be employed to minimize the effect of the Project on landscape conditions include:

- Overburden and NAG5 waste rock material will be used as a cover in the TSF and for construction where appropriate;
- Transmission line development will maximize use of existing logging roads and disturbances;
- New access roads development will maximize use of existing access roads;
- Mine facilities development will maximize use of previously disturbed habitat; and
- As defined in the Project Description, Overburden and Type 5 NAG (non-acid generating waste rock with NPR>2 and zinc concentration<600 ppm) will be used for construction projects (e.g., TSF dam D downstream shell and other mine facilities) although limited amounts of NAG4 will be used for TSF dam downstream shell construction.

Adverse effects on landscape stability will be reduced by:

- Using appropriate blasting methods in accordance with regulatory requirements and industrial best practices procedures;
- Reducing slope gradients along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces;
- Seeding and progressive reclamation of exposed slopes to improve slope stability ensuring seeding is carried out using appropriate species; and

- Where appropriate, using drainage control measures and water passage structures e.g., culverts to manage the natural flow of surface runoff and to mitigate accelerated erosion.

12.2.1.18.4.4.6 Construction Phase – Soils

Topsoil is defined as the duff layer (i.e., needle litter and leafy organic accumulations on the surface) and upper mineral soil horizons (i.e., A horizons) in upland areas. These mineral A horizons are often described as dark colour Ah horizons containing organic material or relatively coarser textured Ae horizons with a light gray appearance. The reclamation material salvaged for the Project will also include some upper and lower subsoil (i.e., B and C horizons) in combination with any A horizons. In the Project area, the A horizon is often less than 10 cm deep. For reclamation activities, a topsoil deficit is anticipated. Based on construction constraints, and ensuring all suitable material is salvaged, a depth of approximately 0.5 m including A, B, and C mineral horizons would be considered suitable reclamation material for salvage. This is in addition to all surface organics materials. The inclusion of subsoil material is not considered detrimental to topsoil quality as the upper subsoil is typically similar to the topsoil (A horizon) material is terms of physical and chemical attributes. Surface organic soils are defined as accumulations of variably decomposed organic materials. These soils are classified based on the degree of decomposition of the organic material. Soil horizons are classified as Of, Om, or Oh, depending on the degree of decomposition. This organic material, found in depressional hydric areas, contains physical and chemical properties suitable for use as a soil amendment for reclamation activities.

12.2.1.18.4.4.6.1 Topsoil Sources

During the construction phase, the reclamation materials (i.e., topsoil with subsoil, organic soil) will be salvaged and stored for use for progressive reclamation practices during the Project life span.The total estimated volume of potentially salvageable soil is 472,745 m^3, corresponding to 756,393 tonnes (t) of soil, assuming soil weight is 1,600 kilogram per cubic metres (kg/m^3) (Table 12.2-15). The soil volume was estimated assuming the uppermost 0.5 m layer of good and fair soil will be salvaged together with the uppermost 1.0 m of organic soil in selected areas. Soil salvaging practices often target the topsoil or uppermost layer (A horizon). However, in the Project area, the depth of the A horizon is often less than 10 cm. The use of heavy equipment limits the depth of soil salvage to about 0.5 m, therefore salvage will include topsoil (>0.1 m depth) and subsoil with Good and Fair reclamation suitability ratings. Soils with Poor suitability, or soils affected by anthropogenic activities (NR), are not considered for salvage due to their low suitability. Organic soils at the Project area occur in two different thickness classes: veneers (Ov), which contain less than 1.0 m of organic accumulation; and blankets (Ob), which contain between 1.0 m and 2.0 m of organic accumulation. An average salvaged depth of 1 m was considered appropriate for the calculation of available organic soils volumes.

Table 12.2.1-21: Soil Volume (m^3) Available for Salvaging at the Project Mine Footprint, Rated According to Suitability for Reclamation

Project Component	Description	Good Soil (m^3)	Fair Soil (m^3)	Organic Soil (m^3)	Totals (m^3)
1	Open Pit	0	0	9,399	9,399
2	Tailings Storage Facility C*	264	1,362	2,319	3,946
3	Tailings Storage Facility D*	2,891	42,686	3,081	48,658
4	Waste Rock Dumps	ns	ns	ns	ns
5	Low-Grade Stockpile	0	226,642	4,178	230,820
6	Water Management Facilities**	337	0	0	338
7	Mine Buildings and Infrastructure	0	87,385	43,605	130,990
8	Borrow Areas	0	48,589	0	48,589
9	Topsoil Stockpiles	ns	ns	ns	ns
Subtotal Soil (m^3)		3,493	406,668	62,584	
Total Soil (m^3)					**472,745**
Total Soil (t)					**756,393**

Note: *Soil salvaged under dams only; ** includes freshwater reservoir; ns = Soil will not be salvaged

12.2.1.18.4.4.6.2 Topsoil Storage Procedures During Construction

Soil will be salvaged in a single lift and then stockpiled. Soil with different textures can be stored in separate sections of a stockpile to assist future reclamation strategies (e.g., fine texture materials can be mixed with overburden to improve water-holding capacity). The salvaged soil will be placed in two separate large soil stockpiles located in the Dam D catchment near Dam C, and between Dam D and the ECD. The amount of soil expected to be salvaged is 410,161 m^3 of soil (rated Good and Fair) and 62,584 m^3 of Organic soil. Drainage from the larger topsoil stockpile will flow by gravity into the TSF. Drainage from the smaller TSF topsoil stockpile will be collected in Dam D, and from the lower larger TSF topsoil stockpile in the ECD, and then pumped back to the TSF.

The surface area of stockpiles should be maximized to maintain higher levels of biological activity (Handbook for Mineral and Coal Exploration in British Columbia 2008–2009). Stockpiles will be managed to prevent loss of soils through erosion and colonisation by non-native vegetation. This may include, shallow slopes, sediment and erosions control measures and a vegetative cover. Stockpiles will be constructed at a maximum slope of 3H:1V and seeded with the recommended erosion control seed mix described in **Section 2.6.7.1**, or with an erosion control seed mix. Clearly marked signage will identify the stockpile for reclamation management at time of mine closure, and to ensure stockpiles are not used for any other purpose but reclamation during life of mine.

Overburden will be located in stockpiles separate from soil and organic soil materials. Overburden near the oxide/weathered rock boundary will be visually inspected for the presence of clasts that might be mineralized. If a high density of clasts is found, the overburden will be handled as oxide/weathered rock and stored in the TSF.

12.2.1.18.4.4.6.3 Operations Phase

12.2.1.18.4.4.6.3.1 Landscape

Preliminary development of the Project footprint will occur during the construction phase. During operations, limited new landscape disturbance is expected to occur within the majority of the Project facilities. Development of the open pit, with concurrent addition to the overburden and waste rock stockpiles and tailing storage facilities as defined in the Project Description, will continue until the open pit hasd reached its maximum extent. Landscape management procedures described for the construction phase will apply to any new landscape disturbance during the operations phase. Landscape and soil management during the operations phase will maximize opportunities for progressive reclamation and the use of existing disturbances for secondary facilities.

12.2.1.18.4.4.6.3.2 Soils

As with landscape, limited new disturbance of soil is expected during the operations phase, since the majority of facilities are expected to be developed during the construction phase. New disturbance is expected to be limited to soil stripping in areas of deep organics and not associated with the advance of pit development. Soil salvage and storage procedures described for the construction phase will also apply to any new soil disturbance during the operations phase. Landscape and soil management during the operations phase will facilitate progressive reclamation and the use of existing disturbances for secondary facilities.

Throughout operations, soil stockpiles will be monitored to ensure preservation of salvaged reclamation material. Ongoing monitoring will include inspections of re-vegetation efforts, surface erosion conditions, and volumetric surveys. Stockpile inspections will occur at regular intervals throughout the year and after major rainfall and spring melting events. Surface erosion monitoring will follow the protocols set out in the SECP (**Section 12.2.1.18.4.1**). Non-active areas within the Project footprint will be re-vegetated during operations to ensure mitigation and avoidance of accelerated soil erosion from non-operational areas.

Erosion of topsoil stockpiles during operations will be controlled by seeding vegetation where practical or through sloping so as to mitigate erosion from, e.g., rilling, channel runoff.

12.2.1.18.4.4.7 Construction Phase – Vegetation

12.2.1.18.4.4.7.1 Ecosystems and Species at Risk Avoidance

Plant species at risk listed under *SARA* will be avoided where possible. BMPs suggest where plant species and ecosystems listed as Red- or Blue-listed in BC by the BC Conservation Data Centre (BC CDC) will be avoided where possible. During construction environmental monitors would be provided with an illustrated list of potentially occurring plant species at risk which occur or may occur in the areas to be cleared. Where practical, plant species at risk identified by the environmental monitors will be salvaged, and re-established in suitable natural habitats unaffected by mine construction.

The ESPRP included in **Section 12.2.1.18.4.13** addresses management procedures for firefighting and fire emergencies and provides measures for forest fire emergencies.

12.2.1.18.4.4.7.2 Timber Salvage Plan

A Timber Salvage Plan will be developed to assist in the planning, scheduling, and implementation of the salvage of merchantable timber on the proposed mine site and associated facility sites. The Timber Salvage Plan will be coordinated with objectives and measures for whitebark pine management as described in **Section 12.2.1.18.4.4.9** and the Wildlife Management Plan (**Section 12.2.1.18.4.6**). Prior to construction, the Proponent will conduct a timber-cruise survey to assess the amount, age, and condition of timber that will be removed from direct Project development. Merchantable timber will be identified and removed from the site, while unmerchantable trees and other debris will be disposed of in accordance with the *Forest and Range Practices Act* and the *Wildfire Act*.

Coarse woody debris (CWD) will be used for reclamation of disturbed or stripped areas. CWD may be used for reduction of erosion, establishment of vegetation and habitat and protection for native species.

12.2.1.18.4.4.7.3 Revegetation and Invasive Species Management

ESC is a primary concern in the management of disturbed landscape. Revegetation (i.e., replanting, seeding) following disturbance is a key preliminary measure supporting erosion and sediment control. However, replanting must follow measures in the ISMP to ensure protection of endemic plant communities and habitat against the chance introduction and spread of invasive species. The ISMP includes regulatory background, an invasive species inventory, procedures for invasive plant surveys, procedures for treatment of infestations, and procedures for monitoring treatment effectiveness. Culturally significant species will be used where appropriate in consultation with First Nations.

12.2.1.18.4.4.8 Management for Plant Species at Risk

Five plant species at risk are documented in or near the Project footprint (**Table 12.2.1-22**).

As discussed under Regulatory Requirements (**Section 12.2.1.18.4.4.4**), whitebark pine is listed in the *SARA,* but is not legally protected within the boundaries of the Project development site. As a general rule where feasible, Red- and Blue- Listed species, as designated by the BC CDC, will be avoided.

Table 12.2.1-22: Species at Risk Documented in or near the Mine Site LSA and RSA

Common Name	Scientific Name	BC CDC	SARA	Provincial Rank	Global Rank	Project Component	Ecosystem Type
Meesia moss	*Meesia longiseta*	Blue	Not listed	S3	G4?	Mine Site LSA; Mine Site Access Road LSA; RSA	Wetland
Sickleleaf tomentypnum moss	*Tomentypnum falcifolium*	Blue	Not listed	S3	G3G5	Mine Site LSA	Wetland
Small-flowered lousewort	*Pedicularis parviflora subsp. Parviflora*	Blue	Not listed	S3	G4T4	Mine Site LSA; RSA	Wetland
Swollen beaked sedge	*Carex rostrata*	Blue	Not listed	S2S3	G5	Mine Site Access Road LSA; Transmission Line; RSA	Wetland
Whitebark pine	*Pinus albicaulis*	Blue	1-E	S3	G3G4	Mine Site LSA; RSA	Terrestrial

Note: BC CDC = British Columbia Conservation Data Centre; LSA = Local Study Area; RSA = Regional Study Area

All species will be discussed during environmental awareness training (**Section 12.2.1.18.4.4.14**). Employees and contractors will receive information on species at risk and invasive species during the site orientation prior to commencing work. The scope of discussion for meesia moss, small-flowered lousewort (**Figure 12.2.1-14**), sickleleaf tomentypnum moss, and swollen beaked sedge will be determined with further revision of the LSVMRP. Training measures may include photographs of known occurrences, as well as any transplanting instructions if required. The Environmental Department will institute a procedure for communicating chance discoveries of plant species at risk.

Figure 12.2.1-14: Small-Flowered Lousewort

During construction, environmental monitors will be provided with field identification guides which contain lists of any plant species at risk that may occur in the areas to be cleared. Where practical, species at risk identified by the environmental monitors will be salvaged and re-established in suitable natural habitats unaffected by mine construction and operations. Whitebark pine is a special case and will be managed in accordance with the WPMP.

12.2.1.18.4.4.9 Management for Whitebark Pine

Whitebark pine (*Pinus albicaulis)* (**Figure 12.2.1-15**) is threatened throughout its range due to the effects of introduced white pine blister rust (*Cronartium ribicola*), mountain pine beetle (*Dendroctonus ponderosae*), fire suppression, and global climate change. Whitebark pine is greatly valued for its role as a keystone species in high elevation ecosystems. This role is due to its ability to pioneer inhospitable sites coupled with its importance as a food source for wildlife species facilitating its distribution, primarily Clark's nutcracker (*Nucifraga columbiana)*.

Figure 12.2.1-15: Whitebark Pine

In support of exploration, Whitebark pine management provides for the retention and nurture of rust-resistant whitebark pine specimens through seedling transplant and cone harvesting. Objectives and measures will be incorporated into all vegetation management. This is of particular relevance to the Timber Salvage Plan (**Section 12.2.1.18.4.4.7**).

Specific measures for management of whitebark pine will include:

12.2.1.18.4.4.9.1 Population Inventory

As part of baseline studies the extent of whitebark pine was delineated and transects were conducted to support an estimate of stem density, tree health (level of rust infection) and extent of population. During construction, an inventory following standards identified by the whitebark pine committee will be conducted on the mine site prior to overburden stripping. Areas of potential non-direct effects (e.g., dust deposition) and areas where other mitigation might be applied (e.g., cone collection, transplanting or stand enhancement) will also be identified and inventoried. The inventory will include transects to assess tree health and identify the level of infection by blister rust. The whitebark pine population inventory results will include estimates of rust infection rates in white bark pine near Mt. Davidson. On site inventories are expected to be updated every 3-5 years throughout mine operations.

12.2.1.18.4.4.9.2 Rust Screening

The Proponent will support the research into other factors affecting the viability of whitebark pine during the Project's construction and operations phases. There are a number of approaches to rust screening to obtain an effective and applicable screening program aligned with provincial priorities. The Proponent will work with regulatory agencies and Aboriginal groups in supporting research initiatives related to rust screening.

Rust screening typically involves blister rust transect surveys within the extent of the Mt. Davidson whitebark pine population. Cones will be collected from phenotypically rust resistant parent trees that occur a minimum of 50 m apart. The target for rust screening is a minimum of 50 seedlings from 100 trees. Following cone collection a portion of seeds will be submitted to various research facilities to conduct further rust screening. The remaining portion of seeds collected from the apparent rust resistant trees will be germinated in a nursery to produce transplants. Excess seed will be stored at the BC MFLNRO Surrey Seed Centre.

On-going visual monitoring of newly planted areas on-site will occur every five years to assess the success of seedling establishment and overall health of each tree. All parent trees involved in this process are permanently marked to facilitate future seed collections should their progeny demonstrate rust resistance. The majority of healthy parent trees will not produce rust resistant seedlings.

12.2.1.18.4.4.9.3 Cone collection and seedling propogation

The mechanisms controlling cone production and masting by whitebark pine are not well known and prediction of cone production greater than 1 year in advance is not possible. Given the time required for trees to mature and produce cones (>40 years), cone collection was initiated by New Gold in 2012. To date, cone collection has been successful in 2013, although 2014 is expected to be a 'good cone year' as first year conelets were observed in 2013. Based on 50% germination for approximately 4 kg of collected seed, 1,500 seedlings are expected to be produced from cone collection in 2013. Seedling propogation will consist of germinating seeds within a nursery, which will be grown for a minimum of 2 years.

To guide seed collection, seedling targets for all activities will be developed. Cone collection and seedling propagation will be conducted to support planting, progressive reclamation and rust screening activities. Planting includes planting in 2016 the seedlings to be grown from seed collected in 2013. Planting will focus on upslope areas from the mine site that contain ESSFmv1 and ESSFmv1p. Progressive reclamation activities in year 8 of operations for the west waste rock dump and open pit slopes will require cone collection be initiated at least 3 years prior. Blister rust screening will require enough seed to grow 50 seedlings from 100 parent trees at a minimum spacing of 50 m. Once seedlings are produced and planted (2 – year old stock) these trees will be monitored each year with re-measurement every 5 years.

Cone collection will occur opportunistically in mast years during the construction and operations phases to support these three activities. Annual inspection for the evidence of conelets will support identification of masting years.

12.2.1.18.4.4.9.4 Reclamation trials and Progressive Reclamation

Reclamation trials using whitebark pine seedlings will be undertaken during progressive reclamation stages to develop expertise in using whitebark pine during the final reclamation phases. Whitebark pine occurs naturally on very rocky sites including what appear to be old exploration roads on Mt. Davidson. Although observations of whitebark pine in coarse, poor substrates are common, reclamation trials will be structured to maximize survival and growth of seedlings. Trials will include:

- Substrate Trials – Trials will require the use of different substrates to identify which substrates are best suited to whitebark pine restoration. Using whitebark pine for reclamation is still in an early research and developmental stage, and it is unclear if plantings within difficult substrates, such as those created during mining activities, will be successful. Transplanting success of individual trees that would otherwise be cleared from the open pit area will provide information on substrate conditions that could be successful for the reclamation of areas using whitebark pine (e.g., west waste rock dump and overburden slope of the open pit). If sufficient individual trees cannot be transplanted to adequately assess the different substrates being tested, then planting will be supplemented with seedlings from cones collected in 2013/14, which are anticipated to be planted in 2016/17; and
- Mycorrhizal Fungi Trials – Whitebark pine relies on various species of mycorrhical fungi (Mohatt et al., 2008). The use of mycorrhizae is a typical nursery practice to improve seedling growth. Inoculating seedlings may be as simple as adding native, inoculated soil collected from areas where whitebark pine naturally occurs. Mycorrhzal inoculation of seedlings should be conducted either wholly or as a part of a paired trial to determine the efficacy of this treatment (inoculated vs. non-inoculated). Where seedlings are available, mycorrhizal fungi trails will be conducted concurrently with other trials e.g., substrate trials where seedlings are planted as part of reclamation research prior to final reclamation.

Progressive reclamation for whitebark pine will occur on the West Dump and the open pit. The East and West dumps as described in the RCP, **Section 2.6**, were identified as potentially for whitebark pine reclamation due to their location and spatial elevation within the landscape. The elevation is similar to their naturally occurring elevation on Mt. Davidson. The West Dump is approximately 172 ha. In year 8 of operations it is predicted to be 75% overburden and is expected to be suitable for planting with whitebark pine. The west dump is considered to be more suitable than the East Dump because the overburden is thicker and soils in the East Dump are intended for reclamation of other areas, which restricts the timing of progressive reclamation for long lived species such as whitebark pine. The open pit will be developed with an overburden slope (slope angle 20 degrees) on the east side, which would allow for an additional 30 ha, approximately, that could be planted with whitebark pine part way through the operations phase. Planting will need to carefully planned and executed to maintain a safe work environment.

Site contouring and preparation will create suitable microsites thus increasing the chances of transplanting success. Site contouring will be proactive and progressive using the available waste rock. The new landforms must be stable, benched, preferably south facing and designed to convey water to natural constructed watercourses and waterbodies.

Monitoring of reclamation trials and progressive reclamation success will be concurrent with any updates to the reclamation plan for the site. It is anticipated the reclamation plan will be updated during project permitting and through the mine life as the mine plan develops. At this time, white bark pine monitoring is proposed to be conducted 1 year after planting and then every 3-5 years. However, successful reestablishment of whitebark pine may be limited by factors beyond the control of the Proponent. The Proponent's support for research into these factors affecting the species (e.g., blister rust screening, and data on tree health documenting blister rust infection levels) as well as activities such as transplanting, cone collection and reclamation trials all support reaching the end land use objectives for this species.

12.2.1.18.4.4.9.5 Off-Site Transplanting

The Proponent initiated off-site transplanting during exploration activities and will continue the practice through the mine life. Using results from the population inventory, individual plants/trees will be relocated to prevent loss. However, this will be limited by the ability to physically move individual specimens, the presence of suitable transplant relocations, the health of the specimen (i.e., no sign of blister rust), and approval of applicable permits. Individuals will only be moved if they show no sign of blister rust.

Transplanting will occur at the time of land clearing during construction and operations so as to avoid unnecessary disturbance if land clearing is not conducted. Associated with exploration some transplants have occurred; results of these transplants will be used to support transplant success. Factors potentially affecting transplant success will be sampled at the time of transplant.

The identification of locations to which individuals or groups of individuals may be transplanted to will be determined through the Mt. Davidson whitebark pine population inventory. Subsequent monitoring will be concurrent with the timing of ongoing population inventories (i.e., every 3-5 years throughout operations) with the intention that results will guide reclamation trails and planting of seedlings.

12.2.1.18.4.4.9.6 Stand Enhancement

Stand enhancement is a mitigation option designed to improve conditions for white bark pine survival and recruitment. If applied, stand enhancement will include (1) the creation of openings to support the caching of seed by Clarks nutcracker and (2) the removal of competing vegetation (e.g., shade tolerant species) around white bark pine trees. If prescribed, this option will consider managing fire risk given its potential for increasing fuel.

The use of stand enhancement as a mitigation option will be based on the results of future inventories and the success of the reclamation trials and progressive reclamation. If implemented, the timing of stand enhancement will follow an updated inventory and may be concurrent with the creation of access to support other mitigation (e.g., transplanting). Tree clearing as part of stand enhancement is subject to permit approval, including referral to Aboriginal groups.

The post-closure objective of management of whitebark pine is the restoration of whitebark pine throughout the Project footprint where suitable. The plan provides information on completed and ongoing fieldwork, a proposed schedule, mitigation site selection, and mitigation measures (**Table 12.2.1-23**). Environmental personnel will familiarize themselves with the plan in its entirety, which includes detailed discussion for each of the summarized mitigation measures.

12.2.1.18.4.4.9.7 Adaptive Management

An adaptive management approach will be implemented to mitigate the potential Project effects on whitebark pine and restore whitebark pine populations on new sites. Adaptive management is a process for continually improving the success of mitigation by earning from the outcomes of operational trials. Uncertainty and unexpected outcomes are inherent in managing complex ecological systems such as the whitebark pine ecosystem. Research trials will be necessary to re-establish whitebark pine on non-whitebark pine habitat; newly created landforms associated with the construction and operations of the open pit.

Table 12.2.1-23: Summary of Mitigation of Impacts to Whitebark Pine

Mitigation Approach	Description	Actions
I. Avoid	Avoid cutting any mature or regenerating whitebark pine, particularly mature trees with no signs of blister rust infection. This action applies where whitebark pine can be retained indefinitely such as upslope areas (south of mine footprint).	• Have qualified personnel flag all whitebark pine to be retained • Amend whitebark pine map to aid in locating flagged trees • Have the map distributed to appropriate workers on site • Train appropriate workers in the identification of whitebark pine
II. Minimize	In future disturbance areas, avoid cutting any mature or regenerating whitebark pine for as long as possible to facilitate natural pollination and seed dispersal in the area. This action typically applies to areas such as exploration trails and drill pads.	• Have qualified personnel flag all whitebark pine to be retained • Create a map to aid in locating flagged whitebark pine • Have the map distributed to appropriate workers on site • Tally any whitebark cut to account for it when calculating compensation • Transplant seedlings up to 1 m in height, or to a tree size safe to move, to mitigation area where feasible • Train all workers in the identification of whitebark pine.
III. Restore	Utilize whitebark pine seedlings as a component of reclamation	• Collect seed from phenotypically rust resistant parent trees

Mitigation Approach	Description	Actions
	work on site with an emphasis on field screening for blister rust resistance, but also contributing to off-site rust screening program.	• Produce seedlings from seed, tracked by parent tree, for use in restoration • Contribute a subset of seed to rust screening programs • Transplant seedlings found within mine footprint up to 1 m in height to mitigation area where feasible • Identify candidate reclamation areas
IV. Offset	Plant areas off-site as compensation for losses. Plantings will focus on seedlings from phenotypically rust-resistant parent trees, as well as transplanted seedlings.	• Identify candidate off-site compensation areas • Collect seed from phenotypically rust resistant parent trees • Produce seedlings from seed, tracked by parent tree, for use in restoration • Contribute a subset of seed to rust screening programs • Transplant seedlings found within mine footprint up to 1 m in height to mitigation area where feasible • Quantify whitebark pine stems lossed to determine

12.2.1.18.4.4.10 Management for Ecosystems at Risk

Ecosystems at risk occur in the proposed mine site footprint, transmission line ROW and within 100 m of the existing Kluskus FSR. Wetland ecosystems at risk are addressed in the WMP (**Section 12.2.1.18.4.3**). Of the upland ecosystems, 13 potentially occur in the Project area and ten were mapped along the transmission line and Kluskus FSR. All upland ecosystems at risk occur in either the Sub-Boreal Spruce Dry Cool subzone (SBSdk) or the Sub-Boreal Spruce Stuart Dry Warm variant (SBSdw3).

Ecosystem at risk maps are available to help environmental monitors identify these locations. The following mitigation measures will be implemented to minimize the environmental effects on ecosystems at risk:

- Avoid Vegetation Loss – wherever practical, avoid loss of vegetation within ecosystems at risk to maintain the vegetation structure and composition;
- Minimize Disturbance – minimize the extent of grubbing, stripping, and the removal of shrubs and herbaceous species within ecosystems at risk. Where clearing is required retain the humus layer and vegetation root mat whenever and wherever possible;
- Implement ISMP – minimize areas of soil disturbance; re-establish native vegetation as soon as possible;
- Maintain Natural Drainage Patterns – minimize linear extent of ROWs crossing or paralleling ecosystems at risk, properly culvert all roadways;

- Minimize Dust Deposition – apply environmentally benign dust suppressant when road conditions are dry and conducive to dust generation and implement AQEMP and TAMP strategies; and
- Follow-up and Monitoring – conduct follow-up surveys and monitor the condition of ecosystems at risk. Address invasive plants by implementing the ISMP.

For transmission lines, as there is a certain amount of flexibility with respect to the placement of transmission towers (230 kV wooden H – frame towers) and new service access roads, the mitigation measures will be primarily directed towards avoiding the locations of ecosystems at risk. Where avoidance is not possible, minimize disturbance, mitigate invasive species, and maintain natural drainage patterns.

For the existing Kluskus FSR, potential Project effects will be from clearing and as a result of potential dust deposition and the dispersal and establishment of invasive plant species during construction.

12.2.1.18.4.4.11 Compliance Monitoring and Follow Up

Monitoring procedures will be implemented during the construction and operations phases to ensure compliance with legislation and permit conditions. Monitoring activities will include:

- Soil salvage monitoring will be conducted to ensure that proper collection, handling, and storage of reclamation materials will occur;
- Monitoring of erosion condition and revegetation activities on the salvage stockpiles will occur throughout the operations phase, including provisions of the ISMP;
- Periodic surveys of the reclamation stockpile will be conducted to ensure that no significant loss of reclamation material occurs during storage;
- Monitoring of success of progressive reclamation;
- Monitoring of vegetation for uptake of metals periodically throughout the construction, operations, and closure phases (targets are at the end of construction, and every five years during operations; closure monitoring periodicity to be determined through operations monitoring);
- Monitoring of topsoil replacement during decommissioning/closure, and success of ISMP measures; and
- Monitoring of post-closure success in terms of the re-establishment of a functioning ecosystem to support all end land use objectives. This monitoring will be established as part of the overall RCP and include commitments stemming from the WPMP.

12.2.1.18.4.4.12 Site Environmental Reporting

Conservation and reclamation progress will be reported annually to the Mines Inspector as part of reclamation reporting requirements of the Mines Act permit. The site environmental department will maintain records to support annual reporting including material volumes and facilities from which material was salvaged. As part of site monitoring techniques installed to control erosion and sedimentation, maintenance records of erosion and sediment controls, visual observations and corrective actions will be maintained by the Environmental and Sustainable Resources Manager for all phases of the Project development.

The Construction Manager, Mine Manager, and the Environmental and Sustainable Resources Manager will prepare monthly internal operating reports. Monthly internal reports may include salvaged soil, reclamation activities, significant monitoring results, and potential risks.

12.2.1.18.4.4.12.1 Pre-Activity Checklist System

For all Project phases, soil management will be a component of the revised CMP to support each major physical component of the Project. Details of these procedures will be finalized as part of the final Project design.

12.2.1.18.4.4.13 Data Management, Record Keeping, and Quality Assurance/ Quality Control

The Environmental Department will prepare external reports on soil management activities as required by the *Mines Act* permit. QA/QC will be conducted and reported in accordance with regulatory requirements.

12.2.1.18.4.4.14 Training and Awareness

Specific training will be provided for personnel directly involved in soil management, procedures will be an integral part of employee and contractor induction training. Training will include the application of signage for location and condition of the reclamation material stockpiles. Employees and contractors will be required to report any unusual conditions related to the disturbance of the reclamation material stockpiles.

12.2.1.18.4.4.14.1 Training for Plant Species at Risk

For workers involved with project components and activities likely to have potential for effecting white bark pine (e.g., land clearing and waste dump construction) a specific orientation will be conducted. The Proponent initiated this approach during exploration activities and will continue the practice through the mine life.

The orientation program will support mitigation actions to identify and protect/transplant individual trees during clearing, as well as ensure awareness of the importance of other mitigation actions as they are implemented (e.g., reclamation trials).

Awareness training will also include a discussion of plant species at risk and where they might be found/known to occur. Currently this includes meesia moss, small-flowered lousewort, sickleleaf tomentypnum moss, and swollen beaked sedge, which are species at risk that have been documented in or near the Project site. Any interaction with wetlands habitat in the Project footprint will be controlled through implementation of the WMP.

12.2.1.18.4.5 Invasive Species Management Plan

12.2.1.18.4.5.1 Introduction

Invasive species management provides for the prevention, control, and monitoring of the growth and spread of invasive plants (including noxious weeds) in areas of disturbed or exposed soil or subsoil. Soil disturbances caused by construction and operations activities render natural areas vulnerable to the spread of invasive plants. Invasive species management provides information for conducting invasive plant surveys, and for applying established, appropriate treatments to control infestations of invasive plants and for monitoring treatment effectiveness. This section presents the ISMP for the construction and operations phases.

12.2.1.18.4.5.2 Objectives

The Invasive Alien Plant Program (IAPP) website of the BC MFLNRO (2012c) describes the importance of the threat of invasive plants:

> *Invasive plants pose a threat to our native environment and are recognized globally as the second greatest threat to biodiversity. ..[Their] presence can cause environmental and/or economic harm, and some species can harm human health. ..[They] reproduce rapidly, are resilient and can overwhelm existing native vegetation.*

Due to the continuous nature of the threat posed by invasive species on naturally occurring ecosystems within the Project boundaries, management of invasive species will be sustained throughout all phases of the Project. The objectives of invasive species management are to:

- Prevent the establishment and spread of invasive plants;
- Identify potential vectors of introduction of invasive species;
- Train staff to enable identification of invasive species;
- Establish a screening process for early detection;
- Identify processes for the prevention of establishment of invasive species; and
- Eradicate, control, and prompt management of invasive species.

12.2.1.18.4.5.3 Linked Environmental Management Plans

In addition to the ISMP, invasive species management will be implemented in conjunction with other EMPs, which encompass management of landscape, soils and vegetation, and with the RCP. In addition to the RCP, linked EMPs include:

- RCP (**Section 2.6**);
- ARMP (**Section 12.2.1.18.4.2**);
- SECP (**Section 12.2.1.18.4.1**);
- TAMP (**Section 12.2.1.18.4.14**);
- LSVMRP (**Section 12.2.1.18.4.4**);
- AQEMP (**Section 12.2.1.18.4.9**);
- WMP (**Section 12.2.1.18.4.3**); and
- WLMP (**Section 12.2.1.18.4.6**).

12.2.1.18.4.5.4 Regulatory Requirements

Under the *Weed Control Act* (Government of BC, 1996i) and *Weed Control Regulation* (Government of BC, 2011a), invasive plants defined as noxious weeds are regulated by the *Weed Control Act,* and must not be introduced or spread to unaffected areas. The *Weed Control Act* aims to control the spread of designated noxious weeds on all provincial Crown and private land in BC. Invasive plants are listed by *Invasive Plants Regulation* (Government of BC, 2004a) under section 47 of the *Forests and Range Practices Act* (Government of BC, 2002b). The *Integrated Pest Management Act* (Government of BC, 2003c) regulates the use of herbicides to control invasive plants.

12.2.1.18.4.5.5 Potential Invasive Plant Species

Invasive plants, by definition, do not occur naturally in a given ecosystem. They reproduce rapidly, are resilient, and can overwhelm existing native vegetation (BC MFLNRO, 2012c). The *Weed Control Act* (Government of BC, 1996i) and the *Forest and Range Practices Act* (Government of BC, 2002b) set out criteria that define invasive plants in BC. The two regional districts in which the Project occurs have invasive plant bylaws and management plans that include defining criteria. Collectively, an invasive plant occurring in the Project footprint would meet one or more of the following criteria:

- Listed as a “noxious weed” in Part I or II of Schedule A of the Weed Control Act (Government of BC, 1996i);
- Listed as an “invasive plant” in the Forest and Range Practices Act (Government of BC, 2002b);
- Listed as “extremely invasive,” “very invasive,” “invasive,” or “aggressive or under bio-control” in Table 3 the Northwest Invasive Plant Council (NWIPC) 2012 Strategic Plan and Plant Profiles (NWIPC, 2012);
- Listed as an “alien invasive species” in the Community Charter (Government of BC, 2003a); or
- Listed as a “priority species” in Appendix 1 of the Cariboo Chilcotin Coast Invasive Plant Committee (CCCIPC) 2012 Regional Strategic Plan (CCCIPC, 2012).

12.2.1.18.4.5.6 Invasive Plant Results

Using the IAPP Application (BC MFLNRO, 2012d), a total of 232 records and 24 invasive plant species were recorded within a 20 km buffer of the RSA. Field surveys identified two species: yellow salsify (*Tragopogon dubius*) and orange hawkweed (*Hieracium auriantiacum*) within the Project area. Yellow salsify was found within the mine site LSA while orange hawkweed was identified just outside the RSA near the mine site access road.

12.2.1.18.4.5.6.1 Mine Site

Field surveys found one invasive plant species within the mine site LSA, yellow salsify (*Tragopogon dubius*), which is listed as an alien invasive species under Section 1 of the Schedule of the *Community Charter* (Government of BC, 2003a). The relevant regional invasive plant strategy (CCCIPC: MacKenzie, 2012) lists *T. dubius* as a plant that "should be monitored to ensure [it] do[es] not become a serious concern." *T. dubius* is considered invasive in the neighbouring Bulkley-Nechako Regional District (NWIPC, 2012), which is 8.2 km west of the mine site LSA.

12.2.1.18.4.5.6.2 Transmission Line

Three records and two invasive plant species occur within the transmission line LSA. These are Canada thistle and orange hawkweed.

12.2.1.18.4.5.6.3 Kluskus FSR

There are five records and four invasive plant species within the RSA; the four species are: field scabrous, common tansy, yellow hawkweed, and butter-and-eggs.

Table 12.2.1-24 provides a list of weeds and invasive plants occurring in or near the project footprint.

Table 12.2.1-24: Weeds and Invasive Plants Occurring in or Near the Project Footprint and Source of Designation

Map Code	Common Name	Scientific Name with Author	*WCA*[(1)]	*FRPA*[(2)]	*CCA*[(3)]	IAPP[(4)]	CCCIPC[(5)]	NWIPC[(6)]
BK	Brown knapweed	*Centaurea jacea* L.	-	X	-	X	-	X
BT	Bull thistle	*Cirsium vulgare* (Savi) Tenore	-	X	-	X	-	X
CT	Canada thistle	*Cirsium arvense* (L.) Scop.	X	X	X	X	-	X
FS	Field scabious	*Knautia arvensis* (L.) Coult.	Bulkley–Nechako[7]	X	X	X	-	X
HB	Annual hawksbeard	*Crepis tectorum* L.	-	-	-	X	-	X
HS	Hawkweed species	*Hieracium* spp.	-	-	-	X	-	-
LS	Leafy spurge	*Euphorbia esula* L.	X	X	X	X	-	X
MH	Meadow hawkweed	*Hieracium caespitosum* Dumort.	-	X	-	X	-	-
MK	Meadow knapweed	*Centaurea debeauxii = Centaurea x moncktonii*	Columbia–Shuswap	-	-	X	X	-
MO	Mountain bluet	*Centaurea montana* L.	-	-	-	X	-	X
MT	Marsh thistle	*Cirsium palustre* (L.) Scop.	Bulkley–Nechako	X	X	X	-	X
OD	Oxeye daisy	*Leucanthemum vulgare* Lam.	Cariboo	X	X	X	-	X
OH	Orange hawkweed	*Hieracium aurantiacum* L.	Bulkley–Nechako and Cariboo	X	X	X	-	-
PP	Perennial peppergrass	*Lepidium latifolium* L.	East Kootenay, Thompson–Nicola	X	X	X	-	-
QH	Queen-devil hawkweed	*Hieracium praealtum* Vill. ex Gochnat	-	-	-	X	-	-
SH	Scentless chamomile	*Matricaria perforata = Tripleurospermum inodorum*	X	X	X	X	X	X
SK	Spotted knapweed	*Centaurea biebersteinii [stoebe* ssp. *micranthos* L. (Gugler) Hayek]	X	X	X	X	X	X
SO	Sowthistle	*Sonchus* spp.	-	-	-	X	-	X
TC	Common tansy	*Tanacetum vulgare* L.	Bulkley–Nechako	X	-	X	-	X
TH	Tall hawkweed	*Hieracium piloselloides* Vill.	-	-	-	X	-	-
WC	White cockle	*Lychnis alba = Silene latifolia ssp. alba (P. Mill.) Greuter & Burdet*	-	-	-	X	-	X
YD	Yellow-devil hawkweed	*Hieracium glomeratum* Froel.	-	-	-	X	-	-
YH	Yellow hawkweed	*Hieracium pratense = Hieracium caespitosum Dumort.*	-	-	-	X	-	-
YT	butter-and-eggs	*Linaria vulgaris* P. Miller	X	X	X	X	-	X
WG	yellow salsify	*Tragopogon dubius* Scop.	-	-	X	X	-	X

Notes: (1-6) Source of designation as Weed or Invasive Plant; (1).WCA = Weed Control Act (Part I or II of Schedule A; 1996i); (2) FRPA = Forest and Range Practices Act (2002); (3) CCA = Community Charter (Sections 1 or 2; 2004); (4) IAPP = Invasive Alien Plant Program (2013e); (5) CCCIPC = Cariboo Chilcotin Coast Invasive Plant Committee (Appendix 1; 2012); (6) NWIPC = Northwest Invasive Plant Council (Table 3; 2012); (7) BC regional district

12.2.1.18.4.5.7 General Measures

12.2.1.18.4.5.7.1 Methods and Vectors of Invasive Plant Introduction

Understanding how invasive plants can be introduced to an area is important for identifying preventive measures to reduce the likelihood of this occurring. Invasive plants can be introduced at any time during the development and continued use of an area. Construction activities will generate the largest initial ground disturbances and create suitable conditions for both the introduction and establishment of invasive plants. Vehicles and machinery are common transport and dispersal mechanisms for invasive plants, and existing roadways provide easy access to invasive plant sources.

Additionally, invasive plants can be found in seed mixes used for reclamation purposes. Reclamation seed mixes will be purchased from a reputable horticulturalist and be “weed-free” seed.

12.2.1.18.4.5.7.2 Prevention

Prevention is the first step in invasive plant species management. By preventing the introduction and spread of invasive plants, the resources needed to control invasive plants in the long-term are greatly reduced. The following are preventive measures that will minimize the introduction of invasive plants.

12.2.1.18.4.5.7.3 Training

Employee orientation will include instruction for understanding the harmful effects of invasive plants and the employees’ role in preventing invasive plant establishment. Instructions will include the requirement and procedures for equipment and vehicle cleanliness, identification of common invasive plant species, and contacts and procedure for reporting locations of invasive plants.

12.2.1.18.4.5.7.4 Limit Soil Disturbances

Unnecessary soil disturbance will be minimized where possible, including limiting the extent of vegetation removal, and by ensuring employees drive only on existing roadways.

12.2.1.18.4.5.7.5 Topsoil Handling

The LSVMRP and RCP include provision for the salvage and storage of reclamation material. To the extent feasible, reclamation material topsoil (i.e., humus, A horizon, and B horizon) will be salvaged from Project areas as indicated in the RCP, during the construction and operations phases. Topsoil stockpiles will be seeded with native seed or approved seed mix free of invasive species as soon as they are stockpiled. This will help to maintain topsoil quality, establish native seed banks, and reduce establishment of invasive species.

12.2.1.18.4.5.7.6 Revegetation of Disturbed Sites

Progressive reclamation will be applied within the Project footprint to the extent feasible. For example, areas decommissioned during operations will be reclaimed as soon as feasible after the facilities have been removed, instead of waiting until the mine closes. Revegetation will use native plants where possible, or an approved species mix as soon as conditions are conducive, to limit the establishment of invasive plants. If the area being decommissioned has a known invasive plant population, control measures will be undertaken prior to revegetation.

12.2.1.18.4.5.7.7 Use of “Weed Free” Seed

Reclamation seed mixtures will be appropriate for the climate and site conditions and purchased from reputable horticulturalists. Seed mixtures with culturally significant species will be used where possible in consultation with Aboriginal groups. At a minimum, certified Canada No. 1 seed will be used. Canada No. 1 Seed, approved under the *Seeds Act* (Government of Canada, 1985f), may not be weed-free (i.e., free of invasive plant species). To ensure a seed mix is virtually weed-free, each purchase of seed for use in the Project area will include a request for a “Certificate of Seed Analysis.” To improve confidence in the cleanliness of the seed supply, a seed sample larger than the typical 25-gram sample may be analyzed. Alternatively, the Environmental Department will start with pure seed and then prepare the seed mix manually.

12.2.1.18.4.5.7.8 Clean Equipment and Materials

Earth moving equipment will arrive on Project sites clean. Such equipment will be cleaned prior to moving between sites. Additional invasive plant control measures may be implement in specific areas if the areas are known to be infested. This may include additional cleaning measures and sequencing work to reduce the potential of invasive plant transfer between areas. The Environmental Coordinator will notify the Construction Contractor of major infestations of invasive plants during construction. The options to confine and eliminate the infestation will be discussed.

12.2.1.18.4.5.7.9 Use of “Weed Free” Hay Bales for Erosion Control

A possible source of invasive plants is bales. Bales will only be acquired from producers of weed-free products. The NWIPC will be contacted for a list of growers enrolled in the Weed Free Forage and Straw Program.

12.2.1.18.4.5.7.10 Early Detection and Eradication

Ground cover will be monitored for invasive plants for up to three complete growing seasons following revegetation depending on the likelihood of colonisation by invasive species and success of reclamation. Proactive management of invasive plants, is beneficial because small infestations are much easier to control than large ones. Monitoring will be done by personel skilled in invasive plant identification and will conduct surveys using the procedures listed in this plan or approved by regulatory agencies. Individual plants and small infestations (typically less than 30 plants) will be destroyed upon discovery, and new infestations will be reported promptly.

12.2.1.18.4.5.8 Monitoring for Compliance and Verification

The framework for verification of objectives of the ISMP consists of screening through invasive species surveys, mitigation, and follow-up treatment monitoring. Results and status from these monitoring programs will be reported as per permit requirements. This is expected to include:

12.2.1.18.4.5.8.1 Screening – Invasive Plant Surveys

Invasive plant surveys will be conducted to obtain the location and extent of plant species infestations. This information will be used to prioritize areas for control, to determine appropriate control methods, and to provide for ongoing evaluation of selected control options. Prioritization for areas of control will be based on:

- Degree of invasiveness;
- Site-specific details (e.g., proximity to undisturbed native plant communities or waterbodies);
- Local and regional concerns about the invasive plant species;
- Extent of infestation;
- Options for control; and
- Potential impacts of control options on the surrounding environment.

12.2.1.18.4.5.8.1.1 Step 1: Determine Survey Locations

Survey locations will be determined and marked on a field map prior to entering the Project footprint. Survey locations will include areas of recent disturbance, areas receiving disturbance on a regular basis, and areas downwind or downstream of disturbed areas, as applicable and safe to access.

Surveys will require monitoring staff to travel the roads, trails, and disturbed areas deemed susceptible to invasion by invasive plant species. A Site and Invasive Plant Survey Record (SIPSR) Form (**Appendix 12.2.1A**, Form FS1260) will be filled out for each site (as defined further in this plan) where invasive plants are found. Surveyed areas and infestation locations will be marked on the map for reference for future surveys.

12.2.1.18.4.5.8.1.2 Step 2: Identify Invasive Plant Species

Plant samples will be collected and submitted to a qualified botanist for identification when the identification ofa suspected invasive plant species is not clear. However, as some rare plant species are early colonizers of disturbed areas, samples will only be taken only if necessary or photographs will be taken if only a few ~5-10 individual plants. Samples will be bagged and sealed at the point of collection to prevent dispersal of seeds or loss of plant parts during collection and travel. Samples will be refrigerated as soon as possible to prevent deterioration of diagnostic features.

12.2.1.18.4.5.8.1.3 Step 3: Document Invasive Plant Location

A separate form (FS1260, **Appendix 12.2.1A**) will be filled out for each site in which an invasive plant has been found. Generally, occurrences separated by more than 100 m are recorded as separate sites.

The estimated centre of the infested site will be recorded using a GPS unit. A visual estimate of the size of the area will be drawn on the field map. The field map will be digitized, and continually updated following each survey, for the duration of the monitoring program.

12.2.1.18.4.5.8.1.4 Step 4: Determine Population Size and Area

The size of the infested area will be estimated by measuring or pacing its length and width, or with a GPS unit. The severity of the infestation will be estimated according to the following categories: sparse (less than 10 plants); low (10 to 100 plants); moderate (100 to 1,000 plants); and heavy (more than 1,000 plants).

12.2.1.18.4.5.8.1.5 Step 5: Determine Growth Stage

The growth stage of the invasive plant will be recorded as follows:

- Seedling – defined as occurring when the first two true leaves are present to when the first bud occurs;
- Bud – defined as occurring when the first flower bud is present but there are no petals visible, to the point at which flowering occurs;
- Flower – defined as occurring when one flower has fully opened until the first seed head is visible;
- Seed set – defined as occurring when the first seed head is visible to when the majority of seed heads are no longer present on the plant; and
- Expired – the majority of seeds or seed heads are no longer present on the plant to when the plant is obviously dead.

12.2.1.18.4.5.8.1.6 Step 6: Photograph Site

A photographic record will enable observation of changes to the landscape over time. Photographs will be taken from a specific distance from the centre of the infestation (where the Universal Transverse Mercator (UTM) co-ordinate was taken), along the four cardinal directions, as practicable. The centre will be marked for reference using a wooden rod, rebar, or measuring stick, and photographs will be taken from the standing position. Distances will be recorded on the printed Photoplot Record (**Appendix 12.2.1A**, Form FS1225), along with site number, photo direction, and date for all photographs. A digital archive system will be created and referenced on the SIPSR.

12.2.1.18.4.5.8.1.7 Step 7: Determine Control Method

Selection of a control strategy must balance effectiveness with economic feasibility. The three categories of control are mechanical, chemical, and biological. Mechanical control involves removal of the invasive plants through mowing, cultivation, or hand pulling. Chemical control involves use of herbicides to kill or stress the invasive plant (not anticipated to be used at the Project). Biological control involves the introduction of organisms capable of destroying specific plant populations, and would require licence and detailed discussion with the BC MOE; it is not considered further in the invasive species management plan. Based on the density and extent of the invasive plant infestation, an appropriate control method will be identified as detailed in the following section. For small infestations, individual plants with no seed heads can be hand pulled or removed with the use of a trowel. The root will be removed and bagged with the plant. However, the monitor must be certain the invasive plant species can be controlled through this method, since some invasive plants spread faster if the roots are disturbed or broken. For invasive plants with seed heads, a bag will be placed over the seed head prior to hand pulling. Care will be taken to prevent dispersal of seeds or loss of plant parts during collection and travel. The control action will be documented on the SIPSR and on the Invasive Plant Chemical and Mechanical Treatment Record (IPCMTR) (**Appendix 12.2.1A**, FS1265).

Mechanical treatment of invasive plants employs various techniques to:

- Physically disturb or remove invasive plants; or
- Interrupt plant reproduction by depleting root reserves through repeated cutting of the plant.

Mechanical treatment is preferred over chemical or biological, as it causes the least impact to adjacent habitat, and typically targets only invasive plants. Mechanical strategies include:

- Hand pulling. Best suited for small, isolated infestations of 0.5 ha or less in area, depending on available labour. Invasive plants will be pulled when the soil is moist, and prior to seed production. Plants hand pulled after seed production has started must be carefully removed to prevent seed dispersal. This method is effective on annual or biennial invasive plants; however, it may have to be implemented repeatedly on an annual basis in order to deplete the seed bank;
- Mowing or cutting. The timing and number of cuts per growing season are critical to achieving satisfactory control. This strategy is acceptable when there are greater than 30 invasive plants to hand pull, and cultivation is not possible. It is best to mow prior to seed production and as close to the ground as possible. This method is effective on perennial invasive plants;
- Cultivation or tilling. Soil tillage attacks the survival mechanism of the invasive plant, therefore preventing seed production and depleting current seed reserves in the soil. The timing and frequency of cultivation and the depth of tillage are critical to achieving satisfactory control; and

- Mulching. Mulching is effective, as it excludes light from the tops of the invasive plant until the reserve food supply in the roots is depleted, starving the plants. The timing and depth of the mulch are critical to success.

12.2.1.18.4.5.8.2 Follow-up – Treatment Monitoring

Treatment monitoring provides for assessment of treatment effectiveness for eradication, and for documenting other treatment impacts, such as injury to non-target species. Monitoring is required for all sites treated with herbicides, and is recommended for sites subjected to mechanical treatment.

Monitoring will occur in the season following the treatment application to determine if there has been immediate regrowth. This may require 1 or 2 growing seasons of monitoring depending on the type and timing of treatment in conjunction with the invasive plant survey. Treatment effectiveness will be documented on the Chemical and Mechanical Monitoring Record (CMMR) (**Appendix 12.2.1A**, Form FS1263), as detailed below.

12.2.1.18.4.5.8.2.1 Step 1: Treatment Location

Before going into the field, the monitor will obtain the field map showing treatment locations and corresponding treatment methods (as documented on the IPCMTR). Monitoring notes will be recorded on the CMMR.

12.2.1.18.4.5.8.2.2 Step 2: Original Invasive Plant Documentation

The monitor will locate the treatment site in the field and confirm the UTM coordinates. Notes from the IPCMTR will be used for describing the invasive plant infestation as it was prior to treatment, including the target species, the number of individual invasive plants, and the areal extent of the infested area.

12.2.1.18.4.5.8.2.3 Step 3: Control Methods Used

The monitor will document the date the treatment was applied, the areal extent of area treated, and the treatment method used.

12.2.1.18.4.5.8.2.4 Step 4: Current Invasive Plant Documentation

The monitor will record the absence or presence of the original target species, and if present, severity of the current infestation. A new SIPSR will be filled out for any new invasive plant species observed. Observed treatment impacts on surrounding natural vegetation will be documented. This could include vegetation eradicated by the herbicide or removed by mowing.

12.2.1.18.4.5.8.2.5 Step 5: Determine Control Success

The completed CMMR and the field map showing any change in size of the area of infestation will be used by the Environmental Department to determine the degree of treatment success. If the objective of control has not been met, then a determination will be made as to whether or not the same treatment will be repeated, or a new treatment will be implemented.

12.2.1.18.4.5.9 Resources for Training and Awareness

As mentioned previously, invasive species management is a part of several linked EMPs. In addition to linked EMPs, invasive plant species management resources for guidance of environmental staff will include:

- Field Guide to Noxious and Other Selected Weeds of BC (Cranston and Wikeem, 2002);
- Guide to Weeds in British Columbia (BC Ministry of Agriculture, 2002);
- Best Practices for Managing Invasive Plants on Roadsides (BC Ministry of Transportation and Infrastructure, 2010;) and
- Pest Management Plan for Management of Vegetation at BC Hydro Facilities (BC Hydro, 2009).

12.2.1.18.4.6 Wildlife Management Plan

12.2.1.18.4.6.1 Introduction

Wildlife management provides for mitigation of potential effects on wildlife species identified as potentially occurring in the Project study areas. Wildlife management applies to wildlife species in general, as developed and assessed through the Application via VCs. The WLMP was developed to address general Project-wildlife interactions during the construction and operations phases, and applies to indicator species as well as wildlife species in general, with particular focus on rare or threatened species of conservation concern (referred to as species at risk), as designated or listed by the:

- Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2012);
- Schedule 1 of the *Species at Risk Act* (*SARA)* (Government of Canada, 2002);
- BC Conservation Data Centre (BC CDC) Red and Blue lists (BC CDC, 2014);
- BC CDC's Animal Tracking List for the Vanderhoof Forest District (BC CDC, 2014);
- Partners in Flight Best Management Practices (PIF, 2014); and
- Conservation Framework (BC MOE, 2014).

EMPs, including for those for specific species, are subject to further iteration and development, which is expected to occur during EA review, Project permitting, and the inclusion of traditional knowledge as it becomes available, and is based on adaptive management during the Project lifecycle. As such, and notwithstanding conditions associated with any EA approval, this WLMP is not final and is subject to update prior to Project operations.

12.2.1.18.4.6.2 Linked Environmental Management Plans

Several EMPs are linked to the WLMP through shared wildlife management measures, such as EMPs relating to vegetation management (listed below) and transportation and access management, which include protective measures from the WLMP. Linked EMPs include:

- ARMP (**Section 12.2.1.18.4.2**);
- LSVMRP (**Section 12.2.1.18.4.4**);
- ISMP (**Section 12.2.1.18.4.5**);
- AHRMP (**Section 12.2.1.18.4.7**);
- WQLDMP (**Section 12.2.1.18.4.10**);
- TAMP (**Section 12.2.1.18.4.14**);
- RTEMP (**Section 12.2.1.18.4.16**);
- Noise and Vibration Mitigation Measures (**Section 5.2.2**);
- AQEMP (**Section 12.2.1.18.4.9**); and
- RCP (**Section 2.6**).

12.2.1.18.4.6.3 Objective and Goals

The objective of wildlife management is to minimize potential effects on wildlife caused by components of the Project while supporting operational requirements for the safety of employees and contractors. To meet this objective, the WLMP targets the following goals:

- Avoid interactions with wildlife;
- Reduce potential wildlife disturbance;
- Reduce and mitigate habitat disturbance; and
- Prevent wildlife mortalities.

Development of the objective and goals reflects key guiding principles from sources that include:

- Regulatory requirements and provincial/federal management objectives;
- Objectives of the Vanderhoof Land and Resource Management Plan (LRMP) (Integrated Land Management Bureau (ILMB), 1997);
- Provincial BMPs and Develop with Care Guidelines;
- SOPs; and
- Aboriginal groups interests and rights.

12.2.1.18.4.6.4 Regulatory Requirements

The following regulatory requirements apply to the WLMP.

12.2.1.18.4.6.4.1 Species at Risk Act

SARA (Government of Canada, 2002b) identifies wildlife species considered at risk, categorizing them as Threatened, Endangered, Extirpated, or of Special Concern, and prohibits a number of specific activities, including killing or harming species at risk, as well as destruction of critical habitat that has been identified in any of the plans required under *SARA*. Environment Canada has identified critical habitat attributes for caribou in the recent proposed recovery strategy that includes the Tweedsmuir subpopulation (Environment Canada, 2014).

The protections under *SARA* currently apply throughout Canada to all aquatic species and migratory birds (as listed in the *Migratory Birds Convention Act, 1994* (Government of Canada, 1994)) regardless of whether the species are resident on federal, provincial, public, or private lands. This means that if a species is listed under *SARA,* and is either an aquatic species or a migratory bird, there is a prohibition against harming it or its residence. For all other listed species, *SARA*'s protections only apply on federal lands, including National Parks and Indian Reserves.

12.2.1.18.4.6.4.2 Migratory Birds Convention Act, 1994 and Migratory Birds Regulations

The following federal laws apply to all actively nesting birds within the Project area. Federal migratory bird protection under section 6 of the Migratory Birds Regulation states that "Subject to subsection 5(9), no person shall:

- Disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird; or
- Have in his possession a live migratory bird, or a carcass, skin, nest, or egg of a migratory bird except under authority of a permit therefor. SOR/80-577, s. 4" (Government of Canada, 1994).

Migratory Birds Convention Act, 1994 issues may arise during land clearing or works related to the Project within riparian setback areas.

12.2.1.18.4.6.4.3 Wildlife Act

Existing wildlife habitat protection legislation is very limited, especially when habitat is on private land. Section 34 of the *Wildlife Act* (Government of BC, 1996f), the only legislation to protect wildlife, deals primarily with eagles, herons, peregrine falcon, osprey, gyrfalcon, and burrowing owl. It protects the nests of these species at all times, whether they are located on private land or Crown land. Section 34 of the *Wildlife Act* states that "A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests, or destroys:

- A bird or its egg;

- The nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl; or
- The nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg." (Government of BC, 1996f).

While the *Wildlife Act* does not specify measures to protect birds, eggs, or nests, pre-clearing surveys for nests are conducted operationally if clearing is proposed during nesting season and the results of the survey inform subsequent management decisions.

Any nests protected at all times under the *Wildlife Act* (i.e., eagle, peregrine falcon, gyrfalcon, osprey, heron, or northern goshawk nests) will require a buffer zone placed around them if they are active in order to protect them from direct and indirect disturbance from any construction activities that occur during the nesting season. If an exception arises, the Proponent will consult with BC MFLNRO or the Canada Wildlife Service (CWS) as appropriate on alternatives.

12.2.1.18.4.6.5 General Management Principles

The following general management principles are based on the key guiding principles described above. These management principles provide a framework for the development of detailed measures, which will be the first iteration in the adaptive management process. The detailed measures will be improved through application of specific knowledge gained through monitoring and evaluation, following the principles of adaptive management.The Proponent will participate in regional initiatives for caribou and establish a working group around access management along the transmission line corridor.

Regional management objectives are developed by regulatory agencies and First Nations and they are used to guide management of wildlife species with a large habitat range, such as caribou. To date the Proponent has supported First Nations-led data collection and wildlife studies (which have been shared with regulatory agencies), contributed to the development of management planning by the Province, and initiated meetings with other tenure holders to discuss measures to support caribou recovery. These examples of regional initiatives are expected to continue, or other programs as developed or put forward by First Nations and/or regulatory agencies.

The results of these initiatives will be considered by the Proponent and incorporated into mine operating plans and environmental management plan updates (i.e., wildlife management plan), where appropriate. The review of environmental management plans is one role that would be undertaken by the environmental monitoring board proposed by the Proponent. This board would also incorporate TK/TLU information into mine construction, operation and closure as it becomes available.

Unless stated otherwise, management principles refer to all parts of the mine site, including exploration areas and linear development areas (e.g., access roads, airstrip, and transmission line). The following 12 management principles apply to the Project:

- Manage and minimize wildlife-human interactions;

- Include provisions for wildlife in transportation and access management;
- Prohibit hunting and fishing for employees and contractors while on company business or while staying in construction or operations camps;
- Prohibit feeding of wildlife;
- Manage waste to minimize wildlife attractants (includes wildlife exclusion practices and equipment and incineration);
- Maintain a bear awareness program;
- Provide employee and contractor training on wildlife safety and awareness;
- Manage wildlife habitat where appropriate;
- Avoid areas and times of heightened wildlife sensitivity where possible;
- Establish wildlife reporting and monitoring procedures;
- Apply any identified group-specific management (e.g., caribou, amphibians, birds); and
- Conduct surveys for presence of nesting birds using the appropriate RISC methods (e.g., raptor nests, owl nests, shore birds, breeding birds, lek species such as grouse, cavity nests) before clearing or grubbing activities during the breeding bird season (March to July).

12.2.1.18.4.6.6 Management of Wildlife-Human Interactions

To minimize potential effects on wildlife it is essential that work activities be carried out in a safe and responsible manner at all times. Many procedures contained in the WLMP directly or indirectly reduce the likelihood of wildlife-human interactions. General procedures during the Project construction and operations phases include:

- As part of safety training, all mine personnel and contractors will be provided wildlife safety and awareness training, including bear awareness and how to avoid disturbing sensitive species;
- Mine personnel and contractors will not attempt to remove nuisance or problem wildlife without direction from the Provincial Conservation Officer Service;
- Harassment of wildlife will not be tolerated on or off the mine site, associated roads, and transmission line, which includes attempts to chase, catch, divert, follow, or otherwise harass wildlife by on- or off-road vehicles, aircraft, or on foot without applicable prior approvals/permits;
- All work areas will be kept free of garbage and spills. All uncontained garbage or spills will be cleaned up following guidance in the spill management plan. Improperly disposed garbage, especially food or kitchen wastes, will be cleaned up and reported to supervisory personnel as soon as possible;
- Wildlife corridors that intersect roads will be monitored prior to and during construction. Appropriate mitigation measures will be used where required, such as installing

wildlife-warning signage for drivers and reducing speed limits for vehicles. Wildlife sightings will be communicated by radio to alert other drivers of potential hazards;

- Wildlife logs will be maintained to provide information regarding presence of wildlife and potential changes in use of areas over time;
- On-site facilities will incorporate bear exclusion fencing as needed, primarily around garbage facilities. Wildlife exclusion options will be reviewed during construction and operations, if needed, depending on the wildlife species and area from which wildlife are to be excluded;
- No recreation trails will be allowed in sensitive habitat, such as grizzly bear or caribou habitat;
- The construction of new roads will be avoided to the extent possible and will adhere to the design, use, and decommissioning principles and procedures; and
- Wildlife interactions (e.g., traffic accidents) and nuisance or problem animals will be reported to supervisory personnel immediately. Reporting procedures will be developed before construction of the mine begins.

12.2.1.18.4.6.6.1 Wildlife-Human Conflicts

It is important to ensure that human health and safety are the highest priority at all times. If judged safe to do so, personnel may attempt to scare off an animal seen entering a mine construction or operating area. If this fails, mine environmental staff in consultation with the BC MOE will use appropriate measures to scare or remove the animal from the site. Mine staff or designates will handle or capture wildlife only as a last resort.

Several passive or active non-lethal wildlife deterrents can be used for wildlife around the mine facility or near mine personnel. These include:

- Pyrotechnics (mammals and birds);
- Gas auditory cannons (mammals and birds);
- Distress calls (birds);
- Flagging (mammals and birds); and
- Exclusion fencing (mammals).

Mine environmental staff responsible for the use of deterrents will be trained in the proper storage, handling, and discharge for devices, such as pyrotechnics or gas cannons.

12.2.1.18.4.6.6.2 Wildlife Injury

Despite best efforts, it is possible that injury or mortality to wildlife will occur. All mine vehicles and equipment using the site access route or on-site access roads will be equipped with two-way radios. Any encounters that result in injury or mortality to wildlife will immediately be reported to the mine environmental staff. Staff will be made aware of any locations of high animal activity on access roads and the appropriate actions to be taken. Any carcasses will be removed from the roadside and disposed of with other organic waste to prevent attraction of birds, ungulates, carnivores, and bears.

A wildlife awareness information program will be developed to ensure personnel and contractors are kept apprised and alert to the dangers of wildlife collisions on roads. Wildlife-human conflict areas will be monitored to identify high-risk areas, which will then be incorporated into the awareness program information.

12.2.1.18.4.6.7 Transportation and Access Management

Access management is critical for preventing potential effects on local and regional wildlife populations and habitats, and is one of the caribou management objectives identified in the Vanderhoof LRMP. The WLMP includes provisions for wildlife fencing, as described under Wildlife-Human Interaction Management (**Section 12.2.1.18.4.6.6**).

The TAMP includes direct and indirect provisions for wildlife. Only mine employees, contractors, visitors on mine business, and Aboriginal groups with prior consent, will be allowed on the mine property. All activities along the transportation route and operation of on- and off-road vehicles, snowmobiles, heavy equipment, airplanes, and helicopters must be conducted in a safe and responsible manner to ensure that effects on wildlife are minimized. Procedures for the mine access road that directly or indirectly affect wildlife include:

- Access to the mine site will be controlled by a security station;
- Speed limits on the mine access road will be posted. Travel speeds will be adjusted according to road conditions, weather, and wildlife presence when and where required;
- Signs will be posted to alert drivers of potential wildlife presence, particularly at sites associated with wildlife migration corridors, crossing points, sensitive habitats, or other high use areas. Reduced travel speeds will be posted where required;
- Implementing BMPs for road surface maintenance to allow good vehicle line of sight and control to help reduce potential collisions with caribou. Selecting vegetation species that minimize attraction of wildlife to roadsides to reduce potential vehicle collisions, as well as help reduce changes in prey-predator densities and distribution;
- Wildlife will be given the ROW along all roads associated with the mine;
- Authorized use of on- and off-road vehicles will be restricted to established roads and designated trails except to access monitoring sites and remote communications equipment. Private vehicle access to the mine site will be limited to authorized personnel. Use of vehicles for recreational purposes on the mine access road will be prohibited at all times;
- To improve visibility, dust on the mine access road and site roads will be controlled during dry periods as needed, as per the AQEMP;

- Snow will be ploughed from roads when necessary, and products having low environmental impact (e.g., sand, gravel, non-palatable salts) will be used as needed to ensure safe road conditions;
- Providing breaks in snow banks along the mine access road to allow wildlife escape;
- Wildlife sightings will be reported to supervisory personnel as soon as possible; and
- Wildlife incidents (e.g., traffic accidents) will be reported to supervisory personnel immediately.

12.2.1.18.4.6.8 No Hunting / No Fishing

A no hunting and no fishing policy will be enforced for all mine personnel and contractors while travelling on company business or while staying in accommodations provided by the Proponent. This policy will be communicated to all employees and contractors during training. Contractors will also be required to adhere to this policy as part of their contractual agreements with the Proponent. The Project is designed to utilize fixed wing aircraft access or grouped land transport, e.g., buses, reducing the use of personal vehicles and supporting the application of this policy.

12.2.1.18.4.6.9 No Feeding of Animals

A no feeding of animals policy will be enforced for all mine personnel and contractors on all mine property, access roads, and transmission line. This policy will be communicated to all employees and contractors during training. Contractors will also be required to adhere to this policy as part of their contractual agreements with the Proponent.

12.2.1.18.4.6.10 Waste Management

Domestic waste will be managed to reduce the risk of wildlife-human interactions, per implementation of the IDWMP (**Section 12.2.1.18.4.11**).

Mitigation measures to minimize wildlife attraction include but are not limited to:

- Using practices that minimize odours from human-generated wastes;
- Implementing a bear awareness program (described below);
- Scheduling timely and appropriate waste disposal;
- Incinerating putrescible waste as soon as practical and not allowing it to accumulate except where in appropriate containers;
- Storing wastes in wildlife-proof containers, including:
  - Trash cans and dumpsters with a bear-resistant design and removable plastic liners to contain odours. Waste containers will be repaired and maintained regularly; and
- Excluding wildlife from waste storage areas, including:
  - Wildlife and bear-resistant fencing, if required. Fencing will be repaired and maintained regularly.

12.2.1.18.4.6.11 Bear Awareness Program

Training will orient employees to correct waste disposal procedures and reporting guidelines. The mine will adopt its own bear awareness program to reduce wildlife- and bear-human interactions associated with domestic food and waste. The objectives of the bear awareness program will include:

- Eliminating bear deaths and relocations as a result of bears being attracted into facility areas due to garbage, fruit, compost, and other human-generated attractants;
- Increasing worker understanding of the negative implications on bears and humans when bears become habituated to camp and urban areas for food;
- Maintaining domestic areas as litter-free as possible;
- Identifying and correcting operational and maintenance deficiencies relating to wildlife management regularly;
- Providing commercial operators/subcontractors food and domestic waste management guidelines; and
- Incinerating acceptable waste as soon as practical.

12.2.1.18.4.6.12 Training and Awareness

Employee and contractor training will be an important element of all phases of the Project. Training will be specific for the role and likely interaction with wildlife components and may include the following topics of relevance to wildlife management:

- Access road use and haulage operating protocols;
- Restricted access recreation proscription rules;
- No hunting / no fishing policy;
- Wildlife observation and interaction reporting procedures;
- Bear awareness program;
- Waste management procedures; and
- Wildlife sensitive locations/timing as applicable.

12.2.1.18.4.6.13 Wildlife Habitat Management

Specific habitat management measures are recommended to minimize the risk to wildlife, e.g., vehicle incidents and changes in habitat suitability. Standard operating practices at the mine site will include:

- Revegetating at sites near roads with species that minimize attraction of ungulates and bears to roadsides;

- Providing escape routes where wildlife corridors intersect roads (to be determined prior to construction); and
- Assessing water pooling areas for western toad breeding (during breeding season) and salvage prior to clearing and work affecting road ditches on the mine access road.

All reasonable efforts will be made to minimize impacts and reclaim disturbed habitats throughout all phases of the Project. Procedures to manage potential effects on wildlife from direct and indirect habitat loss will include:

- Using native species to maximize forage and cover opportunities away from road areas (e.g., using grasses, willows, and other shrubs) unless within or near caribou winter range (to discourage alternate prey species);
- Retaining riparian areas where possible;
- Retaining CWD where appropriate for microshelter habitat for wildlife;
- Using vegetation and CWD to form visual barriers on cutlines, trails, or other linear features to reduce predator access and efficiency;
- Maintaining vegetated buffers adjacent to mine facilities and roads to the extent possible. Exceptions will include areas that will be managed for wildlife and human safety; and
- Reporting any habitat feature (e.g., nest, den, mineral lick) encountered during the course of work activities by mine personnel or contractors to mine environmental staff immediately for follow-up actions as required.

12.2.1.18.4.6.14 Wildlife Timing Windows

If ground disturbance occurs during the bird nesting or denning season, a qualified biologist will survey the potentially disturbed locations to identify the presence/absence of these activities using appropriate RISC survey methods for the species present (e.g., owls, raptors, breeding birds, northern goshawk, bears, and wolverine). Sensitive activity periods are shown in **Table 12.2.1-25**.

Table 12.2.1-25: Sensitive Periods for Wildlife and Fish

Group	Applicable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Caribou	Yes	1	1	1	1.1	1.1	1.1	1.1		1.1	1.1	1.1	1
All birds*	Yes			2	2	2	2	2	3				
Bears*	Yes	4	4								4	4	4
Amphibians*	Yes												
Kokanee*	Yes						5						
Rainbow trout*	Yes				6								

Note:
1. Avoid activities involving mechanical disturbance during the very sensitive period of December 30 to March 31 in the UWR (ungulate winter range). If in the limited case that this cannot be achieved additional monitoring requirements needed including stop work when caribou observed (Section Caribou Conservation 12.2.1.8.4.6.17).

1.1. During April to July 15th (caribou calving) and during Sept 15 to Nov 30 (caribou rut) implement adaptive management measures if animals are detected in caribou summer/fall habitat in proximity to the mine site.

2. Cannot clear vegetation during the nesting period (approximately March to July) without conducting breeding bird survey prior to clearing. Variances allowed based on professional biologist clearance.
3. Some birds may still be nesting. Consultation required with biologist.
4. Bears are denning and a denning survey will be required prior to clearing during this time.
5. June 1 to August 31 (If fish are salvaged, then works can occur during this window).
6. April 15 to July 15 (If fish are salvaged, then works can occur during this window).

Source: *BC MOE (formerly BC Ministry of Water, Land and Air Protection), 2004

12.2.1.18.4.6.15 Reporting Procedures

Reporting procedures for wildlife-human interactions will be included in employee training. Records will be managed by the mine environmental staff and included in annual reports that will be made public. The records will be used to provide an indication of the effectiveness of wildlife mitigation measures and to allow an adaptive management approach to improve the performance of the mitigation measures including the training of mine staff.

12.2.1.18.4.6.16 Wildlife Monitoring Procedures

On an ongoing basis, the mine environmental staff will manage monitoring of wildlife observations and incident reporting. The purpose of monitoring is to provide data to identify existing or potential issues and areas of concern between wildlife and Project components, and to support improved monitoring and improved mitigation.

The wildlife-monitoring program will involve all mine personnel and contractors, and will encompass reporting of wildlife observations and incidents encountered during Project construction and operations. Observations include sightings of wildlife and wildlife sign (e.g., tracks, scat, nests, dens, etc.). Wildlife incidents include close or aggressive encounters, unusual or erratic behaviour, traffic accidents or near misses, and dead or injured wildlife.

Reporting of wildlife observations and incidents will occur on an ongoing basis. Wildlife incidents will be reported to environmental staff as soon as reasonably possible within 24 hours, and wildlife sightings will be reported within 48 hours. Field reports will be submitted and will initiate a file with documentation that will form a database for tracking subsequent wildlife observations and incidents.

The Proponent will continue to support regional management initiatives for ongoing research and monitoring of the Tweedsmuir-Entiako Northern Caribou subpopulation and associated habitat use near the mine.

12.2.1.18.4.6.17 Group-Specific Management

Wildlife groups requiring specific management measures are caribou, amphibians, birds, and moose. The following sections describe requirements for these groups.

12.2.1.18.4.6.17.1 Caribou Conservation

Caribou were identified as a VC for the Project given the proximity of the Project to caribou habitat and UWR and Aboriginal groups interests identified during consultation (**Section 17**). Project level management planning for caribou was developed based on the baseline information available, the identified potential effects, and guiding mitigation documents.

The southern mountain population of woodland caribou is listed by COSEWIC as Endangered (COSEWIC, 2014). The Tweedsmuir – Itcha-Ilgatchuz metapopulation range overlaps the mine site. While there is overlap between the range of the Itcha-Ilgathcuz subpopulation and Tweedsmuir-Entiako subpopulation, the mine site is bisected by the range of the Tweedsmuir-Entiako subpopulation as such is on the edge of the range of the caribou. Both subpopulations have a declining population trend over the last 10 years (Environment Canada, 2014). This has been linked with low calf survival/recruitment (**Section 5.4.11** Caribou).

Baseline information collected during a review of available literature and baseline surveys and incidental observations in the Project area is provided as part of the EA. Baseline surveys did not note any caribou; however, incidental detections of sign, e.g., scat during other surveys indicated limited caribou use in the mine site. Much of the area is affected by mountain pine beetle and as such lichen loading, as a food source for caribou, is currently in decline.

Traditional use of caribou is ongoing and hunting has historically occurred on the south side and summit of Mt. Davidson, south of the mine site. Hunting practices made use of natural features that may limit the movement of the caribou, e.g., snow drifts to increase the success of the hunt. Community members of Aboriginal groups identified the declining numbers of caribou, concerns regarding the effects of wolves and that caribou moved seasonally between Moose Lake and Tweedsmuir Park, west of the mine site.

In determining potential Project effects, habitat suitability modelling was conducted with input from provincial and federal agencies and First Nations. This included the consideration of factors identified in the proposed recovery strategy for woodland caribou, southern mountain population (Environment Canada, 2014). Potential Project effects on caribou are primarily related to the mine site given their range and as such mitigation for caribou is not proposed for the Kluskus FSR or the transmission line once it reaches the Kluskus FSR. Identified potential effects include direct mortality, e.g., vehicle strikes, increased competition by other species, increased predation, and habitat loss. A small amount of available moderate to high quality habitat (5%) will be affected relative to that available in the RSA.

Proposed management actions and mitigation to address the potential effects on caribou have been developed based on provincial and federal guidance documents. Provincial guidance is a combination of known habitat requirements and guidance from other mountain caribou populations, e.g., the South Peace area. Federally, a proposed recovery strategy has been developed under the *SARA* for the caribou present proximal to the mine site and a review process by the federal government is underway to finalize the document. Consistent with the *Canadian Environmental Assessment Act, 2012* and *SARA,* proposed mitigation is required to align with the recovery strategy albeit at the time of writing as a ‘proposed’ strategy.

12.2.1.18.4.6.17.1.1 Disturbance, Mortality, and Population Management

- Mitigation related to mortality and disturbance includes managing air and vehicular traffic, road maintenance, and monitoring and communication of wildlife sightings;
- Implementing caribou awareness and protocols in regular safety and environmental orientations performed at the mine. Workers and contractors will be made aware of seasonal changes in caribou behaviour or presence near the mine;
- Controlling dust on the mine access road and site roads during dry periods to improve visibility, as needed, using products having low environmental impact (e.g., sand, gravel, non-palatable salts) will be used as needed to ensure safe road conditions;
- Posting signs warning drivers of the possibility of caribou encounters in areas of high wildlife activity;
- Implementing BMPs for road surface maintenance to allow good vehicle line of sight and control to help reduce potential collisions with caribou. Selecting vegetation species that minimize attraction of wildlife to roadsides to reduce potential vehicle collisions, as well as help reduce changes in prey-predator densities and distribution;
- Enforcing speed limits along mine access roads to reduce potential wildlife collisions;
- Restricting and controlling mine road access to ensure no unauthorized traffic use of the road. All traffic flow on the FSR will be monitored and controlled via radio communications. Reporting observations of wildlife along the road to environmental staff;
- Implementing a no hunting and no firearms policy;
- Removing carrion along the road to reduce the risk of attractants that may bring predators into caribou habitat;
- Implementing radio communication of road users on mine access roads and sites to allow for the sharing of information, such as wildlife sightings;
- Providing ROW of wildlife on all roads and trails. If caribou are encountered on a road or access trail, staff and contractors will be directed to avoid approaching or following animals, vehicle engines may be turned off and workers will wait until caribou have moved off the road and out of sight before proceeding; they will also record and document the occurrence;
- Implementing adaptive management measures to reduce disturbance, if population monitoring (see below) results in observations of caribou within 500 m of the mine site during sensitive periods;
- Ploughing roadside snow banks on the mine access road within late winter caribou habitat when snow depth is greater than 1 m, to permit breaks approximately every 1 km and allow wildlife to enter and exit the road corridor safely;
- Minimizing sensory disturbance from noise and light by using directional lighting; and
- Maintaining fixed wing aircraft operations 1,000 ft above the UWR, except where emergency safety considerations are required.

12.2.1.18.4.6.17.1.2 Landscape Level Planning

- The Proponent will support regional planning initiatives for the Tweedsmuir-Entiako metapopulation including those related to landscape level protection that considers future and current habitat requirements.

12.2.1.18.4.6.17.1.3 Habitat Management

- Locating Project facilities outside the UWR;
- Locating mine facilities clustered around the open pit, thereby reducing habitat fragmentation and minimizing ‘edge effects’ e.g., disturbance from light and noise;
- Activities that will occur outside of the caribou "least risk window" (**Table 12.2.1-25**), as defined by the BC MOE Least Risk window to wildlife, will incorporate mitigation measures and an adaptive management approach, including stopping work if caribou are observed and combined with monitoring to ensure that displacement and impacts are reduced or avoided;
- Avoiding species that may compete with caribou within the range of the Tweedsmuir Itcha - Ilgachuz metapopulation through the following measures:
  - Implementing the invasive plant species management plan such the growth of non-native plant species is minimized, e.g., dandelion that may support other wolf prey such as deer, or predators such as bear; and
  - Following reclamation and sediment and erosion control revegetation practices within the caribou range that avoid promoting other species, e.g., moose and deer;
- Maximizing the use of existing disturbance areas e.g., cutblocks and roads for linear project facilities;
- Incorporating design considerations for caribou where areas of new disturbance are required for linear corridors (e.g., mine access road, freshwater supply system corridor in caribou habitat), including avoiding areas of high lichen loading and breaking sight lines approximately every 250 m where safe to do so;
- Implementing mine site reclamation to include caribou through ‘wildlife use’ as part of the Project reclamation end land use objectives. Components of the reclamation related to caribou habitat will include:
  - Progressive reclamation and restoration of habitat that meets the general habitat requirements of caribou as outlined in the recovery strategy;
  - Use of plant species in reclamation within caribou habitat that avoids the promotion of other competing species, e.g., moose except where impractical such as the TSF ponds;
  - Placing natural cover such as rock piles and woody debris piles in open areas to reduce predator efficiency and create temporary visual cover for caribou; and
  - Placing woody debris on the surface of the upland slopes and between rocks and along the slopes, parallel and perpendicular with the slopes, to provide habitat

features for security of caribou and to foster habitats not suitable for alternate prey species.

12.2.1.18.4.6.17.1.4 Recreational Activities

- Using a combination of air transport and grouped ground transportation e.g., buses, vehicular traffic on roads to/from the mine site will be minimized and avoid the use of personal vehicles;
- Implementing a no hunting policy for employees, contractors, and visitors while travelling on company business or while staying in accommodation provided by the Proponent;
- Implementing security and access control to the mine site via the mine site access road, which will forbid the personal use of recreational vehicles on the mine access road and mine site. The new mine site access road will be located outside the UWR;
- The deactivation and ultimate reclamation of the current exploration access road which crosses the UWR; and
- Potential recreational foot trails associated with the camp and worker health will avoid sensitive areas for caribou, e.g., areas of high lichen loading and the UWR.

12.2.1.18.4.6.17.1.5 Population Monitoring

- Implementing an incidental caribou observation recording program, consistent with general wildlife mitigation measures, throughout the life of the Project to support an understanding of habitat use, timing of caribou presence and target mitigation;
- Using wildlife cameras to support the incidental observation recording program, which may include areas of known or potential interaction and where mitigation or reclamation has been undertaken, e.g., deactivated and ultimately reclaimed exploration access road or breaks in snow banks along the mine access road; and
- Supporting regional planning initiatives related to the Tweedsmuir Itcha - Ilgachuz metapopulation of caribou. This includes follow up monitoring of caribou, however, the duration and frequency of monitoring (e.g., calving surveys) is subject to further discussion to be effective in addressing knowledge gaps and aligning with existing work underway. To date this has included work in progress on understanding habitat supply related to mountain pine beetle effects.

12.2.1.18.4.6.17.2 Amphibian Conservation

Mitigation for amphibians has been developed around the western toad, to which potential effects were assessed as a VC. Baseline amphibian surveys were conducted related to all mine components and habitat suitability modelling was conducted based on habitat requirements for western toad. Mitigation has been developed based on provincial guidance and specific to the regions overlapped by the Project (BC MOE, 2014).

Baseline studies for amphibians identified four species include the western toad (*Anaxyrus boreas*), Columbia spotted frog (*Rana luteiventris*), wood frog (*Lithobates sylvatica*), and long-toed salamander (*Ambystoma anabystoma*). Only western toad is Blue-listed and identified as a species of special concern under schedule 1 of the *SARA*.

Many of the natural waterbodies within the mine site LSA do not provide suitable breeding habitat, which is likely due to cold-water temperatures. Baseline and incidental field observations indicate that small late ephemeral pools in the LSA may provide breeding habitat. Breeding for these species was confirmed in the mine site LSA and RSA; however, some of these sites were anthropogenic, e.g., wood frog breeding in road ditches. Habitat suitability modelling for western toad indicated most of the LSA and RSA were moderate suitability. However, more northern portions of the mine site (e.g., D-dam, water reservoir, environmental control dam, and mine site access road) overlap high value habitat.

While amphibians were not identified in available traditional knowledge, it is recognized that Carrier people commonly refer to a governance system that includes clans, including the *Jijl tse yu* frog clan. The Nadleh Whut'en and Stellat'en First Nations' clan structures include a frog clan.

The effects assessment identified four potential effects on amphibians: habitat loss and alteration, increased direct mortality (e.g., vehicle collisions), restriction on movement, and health. Mitigation has been developed based on the potential effects specific to the mine components, as follows.

12.2.1.18.4.6.17.2.1 Habitat Loss and Alteration

- Maximizing use of existing disturbed areas for linear corridors to prevent additional fragmentation or loss of habitat;
- Minimizing areas of new disturbance on high value western toad habitat for the transmission line; this may include relocating transmission line poles outside wetland areas and consideration of construction access roads for the transmission line consistent with BC MOE guidance;
- For unavoidable mine site footprint related effects, implementing a wetlands management plan and wetlands offsetting plan consistent with Environment Canada guidelines (refer to wetlands management plan and offsetting plan). This is consistent with BC MOE guidance;
- Implementing sediment erosion control measures for all Project components with the potential to mobilize sediment leading to the potential degradation of amphibian habitat;
- Implementing an invasive plant species management plan to minimize the likelihood of the introduction of plant species that will adversely modify amphibian habitat; and
- Minimizing disturbance, where linear corridors are required to cross riparian habitat, e.g., crossing perpendicular to the stream, and minimizing clearing consistent with the LSVMRP; and ARMP.

12.2.1.18.4.6.17.2.2 Direct Mortality

- Restricting the clearing of terrestrial amphibian breeding habitats, including a 50 m buffer from the habitat, to periods outside the amphibian breeding season (1 May to 31 August) or conduct pre-construction and pre-clearing surveys and amphibian salvage if during the breeding season;
- Incidental wildlife reporting and subsequent posting of signs warning drivers of the possibility of amphibian crossings in areas of high wildlife activity, such as potential toad crossings near breeding sites. If amphibian mortality on roadways is identified along mine access roads or the FSR, adaptive management measures will be implemented which may include additional consideration for amphibian passage, e.g., assisted crossing, tunnel and fence systems or limitations on timing of traffic movement in that area; and
- Implementing dust control measures as defined in the AQEMP include watering roads during the dry, high fugitive dust risk season and avoiding when practical, use of road salts for dust control during summer and winter to reduce attractants to wildlife.

12.2.1.18.4.6.17.2.3 Movement Restriction

- Selecting revegetation species that minimize attraction of wildlife to roadsides;
- Maintaining or enhancing connectivity of habitats and populations where practical including maintaining natural drainage patterns;
- Using stream crossing structures consistent with DFO guidelines that are open bottomed for fish bearing waters, inferred fish-bearing waters or if identified proximal to large aggregations of amphibians associated with breeding; and
- Falling and yarding cut trees away from wetlands and removing introduced debris.

12.2.1.18.4.6.17.2.4 Health

- Following BC MFLNRO BMPs to reduce potential dust or adverse effects on water quality in amphibian habitats;
- Ensuring surface water quality parameter levels as described in the MWAMP.

12.2.1.18.4.6.17.3 Bird Management Plan

Project effects on birds were assessed through two VCs, forest and grassland birds and water birds. Potential effects on the two groups were similar. Mitigation for water birds is addressed through the implementation of other management plans, e.g., ARMP, WMP, and Fisheries Mitigation and Offsetting Plan (**Appendix 5.1.2.6C**). This includes the protection of habitat including water quality and minimizing riparian clearing and the creation of new wetland habitat. As such this section is limited to mitigation for forest and grassland birds and species assessed through this VC.

Forests and grassland birds were detected through the study areas for all Project components. Five species of conservation concern were noted:

- Olive-sided flycatcher (Threatened – COSEWIC and *SARA*, Blue-listed) (*Contopus cooperi*) in all mine component local study areas except the mine access road;
- Rusty blackbird (Special Concern – COSEWIC and *SARA*, Bluelisted) (*Euphagus carolinus*) in the transmission line and the freshwater supply system study areas;
- Barn swallow (Threatened – COSEWIC, Blue-listed) (*Hirundo rustica*) in all mine component study areas except the freshwater supply system corridor;
- Sharp-tailed grouse (Blue-listed) (*Tympanuchus phasianellus columbianus*) in the mine site RSA northeast of Mt Davidson; and
- Common nighthawk (Threatened – COSEWIC and SARA) (*Chordeiles minor*) in all Project component study areas except the Kluskus FSR, and typically associated with wetland habitat.

Raptor species was observed during baseline surveys within the different mine components. Two of the 18 species observed are of conservation concern: short-eared owl (Special Concern – COSEWIC and *SARA*, Blue-listed) (*Asio flammeus*) was observed at the north end of Tatelkuz Lake, and the rough-legged hawk (Special Concern – COSEWIC and *SARA*, Blue-listed) (*Buteo lagopus*).

Forest and grassland birds are harvested by Aboriginal groups in the area. Aboriginal members residing at Tatelkuz Lake Indian Reserve #28 harvest grouse as a food source. Aboriginal groups have raised concerns about potential effects on migratory birds.

The effects assessment identified five potential effects for forest and grassland birds; habitat loss and alteration, mortality, bird health, sensory disturbance and changes in population dynamics. Proposed mitigation is included for other species, e.g., reduction in mortality. Further mitigation is integrated into other linked management plans particularly the LSVMRP and AQEMP with regard to mitigating sensory disturbance or water quality and spills management for bird health. Specific mitigation for birds spanning the five potential effects is described below.

General recommendations for the retention and development of songbird habitat will include the following:

- Where possible, retain and enhance forest edge habitat along road areas to provide escape or thermal cover for passerines;
- Reclaim and revegetate at mine closure, as described in the RCP;
- Where possible, maintain habitat diversity including vegetation age/successional structure and refrain from monocultural stocking when revegetating;

- During replanting/revegetation use a variety of indigenous native plants to promote use by indigenous bird species; and
- Where possible and safe from becoming a fire hazard, retain and enhance CWD and brush pilings on forest floors for core forest nesters.

The site contains nesting habitat for raptors, and has the potential to provide forage habitat for several raptor species. A general raptor management approach for the footprint of the site and adjacent habitat will include the following:

- Remove carrion along the road to prevent/reduce potential effects to raptors or other scavengers; and
- During any clearing, maintain where possible the retention of large snags and CWD along the development perimeter. This would benefit future habitat conditions for prey species of small mammals.

12.2.1.18.4.6.17.4 Moose Management Plan

Moose were assessed as a VC for the EA. Baseline moose surveys were conducted related to all mine components and habitat suitability modelling was conducted based on habitat requirements each life history requirement. Mitigation has been developed based specific potential threats.

Baseline information was collected as part of winter ungulate surveys to determine the presence and distribution of moose across the Project area. The winter tracking surveys completed at Mount Davidson in 2011 detected moose at several locations throughout the Project area indicating the use of winter habitat. Habitat along the lower riparian areas of Mathews Creek, Laidman Lake, Fawnie Creek, and associated wetlands with well-developed shrub complexes appeared to provide high quality wintering habitat for ungulates. During the 2012 ground-based winter track survey, ungulates were not detected on Mount Davidson. In 2012, more moose were detected along the lower Davidson road network compared to the higher elevation mine site, which had greater snow depths. The Davidson road network northeast of the mine site, within the mine site RSA had the most human activity impacts, as a large portion of the forest within this area was harvested.

Moose hunting for subsistence are important to Aboriginal groups. Elders noted the moose population in the area was historically much higher and moose were noted to migrate to the top and sides of the Mt. Davidson range. Historically, Aboriginal groups in the area would travel up the north and south sides of mountains, such as Mt. Davidson, to hunt moose. The harvested meat would be smoked and consumed during winter months. Most Aboriginal groups have hunters in each community that harvest moose as a cultural necessity and an important source of food. Moose heart is used as bait for large rainbow trout.

The effects assessment identified four potential effects to moose; habitat loss or alteration including sensory disturbance, direct mortality, moose movement patterns and changes in moose population dynamics.

The overall effect of the mine site on moose habitat is likely little change in the amount of suitable habitat, due to the relatively high elevation and lower suitability habitat of the mine site compared to other moose habitat available at lower elevations. Clearing of forest for the transmission line is unlikely to affect moose, because most wetlands that are important to moose in spring and summer will likely be spanned with no physical infrastructure footprint. Other mine components, e.g., use of the existing Kluskus FSR and freshwater supply system corridor, are located in the Sub-Boreal Spruce (SBS) biogeoclimatic zone, which is more productive for moose. Clearing of forest will result in new vegetation growth potentially promoting moose forage.

Direct mortality, e.g., vehicle strikes, is typically related to traffic volumes, which during construction and operations, are likely to increase relative to recent (2012/2013) traffic levels, although be lower than historic levels, e.g., mid/late 2000s. Subsequently moose movement may be affected by new linear corridors, e.g., transmission line, traffic levels on the Kluskus FSR and by increase forage from regrowth of vegetation following clearing.

Moose population dynamics are potentially influenced by changes in habitat availability and predation/mortality. While little change in habitat amount is predicted, a potential increase in forage may occur along with changes in mortality. Increased mortality may result from direct mortality, increased predator efficiency related to linear corridors, and increased hunting pressure.

The following mitigation is proposed for the effects identified including alignment with the draft provincial framework for moose management in BC (BC MFLNRO, 2013).

12.2.1.18.4.6.17.4.1 Habitat Loss and Alteration Including Sensory Disturbance

- Maximize use of existing roads and cleared areas, and locating proposed mine access road and transmission lines away from wetland, black spruce and riparian areas or spanning wetlands;
- Minimizing ground disturbance and damage to vegetation in areas adjacent to footprints by flagging or fencing of sensitive habitats thereby reducing potential loss of moose habitat;
- Applying soil erosion and sediment control measures as described in the SECP (**Section 12.2.1.18.4.1**);
- Implementing dust control measures as defined in the AQEMP (**Section 12.2.1.18.4.9**) including watering roads during the dry, high fugitive dust risk season and avoiding use of road salts for dust control during summer and winter to reduce attractants to wildlife that might draw moose close to roads;
- Restoring disturbed habitats at mine closure or development of habitats capable of supporting moose as defined in the RCP (**Section 2.6**) in balance with requirements for other species e.g., moose;
- Implementing a wetlands mitigation and offsetting plan as defined in other sections of the Application including the creation of offsetting habitat;

- Minimizing windthrow will include appropriate boundary design, edge stabilization treatments (e.g., topping, pruning, and feathering edges), and apply any necessary adaptive management techniques;
- Maintaining water tables and drainage patterns by sizing culverts and stream crossings based on DFO and provincial guidelines;
- Implementing invasive plant management techniques as defined in the ISMP (**Section 12.2.1.18.4.5**) including developing and implementing detailed construction and operational plans of invasive plant prevention and detection strategies, and an action protocol if invasive plants are detected (management techniques will include annual monitoring for invasive plants, although recognizing that current data from baseline reports on invasive species identified within the LSA do not pose a risk to moose within the LSA or RSA); and
- Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures.

12.2.1.18.4.6.17.4.2 Direct Mortality

- Including moose awareness information into safety and environmental inductions performed by the mine including a reporting procedure for wildlife observations and incidents involving wildlife along the mine site, mine access road, and Kluskus FSR;
- Maintaining speed limits along roads for Project-related vehicles, as well as implementation of BMPs of road surface maintenance;
- Selecting revegetation species that minimize attraction of wildlife to roadsides and around the airstrip to reduce potential vehicle collisions and predation;
- Providing breaks in snow banks along the access road to allow wildlife escape when the snow pack depth exceeds 1 m. This includes breaks approximately every 1 km along the mine access road and less frequent on the Kluskus FSR as determined by location and frequency of wildlife observations;
- Posting road signs warning drivers of speed limits and of the possibility of moose sensitive areas such as migration routes and seasonal feeding areas;
- Restricting and controlling road access to ensure no unauthorized traffic use of the road. All traffic flow on the FSR will be monitored and controlled via radio communications. Reporting observations of wildlife along the road to environmental staff;
- Removing carrion along the road to reduce the risk of attractants that may bring predators into moose habitat;
- Implementing water quality monitoring and adaptive management (Decommissioning and Closure Activities, Reclamation and Closure Plan, and Follow-up Program); and

- Implementing a no hunting policy for mine workers, contractors, and visitors when travelling to/from the work site or while staying in accommodation provided by the Proponent.

12.2.1.18.4.6.17.4.3 Moose Movement Patterns

- Posting signs warning drivers of the possibility of wildlife encounters in areas of high wildlife activity;
- Implementing BMPs for road surface maintenance to allow good vehicle line of sight and control to help reduce potential collisions with moose;
- Selecting revegetation species that minimize attraction of wildlife to roadsides to reduce potential vehicle collisions, as well as help reduce changes in prey-predator densities and distribution;
- Clearing road ROWs of brush, in non-sensitive areas e.g., outside of riparian areas, to assist in reducing foraging attractants; and
- Minimizing sensory disturbance due to noise and light at the mine area and airstrip as stated in the Noise and Vibration Mitigation Measures (**Section 5.2.2**).

12.2.1.18.4.6.17.4.4 Changes in Moose Population Dynamics

- Removing carrion along the road to reduce the risk of attracting predator species;
- Restricting access to the mine access road and prohibiting the personal use of recreational vehicles;
- Implementing an access management plan along the transmission line corridor developed through a working group including Aboriginal groups; and
- Participating in road safety groups for the use of the Kluskus FSR as hosted by the road owner or primary licence holder.

12.2.1.18.4.7 Archaeology and Heritage Resources Management Plan

12.2.1.18.4.7.1 Introduction

Archaeology and heritage resources will be managed within the Project development area for the duration of mine life. This section presents the AHRMP for the construction and operations phases.

The AHRMP will be revised as necessary to include results of discussions with government agencies and Aboriginal communities, and to include any new archaeological and heritage resource discoveries that may occur in the Project development area. The main issues for consideration under archaeological and heritage resources management include:

- Potential loss of heritage resources and information during construction and operations;

- Use of best project design and management practices to ensure heritage resources are identified, avoided, or protected where possible, and mitigated where not;
- Ensuring all employees and contractors are aware of their legal requirements for archaeology and heritage protection; and
- Transparent consultation on heritage mitigation concerns and options with the Archaeology Branch and Land Tenures Branch – Fossil Management Framework for British Columbia, and with Aboriginal communities.

12.2.1.18.4.7.2 Scope

The Project development area is composed of the following Local Study Areas (LSAs) of the Archaeological Impact Assessment (AIA):

- Mine site;
- Transmission line;
- Mine access road;
- Kluskus FSR realignment;
- Airstrip and facilities; and
- Freshwater supply pipeline.

The Project development area will be updated as necessary to include future assessment results for any additional Project facilities, and for any modifications of facilities already assessed.

12.2.1.18.4.7.3 Objective

The objective of the AHRMP is to provide for the avoidance and/or protection of archaeological and heritage resources in the Project development area, whether already discovered, or potentially existing and as yet undiscovered.

12.2.1.18.4.7.4 Regulatory Requirements

Legislation pertaining to archaeological resources includes the *Heritage Conservation Act (*BC *HCA)* (Government of BC, 1996j), and the BC *Environmental Assessment Act* (Government of BC, 2002a). Archaeological resources are automatically protected under section 13 of the BC *HCA*, which specifies that an individual (or corporation) must not "damage, excavate, dig in, or alter or remove any heritage object" (Government of BC, 1996j) from an archaeological site, except in accordance with a permit issued by the Minister. Archaeological resources include:

- Archaeological sites occupied or used before 1846;
- Aboriginal rock art with historical or archaeological value;
- Burial places with historical or archaeological value;
- Heritage shipwrecks and aircraft wrecks; and

- Sites of unknown attribution that could have been occupied prior to 1846.

Additional legislation includes the *Forest Act* (Government of BC, 1996k) which defines a cultural heritage resource as "an object, a site, or the location of a traditional societal practice that is of historic, cultural, or archaeological significance to BC, a community or an Aboriginal people." Section 10 of the Forest Planning and Practices Regulation (BC FPPR) further refines the definition of a cultural heritage resource under the *Forest and Range Practices Act* (BC *FRPA*) (Government of BC, 2002b)*.* The *FPPR* states the following objective set by government:

> *to conserve, or, if necessary, protect cultural heritage resources that are (1) the focus of a traditional use, by an aboriginal people, and that are of continuing importance to that people; and (2) not regulated under the Heritage Conservation Act"; (Forest and Range Evaluation Program 2013).*

Examples of cultural heritage resources include:

- Culturally modified trees (CMTs), trail blazes, traps, and traplines that postdate 1846 A.D. and are not protected under the BC *HCA.*

In addition palaeontological finds are considered a heritage resources and includes:

- Fossil and fossil sites as defined by the Land Tenures Branch of the BC MFLNRO.

12.2.1.18.4.7.4.1 Heritage Inspection Permit

An AIA was conducted in fall 2012 and summer 2013 under Heritage Inspection Permit #2012-0295, issued by the Archaeology Branch. The AIA encompassed the Project development area identified in the scope of the AHRMP.

12.2.1.18.4.7.4.2 Heritage Investigation and Site Alteration Permits

When an AIA has been completed and archaeological sites protected under section 9 or 13 of the BC *HCA* have been identified, they cannot be altered or changed in any manner without a permit issued by the minister or designate.

If protected sites are identified and that will be affected by the Project, avoidance through Project redesign is the recommended course of action. However, if Project redesign is not possible, then mitigation (potentially including controlled scientific excavation) will be conducted. A Heritage Investigation Permit issued under section 14 of the BC *HCA* must be obtained to undertake archaeological investigation to recover information that might be lost as a result of land-altering activities within the site.

In addition, the Proponent is required to obtain a Site Alteration Permit under section 12 of the BC *HCA* prior to affecting a protected site. The Site Alteration Permit is issued to the Proponent and

Project archaeologist to authorize removal of residual archaeological deposits once an inspection and investigation are completed (Archaeology Branch, 1998).

12.2.1.18.4.7.5 Guidelines

All protected archaeological resources in BC are managed using the following guidelines:

- Archaeological Impact Assessment Guidelines (Archaeology Branch, 1998);
- British Columbia Archaeological Inventory Guidelines (Archaeology Branch, 2000); and
- Culturally Modified Trees of British Columbia: A Handbook for the Identification and Recording of Culturally Modified Trees (Archaeology Branch, 2001).

12.2.1.18.4.7.6 Inventory of Heritage Resources in Project Development Area

The AIA (AMEC, in prep.) identified eight archaeological sites, two historical heritage sites and 39 cultural heritage resources. Results of the AIA are described in Section 8.0, and are further summarized in **Table 12.2.1-26**, which also includes rating for mitigation based on the BC *HCA*. **Table 12.2.1-26** will be updated as necessary to record any new discoveries, whether they occur by chance or through additional assessment.

12.2.1.18.4.7.6.1 Mine Site

The AIA identified three archaeological sites and one historical heritage sites within the mine site footprint. Twenty cultural heritage resource sites consisting of non-protected (post-dating 1846 A.D.) blazed trees and CMTs were identified.

Table 12.2.1-26: Inventory of Identified Archaeological and Heritage Resources (1)

Feature ID	Cultural Feature(s)	General Location	Level of Effect	Mitigation
FhSe-73	Isolated flake in association with a cache pit	Mine site	High	Site avoidance through project redesign; if not possible, then mitigation as described in **Section 12.2.1.1.1.1.1**
FhSe-75	Artifact scatter	Mine site	High	Site avoidance through project redesign; if not possible, then mitigation as described in **Section 12.2.1.1.1.1.1**
FhSf-4	Isolated stone tool	Mine site	High	Site avoidance through project redesign; if not possible, then mitigation as described in **Section 12.2.1.1.1.1.1**
	Remains of an historic cabin	Mine site	High	Not protected under the *BC HCA*; none planned
CHR -1, -2, -3, -4, -5, -6,-10, -11, -13, -15, -16, -20, -21, -22, -23, -24, -25, -26, -27, -28	20 sites consisting of blazed trees and CMTs	Mine site	High	Not protected under the *BC HCA*; none planned
GaSf-47	10 cache pits	Transmission line- primary reference alignment	Low	Site avoidance through project redesign; if not possible, then mitigation as described in **Section 12.2.1.1.1.1.1**
GaSf-48	Single cache pit	Transmission line- primary reference alignment	Low	Site avoidance through project redesign; if not possible, then mitigation as described **Section 12.2.1.1.1.1.1**
Messue Trail FhSe-43	Well-maintained trail; no CMTs or blazes identified; Original alignment: well-maintained trail paralleled by a log fence; no CMTs or blazes observed	Both the primary reference alignment of the transmission line and the Mills Ranch Reroute cross the Messue Trail	Low	Site avoidance through project redesign; if not possible, then mitigation as described in **Section 12.2.1.1.1.1.1**
	2 sites consisting of blazed trees and CMTs	Transmission line – Mills Ranch reroute	High	Not protected under the *BC HCA*; none planned
GaSf-43	Single cache pit	Transmission line – Stellako Reroute	Hgh	Site avoidance through project redesign; if not possible, then mitigation as described in **Section 12.2.1.1.1.1.1**
GaSf-44	Single cache pit	Transmission line – Stellako Reroute	Hgh	Site avoidance through project redesign; if not possible, then mitigation as described in this plan.
GaSf-45	Single cache pit	Transmission line – Stellako Reroute	Hgh	Site avoidance through project redesign; if not possible, then mitigation as described in **Section 12.2.1.1.1.1.1**
GaSf-46	Single cache pit	Transmission line – Stellako Reroute	Hgh	Site avoidance through project redesign; if not possible, then mitigation as described in **Section 12.2.1.1.1.1.1**
	4 sites consisting of blazed trees and CMTs	Mine site	High	Not protected under the *BC HCA*; none planned
Cheslatta Trail (FlSe-2)	CHR-9: eight dead cambium-stripped lodgepole pine CMTs in advanced state of decay	Transmission line- primary reference alignment and Mills Ranch reroute	Low	Site avoidance through project redesign; if not possible, then mitigation as described in **Section 12.2.1.1.1.1.1**
Messue Trail FhSe-43	Wagon ruts in trail bed, associated blazes and CMTs	Near shore of Tatelkuz Lake at site of planned water pipeline intake- BCTS Forestry Road 7655.38 crosses the Messue Trail at this site	Low	Site avoidance through project redesign, or construct waterline within existing forestry road and monitor during construction
	Historic trapline trail	Waterline	Low	Site avoidance through project redesign, or construct waterline within existing forestry road and monitor during construction

Note: (1)This table will be updated to record potential new discoveries; *BC HCA* = British Columbia *Heritage Conservation Act*

12.2.1.18.4.7.6.2 Transmission Line

The AIA identified four archaeological sites within the transmission line footprint; this may change with further assessment, as described above. One historical heritage sites was identified within the primary reference alignment transmission line footprint. Two protected heritage sites were identified, the Messue Trail (FhSe-43), and the Cheslatta Trail (FlSe-2), along with a variant of the Cheslatta Trail (FlSe-15). Ten cache pits were identified at archaeological site GaSf-47 and one cache pit was identified at archaeological site GaSf-48. Assessment of the Mills ranch Reroute identified one protected site, the Messue Trail (FhSe-43) and no historical heritage sites were identified. Two cultural resources sites consisting of non-protected CMTs were identified within the Mills Ranch reroute. Four archaeological sites were identified within the Stellako Reroute (GaSf-43, GaSf-44, GaSf-45, and GaSf-46, each consisting of a single cache pit. Four cultural heritage resource sites were identified, consisting of non-protected CMTs. The remnants of a cabin, previously identified historical heritage site GaSf-10, was also identified.

12.2.1.18.4.7.6.3 Mine Access Road

The AIA identified no archaeological sites and no historical heritage sites within the mine access road footprint; this may change with further assessment, as described above.

12.2.1.18.4.7.6.4 Airstrip and Facilities

The AIA identified no archaeological sites or historical heritage sites within the airstrip and facilities footprint. The airstrip and facilities footprint is the site of previously harvested cutblocks.

12.2.1.18.4.7.6.5 Freshwater Supply Pipeline

The AIA identified no archaeological sites or historical heritage sites within the freshwater supply pipeline footprint; this may change with further assessment, as described above. One protected heritage site, the Messue Trail (FhSe-43), was encountered some distance from the site of the planned intake for the freshwater supply pipeline on the shore of Tatelkuz Lake. Currently, BCTS Forestry Road 7655.38 crosses the Messue Trail. One trapline with associated blazes was identified between the Messue Trail and an unnamed creek west of the trail.

12.2.1.18.4.7.7 Management of Protected Heritage Resources Already Identified

As noted in **Section 12.2.1.18.4.7.6** (Inventory of Heritage Resources in Project Development Area), eight protected archaeological sites were identified within the planned transmission line footprint. The sites consist of two heritage sites within the primary reference alignment transmission line footprint, Mills Ranch Reroute, and the Stellako Reroute, the Messue Trail (FhSe-43), and the Cheslatta Trail (FlSe-2), along with a variant of the Cheslatta Trail (FlSe-15), and archaeological site GaSf-47, GaSf-48. Four archaeological sites are within the Stellako

Reroute, GaSf-43, GaSf-44, GaSf-45, and GaSf-46. These sites will be vulnerable to disturbance during transmission line construction and during routine repairs and ROW maintenance. Management for avoidance of disturbance may include the following measures:

- Use transmission pole structures with longer span widths for sites where the transmission line crosses the protected trails and the Stellako River (e.g., H-frame structures' longer span widths make it easier to cross protected trails with less chance of impact); and
- Provide transmission line construction personnel with awareness training to ensure compliance with section 13 of the *BC HCA* when working near protected sites.

If disturbance of a protected trail site cannot be avoided, such as when heavy equipment must cross the trail, permitting under the *BC HCA* is required as described in **Section 12.2.1.18.4.7.4** (Regulatory Requirements). Work permitted under the *BC HCA* may include the following measures to minimize or mitigate impacts to the trail sites:

- Plan the heavy equipment crossing site to be as close to perpendicular to the trail as possible, to minimize surface area of disturbed trail;
- Where possible, minimize depth of disturbed soil by scheduling disturbance to occur when ground is frozen. Use protective timber mat or rubber blast mats to minimize contact with trail soil, and remove immediately after use;
- Prior to permitted disturbance of the site, the environmental monitor will mark the boundaries of the crossing and the trail at the crossing site. The environmental monitor will monitor ground alteration activities at and in proximity to the crossing;
- Install and maintain proper erosion and sediment control around the disturbed site;
- Prior to arrival of construction equipment, the environmental coordinator will screen the site of permitted disturbance for the presence or absence of invasive plants and weeds, and will implement applicable measures from the ISMP, e.g.:
    - Construction equipment originating from infested sites must be pressure-washed prior to arrival at any non-infested site. Undercarriages and wheel wells of vehicles will be inspected to ensure they are free of attached parts of invasive plants; and
    - Revegetate disturbed sites using native plants, or an approved species mix (i.e., "weed free" seed (per ISMP) as soon as conditions are conducive, to limit the establishment of invasive plants. Use non-palatable vegetation species to minimize interactions with ungulates.

12.2.1.18.4.7.8 Management for As-Yet-Undiscovered Heritage Resources

As the Project develops, heritage resources may be discovered through further assessment or through chance.

If the Project development area is modified to include locations not already assessed through previous AIA fieldwork, a heritage professional (qualified archaeologist or palaeontologist) will assess the new locations. If determined to have moderate to high potential for archaeological or historic heritage resources, additional AIA fieldwork will be conducted.

Communication of any potential heritage resource discovery will follow the reporting structure shown in **Figure 12.2.1-16** to ensure that all levels of management are made aware of the discovery. Management for potential discoveries will include the following responsibilities:

- The proponent and the proponent's heritage professional are responsible for obtaining permits, and advising on methods and procedures;
- Managers will ensure that all employees are informed of corporate heritage policies, commitments, procedures, and plans. Managers will be responsible for the performance of the people and facilities under their control; and
- Contractors, subcontractors, and visitors are required to adhere to legislative requirements, procedures, and policies identified by the proponent, such as the Chance Find Procedure (CFP) described below.

The chain of communication for management of heritage resources will refer to the list of contacts shown in **Table 12.2.1-27**.

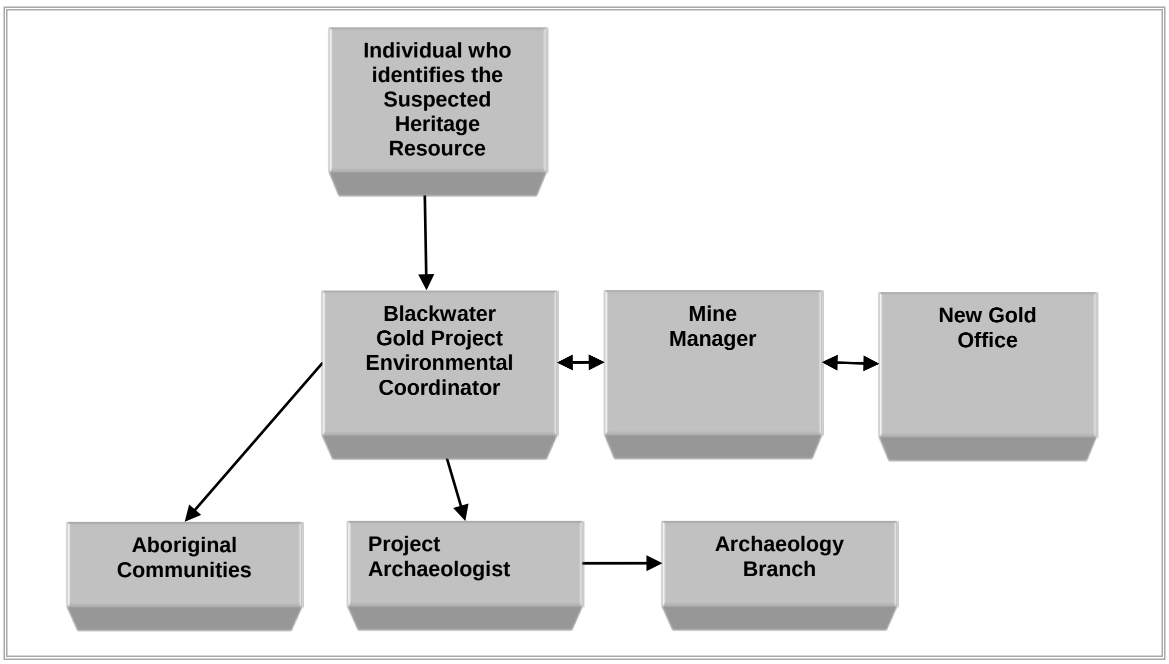


Figure 12.2.1-16: Chain of Communication for Management of Heritage Resources

Table 12.2.1-27: Contact List for Chance Finds

Organization/Title	Person	Phone	Email
Environmental Office	TBD	TBD	TBD
Environmental Coordinator	TBD	TBD	TBD
PMT			
Mine Manager	TBD	TBD	TBD
Project Archaeologist	TBD	TBD	TBD
Aboriginal Community 1*	TBD	TBD	TBD
Aboriginal Community 2*	TBD	TBD	TBD
Aboriginal Community 3*	TBD	TBD	TBD

Note: TBD = to be determined
*Identification of relevant aboriginal community dependent on location of chance find

12.2.1.18.4.7.8.1 Types of Potential Heritage Resources Discoveries

The Project development area exhibits low to moderate potential for discovery of protected archaeological resources, consisting primarily of cambium-stripped CMTs, shaped standing trees, and lithic scatters. Potential for discovery of Cultural Heritage Sites is moderate to high. Potential for discovery of historical heritage remains left by 19th and 20th century mineral exploration and timber harvesting activities is low to moderate. Potential heritage sites could include:

- Isolated or small clusters of artifacts, such as stone (lithic) tools, tool fragments, and lithic flakes and debris associated with tool making, along with bone, antler, and wooden artifacts. Other items that may be identified are fire-cracked rocks from camps and cooking fires, as well as historic remains such as metal, glass, and ceramic fragments;
- Historic camp sites, cabins, and temporary shelters;
- CMTs such as cut trees (or trail blazes); and
- Burial places and trails.

Palaeontological finds could include:

- Moulds and shell fragments of shelled marine invertebrates (ammonites, snails, clams, oysters, scallops, etc.);
- Lower numbers of echinoderms (crinoids);
- Mammoth bone fragments; and
- Fossilized plants.

12.2.1.18.4.7.8.2 Protection of Potential Heritage Resources Sites

Protection of potential heritage sites that may be impacted by works on site will be managed using the following procedures:

- Project plans and drawings will be marked to identify any sites of heritage sensitivity that require protection or monitoring;
- Project plans and drawings will be reviewed on an ongoing basis to ensure that all areas affected by the Project undergo heritage assessment;
- Protective measures will be taken throughout the Project development area to avoid and mitigate effects on identified heritage resources and culturally sensitive areas; and
- If new sites are discovered, all parties will determine the scope of further work or impact management.

12.2.1.18.4.7.8.3 Monitoring of Potential Heritage Resources Sites

An environmental coordinator will be responsible for ensuring that any identified heritage resource sites are avoided, protected, and monitored. Monitoring procedures to be followed during the life of the Project will include the following:

- Monitoring of heritage resources will refer to the Project plans and drawings updated by the heritage professional (**Section 12.2.1.18.4.7.8**, Protection of Potential Heritage Resources Sites);
- Identification, recording, removal, and reporting of artifacts or features from identified heritage resource sites will be conducted under supervision of the heritage professional under Permit issued by the Archaeology Branch; and
- Exposure and identification of previously unidentified heritage resources will automatically result in implementation of the CFP.

12.2.1.18.4.7.8.4 Awareness and Training

Personnel and contractor awareness training will include information on the importance of archaeological, historical heritage, and palaeontological resources in BC. This training will be required for all personnel who will be working on site and will be covered under the environmental orientation. Awareness training will include:

- Aboriginal communities in BC, particularly those living near the Project mine;
- Cultural and historical significance of archaeological, historical heritage, and palaeontological resources;
- Visual examples (i.e., photographs) of any finds from the region of the Project and archaeological, historical heritage, and palaeontological resources that could potentially be identified near the Project; and

- CFP (described below).

12.2.1.18.4.7.8.5 Chance Find Procedure

If a suspected heritage resource is found, the person who made the find will immediately report it to the environmental coordinator (or to any other supervisory personnel if the environmental coordinator is not present). The environmental coordinator will immediately ensure protection of the site against further disturbance, including stopping work and having equipment moved away from the site. The environmental coordinator will also immediately communicate the find following the chain of communications as shown in **Figure 12.2.1-16** using the contacts listed in **Table 12.2.1-27**.

Any found artifact must not be removed from the site until proper procedures have been implemented by a professional archaeologist. Any inspection, investigation, or site alteration by a heritage professional will require permitting under the *BC HCA*, as described in **Section 12.2.1.18.4.7.4** (Regulatory Requirements).

The environmental coordinator will implement subsequent measures of the CFP, as follows:

- An Archaeology Chance Find Recovery Form (**Appendix 12.2.1B**) will be completed by the person who identified the potential heritage resources, or by the environmental coordinator or mine manager. The completed form will be maintained on file in the Project's administrative office, and will contain the following basic information:
    - Date (when the find was encountered);
    - Observer (name of the person recording the information about the find);
    - Find location (detailed enough so that it can be located again; GPS coordinates if possible);
    - Type of find (e.g., archaeological, historical heritage, palaeontological);
    - Description of the obvious disturbance to the find (by equipment, etc.); and
    - Photographs.
- The environmental coordinator will provide details and photographs of the suspected find to a heritage professional, who will make a preliminary assessment of the find;
- If the find is deemed significant, the heritage professional will conduct a site survey and further document the find. The heritage professional will assess the significance of the find and its location, and recommend options for mitigation. The heritage professional will submit recommended options to the appropriate government agency (Archaeology Branch, or Land Tenures Branch for palaeontological finds) and affected Aboriginal communities for review. The heritage professional will determine agreement for mitigation in consultation with the appropriate government agency and affected Aboriginal communities;
- Should suspected human remains be discovered, procedures would follow the Archaeology Branch Policy Statement "Found Human Remains" (Archaeology

Branch, 1999). Local law enforcement will also be informed in the event of found human remains; and

- Once the find is evaluated and mitigated to the satisfaction of the regulatory authorities and the site has been cleared, construction activities may recommence.

12.2.1.18.4.7.8.5.1 Progress Reports

The heritage professional (permit holder) will prepare progress reports to ensure that Project environmental management personnel are informed about the status of heritage resource investigations. During construction, or as needed, the heritage professional will submit progress reports during active periods of heritage resources investigation, monitoring, and data recovery. All reports will be submitted to the environmental coordinator for distribution to the mine manager.

12.2.1.18.4.7.8.5.2 Interim Reports

If archaeological monitoring under a Site Alteration Permit is required, an Interim Report will be submitted to the Archaeology Branch as one of the permit conditions. The report will include the following information:

- A summary of construction activities within or near any archaeological site;
- Any non-compliant activities and subsequent work stoppages, mitigation actions, and/or rectifying measures;
- Unanticipated archaeological concerns and executed mitigation strategies; and
- Incident reports describing specific archaeological issues.

12.2.1.18.4.7.8.5.3 Archaeology Permit Report

The Archaeology Branch requires submission of a Permit Report for inspection, investigation, or alteration conducted under a *BC HCA* permit for heritage resources. The heritage professional (permit holder) will submit a final report to the Archaeology Branch when all investigations for the given permit have been completed.

12.2.1.18.4.8 Visual Resources Management Plan

12.2.1.18.4.8.1 Introduction

Visual resources management provides for the conservation of scenic value within the visual zone study area of the Project. The intent of visual management is to avoid or mitigate mine construction and operations effects on visual resources throughout the Project development area. This section presents the VRMP for the construction and operations phases.

As with the TAMP, the framework for development of the VRMP includes the Vanderhoof Access Management Plan for Forest Recreation (BC ILMB, 2008). The Vanderhoof Access Management Plan for Forest Recreation (Vanderhoof Access Management Plan), which is described in the TAMP, identifies four Access Management Designations of recreational values and provides aesthetics-based management objectives (referred to as "policy objectives" in the Vanderhoof Access Management Plan) for each zone. As with the TAMP, the VRMP also supports the aesthetic values described in the Policy objectives.

12.2.1.18.4.8.2 Objective

The objective of the VRAMP is to avoid, minimize, or mitigate mine construction and operations effects on visual resources throughout the Project development area. Management will ensure support of scenic values of the Vanderhoof Access Management Plan policy objectives, and compliance with legislation described below under Regulatory Requirements.

12.2.1.18.4.8.3 Linked Environmental Management Plans

Some of the management issues identified in the VRMP are also addressed in the TAMP. As with the TAMP, the VRMP also incorporates the Vanderhoof Access Management Plan framework. Heritage resources referenced in the VRMP are also referenced in the AHRMP.

12.2.1.18.4.8.4 Regulatory Requirements

12.2.1.18.4.8.4.1 Visual Landscape Inventory

Established under the *Land Act*, scenic areas define broad geographic areas where scenic values are a priority. Under the BC *Forest and Range Practices Act (*BC *FRPA) (*Government of BC, 2002b), Section 7 Scenic Areas and Visual Quality Objectives of the Government Actions Regulation (BC MFLNRO, 2012a) states:

"7 (1) The minister responsible for the Land Act by order may establish an area as a scenic area if satisfied that the area:

- *is visually important based on its physical characteristics and public use, and*
- *requires special management that has not otherwise been provided for by this regulation or another enactment.*

(2) The minister responsible for the Forest Act by order may establish for a scenic area visual quality objectives that are consistent with subsection (1) and are within the categories of altered forest landscape prescribed under Section 1.1 of the Forest Planning and Practices Regulation."

Guided by these regulations, a Visual Landscape Inventory (VLI) was compiled to provide a systematic and explicit delineation of baseline visual resource conditions near communities and along travel corridors, expressed as Visual Sensitivity Units (VSUs, **Table 12.2.1-28**). VSUs are scenery-based graded categories that identify the degree of concern alteration that a particular site would cause among the public.

Within these scenic areas, Visual Quality Objectives (VQOs) are defined under the *FPPR*. VQOs are categorized by scale of alteration to provide qualitative descriptions of expected visual conditions (**Table 12.2.1-29**).

Table 12.2.1-28: Visual Sensitivity Units

Sensitivity to Human-Made Visual Alteration	Visual Sensitivity Class Descriptions
Very High	The area is extremely important to viewers with a very high probability that the public would be concerned if the VSU was visually altered in any way or to any scale.
High	The area is very important to viewers with a high probability that the public would be concerned if the VSU was visually altered.
Moderate	The area is important to viewers with a probability that the public would be concerned if the VSU was visually altered.
Low	The area is moderately important to viewers with some risk that the public would be concerned if the VSU was visually altered.
Very Low	The area may be somewhat important to viewers with a small risk that the public would be concerned if the VSU was visually altered.

Note: VSU = Visual Sensitivity Unit

Table 12.2.1-29: Established Visual Quality Objectives for Scenic Areas

Visual Quality Objective	Desired Level of Visual Quality and Expected Visual Conditions
Preservation	(i) very small in scale, and (ii) not easily distinguishable from the pre-harvest landscape
Retention	(i) difficult to see, (ii) small in scale, and (iii) natural in appearance
Partial Retention	(i) easy to see, (ii) small to medium in scale, and (iii) natural and not rectilinear or geometric in shape
Modification	(i) very easy to see, and (ii) (A) large in scale and natural in its appearance, or (B) small to medium in scale but with some angular characteristics
Maximum Modification	(i) very easy to see, and (ii) (A) very large in scale, (B) rectilinear and geometric in shape, or (C) both

VQOs were established for the VFD under an Approved Government Actions Regulation Order dated 15 December 2005, pursuant to Section 7(2) of the Regulation. The VQOs were applied to Scenic Areas identified in the VFD District Manager’s letter dated 22 September 2008, under section 180 of the BC *FRPA* (Government of BC, 2002b).

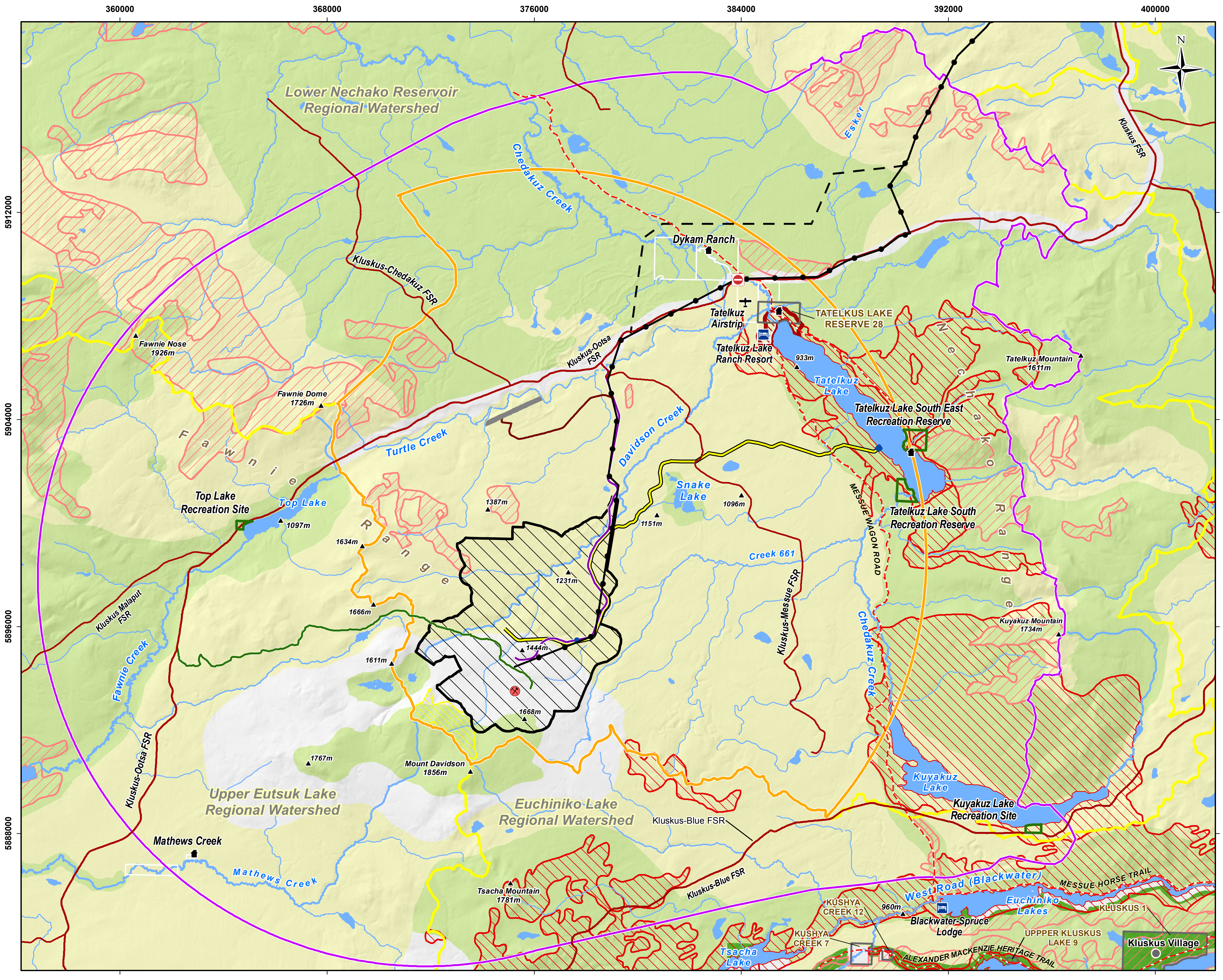
12.2.1.18.4.8.4.2 Recreation Features Inventory

The mandate to develop and maintain a Recreation Features Inventory (RFI) is established in sections 2 to 4 of the *Forest Act* (Government of BC, 1996k), and Part 1 and Section 1 of the *Forest Practices Code of British Columbia Act* (Government of BC, 1996l). The mandate sets out the Ministry's responsibility to assess and classify land according to Recreation Significance and Sensitivity (**Figure 12.2.1-17**). The mandate applies to all provincial Crown lands outside of parks and settled areas. Under the mandate, forest resources include recreation resources, and recreation resources include recreation features.

12.2.1.18.4.8.4.3 BC Recreation Sites and Trails

Public campgrounds and trails on Crown land, outside of parks and settled areas, are designated to “provide enjoyable recreation experiences within an integrated resource management setting” (Recreation Sites and Trails BC (RSTBC), 2013). Visitors can therefore “expect to encounter a number of different land management activities” in such areas. Sites are often associated with lakes and viewpoints over park-like landscapes. An objective of integrated planning and management is to retain the recreational values of these areas, supporting activities such as camping, fishing, kayaking, and hiking.

The level of maintenance at a recreation site or trail depends on the type of structures, environmental conditions, and the amount of use. Maintenance activities are designed to ensure user safety, provide sanitary conditions, protect the environment, ensure access and convenience, and maintain facilities and infrastructure (RSTBC, 2013).



Legend

- Populated Place
- Spotheights
- Restricted Access
- Forestry Service Roads
- Recreation Trails
- Recreation Sites
- Private Land
- Indian Reserves
- Regional Watersheds

Project Components

- Blackwater Camp
- Exploration Road
- Proposed Mine Access Road
- Proposed Transmission Line
- Proposed Transmission Line Reroute
- Proposed Fresh Water Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip Extent
- Proposed Fresh Water Pipeline Intake
- Proposed Mine Site

Visual Landscape Inventory (VLI)

Visual Sensitivity

- Very High
- High
- Moderate
- Low

Recreation Features Inventory (RFI)

Recreation Significance

- Very High
- High
- Medium
- Low
- Unknown

Visual Resources

- Local Study Areas
- Regional Study Areas

Scale:1:145,000

0 2.5 5 10

Kilometres

Reference

BC Government GeoBC Data Distribution
BCGOV FLNRO Recreation Sites and Trails Branch

CLIENT: newgold

PROJECT: Blackwater Gold Project

Spatial Distribution of Recreation Features Inventory and Visual Landscape Inventory in the Mine Site RSA

DATE: January, 2014	ANALYST: WR	**Figure 12.2.1-17**
JOB No: VE52095	QA/QC: SB	PDF FILE: 19-20_RecValMine_v3EMP.pdf
GIS FILE: 19-20_RecValMine_v3EMP.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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Recreation sites and trails were formerly known as Forest Service recreation sites and trails, and were once the responsibility of the BC MOFR. They are now the responsibility of RSTBC of the Ministry of Tourism, Culture, and the Arts. Recreation sites and trails potentially affected by the Project are identified in **Table 12.2.1-30.**

Table 12.2.1-30: Recreation Sites and Trails Requiring Follow Up Monitoring of Effects from Project Activities and Operations

Name	Type	Study Area
Big Bend Meadow	Recreation Site	Access Road LSA
Brewster Lake	Recreation Site	Transmission Line LSA
Chief Gray Lake	Recreation Site	Transmission Line LSA
Crystal Lake	Recreation Site	Transmission Line LSA
Greer Creek	Recreation Site	Transmission Line LSA
Hobson Lake	Recreation Site	Transmission Line LSA
Messue Wagon Road Trail	Recreation Trail	Mine Site RSA
Kuyakuz Lake	Recreation Site	Mine Site RSA
Tatelkuz Lake (SE)	Recreation Reserve	Mine Site RSA
Tatelkuz Lake (S)	Recreation Reserve	Mine Site RSA
Top Lake South	Recreation Site	Mine Site RSA

Note: LSA = Local Study Area; RSA = Regional Study Area

12.2.1.18.4.8.5 Existing Conditions influencing Visual Resources in Project Development Area

Existing land uses and human activities within the mine site RSA are guided by the Vanderhoof LRMP. Resource Development Zones (Davison Creek RMZ 17 and Kluskus RMZ 14) are designated along the Nechako Range and the east facing slopes of the Fawnie range. Agricultural (ranching) and mining (exploration) activities occur on a minor scale with forestry being the dominant land use. Numerous forest cut blocks are located within resource development zones, resulting in various stages of cleared land visible from most vantage points within the mine site RSA. Many access roads to forest cut blocks branch off from the main Kluskus-Ootsa FSR.

The outbreak of Mountain Pine Beetle has led to an increase in allowable timber harvesting rates, intensifying the visual impacts of clearcuts on the scenic quality of an area, especially during winter with the high contrast between snow covered cut blocks and tree-covered blocks. This is particularly evident in the higher elevation slopes of the Fawnie Range and Nechako Range.

Multi-value Emphasis Zones are delineated along the Chedakuz Creek and west of Mount Davidson, in the Laidman Lake RMZ where fewer cut block licenses have been allocated to logging companies.

Cattle ranching occurs near the north end of Tatelkuz Lake, at the Dykam Ranch located north of the Kluskus-Ootsa FSR bridge across the Chedakuz Creek and the Mills Ranch directly to the south. The latter hosts the Tatelkuz Lake Ranch Resort, which provides a pastoral setting for visitors interested in activities in and around the lake (e.g., horseback riding, hiking, fishing, and kayaking).

In general, most parts of the proposed mine site and transmission line study areas are strongly affected by timber harvesting practices, with associated heavy vehicle traffic along the Kluskus FSR. The natural setting is altered by forest cut blocks with varying stand heights and planting patterns.

A noticeable exception is the VSUs along the higher elevations of the mountain ranges (Fawnie Dome, Tatelkuz Mountain, Kuyakuz Mountain) and around recreation sites associated with lakes where excessive impacts have been carefully managed to maintain a higher scenic quality rating. At recreation sites, views are often framed by relatively undisturbed forests, adjacent to lakes, and surrounded by sloping and staggered tree lines. The tree lines effectively block the view of surrounding ridges such that few cut blocks are visible.

Representative examples are Brewster Lake, Kuyakuz Lake and Greer Creek Recreation Sites, where coordinated management by district planners and natural resource managers has retained the recreation value. The success of effective land use planning is reflected by the popularity of these sites, with many visitors using them for picnics, camping, kayaking, fishing, and hunting, especially during summer.

12.2.1.18.4.8.6 Criteria for Visual Resources and Aesthetics Management Priority

Twelve sites were identified as VCs for having priority importance for the management of visual resources and scenic values (**Table 12.2.1-31**). These sites are described under Site-Specific Mitigation.

Criteria for management priority (**Figure 12.2.1-18**) include the degree of proximity of a site to any of the Project's linear components (transmission line, water pipeline, access road) and the RFI category and VLI category for the site. Thus, management would be prioritized for any site that overlaps, or is close to, any linear component, and that has an RFI of High Recreation Site-Specific Mitigation

Significance and a VLI of High to Very High Visual Sensitivity. However, a site will also be managed if it is close to any Project component and has at least one of the RFI or VLI categories.

High value visual resources along the proposed transmission line will typically require management during the planning and construction and operations phases. Visual Resources in the mine site LSA and RSA will require monitoring and management during the operations phase.

Table 12.2.1-31: Valued Components Overlapping Visual Aesthetic Study Areas

Valued Components	Site	Recreation and Visual Features	Study Area
Stellako River	1	Wildlife Management Area, Recreationally Significant Area (High), Visual Sensitivity Unit (Very High)	Proposed Transmission Line LSA
Nithi Mountain	2	Recreationally Significant Area (High), Visual Sensitivity Unit (High)	
Tahultzu Lake	3	Recreation Site (Hallett Lake Recreation Site), Recreationally Significant Area (High)	
Nechako River Valley	4	Recreation Site (Greer Creek Recreation Site), Recreationally Significant Area (High), Visual Sensitivity Unit (High)	
Chief Grey Lake/Hobson Lake	5	Recreation Site (Chief Grey Lake and Hobson Lake Recreation Reserves), Recreationally Significant Area (High), Visual Sensitivity Unit (Moderate to Very High)	
Brewster Lake	6	Recreation Site (Brewster Lake Recreation Site), Recreationally Significant Area (High), Visual Sensitivity Unit (High)	
Chedakuz Lake	7	Recreationally Significant Area (High)	
Tatelkuz Lake	8	Recreation Reserves (Tatelkuz Lake South and South East), Recreation Trail (Messue Wagon Road Trail), Recreationally Significant Area (High), Visual Sensitivity Unit (High to Very High)	Mine Site RSA (Incorporating the Water Pipeline RSA and Proposed Access Road LSA)
Snake Lake	9	Recreationally Significant Area (High), Close proximity to mine site	
Top Lake	10	Recreation Site (Top Lake), Recreationally Significant Area (High)	
Mount Davidson	11	Recreationally Significant Area (High), Visual Sensitivity Unit (Low), Close proximity to mine site	
Kuyakuz Lake	12	Recreation Site (Kuyakuz Lake), Visual Sensitivity Unit (High)	

Note: LSA = Local Study Area; RSA = Regional Study Area

12.2.1.18.4.8.6.1 Site 4 – Nechako River Valley

This site is representative of Site 1 – Stellako River.

Site-specific measures and designs were developed to soften visual impacts, where facilities breach the natural ridgelines of the Nechako River Valley, from a river level vantage point (**Table 12.2.1-30** and **Table 12.2.1-31**).

12.2.1.18.4.8.6.1.1 Mitigation

The transmission line crosses the Nechako River valley; therefore, mitigation will mainly focus on location and design principles that avoid visual intrusions of fabricated elements into the viewshed surrounding the Greer Creek recreation site(**Figure 12.2.1-19**). All measures listed for Brewster

Lake apply, with the addition of the following measures for the intersection of the transmission line with the Nechako River High Sensitivity VSU:

12.2.1.18.4.8.6.2 Site 6 – Brewster Lake

This site is representative of the following sites:

- Site 3 – Tahultzu Lake;
- Site 5 – Chief Grey Lake/Hobson Lake; and
- Site 7 – Chedakuz Lakes.

12.2.1.18.4.8.6.2.1 Mitigation

The proposed transmission line, routing from Endako across the Nechako Range to the mine site on the east slopes of Mount Davidson, routes north of the existing access road to the Brewster Lake Recreation Site (**Figure 12.2.1-20**). From there, it follows logging roads toward the northeast slopes of the Nechako Range.

During the construction and operations phase, dust suppression and monitoring of temporary impacts on recreational users will be required. Most important; however, is management to prevent visual intrusion of fabricated elements into the viewshed surrounding the lake and especially the VSU. The following measures will avoid permanent impacts:

12.2.1.18.4.8.6.2.2 Location and Design

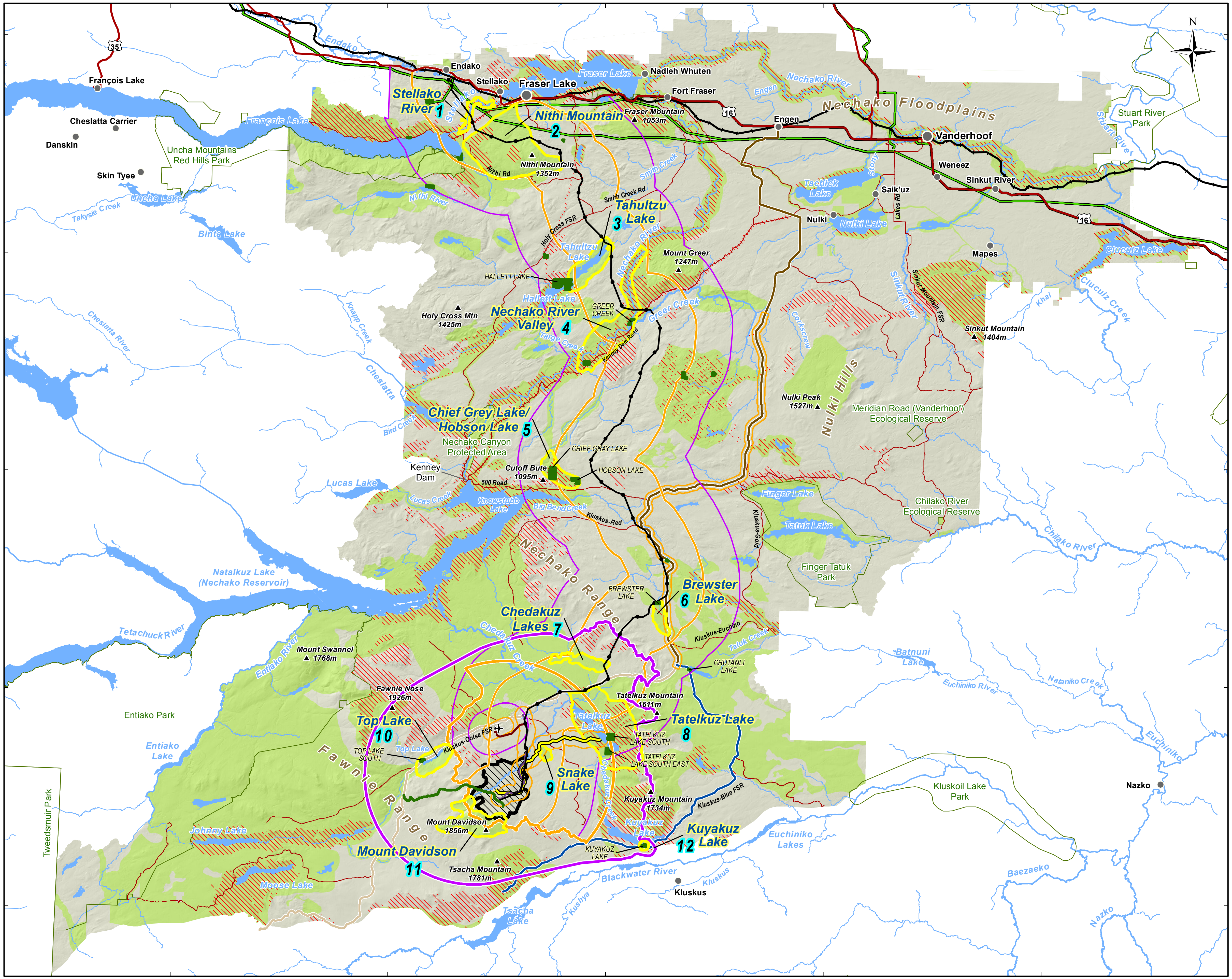
- Locate facilities along existing rights-of-way, shared access, and other infrastructure (Brownfields development) to extent feasible to avoid additional surface disturbance.

12.2.1.18.4.8.6.2.3 Screening and Blending

- Incorporate local topography and vegetation for strategic screening when planning project component location in visually sensitive areas;
- Consider site-specific landscaping and vegetation screening in shared access areas; and
- Revegetate with native vegetation and establish a composition consistent with the form, line, colour, and texture of the surrounding undisturbed landscape.

12.2.1.18.4.8.6.2.4 Paints and Stains

Paint or stain structures to blend with the character of the surrounding environment.



Legend

- Populated Place
- Spotheights
- Highway
- Railway
- Existing Transmission Line
- Parks and Protected Areas

Forestry Service Roads

- Kluskus FSR
- Kluskus-Ootsa FSR
- Kluskus-Blue FSR
- Other FSRs

Project Components

- Proposed Transmission Line
- Exploration Road
- Proposed Fresh Water Pipeline
- Proposed Mine Access Road
- Proposed Airstrip Access Road
- Proposed Mine Site

Visual Resources

- Local Study Area
- Regional Study Area
- High Recreation Significance (RFI)
- Moderate to Very High Visual Sensitivity (VLI)
- Recreation Sites in the Visual Resources Study Areas
- 12 Evaluation Sites

Scale: 1:530,000

0 5 10 20

Kilometres

Reference

BC Government GeoBC Data Distribution
NRCAN Geobase
Ministry of Forests, Lands and Natural Resource Operations

CLIENT: newgold

PROJECT: Blackwater Gold Project

Criteria for Visual Resources Management Priority

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GIS FILE: 19-036_VisualVcsEMP_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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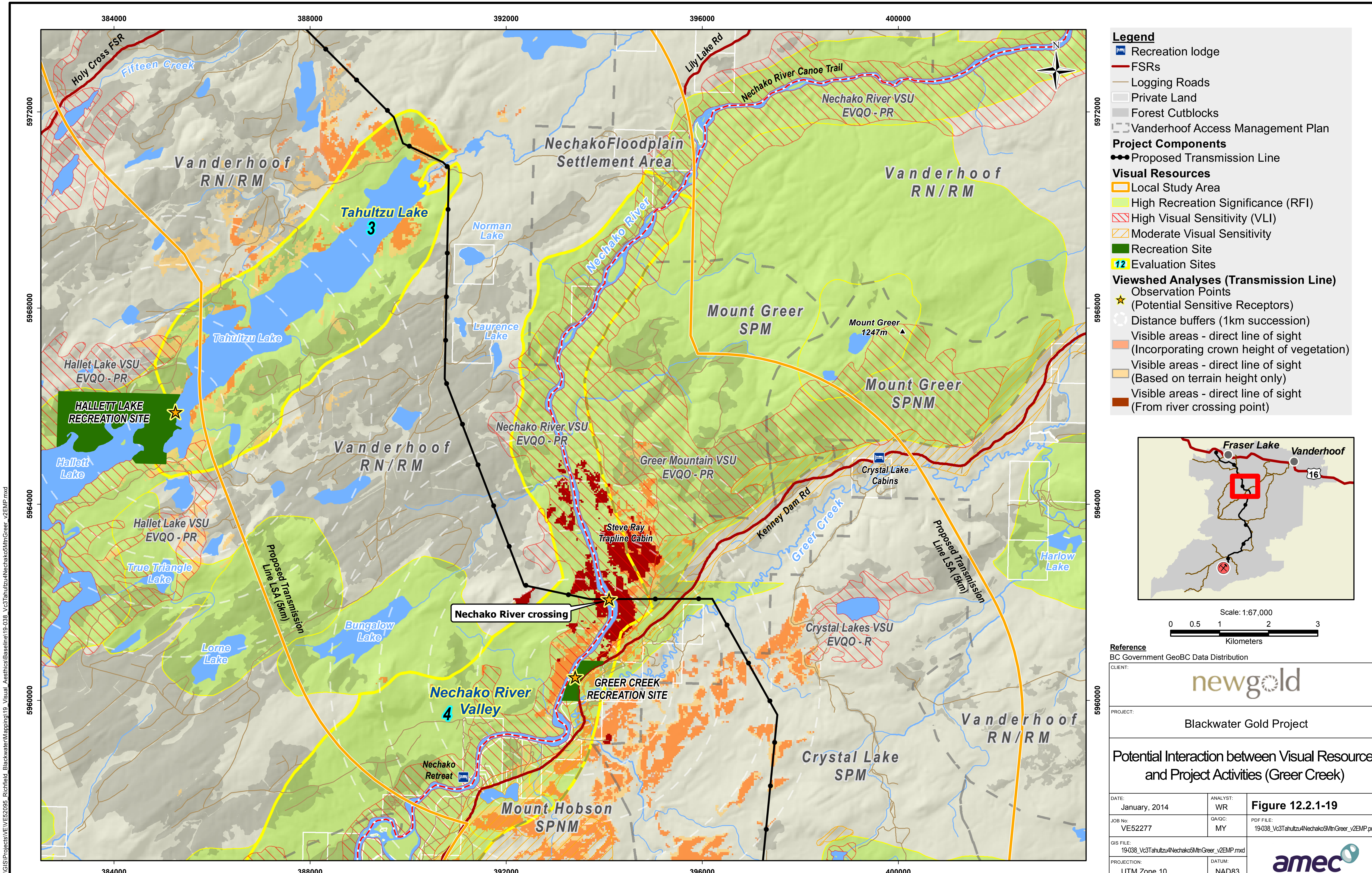

Legend
Recreation lodge
FSRs
Logging Roads
Private Land
Forest Cutblocks
Vanderhoof Access Management Plan
Project Components
Proposed Transmission Line
Visual Resources
Local Study Area
High Recreation Significance (RFI)
High Visual Sensitivity (VLI)
Moderate Visual Sensitivity
Recreation Site
Evaluation Sites
Viewshed Analyses (Transmission Line)
Observation Points (Potential Sensitive Receptors)
Distance buffers (1km succession)
Visible areas - direct line of sight (Incorporating crown height of vegetation)
Visible areas - direct line of sight (Based on terrain height only)
Visible areas - direct line of sight (From river crossing point)
Fraser Lake
Vanderhoof
16
Scale: 1:67,000
0 0.5 1 2 3
Kilometers
Reference
BC Government GeoBC Data Distribution
Holy Cross FSR
Fifteen Creek
Lily Lake Rd
Nechako River Canoe Trail
Nechako River VSU EVQO - PR
NechakoFloodplain Settlement Area
Vanderhoof RN/RM
Tahultzu Lake
3
Norman Lake
Nechako River
Mount Greer SPM
Mount Greer 1247m
Laurence Lake
Hallet Lake VSU EVQO - PR
HALLETT LAKE RECREATION SITE
Hallett Lake
Mount Greer SPNM
Greer Mountain VSU EVQO - PR
Crystal Lake Cabins
Kenney Dam Rd
Greer Creek
Steve Ray Trapline Cabin
Proposed Transmission Line LSA (5km)
True Triangle Lake
Harlow Lake
Nechako River crossing
Bungalow Lake
Lorne Lake
Crystal Lakes VSU EVQO - R
GREER CREEK RECREATION SITE
Nechako River Valley
4
Nechako Retreat
Crystal Lake SPM
Mount Hobson SPNM
384000
388000
392000
396000
400000
5972000
5968000
5964000
5960000
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CLIENT:
newgold
PROJECT:
Blackwater Gold Project
Potential Interaction between Visual Resources and Project Activities (Greer Creek)
DATE: January, 2014
ANALYST: WR
Figure 12.2.1-19
JOB No: VE52277
QA/QC: MY
PDF FILE: 19-038_Vc3Tahultzu4Nechako5MtnGreer_v2EMP.pdf
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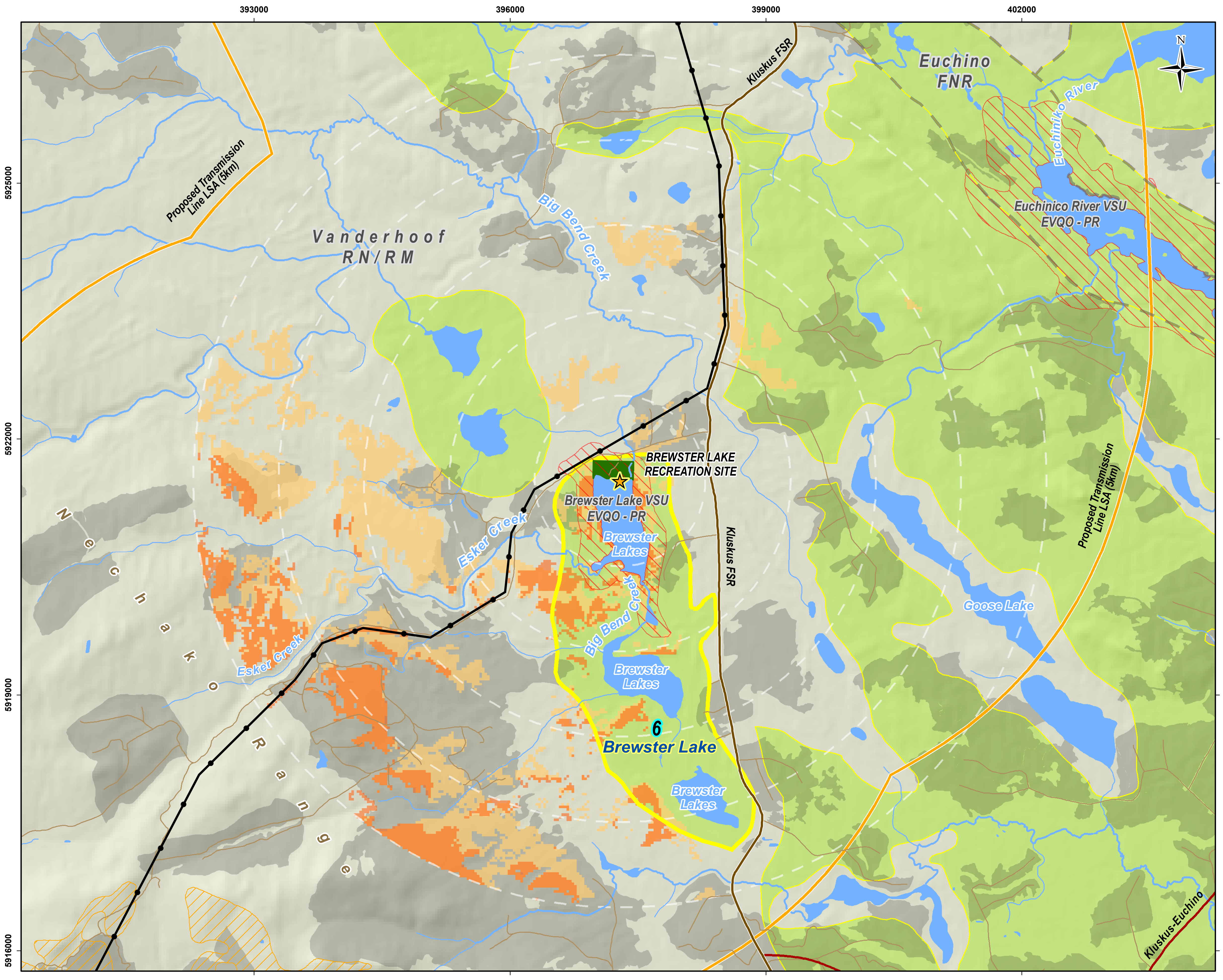
PROJECTION: UTM Zone 10
DATUM: NAD83
amec



Legend

- Kluskus FSR
- Logging Roads
- Private land
- Forest Cutblocks
- Vanderhoof Access Management Plan

Project Components

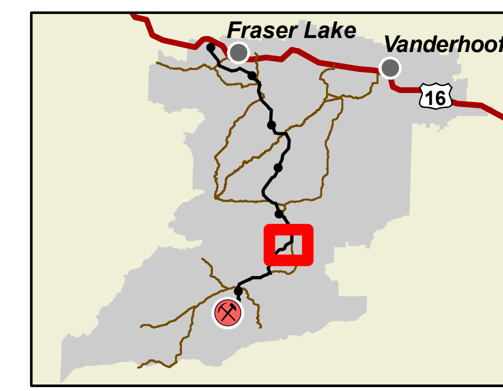
- Proposed Transmission Line

Visual Resources

- Local Study Area
- High Recreation Significance (RFI)
- High Visual Sensitivity (VLI)
- Moderate Visual Sensitivity
- Recreation Site
- 12 Evaluation Sites

Viewshed Analyses (Transmission Line)

- Observation Points (Potential Sensitive Receptors)
- Distance buffers (1km succession)
- Visible areas - direct line of sight (Incorporating crown height of vegetation)
- Visible areas - direct line of sight (Based on terrain height only)



Scale: 1:44,000

0 0.5 1 2
Kilometers

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Potential Interaction between Visual Resources and Project Activities (Brewster Lake)

DATE: January, 2014	ANALYST: WR	**Figure 12.2.1-20**
JOB No: VE52277	QA/QC: MY	PDF FILE: 19-038_Vc7BrewsterLake_v2EMP.pdf
GIS FILE: 19-038_Vc7BrewsterLake_v2EMP.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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12.2.1.18.4.8.6.2.5 Construction Practices

- Due to proximity to Kluskus FSR, dust suppression techniques will be employed to minimize impacts of vehicular traffic during construction and operations; and
- Minimize cut-and-fill disturbance and control erosion by avoiding steep slope (in particular when crossing the Nechako Range).

12.2.1.18.4.8.6.3 Site 8 – Tatelkuz Lake

This site is representative of Site 9 – Snake Lake.

12.2.1.18.4.8.6.3.1 Mitigation

Due to its distance from the mine site, and ridgelines with forest cover restricting visibility, mitigation for this site will focus on light pollution (refer to measures given for Top Lake). Mitigation will reduce impacts of light pollution on commercial operations and permanent residents at this site.

Mitigation measures are also necessary to manage potential impacts from structures and operations associated with the freshwater supply pipeline. Many impacts can be reduced or avoided through design provisions:

12.2.1.18.4.8.6.3.2 Location and Design

- Locate facilities along existing ROWs, shared access, and other infrastructure (Brownfields development) as feasible to avoid additional surface disturbance;
- Aim to select and design materials to repeat and blend with landscape elements; and
- Minimize paved surfaces around mine site facilities to the extent possible, to reduce colour and texture contrasts with existing landscape.

Figure 12.2.1-21 shows the potential interaction between visual resources and project activities for Tatelkuz Lake East Bank areas.

12.2.1.18.4.8.6.3.3 Screening and Blending

- Incorporate local topography and vegetation for strategic screening when planning Project component location in visually sensitive areas;
- Site linear features to follow the edges of clearings (where they will be less conspicuous) rather than passing through the centre;
- Revegetate with native vegetation and establish a composition consistent with the form, line, colour, and texture of the surrounding undisturbed landscape as appropriate; and

- Consider site-specific landscaping in selected areas to provide screening for year-round residents whose properties border the Project.

12.2.1.18.4.8.6.3.4 Paints and Stains

- Paint or stain structures to blend with the character of the surrounding environment;
- Use non-reflective or low-reflective coatings and stains to blend with the Project's backdrop;
- Paint grouped structures the same colour to reduce visual complexity and colour contrast; and
- Avoid prominent signs and prohibit commercial messages on structures.

12.2.1.18.4.8.6.4 Site 10 – Top Lake

12.2.1.18.4.8.6.4.1 Mitigation

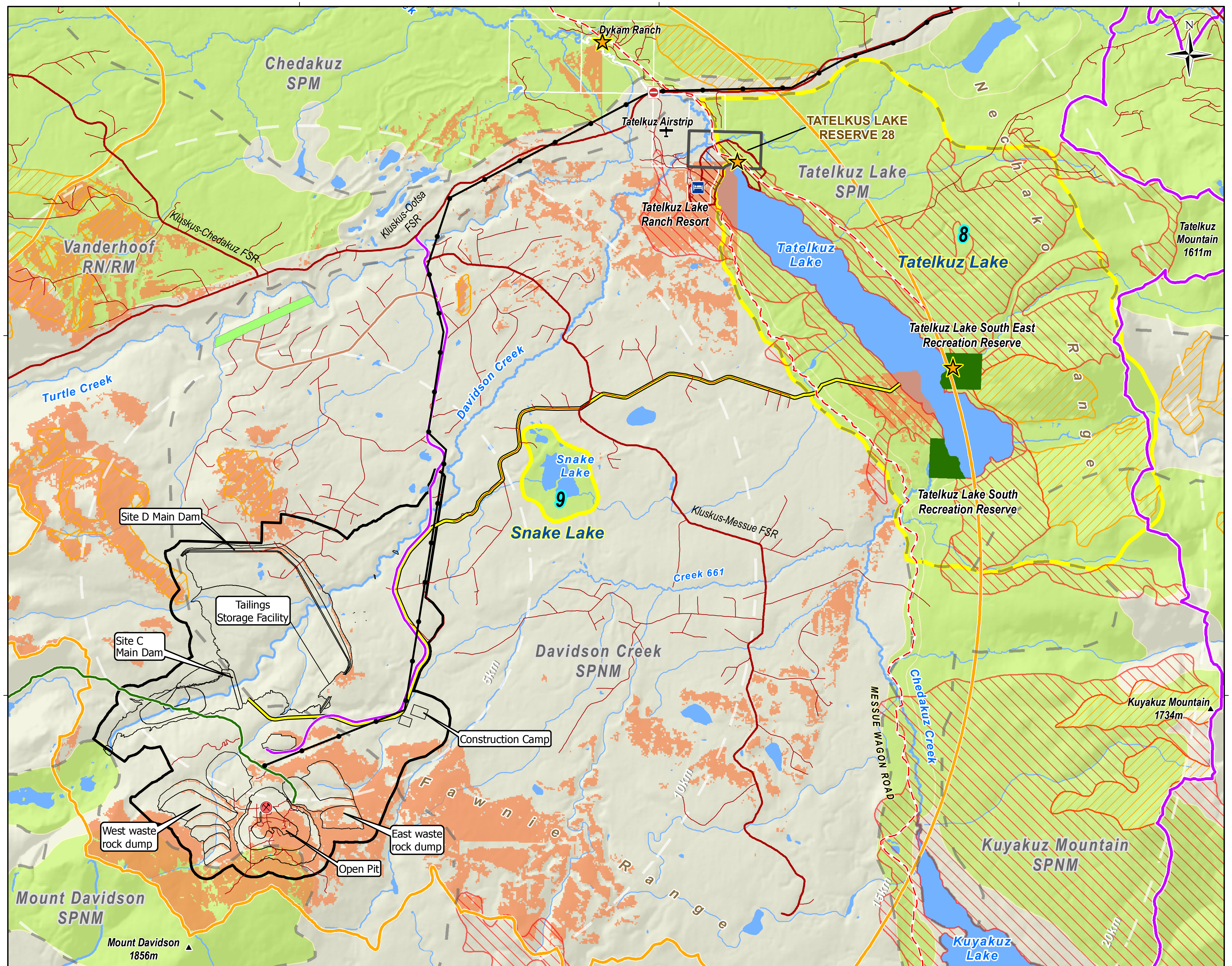
There is no direct line of sight between Top Lake and the proposed mine site, therefore mitigation need only focus on the effects of light pollution. To avoid diminishing the visibility of stars for visitors (**Figure 12.2.1-22**), the following measures will be implemented as mitigation through lighting efficiency where possible and where safety is not compromised:

- Need: limit artificial light (security lights etc.) to the minimum required;
- Direction: all light will be directed only where it is needed, and any light escaping into other directions will be eliminated;
- Intensity: lights installed will only be as bright as required for their specific situation or operational need;
- Duration: artificial lighting will only be used when required, reducing light pollution through automated timers and motion detectors; and
- Spectrum: avoid using full spectrum light (where available), which has blue and ultraviolet wavelengths that are more damaging to wildlife and insects.

12.2.1.18.4.8.6.5 Site 11 - Mount Davidson

This site is representative of Site 2 – Nithi Mountain.

Progressive and final reclamation will be the key to minimizing visual impacts both medium and long term.



Legend

- Airstrip
- Lodge
- Homestead
- Restricted Access
- FSRs
- Logging Roads
- Indian Reserves
- Private land
- Vanderhoof Access Management Plan

Project Components

- Blackwater Camp
- Proposed Transmission Line
- Proposed Fresh Water Pipeline
- Exploration Road
- Proposed Mine Access Road
- Proposed Airstrip Access Road
- Airstrip Footprint
- Proposed Mine Site
- Proposed Site Facilities

Visual Resources

- Local Study Area
- Regional Study Area
- Recreation Site
- Recreation Trail
- 12 Evaluation Sites
- High Recreation Significance (RFI)
- Very High Visual Sensitivity (VLI)
- High Visual Sensitivity
- Moderate Visual Sensitivity

Viewshed Analyses

- Observation Points (Potential Sensitive Receptors)
- Distance buffers from TSF (5km succession)
- Line of sight from Tatelkuz Lake eastbank locations

Scale:1:85,000

0 1 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution
BCGOV FLNRO Recreation Sites and Trails Branch

CLIENT:
newgold

PROJECT:
Blackwater Gold Project

Potential Interaction between Visual Resources and Project Activities (Tatelkuz Lake Eastbank Locations)

DATE: January, 2014	ANALYST: WR	**Figure 12.2.1-21**
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GIS FILE: 19-065_TL-EastBankEMP.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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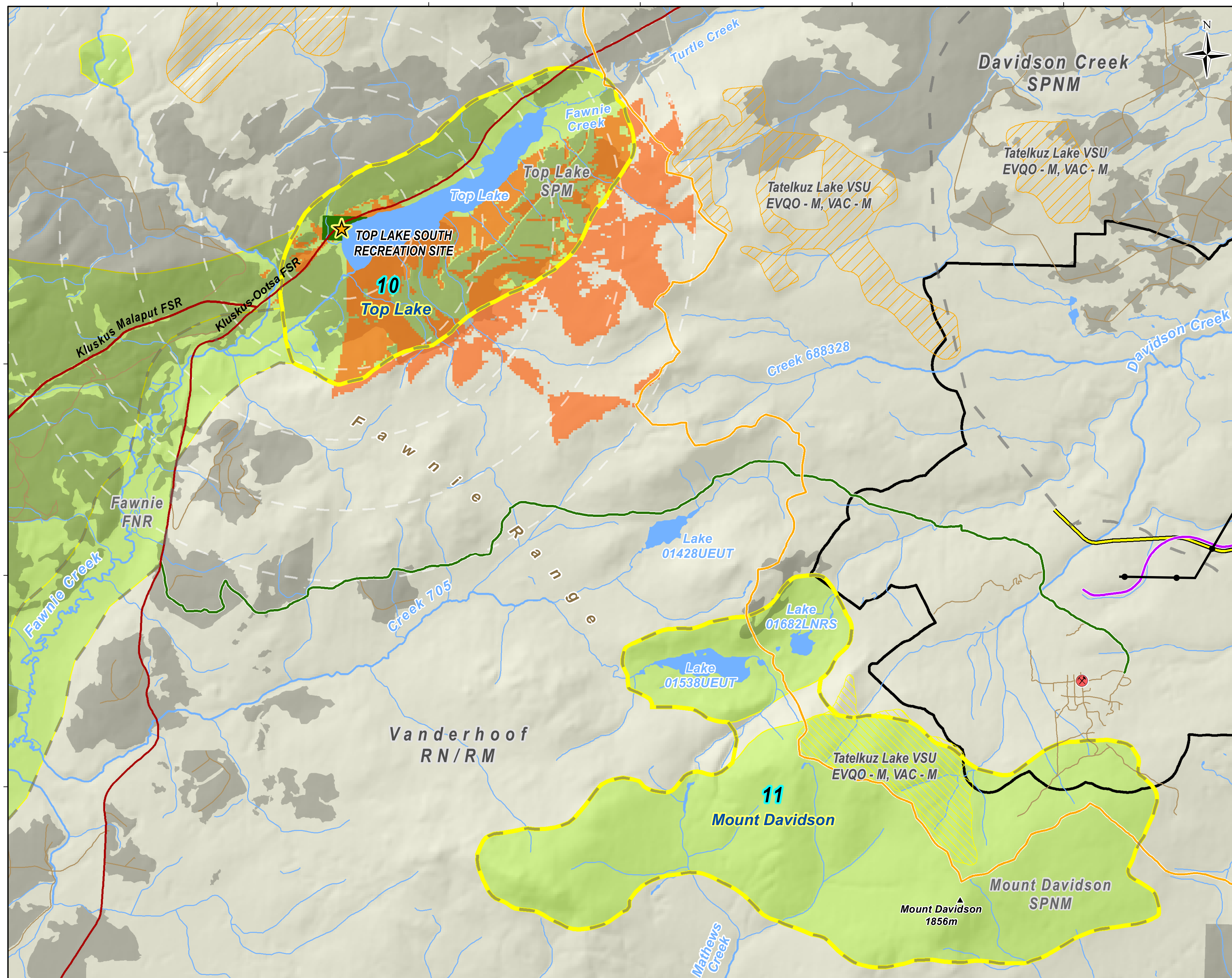

Legend

- Blackwater Camp
- Spotheights
- Forestry Service Roads
- Logging Roads
- Vanderhoof Access Management Plan

Project Components

- Proposed Transmission Line
- Exploration Road
- Proposed Fresh Water Pipeline
- Proposed Mine Access Road
- Proposed Mine Site

Visual Resources

- Local Study Area

Visual Resources

- High Recreation Significance (RFI)
- Moderate Visual Sensitivity (VLI)
- Low Visual Sensitivity
- Recreation Site
- 12 Evaluation Sites

Viewshed Analyses

- Observation Points (Potential Sensitive Receptors)
- Distance buffers (1km succession)
- Incorporating crown height of vegetation

Scale: 1:55,000

0 0.5 1 2 3

Kilometers

Reference

BC Government GeoBC Data Distribution

CLIENT:	newgold
PROJECT:	Blackwater Gold Project
	Potential Interaction between Visual Resources and Project Activities (Top Lake, Mount Davidson)

DATE:	ANALYST:	
January, 2014	WR	**Figure 12.2.1-22**
JOB No: VE52277	QA/QC: MY	PDF FILE: 19-038_Vc11TopLake_v2EMP.pdf
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PROJECTION: UTM Zone 10	DATUM: NAD83	

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12.2.1.18.4.8.7 Awareness and Training

The *Forest Practices Code of British Columbia Act* (Government of BC, 1996l) recognizes scenic landscapes as an integral component of the resource base. The *Forest Practices Code of British Columbia Act* provides managers, planners, and field staff with planning and monitoring tools such as the RFI, VLI, and VQO that form the basis of management in the VRAMP. These tools are intended for use in assessing the visual impact of forest practices in scenic areas, at both the landscape and stand level, and within targeted social and economic constraints.

Consequently, managers of major development projects within forestry districts need to be conversant in the basics of these tools, to manage the impacts of their projects on surrounding landscapes and existing productive and recreational activities.

References from this plan will serve as background information to enable the Site team to communicate and coordinate effort with forestry managers. Specific training objectives are:

- Understanding the Proponent's commitment to the maintenance of specific visual resources that were identified during public consultations and in communication with regulatory agencies;
- Understanding reporting requirements when visual resources are or may be affected;
- Understanding visual resource management concerns such as season-related impacts;
- Becoming familiar with visually mitigative painting and staining techniques, e.g., use of non-glare, non-reflective, non-chalking paint; use of subdued natural earth tone colours that blend, rather than contrast, with existing backdrop vegetation and soils colours; and
- Conducting training in dust suppression techniques.

12.2.1.18.4.8.8 Monitoring

For the duration of mine life, the effectiveness of visual resources and aesthetics management will be monitored through the following measures:

- Maintaining a well-publicized feedback procedure to allow communities of interest and opportunity to voice concerns;
- Ongoing interaction with relevant managers in the VFD, for coordination of effort in activities and areas of mutual interest; and
- Monitoring of visual impacts at varying distances from the mine site, near sensitive receptors, to be conducted at specific stages during the construction and operations phases. Observations will be recorded on evaluation sheets, and will include photographs for cataloguing effectiveness.

12.2.1.18.4.9 Air Quality and Emissions Management Plan

12.2.1.18.4.9.1 Introduction

The Project has adopted an air quality and emissions management system that recognizes and responds to the issue of gaseous and particulate emissions at all stages of Project, from mine planning, construction, and operations through to closure. This includes systematically identifying sources, predicting contaminants levels, evaluating potential effects on human health and the environment, and incorporating prediction and control measures.

As configured, the Project will generate the following types of atmospheric emissions:

- Emissions to atmosphere from point and fugitive sources;
- Particulate matter (dust) generated by mining and ore processing activities and general vehicle movements; and
- Greenhouse gas (GHG) emissions from diesel fuel combustion in heavy equipment operation, blasting and indirect emissions from purchased electricity.

The AQEMP describes guidelines for prevention and mitigation of atmospheric emissions from project activities. The AQEMP also includes requirements for monitoring and reporting of ambient concentrations of pollutants. Dust management is discussed in **Section 12.2.1.18.4.9.6**.

12.2.1.18.4.9.2 Objectives

Air quality and emissions management objectives will apply to the Project mine site and processing plant, and will provide the appropriate level of guidance and detail to the EPCM team, operations staff and other project contractors, to ensure environmental effects and risks are adequately addressed.

Air quality and emissions management targets are:

- Identify project activities which may impact emissions;
- Establish measurable goals and targets related to air quality and emissions management;
- Protect the air quality through the development of environmental mitigation measures associated with construction and operations activities;
- Address air quality related environmental aspects in the planning, design and execution phases of the Project;
- Implement BMPs for air emissions;
- Describe the management practices expected of all employees, contractors, and subcontractors related to the air quality and emissions management; and
- Identify the process for recording, reporting, and correcting non-compliance related to the AQEMP.

12.2.1.18.4.9.3 Scope

Air quality and emissions management addresses the management of emissions associated with activities that may cause an increased concentration of air pollutants throughout all phases of the Project. Emitted substances will be dispersed into the surrounding air and concentration levels will depend on emission rates, release characteristics, meteorological parameters, and topography. Air quality and emissions management defines the programs and procedures that have been, or will be, developed for ensuring that all air quality risks are adequately addressed, prevented, and controlled for all phases of the Project including design, construction, operations, and decommissioning/closure. This includes the following activities:

- Equipment selection (vehicles, drilling and process equipment, etc.);
- Site clearing;
- Vehicle traffic and use of heavy equipment (paved and unpaved roads);
- Aviation traffic;
- Extraction of ore and waste rock/overburden;
- Facilities and mine construction;
- Mine waste management (overburden, tailings and waste rock);
- Solid waste management (incinerators);
- Blasting;
- Mill and refinery facility operations; and
- Mine closure and remediation activities.

12.2.1.18.4.9.4 Regulatory Requirements

BC and Canada have the following air quality regulations and Codes of Practice:

- *Environmental Management Act* (Government of BC, 2003b);
- Canadian Environmental Protection Act, 1999 (Government of Canada, 1999); and
- Environmental Code of Practice for Metal Mines (Environment Canada, 2009).

12.2.1.18.4.9.4.1 Ambient Air Quality Standards

Ambient air quality guidelines are described in (but not limited to) the regulations listed in the following subsections.

12.2.1.18.4.9.4.2 Quality Objectives for British Columbia and Canada

Table 12.2.1-32 presents the BC guidelines and the Canadian air quality objectives for regulated compounds. The compounds include sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), oxidants expressed as ozone (O_3), total suspended particulates (TSP), PM up to 10 µm in diameter (PM_{10}), and PM up to 2.5 µm in diameter ($PM_{2.5}$). The guidelines and objectives refer to averaging periods ranging from one hour to one year. In addition, the Canadian government has established four levels of objectives (Environment Canada, 1981; CCME, 1999).

Table 12.2.1-32: British Columbia and Canadian Ambient Air Quality Guidelines and Objectives updated at 26 June 2013 in µg/m³

Pollutant	Averaging Period	BC Guidelines/Objectives			Canadian Objectives		
		Level A	Level B	Level C	Maximum Desirable	Maximum Acceptable	Maximum Tolerable
SO_2	Annual	25	50	80	30	60	-
	24-h	160	260	360	150	300	800
	1-h	450	900	900-1,300	450	900	-
NO_2	Annual	-	-	-	60	100	-
	24-h	-	-	-	-	200	300
	1-h	-	-	-	-	400	1,000
CO	8-h	5500	11,000	14,300	6,000	15,000	20,000
	1-h	14,300	28,000	35,000	15,000	35,000	-
Ozone (O_3)	1 hr				100	160	300
	8 hr				123		
	24 hr				30	50	
	Annual					30	
TSP	Annual	60	70	75	60	70	-
	24-h	120	200	260	-	120	400
PM_{10}	Annual	-	-	-	-	-	-
	Interim 24-h	-	50	-	-	-	-
$PM_{2.5}$	Annual 24-h	-	8 25	-	10 28	-	-

Note: h = hour
PM_{10} = particulate matter emissions with an aerodynamic particle diameter less than 10 µm.
$PM_{2.5}$ = particulate matter emissions with an aerodynamic particle diameter less than 2.5 µm
BC limits are an air quality objective, Canadian limits are proposed ambient air quality standards for 2015 (CAAQS).
The $PM_{2.5}$ 24-hour standard is based on the 98th percentile averaged over three consecutive years.

The levels are defined as follows:

- The maximum **desirable** level defines the long-term goal for air quality, and provides a basis for an anti-degradation policy for the unpolluted parts of the country and for the continuing development of control technology;
- The maximum **acceptable** level is intended to provide adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, and personal comfort and well-being;
- The maximum **tolerable** level denotes the concentration of an air pollutant that requires abatement without delay to avoid further deterioration to an air quality that endangers the prevailing Canadian lifestyle or, ultimately, to an air quality that poses a substantial risk to public health;
- The **reference** level is considered to be the lowest level of exposure likely to result in a defined and identifiable but minimal effect; and
- The maximum allowable concentrations of airborne contaminants are determined by national and provincial (BC) Ambient Air Quality Objectives (AAQO). Jurisdictions within BC have the flexibility to define ambient air quality guidelines that are more stringent than the national criteria. These stringent requirements are within Environment Canada (EC) policy of the keeping clean areas clean and continuous improvement concept, which are meant as guidance for those areas that are already in attainment of the Canada-wide Standards (CWS). It moves the traditional scope of management beyond compliance with a numeric standard, and puts more emphasis than ever before on managing and improving air quality below a numeric standard.

In BC, the maximum concentrations in ambient air are currently specified as guidelines for SO_2, NO_2, CO, oxidants expressed as O_3, etc. The province has air quality criteria for ambient air concentrations defined at three levels. These are:

- Level A – below this level, air quality is “good.” It represents the maximum desirable concentration;
- Level B – below this level (but above Level A), air quality is ‘fair’. It represents the maximum acceptable concentration; and
- Level C – below this level (but above Level B), air quality is “poor.” Above this level, air quality is “very poor.” It represents the maximum tolerable concentration.

Particulate matter (PM) and O_3 guidelines have been subject to a recent review by the CCME. Canadian Ambient Air Quality (CAAQ) standards have been adopted and are included as “desirable” in **Table 12.2.1-33.**

12.2.1.18.4.9.5 Linked Environmental Management Plans

EMPs linked to the AQEMP through potential effects of relevance to air quality and emissions management include, but are not limited to:

- WLMP (**Section 12.2.1.18.4.6**);
- ARMP (**Section 12.2.1.18.4.2**);
- SECP (**Section 12.2.1.18.4.1**);
- LSVMRP (**Section 12.2.1.18.4.4**);
- OHSMP (**Section 12.2.1.18.4.15**); and
- RCP (**Section 2.6**).

12.2.1.18.4.9.5.1 Specific Equipment Requirements

12.2.1.18.4.9.5.2 Heavy-Duty Vehicles

Technical requirement and emissions standards are described in (but not limited to) the following regulations:

- On-Road Vehicle and Engine Emission Regulations (SOR/2003-2), Canada Gazette Part II, Vol. 137, No. 1;
- Off-Road Compression-Ignition Engine Emission Regulations (SOR/2005-32);
- US EPA; 40 CFR Part 9, 86 and 89 Control of Emissions of Air Pollution from Non-road Diesel Engines; Final Rule; and
- Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations, SOR/2013-24.

Table 12.2.1-33 and **Table 12.2.1-34** summarize the applicable key points in these regulations.

Table 12.2.1-33: On Road Heavy-Duty Vehicles and Engines Emission Standards

Pollutant	Weight (t)	Phase Year	Emission (g/mile)
NMHC	3.8 – 4.5	2005	0.280
	4.5 – 6.4		0.330
	3.8 - 4.5	2008 – 2009	0.195
	4.5 – 6.4		0.230
NO_x	3.8 - 4.5	2005	0.9
	4.5 – 6.4		1.0
	3.8 - 4.5	2008 – 2009	0.2
	4.5 – 6.4		0.4
PM	3.8 – 6.4	2008 – 2009	0.02

Note: NMHC = non-methane hydrocarbons; NOx = nitrogen oxides; PM = particulate matter; g/mile = grams per mile

Source: Canada Gazette Part II, Vol. 137, No. 1 Table 4

Table 12.2.1-34: Non-road Vehicles Emission Guidelines

Environmental Agency or Institution	Emission Units	Net Power (kW)	Air Contaminant		
			CO	PM	NMHC + 5 NOx
Environment Canada, Off-Road Compression-Ignition Engine Emission Regulations (SOR/2005-32)	6 g/kWh	130 – 224(1)	3.5	0.2	4.0
		225 – 449(1)	3.5	0.2	4.0
		450 – 559(1)	3.5	0.2	4.0
		>560[2]	3.5	0.2	6.4

Note: kW = kilowatt; CO = carbon monoxide; PM = particulate matter; NMHC = non-methane hydrocarbons; NOx = nitrogen oxides; g/kWh = grams per kilowatt hour;
(1)Tier 2 and 3 = year 2006; (2)Tier 2 = year 2006.

Source: http://www.ec.gc.ca/CEPARegistry/regulations/detailReg.cfm?intReg=88

12.2.1.18.4.9.5.2.1 Fuel

Technical requirement and emissions standards are described in (but not limited to) Sulphur in Diesel Fuel Regulations, SOR/2002-254, January 2003 as amended.

12.2.1.18.4.9.6 Emissions Management Measures

12.2.1.18.4.9.6.1 Gaseous Contaminants

Management of gaseous contaminants emission will be applied throughout all phases of the Project life cycle at the mine site, including construction, operations, and decommissioning/ closure. Site-specific procedures to minimize greenhouse gas emissions will be developed. Emission rates and impacts of gaseous contaminants from the Project, including greenhouse gas emissions, are predicted in **Section 5.2.3**, Climate Change.

12.2.1.18.4.9.6.1.1 Construction and Operations Phases

The following emission mitigation and control measures will be commonly used with all activities and phases in the Project. Many of the emission sources are diesel fuelled internal combustion engines where emissions level depends on engine design parameters, emissions controls, equipment maintenance, and the power rating and not Project phase or activity. Gaseous contaminants emission control measures may include, but are not limited to use low sulphur and low aromatic fuel when available.

12.2.1.18.4.9.6.2 Dust Emissions Management

12.2.1.18.4.9.6.2.1 Construction Phase

The following procedures for on-site dust management will also apply to all phases of the Project in which these activities are inclusive. These procedures may include but need not be limited to the following:

- Clearing of vegetation for construction will be done to minimize cleared areas;

- Progressive reclamation of disturbed areas will occur as soon as feasible;
- Maintenance of unpaved roads which will be regularly compacted and kept in good repair;
- Use of coarse aggregate for road surfaces with low silt content;
- Vehicles will be driven at designated speeds on site roads;
- Roadways will be wetted to minimize dust from ore and waste rock haulage and grading, when ambient air temperatures permit;
- Cleaning of paved areas as required to minimize dust;
- Wetting of materials to minimize dust in material handling, as needed;
- Water or spray quantities used will be documented; and
- Reporting incidents involving excessive dust on site.

12.2.1.18.4.9.7 Monitoring

The purpose of this monitoring component is to document the efficacy of the mitigation measures implemented and to meet regulatory requirements at the Project site. The plan will ensure that project activities are conducted according to applicable legislation and the conditions of all project approvals. In particular, monitoring results will be reviewed annually to determine any emissions trends and to revise operating practices or monitoring protocols as required.

Monitoring will be carried out in order to meet permit and reporting requirements. It will also be used as a tool to determine the efficacy of the mitigation measures implemented. Monitoring will focus primarily on particulate, with permits dictating these requirements. Gaseous monitoring may occur periodically based on need, but gaseous emissions will primarily be estimated using emission factor calculations.

The legislation includes but is not limited to the following:

- Air Monitoring Guidelines: Volume 1 Particulate Non-continuous, March 1996 http://www.env.gov.bc.ca/air/codes/amgv1pnc.html;
- British Columbia Field Sampling Manual: 2003 — For Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples; March 2004;
- BC MOE 2012. Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators. October 9, 2012.

The Proponent will collaborate as required with other government-sponsored monitoring programs as required to measure the effects of air quality occurring in the Project area during the construction and operations phases of the Project. The monitoring program will be submitted for review to the appropriate regulatory authorities for comment before construction/operations begin.

12.2.1.18.4.9.8 Monitoring Location

The goal of establishing ambient air monitoring stations is to provide the best assessment of air quality in the area that will be potentially affected by air emissions during long-term operations of the Project. While it is recognized that the regulatory authorities through the Air Emission Permit may specify terms, conditions, and requirements of ambient monitoring, it is proposed that some of the above substances will be monitored in order to adequately assess ambient air quality based on the following criteria:

- Level of concern with reference to health effect (relates to ambient air quality objectives and targets);
- Probability of occurrence of the substance at higher concentrations in the mine and plant operation;
- Expected lowest ambient concentrations with reference to the monitor detection limit; and
- Availability of suitable monitors for contaminants in terms of cost, accuracy, detection limits, and suitability for site operation.

Based on the above criteria, it is anticipated that PM monitoring will be required.

Throughout all project phases, if stations indicate elevated levels of any parameter then the Proponent will determine whether (a) additional mitigation measures are required and (b) whether additional monitoring is required.

As for the baseline assessment, particulate monitoring will be conducted using Thermo Scientific Partisol 2025i-D Dichotomous Sequential Air Samplers. These are used for simultaneous concentration measurement of fine ($PM_{2.5}$) and coarse (PM_{10}) ambient particulate matter. The sampler combines sequential filter exchange capabilities with dichotomous splitting technology to provide an automated split sample stream that offers long-term unattended operation. The sampler utilizes a virtual impactor to separate an incoming dust into its fine and coarse components. The sampler will be installed, as needed, inside a temperature controlled shelter.

A weather station will also operate at the same location. The station will be a self-contained, solar/battery-powered system and include instrumentation to measure hourly averages of temperature, wind speed, wind direction, relative humidity, solar radiation and rainfall. Wind speed and direction will be measured at a height of 10 m above grade.

The intent is that monitoring data will be used to provide feedback to modify the dust and air quality management procedures instituted at the site. However, it is noted that such sampling does not occur in “real time” and there will be a delay between the events that lead to any elevated concentrations and the receipt of monitoring results. For on-site dust monitoring, regular inspections are proposed and possible sources of dust emission which may be affecting on-site personnel or the off-site environment be noted and the appropriate mitigation measures implemented. The air quality monitor will carry a pre-calibrated continuous dust monitor such as a DustTrak or equivalent equipped with a PM_{10} head in order to quantify any observed emission impacts. Results of inspections, any short-term monitoring, and any mitigation required will be documented on site and made available for inspection by regulatory authorities as required.

12.2.1.18.4.9.9 Reporting

Reporting will be carried out to meet permit, regulatory and corporate requirements, and to inform interested stakeholders. Reporting may include but will not be limited to:

- Annual permit and licence reporting;
- Annual GHG reporting;
- Annual National Pollutant Release Inventory (NPRI) reporting;
- Corporate Sustainability Reporting; and
- Any other community reporting.

NPRI and GHG reporting will be based on emissions estimation and annual permit reporting will be based around results from monitoring requirements.

Incidents related to air quality will also be reported as part of corporate sustainability report, and any community reporting. This will also include any air quality complaints.

The following items are to be included in the annual air quality monitoring report:

- Type of monitoring conducted;
- Monitoring location(s);
- Instrumentation used;
- Weather conditions during the air monitoring period (based on site meteorological data);
- Date, time, and duration of monitoring;
- Results of monitoring at each monitoring location;
- Measurement error analysis (statistical and systematic errors);
- Samplers calibration certificate;
- QA/QC data; and
- Statement outlining the compliance or non-compliance with the regulatory limits.

When concentrations exceeding regulatory limits are found, a summary of reason(s) for such non-compliance will be given, and strategies and concrete measures proposed to manage or prevent air quality exceedances in the future.

The annual report will summarize the data, annual arithmetic means as well as a statistical analysisgraphs could add to the transparency of the results.

12.2.1.18.4.10 Water Quality and Liquid Discharges Management Plan

12.2.1.18.4.10.1 Introduction

Water quality and liquid discharges management will provide for domestic wastewater collection, treatment, conveyance, and disposal, to service the work camps (construction camp and operations camp), and mine plant site and associated buildings for all phases of the Project. Development of wastewater management components is staged to match workforce estimates, which will reach a total capacity of about 1,500 persons during the construction phase.

The wastewater management system will be designed to accept 375 [2]m^3/d of *Municipal Wastewater Regulation* (*MWR*) Class C septic effluent quality from the wastewater sources (Class C: maximum [3]BOD_5 = 45 [4]mg/L; maximum [5]TSS = 45 mg/L). Wastewater management strategy includes allowances for gravity collection to a combined operations and modular (temporary) treatment system, with pressurized conveyance to in-ground disposal via Rapid Infiltration Basins (RIB; **Appendix 12.2.1C**, Drawing 5, Rapid Infiltration Basin Plan and Profile). A level of redundancy will be incorporated into both the treatment and disposal portions of the system for regular maintenance and/or troubleshooting.

12.2.1.18.4.10.2 Objective

The objective of the WQLDMP is the collection and treatment of wastewater and protection of groundwater and surface water quality over the life of the Project, while providing for operational requirements and the safety of personnel. This objective is targeted through strategic actions designed to manage wastewater such that there is no surface discharge of treated effluent to the adjacent streams.

12.2.1.18.4.10.3 Linked Environmental Management Plans

EMPs with overlapping areas of management concern, or which may be cross-referenced to the WQLDMP include:

- IDWMP (**Section 12.2.1.18.4.11**);
- ESPRP (**Section 12.2.1.18.4.13**);
- MWAMP (**Section 12.2.1.18.4.18**);
- OHSMP (**Section 12.2.1.18.4.15**); and
- RCP (**Section 2.6**).

12.2.1.18.4.10.4 Scope

12.2.1.18.4.10.4.1 Summary of Proposed Wastewater Management System Components

The scope of the WQLDMP includes the relevant regulatory background, description of design criteria, components of the Project wastewater management system (pre-treatment, treatment, and disposal), a wastewater system-operating plan, operator training requirements, and a

[2] m^3/d = cubic metres per day
[3] BOD5 (or BOD) = five-day biochemical oxygen demand
[4] mg/L = milligrams per litre
[5] TSS = total suspended solids

monitoring plan and document control. In summary, components of the proposed wastewater management system comprise:

- Modification of the wastewater system servicing the existing exploration camp in support of increasing camp capacity from 250 persons to 400 persons, with continued discharge of Class C effluent to the existing buried septic field;
- Installation of two new RBCs packaged treatment plants, each with a capacity of 400 persons, to provide treatment capacity for an additional 1,000 persons for the two-year duration of construction, with effluent discharge to ground via RIBs;
- Construction of parallel aerated lagoons, each with capacity for 500 persons, to provide service to the 500 person operations camp, with discharge of Class C effluent to ground via RIBs:
  - Effluent from the 1,400-person construction camps is proposed to be pumped to the RIB via a 150 mm diameter ductile iron / high-density polyethylene (HDPE) forcemain; and
- Future relocation of the two existing RBC packaged treatment plants (currently providing service to the existing exploration camp) to service the mine plant site, truck shop and administrative buildings, with discharge of Class C effluent (with disinfection) to the TSF via a 1.65 km long gravity outfall pipe.

12.2.1.18.4.10.4.2 Sequence of Implementation for Proposed Wastewater Management Components

Appendix 12.2.1C, Drawing 1, Site Plan, shows the general layout of the proposed wastewater management components. A detailed schedule of implementation for the components will be developed before the start of the construction phase.

In overview, construction of the Project is anticipated to require approximately two years. The mine will have an operating life of approximately 17 years, with closure and reclamation to follow. At various times during the course of construction and operations of the mine, wastewater will be generated from at least four locations on the mine site, including:

- Existing 250 person exploration camp (to be expanded to 400 person capacity);
- 1,000 person (temporary) construction camp;
- 500 person (permanent) operations camp; and
- Mine operations/plant site.

Prior to availability of the larger 1,000 (construction) and 500 (operations) person camps, early stages of construction will require expansion of the capacity of the existing exploration camp to 400 people. This will require modification of the existing in-ground wastewater system. A second in-ground disposal system will provide service to the construction camp and operations camp. A third *reclaimed water re-use* system, discharging into the TSF, treated (and disinfected) using the existing RBCs relocated from the exploration camp, will be implemented for the mine plant site and associated buildings. Relocation of the RBCs is anticipated to coincide with termination of exploration and decommissioning of the exploration camp.

12.2.1.18.4.10.4.3 Summary of Design Flows

Based on a per capita wastewater generation of 250[6]L/cap/d (**Section 12.2.1.18.4.10.8**) the average daily wastewater flow from the 500 and 1,000 person operations and construction camps will be 125 m^3 and 250 m^3 respectively for a total of 375 m^3. The wastewater treatment and disposal from these sources will be sized accordingly. The pumping and disposal systems will convey and receive the daily flows, with buffering of hourly peak flows (up to 10 times the daily flow) occurring in the treatment systems located prior to the pump station. Flows would be treated to *MWR* Class C effluent quality supplemented with ultraviolet (UV) disinfection and infiltrated to ground via RIBs.

Operation of the system at full design capacity (375 m^3/d) is expected to last only a few years before the construction camp is replaced by the longer-term (17 year expected mine life) operations camp. Construction of the proposed new wastewater system is not scheduled to occur until the first quarter for Year -2.

12.2.1.18.4.10.5 Regulatory Requirements

Sewage systems that discharge effluent volumes in excess of 22,700 litres per day (L/d), or that discharge to surface waters, or that use reclaimed effluent for other processes other than discharge to ground or surface water, are regulated by the *Environmental Management Act Municipal Waste Regulation (MWR)*. The BC MOE has confirmed that its preference is that each discharge location be separately registered under the *MWR*.

This will require three separate regulatory/registration processes for each of the following:

- Expansion of the existing 250-person camp to 400-person capacity for discharge to ground at the existing ground disposal field;
- Treatment and disposal of sewage effluent from the temporary 1000-person construction camp and permanent 500-person operations camp to ground via RIB; and
- Treatment and disposal of effluent from the plant site to the TSF.

12.2.1.18.4.10.6 BC MOE MWR Authorization

Registration under the *MWR* requires a number of provisions to be met prior to successful registration and authorization for discharge, including:

- Submission of a summary of technical design information, including system description and design drawings and specifications, daily discharge flow, effluent quality expected, etc.);

[6] L/cap/d: litres per capita per day

- Development of a wastewater system operating plan, including provisions for operator training and certification; and
- Development of an environmental and effluent monitoring plan.

Following registration, a number of ongoing submissions are required, including regular monitoring of discharge flow, effluent quality and receiving environment.

12.2.1.18.4.10.7 Existing Wastewater Treatment and Disposal System

The existing wastewater disposal system for the exploration camp (**Appendix 12.2.1C**, Drawing 1, Site Plan) consists of two RBC packaged treatment plant units (installation completed by early 2012), gravity pipes from the exploration camp buildings, septic tanks and a pump and forcemain system which pumps effluent a distance of approximately 0.8 km to an in-ground septic field. Installation of the treatment plants has provided an increase in the quality of the treated effluent from Class D (septic tank) to Class C (45 mg/L BOD_5, 45 mg/L TSS) such that the receiving capacity of the septic field is 250 persons.

12.2.1.18.4.10.8 Design Criteria

Wastewater design criteria include the anticipated mine development schedule, related workforce estimates and phasing, associated wastewater quantity (volume, flow rate and peaking factor), both raw (influent) quality and required treated (effluent) wastewater quality.

12.2.1.18.4.10.8.1 Mine Development Schedule

Important construction dates relevant to the wastewater strategy are as follows:

- Expand existing 250-person exploration camp to 400-person camp: pre-construction;
- 1,000 person construction camp construction: Year -2;
- 500 person operations camp construction: Year -1;
- Site C TSF construction: Year -1 to Year 1;
- 1,000 person camp decommissioning: Year 1 to ~ Year 0.5;
- Mine operations: Year 1 to approximately Year 17; and
- 500 person camp operation: Year -1 to approximately Year 17.

12.2.1.18.4.10.8.2 Workforce Estimates

Workforce is expected to range from approximately 400 people in late early construction, prior to the beginning of mine construction, to 1,500 people during peak construction activities. Following the completion of construction (Year 1), the 1,000 person camp will be decommissioned, and the 500 person operations camp will service mine operations for the life of the mine (approximately 17 years).

Figure 12.2.1-23 shows the expected workforce distribution from early construction to Year 2.

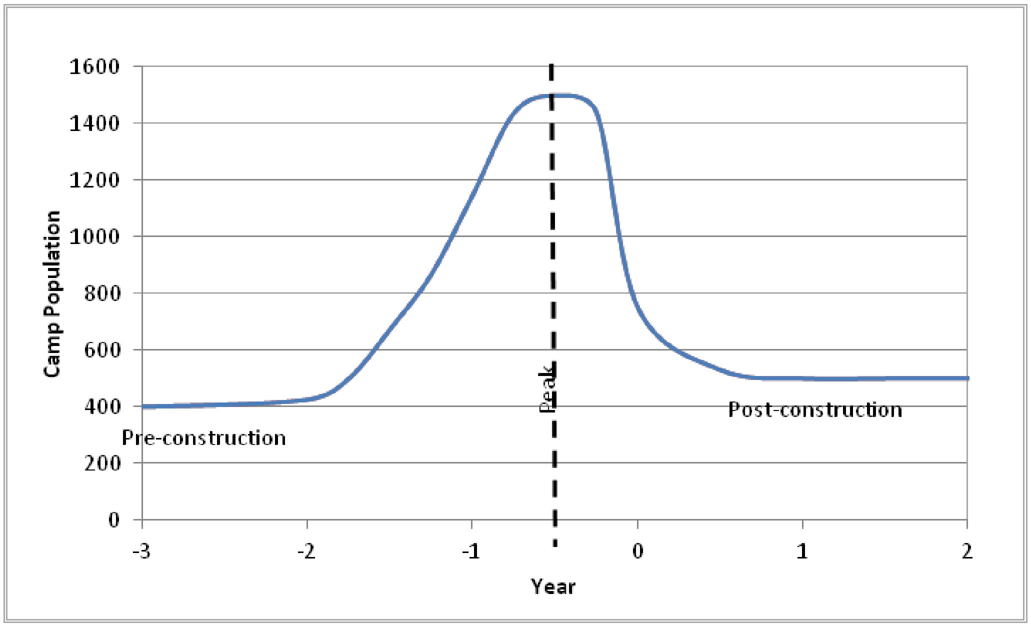


Figure 12.2.1-23: Mine Workforce Estimate

12.2.1.18.4.10.9 Wastewater System Operating Plan

Upon development of the detailed wastewater system design, a wastewater system operating plan will be developed and included with this EMP prior to commencement of construction. The Wastewater System Operating Plan will include but not be limited to:

- Process descriptions;
- General operation and maintenance practices;
- Operator personnel and contact;
- Environmental Operators Certification Program (EOCP) requirements;
- Treatment plant effluent and environmental monitoring practices and requirements; and
- Spill reporting procedures per ESPRP.

12.2.1.18.4.10.10 Operator Training and Certification

Section 47 of the *MWR* requires that the sewage treatment facilities are operated by persons who:

- Have the education, experience, and qualifications specified in the required Wastewater System Operating Plan; and
- Are certified under the EOCP.

The proponent currently employs operators that were certified by the EOCP in 2013. The requirements that were required certification by the EOCP included:

- Minimum of 50 hours of hands-on experience operating a facility/system of equivalent or higher classification; and
- Completion of appropriate training for which a minimum of 1.2 Continuing Education Units (CEU) have been awarded by the EOCP.

The level of operator training and certification that is required is directly related to the EOCP Facility Classification (described below). In the long term, due to the simplicity of lagoon operations, the operator training and certification requirements are not expected to vary significantly. In the short term, however, the operator training and certification will likely increase during the two-year construction period as a result of the operating requirements for the RBC packaged treatment plant(s) and the proposed 1,500-person occupancy level. For the construction phase, the Proponent will either:

- Provide for increased operator training and certification in advance of construction; or
- Arrange for a qualified contractor to operate and maintain the wastewater management system during the construction phase.

12.2.1.18.4.10.11 Environmental and Effluent Monitoring Plan

In accordance with the waste water treatment plant permit, a suitable effluent environmental monitoring program will be implemented during operation of the wastewater system. The proposed Environmental and Effluent Monitoring Plan will consist generally of a surface water and groundwater quality-monitoring program, and is expected to include regular sampling from groundwater wells and nearby creeks for common polluting parameters.

Monitoring will confirm the effectiveness of water treatment, and will ensure that the appropriate water quality guidelines are being met at the property boundary to protect down-gradient receptors. Based on guidance in the *MWR*, and subject to permit conditions, the proposed Environmental and Effluent Monitoring Plan will consist of bi or tri-annual sampling of the monitoring network at freshet (May-June), during water level recession (September or October) and base flow (November) of groundwater for the following parameters:

- Field parameters (pH, temperature, ORP, and electrical conductivity);
- Alkalinity;
- Total nitrate, nitrite and ammonia;
- Total and dissolved phosphorous;
- Ortho-phosphorous;
- Chloride;
- Dissolved Metals;
- BOD_5 and TSS; and
- Total coliform, fecal coliform and *E. coli*.

After the first full year of monitoring, when the groundwater flow direction can be better understood based on the collection of water level data, a qualified professional will re-evaluate the proposed monitoring network. The final configuration of the monitoring array will be in place by the end of the second year of *MWR* registered effluent dispersal and monitoring.

A report evaluating the results of the ongoing groundwater monitoring will be submitted to annually the BC MOE Regional Officer within 120 days of the end of each calendar year (typically March 31 of the following year). After two years (i.e., six sample events plus the pre-discharge sampling documented in the EA), a qualified professional will review the monitoring program for potential reduction of number of parameters and frequency of monitoring (to annual sampling). The recommendations will be submitted to the Ministry Regional Officer for approval.

Monitoring of the fecal levels of effluent discharged from the existing RBCs and coliform and BOD_5 in the TSF, will confirm whether or not additional measures for effluent disinfection will be required.

12.2.1.18.4.11 Industrial and Domestic Waste Management Plan

12.2.1.18.4.11.1 Introduction

The IDWMP describes the procedures for managing all anticipated hazardous and non-hazardous industrial and domestic waste generated as a result of Project activities. Implementation of the IDWMP will ensure management of hazardous and non-hazardous industrial and domestic wastes in a manner that protects the health and safety of personnel, the public, and all aspects of the environment. This plan is to be adopted by all employees and contractors associated with the Project.

12.2.1.18.4.11.2 Objectives

The objectives of the IDWMP include:

- Ensuring compliance with all regulatory requirements;
- Minimizing wastes sent to landfill; and
- Ensuring employees and contractors are aware of their responsibilities and requirements.

12.2.1.18.4.11.3 Scope

The IDWMP includes the collection, storage, handling, transportation, recycling and disposal of waste. It will also provide information on safe and environmentally sound processes to minimize waste products generated during site activities. This plan establishes the basis for waste management for all phases of mine life. It includes basic principles of waste management that will be modified in accordance with waste types and volumes generated over the project life cycle. Additional details for waste disposal as part of decommissioning and closure are provided in the RCP.

12.2.1.18.4.11.4 Regulatory Requirements

Copies of relevant acts, regulations, and permits will be kept on file at the mine site, and an overview understanding of their regulation will be given to mine site personnel as part of their training. Federal and provincial legislation guiding waste management includes:

- *Canada Transportation Act* (Government of Canada, 1996);
- *Transportation of Dangerous Goods Act (*federal *TDG Act)* (Government of Canada, 1992), which includes the Transportation of Dangerous Goods Regulation (federal *TDGR*) (Government of Canada, 2001);
- *Transport of Dangerous Goods Act* (BC *TDG Act*) (Government of BC, 1996m), which includes the Transport of Dangerous Goods Regulation *(*BC *TDGR*) (Government of BC, 1985);
- *Hazardous Products Act* (Government of Canada, 1985e), including the Controlled Products Regulations (Government of Canada, 2010);
- National Fire Code of Canada (National Research Council, 2010);
- Federal Metal Mining Effluent Regulations (Government of Canada, 2002a);
- *CEPA, 1999* (Government of Canada, 1999), including the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (2005), and the Interprovincial Movement of Hazardous Waste Regulations (Government of Canada, 2002);
- *Canada Water Act* (Government of Canada, 1985a);
- Canada Labour Code, including the Canada Occupational Health and Safety Regulations (Government of Canada, 2012);
- *Environmental Management Act (*Government of BC, 2003b), Chapter 53 (Sewage, Air, Refuse, and Special Waste Regulations (Government of BC, 1988)), including the Hazardous Waste Regulation (*HWR*) (Government of BC, 2009), the Spill Reporting Regulation (Government of BC, 2008), and the *Contaminated Sites Regulation* (Government of BC, 2011);
- *Health Act* (Government of BC, 1996b), Chapter 179;
- *Drinking Water Protection Act* (Government of BC, 2001), Chapter 9;
- Health, Safety and Reclamation Code for Mines in BC (Government of BC, 2008), *Mines Act* (Government of BC, 1996c), Chapter 293, including the *Workplace Hazardous Materials Information System Regulation* (Mines) (Government of BC, 2005);
- *Workers Compensation Act* (Government of BC, 1996g), including the *Occupational Health and Safety Regulation* (Government of BC, 2012); and
- *Fire Services Act* (Government of BC, 1996a), including the *Fire Code Regulation* (Government of BC, 2006).

12.2.1.18.4.11.5 Waste Management Process

12.2.1.18.4.11.5.1 Classification of Waste Groups

Wastes anticipated to be generated over the life of the Project are classified into five groups, based on end treatment:

- Food and other putrescible;
- Combustible (non-putrescible);
- Non-combustible;
- Recyclable; and
- Hazardous.

Industrial waste includes inert bulk wastes other than mining wastes generated by ore extraction (overburden rock) and processing (tailings), which are dealt with in separate management plans.

Management of the five waste groups identified above will apply a waste hierarchy procedure adopted as Project policy, as follows:

- Avoid/Reduce – take action to reduce or avoid waste generation;
- Reuse/Recycle – reuse or recycle wastes where practical; and
- Treat/Dispose of wastes appropriately – treat or dispose of waste in an environmentally responsible manner that meets regulatory requirements and manages environmental liabilities appropriately.

12.2.1.18.4.11.5.2 Site Facilities

Mine facilities will include designated temporary waste storage and collection areas. These collection areas will be sited at locations on the mine at convenient locations to key sources of waste production including process buildings, laydown area, camp, etc. Specific locations will be detailed by the environmental department, as necessary for the various Project phases with input from the PMT. All stored wastes will be housed in appropriate containers, such as metal bins, barrels, mini-bulk bags, and pails.

Wastes will be transported from the collection points to one of three endpoints for sorting, further treatment and/or disposal:

- Incinerator;
- On-site landfill; and
- Backhaul off site with appropriate contractors to an approved waste or recycling facility.

The existing exploration camp utilizes an incinerator and ash is disposed of in the existing landfill. Incineration will continue to be used during construction, operations, and into early closure. Ash and other wastes that cannot be recycled and that are not hazardous will be disposed of in the landfill. The landfill will be located in the overburden zone of the West waste rock dump. Any surface runoff and seepage from the landfill will drain by gravity to the TSF. The landfill will be constructed in cells to coincide with ongoing construction of the West waste rock dump. Only one cell will be used at any given time. The cells will be constructed by placing about 3 m of compacted overburden (till). An additional 5 m of overburden will be placed and a landfill cell dug to a depth of about 3 m with a backhoe. After filling, the cell will be covered with a minimum of 2 m of compacted overburden. Since surface water and seepage will drain to the TSF no dedicated leachate collection or monitoring system is required although runoff and seepage from the West waste rock dump will be monitored. Signs will be erected at the landfill to identify the site and to remind construction and mine workers of the acceptable and prohibited wastes.

12.2.1.18.4.11.5.3 The Proponent's Recycling Policy

The Proponent's corporate policy will support active involvement of all mine personnel and contractors in achieving the environmental goals of waste minimization, materials conservation, and recycling. Recyclables will be disposed of in the following manner:

- Scrap iron and steel will be placed in designated and marked bins;
- Scrap copper will be stockpiled separately, as it is of greater value than steel and iron. Copper wire and brass scrap will be placed in designated and marked scrap copper bins;
- Mixed recyclables include paper, cardboard, glass, tins, aluminum cans and plastics. Plastics with the recycling marks 1, 2, 3, 4, 5, 6, and 7 can be recycled. Recyclables will be placed in designated and marked recycling bins located throughout the site. Since waste may contain food residues, these bins will be equipped with wildlife exclusion measures, such as clamping lids;
- Vehicle batteries must be stored on a containment pallet or in designated bins and held for pickup by a licensed contractor;
- General, domestic use battery types (alkaline, NiCad, etc.) will be placed in designated and marked bins;
- Fluorescent lights (tubes/CFL) will be placed in a designated and marked bin and held for pickup and removal to a specialized recycling facility;
- Printer in or toner cartridges will be placed in designated and marked containers in various office locations;
- Mobile phones and electronic equipment (e-waste) may contain recyclable materials. E-waste will be placed in designated and marked containers for recycling;
- Metal drums that cannot be reused (e.g., for storage of used fuel filters) will either be crushed and disposed of as scrap metal; and
- Plastic drums with a recycling mark numbered 1, 2, 4, or 5 will be rinsed out and placed in designated and marked recycling bins. Rinsate, if no hazardous, will be placed in the TSF; otherwise disposed of as hazardous waste. Oil-contaminated plastic containers will be disposed of as hazardous waste.

Some recyclables may be backhauled off site in outgoing delivery vehicles and donated to a local charity. A designated recycling program would be established to accommodate this, and will include separation of key recyclables that are part of the BC deposit/refund program.

12.2.1.18.4.11.5.4 Industrial Waste Management

Combustible (non-putrescible) wastes such as clean, untreated wood waste will be incinerated consistent with the incinerator operations and air discharge permit. Pallets will be stockpiled and reused wherever possible. Pallets that cannot be reused will incinerated.

Non-combustible solid wastes are those that cannot readily burn and those that are not suitably disposed of through burning (e.g., conveyor belts and tires). These materials will be stored in designated and marked bins located throughout the site. Wastes such as scrap metal, timber, and unsalvageable equipment will be sorted in steel recycle bins for either on-site reuse or off-site recycling.

Bulk wastes that cannot be recycled, or reduced in volume with incineration will be transferred to the landfill. Discharge to the landfill will also include non-combustible camp refuse and inert industrial refuse that cannot be incinerated. This waste may consist of treated wood, plywood, rubber, non-recyclable scrap metal and machinery parts (cleaned of any petroleum residues), building construction debris, and plastic. **Table 12.2.1-35** shows options for disposal of these materials.

Prior to construction of the West NAG dump overburden stockpile and designated area for the landfill, wastes to be landfilled will be temporarily placed in a laydown area likely in dumpsters, pending transfer to the landfill. Procedures for handling industrial wastes and segregation effectiveness will be tested and reviewed during the construction period. Standard operating procedures will be modified if indicated.

Table 12.2.1-35: Non-Combustible Solid Wastes

Waste Description	Storage Actions and Location	Disposal Method
Conveyor Belts and Tires	• Retain in storage yard outside truck shop	• Reuse and recycle • Examples of reuse include, where possible, reusing tires for haul road berms, turning area road protection, and as bunks for laydown of stock material
Unusable Vehicles	• Stored in a designated laydown area	• Driven or backhauled for refurbishment or recycling
Glass	• Stored in labelled bins	• Reuse and recycle • Non-reusable and non-recyclable glass (windows etc.) will be disposed of in the landfill
Plastics	• Stored in labelled bins	• Reuse and recycle • Non-reusable and non-recyclable plastic containers that originally contained non-hazardous materials, not including food products, will be disposed of in the landfill
Car and truck wash sump sludge	• Stored in labelled drums	• Dewater, then landfill
Scrap Metal	• Restock and reuse scrap metal pieces for other projects where possible • Stored in a designated laydown	• Reuse, recycle, and resale where possible
Welding rods	• Stored in labelled bins	• Recycle via an approved off-site facility
Electronic and Electrical Equipment	• Electronics waste will be collected and stored in watertight containers • Equipment that may contain polluting substances, such as heavy metals, will not be disposed of in the landfill • Placed in dry storage	• Reuse and recycle

12.2.1.18.4.11.5.5 Domestic Waste Management

Domestic (kitchen) wastes will be treated similarly in all mine phases. Domestic wastes will be incinerated daily or periodically, as indicated by volume accumulated. Plastics will be separated at source where possible and not incinerated to eliminate a major source of dioxins and to ensure compliance with the Canada Wide Standard for dioxins/furans. Ash will be landfilled in the on-site landfill proposed for the overburden part of the West NAG Dump. Ash will be covered with overburden to limit fugitive dust emissions. Any leachate from the landfill will flow by gravity to the TSF.

Food, food-covered packaging, and other combustible (non-recyclable) office wastes will be collected and stored in sealed, wildlife-resistant containers. Options for disposal of these wastes are shown in **Table 12.2.1-36** and **Table 12.2.1-37**.

For initial construction the existing exploration camp incinerator will be used to incinerate domestic waste. Once the construction camp is completed and incinerator installed domestic waste from this camp with be incinerated in the dedicated incinerator.

Table 12.2.1-36: Putrescible Waste

Waste Description	Storage Actions and Location	Disposal Method
Food Waste and Packaging	• Dedicated steel bins and dumpsters (wildlife proof) for the collection of food waste and packaging will be provided where people eat, including at the camp kitchen and in remote offices and lunchroom trailers • Oil and grease collected from the kitchen will remain stored in the kitchen until transferral to the incinerator for immediate disposal	• Bag lunches and kitchen food waste and packaging will be stored in plastic bags, collected, and incinerated to minimize the attraction of wildlife • Ash will be deposited in the landfill and covered with intermittent fill to reduce fugitive dust
General Camp Wastes (collected from offices, camp rooms, and leisure and recreation areas)	• Sort general waste into specific containers provided for recyclables or for substances requiring additional processing • Use clear trash bags to allow cleaning staff to perform regular cursory inspections of camp waste and confirm sorting	• General camp waste will be incinerated and the ash deposited in the landfill.

Table 12.2.1-37: Combustible (Non-Putrescible) Wastes

Waste Description	Storage Actions and Location	Disposal Method
Corrugated Cardboard	• Use bulk-shipped when possible to reduce cardboard packaging volumes • Cardboard waste will be stacked or bundled, placed in containers, and protected from the weather	• Reused as packaging for backhauled materials • Incinerated
Paper	• Have printers set to use both sides of paper when printing or photocopying • Encourage use of online viewing • Specific containers will be set up in offices and common rooms on site to collect waste paper	• Collected and incinerated
Waste Lumber	• Promote restocking and reusing lumber products for future projects or as backhaul packaging • Place in an appropriate collection bin	• Collected and incinerated

12.2.1.18.4.11.5.6 Hazardous Waste Management

The *CEPA* defines hazardous wastes as "those with properties such as flammability, corrosiveness, or inherent toxicity." The *HWR* defines hazardous waste as dangerous goods if they:

- Are no longer used for their original purpose; and
- Meet the criteria for Class 2, 3, 4, 5, 6, 8, or 9 of the federal Dangerous Goods Regulations.

A range of materials that are controlled under the *Hazardous Products Act* (Government of Canada, 1985e) and related Controlled Products Regulations (Government of Canada, 2010) may be used during all phases of the Project. When these become waste they will be designated as hazardous waste unless shown to be otherwise. Special wastes, such as glycol coolant, solvent fluids, waste oil, used oil filters, used batteries, and contaminated fuel, will be handled, stored, transported, and disposed of at an authorized location in accordance with the HWR. The HWR includes provisions for inspections, fire, and weather protection, and records management for hazardous waste facilities.

Explosives and radioactive materials are not classified as hazardous waste, as stated in the Hazardous Waste Legislation Guide (BC MOE, 2005):

> *"Explosives are regulated by the Explosives Act, and radioactive materials are regulated by the Nuclear Safety and Control Act."*

12.2.1.18.4.11.5.7 Hazardous Waste Storage and Disposal

Hazardous wastes will be handled in a similar manner for all mining phases; only the nature and quantities will change with change in phases.

Hazardous and non-hazardous wastes will be stored separately, and will be segregated according to the classifications provided in the *HWR*. Segregation will ensure both that there is no contact between hazardous materials and that sufficient storage space between containers will be maintained for safe access and handling of containers. Other provisions for the safe storage and disposal of hazardous wastes will include:

- Drums, containers, and storage areas will be properly labelled, marked, placard, and secured;
- Storage areas will contain any spills, and secondary containment measures will be dictated by the nature of the containers' contents, size, and capacity. These may include:
    - drip trays;
    - metal and plastic bins;
    - double or redundant packaging;
    - impervious liners and dike systems; and

  - pre-fabricated hazardous waste structures with containment floors.
- Spill kits sufficient in content and quantity will be located in free and unobstructed proximity wherever hazardous materials are stored;
- Fire prevention systems appropriate and adequate for the materials being stored will be provided; and
- Hazardous wastes will be protected from the weather.

Guidelines for disposal of hydrocarbon wastes and chemical wastes are shown in **Table 12.2.1-38** and **Table 12.2.1-39**, respectively.

These guidelines will be updated when wastes and waste quantities are specifically characterized. At that time, wastes will be checked for potential control under the federal *TDG Act* and *TDGR*. For example, certain hazardous wastes such as batteries and waste oil may be dangerous goods under the *TDG Act* and *TDGR*, and waste oil used for fuel must not exceed limits specified in the *HWR* for several substances (e.g., total arsenic, total cadmium).

The Proponent will obtain a hazardous waste generator number if required by the anticipated quantities of hazardous wastes temporarily stored on site.

During the construction period, hazardous waste storage facilities will be constructed and procedures for handling hazardous wastes tested and refined as required. Standard operating procedures will be updated during this period to reflect learnings from early experience. Most hazardous wastes will consist of petroleum product containers, waste oil, and lead-acid batteries.

12.2.1.18.4.11.5.8 Transportation of Waste Materials

Waste will be transported to final approved disposal facilities in a manner that prevents the inadvertent release of wastes or recyclables. All waste will be transported from the site according to the most recent amendment of pertinent regulations, such as the provincial *TDGR*, and the following practices:

Timing for waste haul will be optimized to consider the following safety and environmental factors:

- Weather conditions;
- Road conditions and congestion; and
- Identified restricted activity periods.

Only Project-approved waste or site services personnel will transport waste in vehicles designated and approved for waste transport. Hazardous waste will be transported under contract by a Project-approved transporter licensed under the *HWR*. Criteria for approval are:

- Knowledge of emergency spill response and reporting procedures. The TAMP requires that all personnel have access to the ESPRP, which includes medical and environmental emergency contact information, spill response procedures, and incident reporting procedures;

- Emergency spill response equipment carried on vehicle (e.g., shovels, spill kits of appropriate size and content);
- Fire extinguisher and fire prevention materials carried on vehicle; and
- Communications equipment and knowledge of communications procedures.

The following transportation measures will be adhered to:

- Non-compatible materials will be transported in separate containers; and
- Manifests will be maintained in compliance with the TDGR and HWR.

Details for the transport: identification of waste, including routing restrictions, waste pickup schedule and waste tracking and documentation requirements for waste identification, pickup, delivery, and chain of custody will be confirmed with the waste services provider, as appropriate, before waste is transported. Spill prevention, notification, and response procedures will be provided in the emergency response plan.

12.2.1.18.4.11.5.9 Transportation Documentation

Transportation of all hazardous and non-hazardous waste from the site will be recorded and documented to account for all waste materials. These records will be completed by the waste services provider. The proponent will collect and retain copies of transportation documentation on a monthly basis. Documentation from transportation of hazardous waste will be compiled into a Hazardous Waste manifest and be maintained for at least 2 years.

The information provided on the manifest form, in addition to vehicle labels and placards, is also intended to assist first responders (police, ambulance, and fire department) with hazard information should an accident occur in transit. If all or part of a hazardous waste shipment is lost during transportation (as by a truck accident), the carrier will immediately notify the mine manager or designate and the proponent's environmental department. A contact list will be provided and retained at the security gate for quick reference (refer to ESPRP). Reports for on-site and off-site spills will be completed by the carrier or waste services provider and reviewed with the proponent's management.

Table 12.2.1-38: Hydrocarbon Wastes

Waste Description	Storage Actions and Location	Disposal Method
Used Oil	• Includes waste lubricating oils from service vehicles, mobile or stationary equipment, generators, and pumps • Stored in empty bulk lubricant cubes • Cubes will be stored at a designated site	• Reuse as incinerator fuel • Excess waste oil, or waste oil not fit for combustion, will be backhauled to the product supplier or to a registered hazardous waste receiver for recycling
Hydraulic Fluid	• Where possible, filter and reprocess hydraulic fluid for reuse in site equipment • Transferred to clearly labelled, tightly sealed, sound containers, such as steel drums, and grouped for storage at a designated site	• Hydraulic fluid that cannot be reprocessed will be combusted in the waste oil burner • Fluid not fit for combustion, will be backhauled to the product supplier or to a registered hazardous waste receiver for recycling
Used Oil and Fuel Filters	• Waste oil and fuel filters must be drained prior to disposal • The filters will then be crushed to release additional oil and reduce disposal volume • Placed in clearly labelled, tightly sealed, sound containers, such as steel drums, located near the drainage area • Full drums or oily waste bins will be stored at a designated site	• Crushed and stored in drums • Excess will be backhauled to supplier or registered hazardous waste receiver
Oil and water separator sludge	• Retain in sump prior to removal	• Recycle to process (operations) or approved off-site treatment or disposal facility
Used Rags and Absorbent Pads	• Used rags and sorbents will be stored in a well-ventilated area in clearly labelled steel drums • Drums will be located as close as practicable to the waste generating source • Granular sorbent will be collected in drums stored at a designated site	• Rags and sorbent pads will be incinerated on site • Backhaul to supplier or registered hazardous waste receiver for recycling
Contaminated or Expired Fuels, such as Jet B Aviation Fuel	• Retain in clearly labelled, tightly sealed, sound original containers in the fuel storage area	• The fuel may be combusted in a waste oil burner or transported to a designated storage site until it can be backhauled to a registered hazardous waste receiver
Empty Petroleum Hydrocarbon Containers and Drums	• Empty bins, drums, or pails will be stored at a designated site	• Returned to the supplier during the backhaul; or • Remove to landfill if deemed “empty”
Hydrocarbon Contaminated Debris and Soil from Spills	• Contaminated soil bins will be strategically placed at laydown areas and/or other designated sites for use in temporary storage of small amounts of contaminated soils until such soils can be removed or treated • A bioremediation pit or pad may be constructed on site to treat hydrocarbon soaked soils	• Tested and removed off site by a hazardous waste services provider to an approved facility; or • Placed in the bioremediation pit or pad

Table 12.2.1-39: Chemical Wastes

Waste Description	Storage Actions and Location	Disposal Method
Glycol/Antifreeze	• Waste glycol will be stored in clearly labelled, tightly sealed drums • Placed in a secondary containment structure within a designated site. • Unused and waste glycol will be stored in an enclosed area capable of deterring wildlife	• Backhauled to supplier or registered hazardous waste receiver for recycling
Excess or waste solvents	• Packaged in clearly labelled, original, tightly sealed, sound containers and stored in a designated site	• Backhauled to a registered hazardous waste receiver
Waste Batteries (dry cell)	• Small containers will be placed in offices and common rooms for collection	• Backhauled to a recycling facility
Waste lead Acid Batteries and Rechargeable Batteries	• Sealed for temporary storage at a designated site, in labelled metal containers or 205 L plastic drums	• Backhauled to a registered hazardous waste receiver
Aerosol Cans	• Wherever possible, aerosol cans will be substituted with refillable type pump or spray bottles • Collected in specific containers placed around the site and stored at a designated site for collection and backhaul	• If feasible, puncture, depressurize, and drain the cans to allow on-site disposal in the landfill • Backhauled to a registered hazardous waste receiver
Paints	• Excess and waste paint will be tightly sealed and clearly labelled (WHMIS) in original containers • Unopened paint containers and waste paints will be stored at a designated site for collection and backhaul	• Return to supplier or backhaul to a paint recycler or registered hazardous waste receiver • Small quantities of unwanted paint up to 5 L can be disposed in the landfill after being allowed to dry thoroughly
Fluorescent Lamp Tubes Containing Mercury	• Tubes will be packaged in their original shipping box (or equivalent) • Tubes are considered hazardous waste if broken and will be handled accordingly • Stored at a designated enclosed site for collection and backhaul	• Shipped to an approved hazardous waste recycling or disposal company
Floor Wash/Equipment Wash	• Sump around site	• Recycled to process water (operations)
Drilling Muds from Drilling Core Holes	• Drill sumps or tanks around site	• Mine pit
Waste Chemical Containers	• Many chemical containers are not safe to dispose of directly and must be recycled, or require handling precautions identical to full containers	• Dispose of in accordance with requirements listed in the MSDS for each chemical
Laboratory Chemical Wastes (spent acids, caustics, solvents, washings, and solutions)	• Stored in appropriately marked containers at a designated site • Chemical users must be familiar with safe handling and storage procedures provided by the manufacturers in their MSDS	• Safely incinerated (no sharps) or landfill on site • Returned to registered laboratory chemical waste receiver
Waste Organic and Inorganic Chemicals Including Lab Packs	• Stored in appropriately labelled containers at a designated site for collection and backhaul	• Returned to supplier or to approved off-site disposal facility
Hazardous Biological Waste	• Properly contained and labelled as a biohazard • Stored in a secure area of the first aid centre • Hazardous biological waste will remain under the direct supervision of medical staff	• Disposed at a registered hazardous biological waste receiver (not incinerated)
Waste lead from laboratory assays	• Per HMMP lead fume/filter canisters from the fire assay baghouse will be the only lead waste product	• Lead fume/filter canisters will be treated as hazardous waste and stored and transported appropriately using registered hazardous waste contractor

12.2.1.18.4.11.6 Measurement

Inspection results and quantities of the main waste streams will be kept by the environment department and reported annually. The results of this data will be used to determine the success of the IDWMP and where improvements are required. Quantities of tyres, oil, fuel, plastics and other recyclables will be tracked as part of GRI reporting.

Non-hazardous and hazardous waste tracking will be compiled at least annually for corporate reporting. Programs responsible for a reduction in waste will be discussed and the results reviewed. Objectives and targets for waste minimization will be set, for annual and 5 year terms. These targets will drive continual improvement of the waste management program.

12.2.1.18.4.11.7 Awareness and Training

For all personnel, waste handling training will include identification of waste groups, and the handling, storage, and disposal procedures for each waste group. General waste training will be provided during the site environmental orientation. This will include aspects such as what materials can be recycled, the location of transfer stations and bins and hazardous and controlled waste.

Employees (e.g., warehouse staff) who receive, offload, or store hazardous materials or who are involved in storing and shipping hazardous wastes off-site will receive hazardous materials and hazardous waste training before they begin employment. Training will be reviewed annually. TDG training will ensure that relevant employees know how to package, label, and ship hazardous wastes including proper record keeping and manifesting. Warehouse staff will also be responsible for ensuring all transportation contractors have required TDG training. Training under the *HWR* will include:

- Employee duties and responsibilities;
- Use of personal protective equipment;
- Fire and explosion response procedures;
- Emergency spill response procedures;
- Communications and alarm systems;
- Shut down procedures; and
- Specific hazards for each hazardous waste managed at the facility.

The safety department will maintain a record of:

- All employees and employee duties and responsibilities;
- The level of training received by each employee; and
- The date of the last training session for each employee.

12.2.1.18.4.11.8 Contact Details

Table 12.2.1-40 contains a list of contact details.

Table 12.2.1-40: Contact Details

Company/Agency	Contact Person	Position	Phone
Licensed contractor	TBD	TBD	TBD
Recycling Council of British Columbia (RCBC)	Office	N/A	1-800-667-4321
Recycling facility	TBD	TBD	TBD
Ministry of Environment	TBD	TBD	TBD

12.2.1.18.4.12 Hazardous Materials Management Plan

12.2.1.18.4.12.1 Introduction

Construction and operations of the Project will involve the use of a number of hazardous materials and dangerous goods. The HMMP provides direction for transportation, storage, handling, and use of all chemicals, petroleum products, and materials that could potentially be harmful to human health or the environment at the mine site. The management of hazardous wastes was discussed in the previous EMP.

Explosives are regulated under the *Explosives Act* (Government of Canada, 1985c) and as such are not defined as hazardous materials; however, they are included for management under the HMMP, due to their requirement for special handling.

This plan will be reviewed and revised as required prior to any hazardous materials being brought to the site.

12.2.1.18.4.12.2 Management Objective

The objective of the HMMP is to provide all necessary procedures for the management and use of the Project chemical and hazardous material product inventory. Management and use of this product inventory will be conducted in a manner that ensures the health, safety, and well-being of workers and that ensures the environment is not compromised from hazardous materials at the Project site.

12.2.1.18.4.12.3 Linked Environmental Management Plans

The HMMP is based on the principles of adaptive management and continual improvement, and will be applied in conjunction with other management plans under the EMS for the Project. Plans linked with the HMMP include:

- AQEMP (**Section 12.2.1.18.4.9**);
- WQLMP (**Section 12.2.1.18.4.10**);
- IDWMP (**Section 12.2.1.18.4.11**);
- CYMP (**Section 12.2.1.18.4.19**); and

- OHSMP (**Section 12.2.1.18.4.15**).

Measures specific to the management of hazardous waste are included in the IDWMP (**Section 12.2.1.18.4.11**).

12.2.1.18.4.12.4 Regulatory Context

All components of the HMMP will be in compliance with regulatory requirements and will use BMPs as an additional guiding principle. Hazardous materials in BC are regulated under federal and provincial legislation, including the following:

- *Hazardous Products Act* (Government of Canada, 1985e), including the *Controlled Products Regulations* (Government of Canada, 1988);
- Transportation of Dangerous Goods Act (federal TDG Act) (Government of Canada, 1992), which includes the Transportation of Dangerous Goods Regulation (federal TDGR) (Government of Canada, 2012);
- Transport of Dangerous Goods Act (BC TDG Act) (Government of BC, 1996m), which includes the Transport of Dangerous Goods Regulation (BC TDGR) (Government of BC, 1985);
- *Explosives Act* (Government of Canada, 1985c), including the *Explosives Regulations* (Government of Canada, 2009), and the Ammonium Nitrate and Fuel Oil Order;
- Canadian Environmental Protection Act, 1999 (Government of Canada, 1999), including the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (Government of Canada, 2005), and the Interprovincial Movement of Hazardous Waste Regulations (Government of Canada, 2002);
- Canada Labour Code, including the *Canada Occupational Health and Safety Regulations* (Government of Canada, 1986);
- *Environmental Management Act* (Government of BC, 2003b), including the *Hazardous Waste Regulation* (Government of BC, 2009), the *Spill Reporting Regulation* (Government of BC, 2008), the *Contaminated Sites Regulation* (Government of BC, 2011), and the *Petroleum Storage and Distribution Facilities Storm Water Regulation* (Government of BC, 2004);
- Health, Safety and Reclamation Code for Mines in BC, 2008, *Mines Act* (Government of BC, 2008b), Chapter 293, including the *Workplace Hazardous Materials Information System Regulation* (Mines) (Government of BC, 2005);
- *Workers Compensation Act* (Government of BC, 1996g), including the *Occupational Health and Safety Regulation* (Government of BC, 2012); and
- *Fire Services Act* (Government of BC, 1996a), including the *Fire Code Regulation* (Government of BC, 2006).

Workplace Hazardous Materials Information System (WHMIS) requirements are enforced under the *Controlled Products Regulations* (Government of Canada, 2010), the *Occupational Health and Safety Regulation* (Government of BC, 2012), and the *Workplace Hazardous Materials Information System Regulation* (Mines), identified above (Government of BC, 2005). The key elements of WHMIS are cautionary labelling of containers of controlled products, the provision of Material Safety Data Sheet (MSDS), worker education, and site-specific training programs. These key elements are discussed below in the relevant sections of this HMMP.

12.2.1.18.4.12.5 Hazardous Materials Management

12.2.1.18.4.12.5.1 Identification

A hazardous material is one which, as a result of its physical, chemical, or other properties, poses a hazard to human health or the environment when it is improperly handled, used, treated, stored, disposed of, or otherwise managed. Hazardous materials in BC are identified in accordance with the federal *Controlled Products Regulations* (Government of Canada, 2010).

Hazardous materials at the mine site would typically include petroleum products for vehicles and equipment, mill reagents for ore processing activities, assay laboratory chemicals, and other domestic and industrial products in smaller quantities (e.g., propane, batteries, fluorescent lights, and antifreeze). These materials will be identified through a review of all resources used during construction and operations phases (e.g., mining, processing, maintenance, shipping/receiving, purchasing, contractors) in the context of relevant legislation.

12.2.1.18.4.12.5.2 Classification and Labelling

Hazardous materials and wastes are classified and labelled according to both WHMIS and TDG legislative requirements. Care will be taken to ensure all secondary containment is labelled correctly. The classification and labelling of products under WHMIS and TDG is similar but not identical.

Under WHMIS, there are six classes of hazardous materials (letter-designated 'a' through 'f'), with some of the classes further broken down into divisions and subdivisions. The six classes are:

- Compressed Gases;
- Flammable and Combustible Materials;
- Oxidizing Materials;
- Poisonous and Infectious Materials;
- Corrosive Materials; and
- Dangerously Reactive Materials.

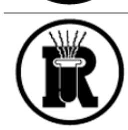
Under TDG, there are nine classes of hazardous materials (number-designated 1 through 9), with some of the classes further broken down into divisions and subdivisions. The nine classes include the following:

- Explosives;
- Gases;
- Flammable and Combustible Liquids;
- Flammable Solids;
- Oxidizing Substances;
- Poisonous (Toxic) and Infectious Substances;
- Radioactive Materials;
- Corrosive Materials; and
- Miscellaneous Products or Substances.

Each class of hazardous material is associated with at least one symbol, and potentially multiple symbols, depending on the number of divisions and subdivisions under the class. There are eight hazard symbols under WHMIS, and 25 hazard symbols under TDG regulations. **Table 12.2.1-41** shows the eight WHMIS symbols, with respective names, classes, and examples.

One or more symbols are attached to the material's storage container or transport vehicle to provide a quick means of communicating all of the possible hazards associated with the material. Hazardous material storage containers will have proper WHMIS-compliant supplier labels as required.

Table 12.2.1-41: WHMIS Symbols for Each Material Class

Symbol	Class and Name	Examples
	Class A: Compressed Gas	Compressed air, aerosols, nitrogen, carbon dioxide, propane, chlorine, hydrogen
	Class B: Flammable and Combustible Material	Propane, butane, acetylene, ethanol, acetone, turpentine, toluene, kerosene, Stoddard solvent, spray paints and varnish
	Class C: Oxidizing Material	Oxygen gas, hydrogen peroxide, bleach
	Class D-1: Materials Causing Immediate and Serious Toxic Effects	Hydrogen sulphide, strychnine, cyanide, nerve gas
	Class D-2: Materials Causing Other Toxic Effects	Asbestos fibres, mercury, ammonia
	Class D-3: Biohazardous Infectious Materials	Materials contaminated with bacteria or viruses (AIDS, hepatitis, salmonella, West Nile virus, SARS)
	Class E: Corrosive Materials	Acids, caustic soda
	Class F: Dangerously Reactive Materials	Fibreglass repair kits, epoxy resins

12.2.1.18.4.12.5.3 Training and Awareness

The Proponent will develop a training program for the handling of hazardous materials and hazardous waste. The requirement for training for hazardous waste is included in the IDWMP. All relevant personnel will be trained on proper hazardous materials management practices. The training program will include WHMIS and other BMPs as described in the IDWMP. Records of all personnel who have completed training will be maintained.

Employees (e.g., warehouse staff) who receive, offload, and store hazardous materials or who are involved in storing and shipping hazardous wastes off site will receive hazardous materials and hazardous waste training before they begin employment. Training will be reviewed annually.

TDG training will ensure that relevant employees know how to package, label and ship hazardous wastes including proper record keeping and manifesting. Training under the *HWR* will cover:

- The employed person's duties and responsibilities;
- Use of personnel protective equipment;
- Fire and explosion response procedures;
- Spill response procedures;
- Communications and alarm systems;
- Use of abatement and clean up equipment;
- Shut down operations; and
- Hazards of all hazardous waste managed at the facility.

The PMT and mine manager will have access to records of:

- All persons employed in the operations of the mine and their duties and responsibilities;
- A description of the level of training received by each person so employed; and
- The date of the last training session for each person so employed.

12.2.1.18.4.12.5.4 Hazardous Materials Inventory

BMPs require an accurate and detailed inventory of all hazardous materials and dangerous goods. The inventory will include all chemicals and raw materials on site, including chemicals brought on site by contractors.

Table 12.2.1-42 is an example of an inventory form that would be generated and provided prior to construction.

The HMMP will include a list of anticipated consumption rates for selected hazardous substances prior to construction. An example of selected hazardous substances could include those shown in **Table 12.2.1-43**.

Table 12.2.1-42: Hazardous Substances Inventory for Construction and Operations Phases

Substance	Use	Delivery Form, Typical Volume in Site Storage	Storage Vessels
Acetic Acid			
Ammonium Nitrate			
Automotive Grease			
Cyanide			
Diesel Fuel			
Ethylene Glycol			
Hydrochloric Acid			
Hydrofluoric Acid			
Jet Fuel			
Motor Oil/Hydraulic Oil/ Transmission Fluid			
Nitric Acid			
Slaked Lime			
Sodium Hydroxide			
Sodium Nitrite			
Unleaded Gasoline			
Varsol			

Table 12.2.1-43: Anticipated Consumption of Selected Hazardous Substances

Material	Area of Use	Consumption (estimate only)
Acetic Acid		
Ammonium Nitrate		
Automotive Grease		
Cyanide		
Diesel Fuel		
Ethylene Glycol		
Hydrochloric Acid		
Hydrofluoric Acid		
Jet Fuel		
Motor Oil/Hydraulic Oil/ Transmission Fluid		
Nitric Acid		
Slaked Lime		
Sodium Hydroxide		
Sodium Nitrite		
Unleaded Gasoline		
Varsol		

12.2.1.18.4.12.5.5 Handling and Use

Each hazardous material will be handled and used in accordance with information found in its respective MSDS. An MSDS is a comprehensive and concise source of health and safety information for workers and emergency personnel. Information in an MSDS is typically categorized as shown in **Table 12.2.1-44**.

Table 12.2.1-44: MSDS Information

Identification of the Material	Accidental Release Measures	Composition/Ingredients
Hazard information	First aid measures	Firefighting measures
Contact information	Handling and storage	Exposure controls
PPE	Ecological information	Stability and reactivity
Toxicological information	Physical and chemical properties	Disposal considerations
Transport information	Regulatory information	Other information

Note: MSDS = Material Safety Data Sheet; PPE = Personal Protective Equipment

Catalogues of all area-relevant MSDSs will be maintained in appropriate areas from the start of construction through all operational phases of the Project. These catalogues will be reviewed regularly and updated as necessary whenever a new hazardous material is scheduled for delivery to site. Relevant MSDS information will be available at various locations, such as all petroleum dispensing stations and the maintenance shop as well as through designated online database.

12.2.1.18.4.12.5.6 Storage and Disposal

A warehouse or storage facility will provide temporary control for mining and processing chemicals, and materials that require special management due to their hazardous nature. Storage of diesel and petroleum products will be required to meet the *Petroleum Storage and Distribution Facilities Storm Water Regulation* if tanks exceed 100,000 L.

Each hazardous material will be stored in a container appropriate for its WHMIS hazard classification, and in accordance with any other information contained in its respective MSDS. If secondary containment is required, WHMIS labelling requirements will still apply unless the secondary container is completely clean after use.

Disposal of hazardous waste will be managed in accordance with BC *Hazardous Waste Regulation*. (Management of hazardous waste is described in the IDWMP. Disposal quantities will be minimized to the fullest extent possible.

12.2.1.18.4.12.5.7 Inspection Program

An inspection program will be implemented to ensure that all hazardous materials and wastes are being managed according to regulatory requirements and measures detailed in this plan. All inspections will be logged with the date and time of inspection, facility inspected, and the name and title of the person making the inspection. **Table 12.2.1-45** presents potential inspection procedures to be used for fuel containment facilities.

Table 12.2.1-45: Inspection Procedures for Petroleum Storage Sites

Petroleum Storage Site	Inspection Procedure
Fuel Tanks	• Examine all tanks, pipelines, and connections for evidence of leaks and proper fitting • Examine diked area for evidence of leaks • Examine fill records • Inspect quantity gauges and meters • Inspect oil water separator sump for proper operation • Check drip tray levels and any evidence of leakage • Complete and file inspection report with management responsible for facility
Diesel Gensets	• Examine holding tank, pipelines, and connections for evidence of leaks • Examine fill records • Determine volume of contents and check against records • Complete and file inspection report with the General Manager
Other Fuelling Stations	• Examine all tanks, pipelines, and connections for evidence of leaks and proper fitting • Examine diked area for evidence of leaks • Examine fill and dispensing records • Inspect quantity gauges and meters • Inspect oil water separator sump for proper operation • Complete and file inspection report with the General Manager

12.2.1.18.4.12.5.8 Safe Handling Procedures

Table 12.2.1-46 presents safe handling procedures for hazardous materials and petroleum products likely to be used at the mine.

12.2.1.18.4.12.5.9 Environmental Protection Measures

Hazardous materials management encompasses the implementation of proper identification, transportation, storage, use, and ultimate disposal of all potentially hazardous materials. The safety of workers and the public and the protection of the environment will be taken into account for all stages of materials handling. **Table 12.2.1-47** summarizes the mitigation measures to ensure effective management of hazardous materials and petroleum products.

Table 12.2.1-46: Summary of Safe Handling Procedures for Hazardous Products

Product	Handling Procedures
Diesel	• Do not get in eyes, on skin, or on clothing • Avoid breathing vapours, mist, or fumes • Do not swallow • Wear protective equipment and/or garments if exposure conditions warrant • Wash thoroughly after handling • Launder contaminated clothing before reuse • Use in areas with adequate ventilation • Keep away from heat, sparks, or flames • Store in a closed container in a well-ventilated area • Bond and ground during transfer
Ammonium Nitrate	• Wear protective clothing and impervious gloves • Do not eat, drink, or smoke while handling • Keep away from combustible or reducing agents • Prevent dispersion of dust
Sodium Nitrite	• Wear protective clothing, impervious gloves, and eye protection • Store in a cool, dry location away from combustible and oxidizable materials
Ethylene Glycol	• Use adequate ventilation • Wear protective gloves, and chemical safety goggles if there is a possibility of eye contact • Keep in tightly closed container • Store in a cool, dry, ventilated area • Separate from acids and oxidizing materials • Take care when handling empty containers; containers of this product may be hazardous when empty, as they retain product residues (vapours and liquids)
NaCN	• See Cyanide Management Plan (**Section 12.2.1.18.4.19**) • Delivery in ISOtainers by certified carriers and handled in a controlled area by trained employees • CN handling areas in the process plant will have HCN gas detectors and antidotes for CN poisoning • All Mine Health and Safety procedures for safe CN handling will be strictly adhered to

Product	Handling Procedures
Ferric sulphate (Coagulant)	• Use adequate ventilation; avoid breathing dust or use dust respirator in confined area • Use rubber gloves to handle liquid; wear chemical goggles if splash risk • Store protected from weather
Copper sulphate	• Use adequate ventilation; avoid breathing dust or use dust respirator in confined area • Eye wash stations available in work areas • Wash outside of gloves before removing • Wear PPE to protect clothing
Acetic Acid	• Keep away from sources of ignition. Do not smoke while handling. Wear protective equipment, chemical resistant gloves, and eye protection while handling
Nitric Acid	• Store in a cool place away from heated areas, sparks, or flame. Store in a well-ventilated area. Store away from incompatible materials. Do not add any other material to the container. Do not wash down the drain. Do not breathe gas, fumes, vapour, or spray • In case of insufficient ventilation, wear suitable respiratory equipment. Keep away from direct sunlight or strong incandescent light • Keep container tightly closed and dry. Manipulate under an adequate fume hood. Avoid contact with combustible materials (e.g., wood, paper, oil, or clothing). Empty containers may contain hazardous residue. Handle and open container with care. Immediately remove all contaminated clothing • This product must only be used by qualified personnel. Do not get in eyes, on skin, or on clothing. Wash well after use. Do not allow smoking and food consumption while handling. In case of accident or if you feel unwell, seek medical advice immediately (show the label when possible.). Do not allow water to get inside container to avoid violent reaction. May catch fire in contact with combustible materials. May develop pressure; vent periodically
Hydrochloric Acid	• Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage • Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes • When diluting, the acid will always be added slowly to water and in small amounts • Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing • When opening metal containers, use non-sparking tools, as there is a possibility of hydrogen gas being present. Containers of this material may be hazardous when empty, as they retain product residues (vapours, liquid); observe all warnings and precautions listed for the product
Hydrofluoric Acid	• Keep in tightly closed polyethylene containers. Store in a cool, dry place with adequate ventilation, separated from other chemicals. Protect from physical damage • Storage facilities should be constructed for containment and neutralization of spills. Handling and storage of hydrofluoric acid requires special materials and technology, including containers, pipes, valves, which are available from suppliers. Containers of this material may be hazardous when empty, as they retain product residues (vapours, liquid); observe all warnings and precautions listed for the product • Small quantities for lab use only. PPE required at all times

Product	Handling Procedures
Sodium Hydroxide (Caustic Soda)	• Store in a dry place indoors. Keep containers closed and correctly labelled when not in use • Wash thoroughly after handling. When handling, wear safety goggles and face shield, rubber gloves, rubber boots, rubber apron, polyvinyl chloride (PVC) clothing, and plastic hard hat. Wear NIOSH/MSHA-approved dust-type respirator wherever dust or mists may be generated. Never touch eyes or face with hands or gloves that may be contaminated with caustic soda
Sodium metabisulphite	• Wear PPE to handle: chemically resistant elbow-length gloves, coveralls; wash PPE after use • Stored in cool, dry, well-ventilated place • Keep containers tightly closed • Store away from oxidizers and acids
Sulphur	• Wear protective clothing when handling • Store in a well-ventilated area; avoid breathing dust, or wear a dust respirator
Anhydrous borax (flux)	• Not a hazardous substance under TDGA • No special handling precautions • Store indoors, dry • Use good housekeeping to minimize dust generation
Potassium nitrate (flux)	• Store in a cool dry area • keep away from combustible materials, acids, alkalies, reducing agents, heat • avoid ignition • Store in a well-ventilated area or wear suitable respirator if in a confined area • Keep containers tightly closed
Slaked Lime	• Wear clean, dry gloves, full-length pants over boots, a long-sleeved shirt buttoned at the neck, head protection, and approved eye protection. After handling lime, employees must shower • If exposed daily, use barrier cream (Vaseline, silicone-based, or similar), to protect exposed skin, particularly neck, face, and wrists. Store in a well-ventilated place
Jet Fuel	• Avoid skin contact. Launder contaminated clothing before reuse • Store in a flammable liquids area. Store away from heat, ignition sources, or open flame
Motor Oil/Hydraulic Oil/Transmission Fluid	• Wear protective clothing and impervious gloves when working with oils or transmission fluids • Keep containers closed until ready for use

Product	Handling Procedures
Unleaded Gasoline	• Avoid skin contact • Avoid breathing vapour, mist, or fumes • Launder contaminated clothing before reuse • Store in a flammable liquids area away from heat, ignition sources, or open flame • Bond and ground during transfer
Varsol	• Avoid eye contact • Use with adequate ventilation • Wash thoroughly after handling • Handle with care as empty containers retain residue • Follow label instructions • Avoid repeated skin contact • Store in cool, ventilated area, away from ignition sources or incompatible materials • Keep container tightly closed • Avoid breathing vapour, mist, or fumes
Automotive Grease	• Avoid prolonged or repeated contact with skin • Remove contaminated clothing; launder or dry-clean before reuse • Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period

Note: NIOSH = National Institute for Occupational Safety; MSHA = Mine Safety and Health Administration

Table 12.2.1-47: Hazardous Materials Management

Topic/Activity	Mitigation Measures
Transportation	• Transportation of hazardous materials and hazardous wastes will adhere to all applicable regulatory requirements, including but not limited to Transportation of Dangerous Goods Regulation • Equipment and containers that are capable of safely transporting hazardous materials will be in compliance with Section 7.33.1 of the federal Transportation of Dangerous Goods Regulations for bulk containers, and Sections 7.21 and 7.23 for materials in packages or small containers • Trucks carrying material that may spill onto the roadway during transport will be covered and restraints used to prevent material from escaping the load • All materials and litter deposited on roadways by vehicles from construction-related activities will be collected and disposed of according to BMPs • As practical, hazardous material shipment routes and loads will be optimized to reduce the length and number of trips • Chemicals will be trucked in closed containers, all hazardous goods will be manifested, and the trucks and their containers will be labelled and placarded to Transportation of Dangerous Goods Regulation standards • Containers appropriate for the material will be used, ensuring: that they are labelled to communicate the hazard the material represents; compatibility between container material and the hazardous material; that only containers in good condition are used; that no incompatible materials are stored in the same container • Vehicles appropriate for the containers will be used, ensuring that they are labelled to communicate the hazard the material represents, and that non-compatible materials are transported by separate shipment • Vehicles and transportation plans will be designed to minimize the chance of a potential spill (e.g., by ensuring containers are properly secured, and that there is sufficient space between containers in the vehicle to allow safe access and handling of containers) • Vehicles and transportation plans will be designed to minimize the effect of a potential spill, should one occur (e.g., by keeping all equipment necessary to clean and mitigate spills, including fire prevention equipment, in or near the vehicle, and by implementing a no-smoking policy) • The Proponent will ensure that proper training, inspections, and record-keeping procedures are followed for transportation plans (e.g., by ensuring that: manifests are maintained according to BC regulations; driver teams are adequately trained and equipped for spill first response, containment and communication; materials and wastes are transported by a licensed hauler; and periodic inspections are conducted to ensure that transport performance complies with appropriate regulations and company policies) • Planning of timing and routes of hauls will consider the following safety and environmental factors: - weather conditions - road conditions and congestion - identified restricted activity periods - availability of appropriate transportation equipment and personnel • Transportation vehicles will be equipped with spill kits of appropriate size and contents. Vehicle operators will be trained in haul road safety and spill response
Storage and Inventory Control	• All major equipment and materials storage and servicing areas will be clearly identified on the construction drawings • Hazardous materials will be segregated and stored using accepted management practices, including but not limited to: - controlling access

Topic/Activity	Mitigation Measures
	- situating away from environmentally sensitive areas - situating away from ignition sources - equipping with spill kits - meeting regulatory requirements for design and operation - protecting from the elements - organizing to ensure proper segregation of incompatible materials, e.g., basic and acidic materials will not be stored in the same container, and will be stored safely and sufficiently far apart to prevent accidents - designing fire prevention systems appropriate and adequate for the materials being stored - properly labelling, marking, placarding, and securing drums, containers, and storage area(s) - allowing sufficient storage space between containers for safe access and handling of containers - designing facilities and measures to contain spills and prevent contamination of the environment, particularly soil and groundwater. For example, floors, curbing, walls, and roofs will be designed to adequately contain spills and to protect the storage area(s) from weather where necessary. Containers or liner materials will be compatible with the waste being stored • Inventory control of hazardous materials (both those stored and in use) will be maintained • Non-hazardous materials will be used in lieu of hazardous materials wherever possible • Product inventories will be kept to a workable minimum to prevent expiration of dated products (shelf life) and the generation of wastes
Housekeeping	• Housekeeping measures will include: - storing hazardous materials neatly and properly - maintaining clear work areas and walkways - ensuring the minimum accumulation of hazardous materials - conducting housekeeping inspections
Security	• Where practical, the following security measures will be put in place to prevent unauthorized access to hazardous materials storage area(s), vehicles, and equipment: - conducting routine checks by Construction Contractor and environmental personnel - installing fencing - installing proper lighting - controlling general site access at main entrances - controlling vehicular traffic
Inspections and Preventive Maintenance	• An MSDS and WHMIS system will be used to screen and classify waste streams
	• Inspecting of site storage facilities

Topic/Activity	Mitigation Measures
	• Inspecting mine and mill facilities for proper segregation, storage, and disposal practices • Inspecting spill kits and protective equipment (and reordering /replacing as necessary) • Periodically reviewing transportation procedures (including procedures, training, equipment, spill kits, records, and employee awareness) • Reviewing inspection findings with operations, transporters, and off-site contractors to correct deficiencies, maintain awareness and communication, and recognize negative or positive performance
Record-Keeping and Reporting	• Reports for on- and off-site spills will be completed, reviewed with operations, and tracked • All hazardous materials transported to the site, used and/or stored at the site, or transported away from the site as waste will be tracked, quantified, and recorded through a manifest system. Selected components of the record-keeping and reporting system will include • Documenting all employee training • Periodically analyzing all waste streams (dependent upon volume and risk) to ensure compliance • Documenting on- and off-site disposal, tracking waste types, volumes, methods of disposal, and locations • Documenting any on- or off-site spills; the BC Spill Reporting Regulation will be complied with as required

12.2.1.18.4.12.5.10 Ammonium Nitrate and Fuel Oil

Ammonium nitrate and fuel oil (ANFO) will be the main explosive used for mining at the site, and is a mixture of ammonium nitrate (AN) and fuel oil (FO). ANFO is approximately 94.3% AN and 5.7% FO by weight. The basic chemistry of ANFO detonation is the reaction of AN with the long-chain hydrocarbons in FO to form nitrogen, CO_2, and water (as well as some CO and nitrogen oxides (NOx), if detonation conditions are suboptimal). Under most conditions, ANFO is cap-insensitive, and thus is classified as a blasting agent and not a high explosive. ANFO decomposes through detonation rather than deflagration. It is a tertiary explosive, consisting of distinct fuel and oxidizer phases, and requires confinement for efficient detonation and brisance. Because it is cap-insensitive, it generally requires a primer, also known as a booster (e.g., historically, one or two sticks of dynamite; more recently, Tovex or cast boosters of pentolite) to ensure continuation of the detonation wave-train. It requires confinement (placement in boreholes) for efficient detonation and brisance (shattering capability).

12.2.1.18.4.12.6 Material-Specific Mitigation Measures

Minimizing the risk of safety infractions and/or environmental damage from accidental releases of hazardous materials includes the following practices for handling explosives and other project-specific hazardous materials (**Table 12.2.1-48**).

Table 12.2.1-48: Explosive Material-Specific Mitigation Measures

Topic/Activity	Mitigation Measures
Explosive Materials Mitigation Measures	
ANFO	• An explosives supplier will be contracted to provide a down-the-hole blasting service • The supplier will provide AN, emulsifier, aluminum powder, explosives magazines, mixing equipment, and delivery trucks; the mine operator will provide FO • The supplier will mix AN with FO at the on-site explosives manufacturing and storage facility • Use of explosives on the mine site will be in compliance with Part 8 of the Health, Safety and Reclamation Code for Mines in BC, 2008: - Mine employees will charge the holes, place the detonators and boosters, and tie in the patterns; all explosives will only be employed at safe distances from facilities or personnel - Perimeter fences and security lights will surround the explosives manufacturing and storage facility - Access to the explosives manufacturing and storage facility will be restricted to authorized personnel only, and log books will be kept in each magazine for tracking purposes - All explosives will be transported to site by dedicated trucks - The blasters' vehicles will be kept tidy, with any empty packaging disposed of appropriately - Explosives storage in vehicles will not be allowed - Daily use of ANFO (and other explosives) will be recorded and stored in a document control system - Access and use of explosives will be under the exclusive control of the mine drill/blast foreman and the explosives contractor - The blasting superintendent will be responsible for inspecting all explosives facilities, including storage areas, the magazine for high explosive detonators and blasting caps, and the explosives manufacturing and storage facility - Explosives identified as deteriorated or damaged will be destroyed; the supplier will be consulted on the appropriate handling and disposal - Only qualified personnel holding valid blasting certificates will handle these materials - At mine closure, all unused explosives will be removed from site, or safely burned or detonated if the quantities are small - Appropriate Explosives Permits will be obtained under the Explosives Act
AN	• AN will be delivered to site in a prill truck or in heavy-duty tote-bags • AN will be stored in a designated location within the explosives storage area, away from the explosive caps/detonator storage magazines • AN will be handled and managed by the explosives contractor, who will be qualified and trained in safe handling procedures and all applicable legislation and regulations • Personnel exposed to AN will wear suitable PPE • Mine personnel involved in explosives spill response will have explosives training • Spills will be swept up and placed in suitable containers for use or disposal. All spills will be reported to a spill response coordinator • The mine will record all daily use of AN. Records will be checked and reconciled on a daily basis

Topic/Activity	Mitigation Measures
Detonators and blasting caps	• Detonators and blasting caps are required for proper detonation of ANFO • They will be located in separate magazines. Magazines will be designed to Type 4 magazine standards • Magazines will be separated by barriers that meet the “donor-receiver” conditions of safe storage • Features of Type 4 magazines are: - Steel exterior shell - Walls and floors covered with 20 millimetre (mm) plywood, fastened with counter-sunk non-sparking fasteners - Interiors marked with stacking limit lines - Access by a laminated door with high security locking hardware • The magazines will be dedicated to storing high energy explosives and blasting caps • Explosives stored in magazines will be clearly labelled • Inventory will be used on a first-in, first-out basis, to ensure quality control and prevent degradation due to cold weather storage • Explosives will be transported to site by vendor/supplier • Explosives magazines will be electronically monitored and checked daily
Specific Mitigation Measures for non-explosive materials	
Petroleum Products (Fuel Oil)	• Fuel oil (or diesel fuel) storage and handling procedures will be detailed in a Fuel Management Plan • Fuel oil is the fuel component of the ANFO explosive, and is used as fuel for mine vehicles and equipment • Storage tanks will be sited within a high-density polyethylene (HDPE)-lined and bermed tank farm
Mill Reagents	• Hazardous substances used for, or resulting from, the recovery of gold (e.g., cyanide, cyanidation mill tailings, and leach solutions) will comply with all regulatory requirements governing safe management. The Project will implement a Cyanide Management Plan (Section 12.2.1.18.4.19), that will be applied in conjunction with the HMMP and associated plans to ensure safe management of these and all related substances. A core component of the CMP is adopting the principles of the International Cyanide Management Code.
Assay Laboratory Chemicals	• Hazardous chemicals will be used in the assay laboratory as part of assay and testing. Storage and transport of these chemicals will meet all regulatory requirements • A specific Spill Response Plan for the laboratory will be developed prior to use • Cupels, crucibles and rejects will be processed through the mill via the coarse ore stockpile (COS). Lead fume/filter cannisters from the fire assay baghouse will be the only lead product produced. Waste lead will be treated as hazardous waste and stored and transported appropriately.
Liquid Effluent	• Liquid effluent will be disposed of in accordance with the Liquid Discharges Management Plan

12.2.1.18.4.13 Emergency and Spill Preparedness and Response Plan

12.2.1.18.4.13.1 Introduction

The ESPRP is intended to provide a conceptual framework for emergency response for the Project. The ESPRP provides a policy level overview that will be further expanded and refined as engineering design and permitting progress. It will be updated into a fully developed ESPRP before construction starts with particular emphasis on potential emergencies and spills relevant to construction activities. It will also be reviewed and updated prior to operations and closure to reflect risks relevant to those Project phases.

Contractors will be required to have their own ESPRP or to adhere to the Project ESPRP. Where contractors have their own ESPRP it will be consistent with the objectives and elements of the Project ESPRP.

The ESPRP flows from the corporate HSES policy, commitments, goals and objectives, and details the protocol for communication in the event of an emergency. Implementation of the ESPRP requires resources and training from the Proponent and from contractors during the construction phase.

12.2.1.18.4.13.2 Purpose and Scope

The fully developed ESPRP will encompass the objectives of the Mine Emergency Response Plan (MERP) (BC Ministry of Energy, Mines and Natural Gas (BC MEMNG), 2013) as required by the Health, Safety and Reclamation Code for Mines in British Columbia (HSRC) (BC Ministry of Energy, Mines and Petroleum Resources (BC MEMPR), 2008). The ESPRP will provide guidance for responding to all types of mine emergencies, and will identify roles and responsibilities in discovery of and response to emergencies. The ESPRP will include development of the component plans Mine Rescue Emergency Response Plan, Crisis Management Plan, and ESPRP.

12.2.1.18.4.13.3 Objectives

The objectives of the ESPRP are to:

- Protect employee and contractor health and safety;
- Minimize environmental impact of an event;
- Ensure compliance with all legal and other requirements;
- Ensure spill and incident clean-up is timely and effective;
- Ensure all parties are aware of their responsibilities; and
- Ensure human and equipment resources are available and that training is sufficient and appropriate.

12.2.1.18.4.13.4 Linked Environmental Management Plans

Some of the emergency concerns addressed in the ESPRP are also addressed in the following EMPs:

- OHSMP (**Section 12.2.1.18.4.15**);
- IDWMP (**Section 12.2.1.18.4.11**); and
- HMMP (**Section 12.2.1.18.4.12**).

12.2.1.18.4.13.5 Emergency Response Overview

An emergency is a situation that affects the environment, or the health, safety, or welfare of employees, contractors, Aboriginal Groups or the community, or the Project property, and whose magnitude requires a controlled and coordinated response. Many factors influence the intensity or complexity of an emergency.

An emergency response plan sets out the basic mechanisms, organizational structures, responsibilities, and procedures to guide staff in responding to emergencies. For the plan to be effective, all employees and contractors must be made aware of its provisions and their responsibilities under the plan.

12.2.1.18.4.13.6 Regulatory Requirements

12.2.1.18.4.13.6.1 Mine Health and Safety

The *Mines Act* (Government of BC, 1996c) and the Health, Safety and Reclamation Code (BC MEM, 2008)) regulate and mandate certain components of emergency preparedness. Relevant aspects are included in Mine Health and Safety Regulatory Framework.

12.2.1.18.4.13.7 Spill Prevention and Response

12.2.1.18.4.13.7.1 Canadian Environmental Protection Act, 1999 – Environmental Emergency Regulation

The *Canadian Environmental Protection Act, 1999 Environmental Emergency Regulation* describes quantities of materials that trigger requirements for creation and submittal of a material-specific Emergency Response Plan to federal agencies if the material is stored on-site on a permanent or semi-permanent basis.

12.2.1.18.4.13.7.2 BC Environmental Management Act – Spill Reporting Regulation

The *Spill Reporting Regulation* (Government of BC, 1990) in the BC *Environmental Management Act* (Government of BC, 2003b) includes spill quantities for numerous materials that must be reported to the province, with details on required content of the report. Details of the spill quantities and report requirements are described below.

12.2.1.18.4.13.7.3 BC Contaminated Sites Regulation

The BC *Contaminated Sites Regulation* (Government of BC, 1996h) includes numerical standards for contaminant concentrations in soil, groundwater, surface water or sediment following a release to the environment. The regulation also provides guidance on remediation requirements and risk assessment.

12.2.1.18.4.13.7.4 Spill Cost Recovery Regulation

The Spill Cost Recovery Regulation (Government of BC, 1998) under the BC *EMA* describes the fees that may be recovered from any party that engages provincial resources in spill response activities.

12.2.1.18.4.13.7.5 Transportation of Dangerous Goods Act – Transportation of Dangerous Goods Regulation

The *Transport of Dangerous Goods Act* (BC *TDG Act*) (Government of BC, 1996m), includes the *Transport of Dangerous Goods Regulation* (Government of BC, 1985). The BC *TDG Act* describes the required classification system for potentially hazardous materials, as well as safe transportation and handling procedures. The federal *Transportation of Dangerous Goods Act* (federal *TDG Act*) (Government of Canada, 1992) includes description of the training requirements for persons handling or transporting dangerous goods in Canada. The federal *TDG Act* includes the Transportation of Dangerous Goods Regulation (federal *TDGR*) (Government of Canada, 2001).

12.2.1.18.4.13.8 Other Guidance

12.2.1.18.4.13.8.1 Environmental Code of Practice for Metals Mines

The Environmental Code of Practice for Metal Mines (Environment Canada, 2009) is not a regulation but rather a guidance document that recommends environmental protection practices for the mine life cycle. The Code recommends that site-specific environmental emergency plans should be developed and implemented, then tested and updated on a regular basis. Elements of emergency planning should be consistent with recognized guidance documents such as APPELL for Mining: Guidance for the Mining Industry in Raising Awareness and Preparedness for Emergencies at Local Level.

12.2.1.18.4.13.8.2 APPELL (2001)

The APPELL for Mining Handbook provides a framework for the preparation of an Emergency Response Plan and encompasses ten steps:

- Identify the emergency response participants and establish their roles, resources and concerns;
- Evaluate the risks and hazards that may result in emergency situations in the community and define options for risk reduction;

- Have participants review their own emergency plan for adequacy relative to a coordinated response, including the adequacy of communication plans;
- Identify the required response tasks not covered by the existing plans;
- Match these tasks to the resources available from the identified participants;
- Make the changes necessary to improve existing plans, integrate them into an overall emergency response and communication plan and gain agreement;
- Commit the integrated plan to writing and obtain approvals from local governments;
- Communicate the integrated plan to participating groups and ensure that all emergency responders are trained;
- Establish procedures for periodic testing, review and updating of the plan; and
- Communicate the integrated plan to the general community.

The Proponent intends to integrate the emergency response guidance from the Environmental Code of Practice and APPELL into the final ESPRP for the Project.

12.2.1.18.4.13.9 Policy Directive

A clear and concise site policy directive will be issued that spells out management's support for the emergency plan, long-range goals and purpose for the plan, appointment of the planning committee, budget and incentives for the program, and involvement of all employees in training programs. The Policy directive will be based on the Proponent's corporate 15 guiding principles, which state:

- 14.1 Systems are in place to identify potential emergency situations and their impacts, including those associated with neighbouring activities;
- 14.3 Emergency Response Plans are aligned with site and corporate office Crisis Management Plans, the company business requirements, and external response organizations, taking into account their response capabilities; and
- 14.5 Emergency response and crisis management drills and exercises are scheduled and conducted regularly, including liaison with and involvement of external response organizations and other stakeholders as appropriate.

The Proponent has also developed an Incident and Crisis Management corporate standard. The purpose of the standard is to ensure that environment-related incidents are consistently reported, investigated and corrective actions assigned to ensure the risk of recurrence is minimized. This standard ensures that an ESPRP is maintained and exercises are regularly performed and documented.

In particular, the Proponent's corporate office will:

- Establish and maintain a hazard and incident reporting system that ensures that significant incidents are communicated to the executive in a timely manner;

- Maintain a register of Emergency Response Plans associated with significant risks at each site; and
- Maintain and annually review the corporate Crisis Management Plan.

The Proponent's mine sites will:

- Encourage reporting of environmental hazards and incidents;
- Maintain an investigation process which identifies causal factors and corrective actions;
- Track corrective actions to closure and retain verification evidence;
- Maintain Emergency Preparedness and Response Plans for identified significant risks and perform an environment related test annually; and
- Support the Crisis Management Plan at site level and take part in simulation exercises.

12.2.1.18.4.13.10 Responsibilities

12.2.1.18.4.13.10.1 Emergency Response

This section summarizes responsibilities for Emergency Response during operations. These will be adapted for the organizational structure for the construction phase and described in the final Construction Environmental Management Plan.

Responsibilities specific to spill response are further described in Responsibilities for Spill Response Plan (**Section 12.2.1.18.4.13.16**).

12.2.1.18.4.13.10.1.1 Mine Manager

- Provide resources and support for the implementation of this plan;
- Coordinate management in the event of a crisis;
- Act as contact point for Ministry representatives; and
- Coordinate external notifications in the event of a crisis.

12.2.1.18.4.13.10.1.2 Dispatch/Security Control

- Provide notification to staff in the event of an emergency; and
- Coordinate site access during an emergency.

12.2.1.18.4.13.10.1.3 Mine Rescue Team

- Act under the instruction of the Mine Rescue Chief; and
- Carry out activities as required during an emergency.

12.2.1.18.4.13.10.1.4 Safety Department

- Review and update Emergency Response Procedure as required.

12.2.1.18.4.13.10.1.5 All Employees

- Understand how and when to call in a Code One emergency; and
- Muster and provide support as needed in an emergency.

12.2.1.18.4.13.10.2 Spill Response

12.2.1.18.4.13.10.2.1 Mine Manager

- Provide support and resources for the implementation of this plan.

12.2.1.18.4.13.10.2.2 Department Managers

- Ensure potential for spills are minimized in their respective areas;
- Provide resources for correct chemical storage in their areas;
- Perform incident analysis if required; and
- Ensure spill kits within their area of control are monitored and restocked after use.

12.2.1.18.4.13.10.2.3 Mine Rescue Team

- If required, control spill and make area safe for clean-up. If the team has appropriate HAZMAT training.

12.2.1.18.4.13.10.2.4 Environmental Department

- Ensure appropriate response to spill, considering substance properties and environmental receptors;
- Determine if additional resources are required and coordinate clean-up on spill;
- Carry out any testing required to determine if clean-up was effective;
- Communicate spill to regulatory bodies if required;
- Coordinate incident analysis if required;
- Review and update Emergency Response Plan if required; and
- Provide training for adequate spill response.

12.2.1.18.4.13.10.2.5 All Employees

- Understand how and when to call in a Code One emergency;
- Carry out spill response as required by this plan; and
- Complete internal reporting and follow up actions as required by the incident.

12.2.1.18.4.13.11 Phases of Mine Development

12.2.1.18.4.13.11.1 Construction Phase

Between 800 and 1,400 (peak) personnel will be housed in a camp on site for two years during construction of the mine and processing facility. Many sub-contractors will be operating on-site during construction, and specific procedures will be developed to ensure that appropriate emergency planning and safety precautions are adhered to.

12.2.1.18.4.13.11.2 Operations Phase

An operations camp will provide accommodation for up to 500 personnel during operations. The anticipated life-of-mine (LOM) is 17 years. Transport and handling of chemical reagents and the operation of the processing facility represent the primary differences between the operations phase and other phases with respect to emergency response.

12.2.1.18.4.13.11.3 Decommissioning/Closure Phase

Site conditions will be restored during the decommissioning/closure phase. The number of employees on-site and the support services available will be reduced dramatically. A revision of the ESPRP will be required when active mining operations are completed.

12.2.1.18.4.13.12 Management for Emergency Preparedness

The following emergency preparedness components incorporate the mine health and safety regulatory framework described in *Emergency Response Team* section.

12.2.1.18.4.13.12.1 Mine Rescue

A mine rescue emergency response plan will be developed and filed with the Chief Inspector for Mines. The Mine Manager will ensure that there is a fully trained mine rescue team. A mine rescue team will have a normal compliment of six workers, including a team captain, vice-captain, coordinator, and qualified trainer. The team will keep a training logbook on-site. Training will include mine rescue, as well as hazardous materials handling, firefighting, crisis management, and incident command training. This team will form the core of the Emergency Response Team, responsible for rescue and firefighting duties in the event of an emergency.

12.2.1.18.4.13.12.2 Firefighting

Firefighting equipment will be provided and maintained at locations throughout the site where fire may endanger life. All vehicles on site will carry first aid kits and fire extinguishers. The BC Fire Code will dictate the level of firefighting equipment required. A water system for fire suppression has been incorporated into the mine design. During construction, there will be an additional reliance on fire extinguishers as in-built fire suppression will not be established. All employees will be trained in the use of a fire extinguisher. Firefighting personnel are part of the mine rescue team described above.

Fire hazard areas may be designated where no means of producing heat or flame will be permitted. Such areas will be clearly marked with warning signs.

12.2.1.18.4.13.12.3 First Aid

Requirements for first aid are set out by the Workers Compensation Board (WCB). A first aid station will be maintained and equipped with a rapid contact system for medical physicians in Vanderhoof and Prince George. An accident and injury procedure will be developed detailing the actions and record keeping required for minor, serious, and major injuries. An effective means of summoning the first aid attendant will be developed. An airstrip (described in the TAMP) will be constructed approximately 15 km north of the mine site. A specific procedure will be developed for summoning either a road ambulance or Provincial Air Ambulance.

Mine rescue personnel as well as other designated personnel on site will be trained as first responders with the ability to perform immediate first aid.

12.2.1.18.4.13.12.4 Evacuation

Safe evacuation procedures for the mine site will be developed and posted in conspicuous places. Each employee will be instructed in the evacuation procedures and be familiar with the emergency escape routes from the mine site. An emergency warning system will be implemented, and tests conducted at regular intervals. Reports of these tests will be retained and reviewed by the occupational health and safety committee.

The Mine Manager will implement a system to account for all personnel including contractors and visitors on the mine site. This would facilitate the early determination of any missing personnel in the event of an emergency. A written copy of this system will be available for inspection.

In a severe emergency (e.g., forest fire), the entire mine site may be evacuated. A specific site evacuation plan will be developed that includes procedures for plant shutdown and other protection measures. Transportation requirements will be included in the plan.

12.2.1.18.4.13.12.5 Site Security

Access to the mine site will be restricted to those with permission from the Mine Manager. A security gate will be located on the access road at the entrance to the mine site.

During an emergency, site security will be responsible for limiting access to the affected area to authorized personnel only. The purpose is to ensure the safety of all response, support, and non-involved personnel. The site security will be under the control of the Mine Manager.

12.2.1.18.4.13.12.6 Public Safety

In the interest of public safety, a number of measures will be undertaken to limit the exposure of the public to active mining operations. This may include installing intersection controls and warning signs along the access corridor cautioning travelers of the active haul route for the mine.

12.2.1.18.4.13.12.7 Emergency Response Partners

A formal aid agreement will be negotiated and signed off by the ER parties.

Emergency response partners include other industrial operations in the area, local communities and larger neighbouring urban centres, and regional health centres. Emergency response partners will be identified for potential engagement in emergency response partnership based on proximity, facilities, and services available. Identification will include review of the Bulkley-Nechako Regional District Emergency Preparedness Program and the Regional District of Fraser-Fort George Emergency Response and Recovery Plan. The Emergency Response and Recovery Plan addresses the specific needs of the approximately 50 communities in the Regional District with respect to major emergencies.

Vanderhoof is the closest populated centre with regional services near the mine site. It is approximately 20 km east of Engen, which is at the north terminus of the FSRs that access the mine from Highway 16. Facilities in Vanderhoof include two secondary public airports and a regional hospital with capacity for medical emergencies. Prince George is the largest neighbouring urban centre and includes the most developed health and transportation facilities serving the region, including an international airport. Vanderhoof and Prince George are respectively 110 km and 160 km north/northeast of the Project in straight-line distance.

A list of emergency contacts will be maintained at the mine site headquarters and at the proponent's office in Vanderhoof. In addition to emergency response partners, the list will include emergency contacts for communities and Aboriginal groups identified in the area, as well as individual residents and other industries that could be affected by an emergency incident occurring at the mine site. Local communities in the region extend from Burns Lake in the west to Prince George in the east.

12.2.1.18.4.13.12.8 Emergency Preparedness

Emergency preparedness includes appropriate steps to prevent crises from occurring, and training developed to ensure that all employees know how to respond to an emergency situation.

An emergency response plan coordinator (or similar) will be responsible for planning, developing, and implementing the emergency response plan. A full Mine Emergency Response Plan will be prepared during the permitting stage of the Project. Risk Management and Hazard Assessment.

A risk-based assessment of potential hazards and incidents will be conducted and include failure modes and potential impacts. This will be used to identify potential significant risks, so that procedures can be developed to mitigate their effects.

At the start of the Project, and at regular intervals thereafter, the emergency response plan coordinator will tour the mine site to determine what eventualities could lead to emergencies. Ultimate responsibility rests with the Mine General Manager. The emergency response coordinator would normally be drawn from the mine rescue team and will be assigned prior to operations.

Means of prevention and protection will be identified, along with specific action items that will reduce risks. Periodically controls will be reviewed to assess effectiveness in mitigating risks. **Table 12.2.1-49** shows the contact information for a number of emergency response partners.

Table 12.2.1-49: Emergency Response Partners

BC MEMNG – First Contacts in Case of an Emergency:	
Mining Operations in region:	
Mount Milligan Fort St. James Office Vancouver Office	 250-996-0066 604-681-9930
Chief Inspector of Mines	250-952-0494
Deputy Chief Inspector of Mines, Health & Safety	250-952-0471
BC MEMNG maintains one mine rescue equipment cache for the province. This cache is located in Kamloops. The Chief Inspector of Mines or the Deputy Chief Inspector of Mines, Health & Safety authorize any loan of equipment from the cache.	
EMBC (formerly PEP)	
Emergency Coordination Centre	1 -800-663-3456
BC MOE – Environmental Emergency Program Enforcement and Environmental Safety Programs Officers:	1-800-663-3456 (via EMBC)
Transportation Safety Board of Canada (Gatineau, Quebec):	1-800-387-3557
RCMP (Emergencies)	911
RCMP (Vanderhoof office)	250-567-2222
RCMP (Fort St. James office)	250-996-8269
BC Air Ambulance	911
BC Ambulance Service (Vanderhoof)	250-567-9039
St. John Ambulance (Prince George)	250-561-1696
Local Hospitals:	
St. John Hospital (Vanderhoof)	250-567-2211
University Hospital of Northern British Columbia (formerly Prince George Regional Hospital)	250-565-2000

Notes: 1. BC = British Columbia; BC MEMNG = British Columbia Ministry of Energy, Mines and Natural Gas; BC MOE = British Columbia Ministry of Environment; EMBC = Emergency Management BC; RCMP = Royal Canadian Mounted Police.
2. This table will be updated to include emergency contacts for communities, Aboriginal groups, individual residents and other industries identified in the Project area as having the potential to incur effect from an emergency incident occurring at the mine site. This table will also be updated to include any other contacts (designated mine site control centre, specialist consultants, etc.) identified through ongoing development of the ESPRP.
3. All information in this table is to be confirmed and updated before implementation of the ESPRP and periodically thereafter.

12.2.1.18.4.13.12.9 Control Centre

A location for a control centre (i.e., the mine administration building) will be established from which all emergency response efforts will be coordinated. The control centre will be staffed with qualified personnel responsible for the mine departments affected by the emergency. The location and telephone number for the control centre will be made known to all employees and contractors and permanently displayed.

12.2.1.18.4.13.12.10 Training and Exercises

To maintain an adequate level of emergency response skills, the mine will develop a regular training schedule that will involve all employees. This will include instruction in basic emergency response, firefighting and spill response. Minor emergencies can be prevented from escalating through good housekeeping procedures, good working practices, and first aid training.

Routine planned drills will be conducted to evaluate whether mine employees and emergency responders have the skills necessary to carry out the emergency response plan.

12.2.1.18.4.13.12.11 Document and Records Management.

Easy access to emergency planning and response information will be afforded through an electronic database (intranet) accessible to all mine employees. Physical copies of these plans will be made available in various locations throughout the mine site.

A process will be established to ensure physical copies are maintained and up to date. Records of training activities and findings will be maintained to ensure “lessons learned” can be implemented.

Basic emergency response information will be provided to all visitors to the mine site as part of the required site orientation.

12.2.1.18.4.13.12.12 Crisis Management Plan

The Crisis Management Plan will be managed as a corporate document and will form as the guide to all actions in the event of an emergency. It will contain site-specific information covering generally the following topics:

- Emergency response policy statement;
- Organizational chart showing chain of command;
- Emergency notification plan;
- Personnel duties and departmental roles;
- Evacuation plan;
- Check-in/check-out procedure for emergency operations;
- Control centre information;
- Communications plan;
- Information dissemination plan;
- Forms for recording events;
- Emergency support partners’ contact information;
- Specialized equipment sources; and
- Special consultant listing.

A contact list of professionally skilled personnel with expertise relevant to various types of emergencies will be maintained. Similarly, a list of alternate sources of supplies, personnel, and special services (i.e., spill response) will be maintained.

The Crisis Management Plan will also include a list of individuals who will assume temporary command in the event of an emergency, both on a site-wide scale and for each part of the operation.

12.2.1.18.4.13.13 Continuous Improvement

A mine site is a dynamic environment where conditions change. Personnel changes present both a drain on knowledge and a source of new ideas. The emergency plans for the mine site will be reviewed and updated on an ongoing basis.

An evaluation of response and performance will be conducted following significant events and each practice or training exercise to ensure that lessons learned can be incorporated into further refinements of the Emergency Response Procedures Plan.

Periodic reviews of the plan will be conducted, and the emergency procedures manual revised as needed.

12.2.1.18.4.13.13.1 Emergency Response Structure

An emergency response structure ensures efficient mobilization without creating confusion or disorder. The roles and responsibilities of all employees must be clearly understood, and adequate training must be given so that everyone can carry out their duties. The incident reporting responsibilities and procedures will be clearly set out, including actions to be taken and triggers that initiate subsequent steps in the emergency response.

The emergency response structure will be determined by the severity of the incident. A Code One emergency is the most severe, as determined by the immediate need of additional resources to control the emergency. An incident that is not designated as a Code One emergency will follow a regular incident flow chart (to be developed).

12.2.1.18.4.13.14 Code One Emergency

A Code One emergency is one that cannot be controlled by personnel who are at the site of the emergency. Code One emergencies may include but are not limited to:

- Uncontrollable fire;
- Significant spill ($\geq$ 100 L) or spill into waterway; or
- A significant first aid event including immediate danger to life and health, cardiac arrest, severe burns; i.e., any event that would result in evacuation of the patient to hospital by air ambulance.

The following sections describe the procedures that will be implemented for managing Code One emergencies (**Figure 12.2.1-24**).

12.2.1.18.4.13.14.1 Containment: First Discoverer – Emergency Reporting Procedure

An emergency response procedure will be developed that clearly spells out the immediate actions required to initiate a Code One emergency.

Any person who is involved in or is the first to arrive at an emergency scene is responsible for initiating the emergency response notification process, by calling in a Code One.

If safe to do so, persons at the scene of an emergency should attempt to mitigate the risks and assist individuals. If it is not safe to do so, all persons must evacuate to their appropriate muster stations immediately. If it is not designated as a Code One emergency, a regular incident response and reporting procedure will be followed.

12.2.1.18.4.13.14.2 Notification: All Personnel Can Initiate Emergency Response

A procedure will be developed to describe how communication of a Code One emergency will occur. All personnel will be trained in the notification procedure and will understand how to respond in an emergency situation. The steps and instructions will be clear, to avoid confusion and delay. At this point, normal operating procedures cease to apply.

The Emergency Response Team will then mobilize and respond to the affected area. This team will be specially trained, e.g., mine rescue, firefighting, and spill response.

12.2.1.18.4.13.14.3 Mobilization: Management from the Control Centre

The mobilization level will have been reached after the Control Centre has been established. Senior management will direct emergency operations.

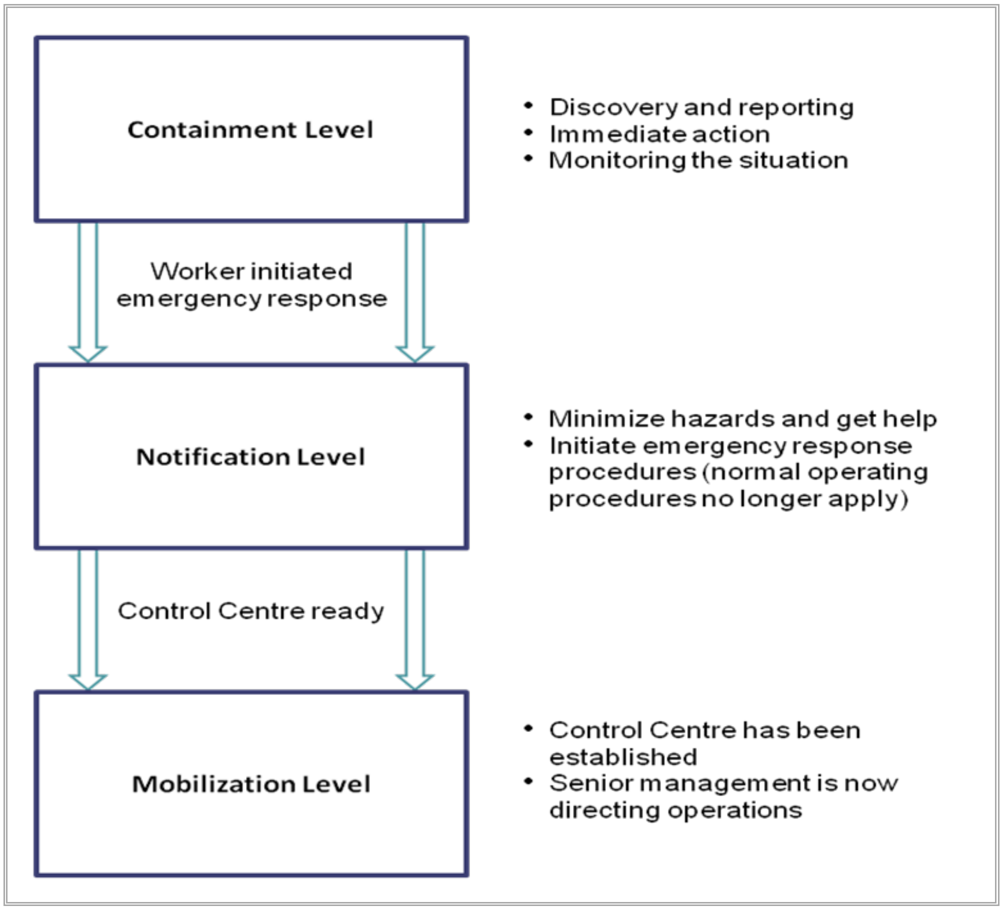


Figure 12.2.1-24: Emergency Response Levels

12.2.1.18.4.13.14.4 Communication

Clear and prompt communication forms a cornerstone of effective emergency response. A communications coordinator will be appointed to oversee these systems and ensure that systems are sufficient to handle emergency situations. Back-up and alternative communications means will be developed. A policy for authorized telephone and radio use during an emergency will be issued, and a standardized system for recording calls during an emergency implemented.

12.2.1.18.4.13.14.5 Notification of Emergency

Emergency control centre personnel will ensure that all appropriate contacts, communities, Aboriginal groups, individual residents, other industries, and agencies are notified of a situation. They will also ensure that the mine rescue teams are operating as planned, and transportation (for evacuation or transfer to hospital) is available as required.

Information will be provided to the media and relatives in a controlled yet timely manner by the designated representative in the Control Centre. This is to help ensure the accuracy and consistency of all information that is released.

12.2.1.18.4.13.14.6 Communication with Emergency Response Partners

The emergency control centre will establish communication with provincial emergency authorities especially Emergency Management BC (formerly Provincial Emergency Program) and Inspector of Mines.

A procedure for when and how to communicate with other emergency response partners will be developed.

12.2.1.18.4.13.14.7 Infrastructure

The Project site is located in a remote location, and telephone service to the outside world will be provided by satellite phone. This service applies to both voice and data transfers. On-site communication will be facilitated by a radio system and a local voice and data network. An audible emergency siren will be used to notify workers of evacuations and site wide emergencies.

Emergency transportation infrastructure will include a helipad at the mine site and an airstrip. The airstrip will be constructed approximately 15 km north of the proposed plant site. The airstrip will be approximately 5,500 ft (1,675 m) long, which can accommodate Boeing 737-200 or turbo prop aircraft of similar capacity. The airstrip facility is described in the TAMP (**Section 12.2.1.18.4.14**).

12.2.1.18.4.13.15 Specific Emergency Responses

This section identifies some of the more significant emergencies that the mine may face and sets out the framework for response planning.

12.2.1.18.4.13.15.1 Fire at the Mine Site

In the event of a fire, all employees are expected to be aware of, and capable of, carrying out initial containment measures. All vehicles on site will carry first aid kits and fire extinguisher. These measures include an attempt to control the fire with the nearest extinguisher, raising the alarm, and seeking assistance. A fire within the administration building, camp, processing plant, or maintenance shops will trigger a building evacuation. An equipment fire on a single piece of equipment in the pit will not typically trigger the emergency response plan.

The airstrip and camps will be equipped with specific firefighting equipment to allow immediate response to emergencies. The Emergency Response Team will be trained in firefighting and would be available to respond to fire alarms.

12.2.1.18.4.13.15.2 Forest Fire

In the event of a forest fire near the mine site, management would initiate close monitoring of the fire and seek advice from the BC MFLNRO. Key personnel will be placed on standby pending an evacuation. Evacuation of personnel by bus will be the typical procedure. Fire extinguishers will be on all vehicles for employees to extinguish small fires they may come across. Firefighting equipment will also be strategically located across the whole site.

Extreme fire conditions may close the access road(s) into the mine site. This could result in the cessation of operations until the roads are once again passable. Water for firefighting, if required, will be drawn from Tatelkuz Lake or other sources of non-contact water.

Forest fires that cannot be contained by on-site personnel will prompt the contact of the BC Emergency Coordination Centre and other emergency response partners.

12.2.1.18.4.13.15.3 Power Outage

A prolonged loss of power will require special procedures, particularly during winter. Emergency generation facilities will be installed to provide back-up power to critical systems.

12.2.1.18.4.13.15.4 Road-Closure

As stated above, the mine site is accessed by FSRs originating in the community of Engen, approximately 20 km west of Vanderhoof, off Highway 16. The existing access route makes use of the Kluskus FSR for 103 km and continues on the Kluskus-Ootsa FSR for an additional 43 km to an 18-km access road that connects to the existing exploration camp. The access road to the camp will be decommissioned to remove it from UWR, which it currently traverses, and a new access road will connect the mine site to the Kluskus-Ootsa FSR at a point closer to the Kluskus FSR.

Sections of the road access route could be blocked or otherwise impassable at times. Possible causes include:

- Floods or washouts;
- Severe weather (heavy snowfall);
- Road accidents;
- Large spills; and/or
- Forest fire.

Emergency planning will include an emergency supply of frozen food and potable water for emergency closures. Stocks will be available at the construction and operations camps. An alternative means of transporting food, medical and other critical supplies will be established in planning for prolonged closure due to road blockage. This could involve air support services using the mine's airstrip facility (approximately 15 km north of the mine) and/or the helipad facility.

12.2.1.18.4.13.15.5 Freshwater supply and Sewage Treatment System Failure

A plan will be developed to address failure or forced shutdown of the potable water system and/or the sewage treatment system. The plan will include alternative sources, duration of outages that can be handled, and the requirements for contacting the Northern Health Authority (NHA).

12.2.1.18.4.13.15.6 Petroleum Spill

Responses to spills of petroleum products are described in **Section 12.2.1.18.4.13.16**, Spill Response Planning.

12.2.1.18.4.13.15.7 Tailings Storage Facility Failure

The risk of a tailings impoundment failure is very low, as qualified professionals will carry out the design and all details of construction and maintenance will be followed. Site layout considerations will avoid placing critical infrastructure and camps immediately downstream of the tailings impoundment as a precautionary measure.

Minor sloughs from the tailing dams will be excavated and the material returned to the TSF. Inspections will be conducted following extreme precipitation or runoff events. Any spills will be contained and the water returned to the TSF.

12.2.1.18.4.13.16 Spill Response Planning

Before construction, a detailed ESPRP will be developed for the mine site for reference and use by field personnel in the event of a deleterious material spill. Spills could occur on land or in waterbodies. The following sections describe the framework that will be integrated into the ESPRP, to ensure that all regulatory obligations are met and potential impacts to people, property, and the environment are minimized.

All on-site activities will be performed in a way that will prevent the release of contaminant substances to the environment. All materials will be handled and stored in a manner that will prevent the release of contaminant substances to the environment.

While spills may occur anywhere on site, certain areas and activities lead to increased risk for spills. These areas include:

- Cyanide:
  - Storage;
  - Mill processing; and
  - Tailings;
- Hydrocarbons:
  - Heavy equipment;
  - Storage; and
  - Fixed plant;

- Other chemicals and reagents:
    - Storage.

All spills occurring on site or involving substances directly associated with operations will be responded to in a way that will uphold the following priorities:

- Protection of human life;
- Protection of human health;
- Protection of the environment;
- Protection of property; and
- Minimized disruption to operational activities.

At all times, applicable regulations will be used to guide response and cleanup activities.

12.2.1.18.4.13.16.1 Environmental Receptors

The four main environmental receptors of a spill include:

- Surface freshwater;
- Groundwater;
- Air; and
- Soil.

Secondary effects on terrestrial or aquatic wildlife and vegetation may occur following exposure to a spilled substance.

The main potential for environmental effect from a release of a spilled material on site will be to soil and groundwater. Secondary potential effects will be to waterbodies.

Materials transported to and from the mine site will have higher potential to reach a surface waterbody in the event of an accident during transport near a waterway crossing.

12.2.1.18.4.13.16.2 Spill Prevention

With appropriate maintenance, chemical storage, inspections and housekeeping, the impact of spills can be minimized. The mine site will focus on implementing all practical measures for spill prevention.

All potentially deleterious materials will be identified in the ESPRP, with reference to the HMMP and with appropriate handling procedures.

12.2.1.18.4.13.16.3 Internal Spill and Incident Reporting

A reporting procedure will be established to ensure all incidents are recorded and appropriate ones are investigated. This will allow for the monitoring of trends, determining the effectiveness of controls, and continual improvement of the mine site.

12.2.1.18.4.13.16.4 Site Planning

At locations where the potential for spillage of hazardous material is highest, spill control and containment measures will be incorporated into the infrastructure. For example, a primary means of spill containment of petroleum products at high-risk areas will be the installation of oil-water separators at all fuelling locations and maintenance bays. The oil-water separators will be monitored and cleaned as necessary, per site hazardous materials disposal procedures.

12.2.1.18.4.13.16.5 Material Storage

All materials will be stored in a safe and appropriate manner that will mitigate accidental releases to the environment. BMPs will be incorporated into the site planning and will likely include but not be limited to:

- Double-walled containment tanks or bermed storage areas, with barriers to protect tank from accidental impact;
- Double-walled containment tanks or bermed storage areas for material containers, with adequate capacity and weather protection;
- Provisions for drainage and oil water separation;
- Spill response kits readily available, specific to type of material; and
- Regular inspections of all storage areas and storage tanks.

12.2.1.18.4.13.16.6 Material Handling

Material handling procedures will be documented in the ESPRP and include but not be limited to:

- Fuelling procedures; and
- Fuel truck transfer procedures, etc.

12.2.1.18.4.13.16.7 Material Transportation

All trucks will be certified as per the federal and provincial *TDG Acts* and thoroughly inspected to ensure adequate containment of cargo. All truck operators will require certification under the *TDG Act*.

12.2.1.18.4.13.16.8 Emergency and Spill Response Plan

The objective of the ESPRP will be to ensure that when accidental spills occur, all available resources are used appropriately to minimize the extent and severity of effect on the environment.

Per the BC *EMA*, Spill Reporting Regulation:

> *Where a spill occurs, the person who immediately before the spill had possession, charge or control of the spilled substance shall take all reasonable and practical action, having due regard for the safety of the public and of himself or herself, to stop, contain and minimize the effects of the spill.* (Government of BC, 1990).

12.2.1.18.4.13.16.9 Responsibilities for Spill Response Plan

Table 12.2.1-50 summarizes the Project site responsibilities for the ESPRP during the operating phase. These responsibilities will be adapted for the construction phase.

12.2.1.18.4.13.16.10 General Spill Response Procedure

The following procedure summarizes the basis for actions in dealing with spills no matter the size:

- **Communicate** that the spill has occurred to supervisor;
- **Consider** the risk (danger) to personal health and the environment. If possible secure the area, identify substance and level of response required. Protect waterways from oil or chemical pollutants. For a chemical spill, check the MSDS for identification of all hazards associated with the chemical;
- **Cease** the flow from the source;
- **Contain** the spill to minimize contamination (e.g., temporary berm, booms and socks from the kit);
- **Clean up** the spill using the pads, pillows, etc. in the kit. Finish cleanup with floor sweep;
- **Conclude** by reporting and investigating how the spill could have been prevented; and
- Dispose of **Contaminated Product**. Ensure the contaminated waste is treated appropriately (e.g., oil-soaked waste in marked bins separated from general waste bins).

An Incident Report will be completed once the spill is cleaned up. This will allow actions to be formulated that will (where possible) reduce the likelihood of future spills and also flag that any supplies used in attending the spill are re-stocked. A Spill Report will be sent to Emergency Measures BC (EMBC) if required (refer to *Reporting* in this section).

Table 12.2.1-50: Responsibilities for Spill Response during Operations

Responsibility	General Manager	Environmental and Sustainability Manager	Line Management	All Employees and Contractors	Emergency Response Team
Supporting the implementation of the Spill Management Plan and associated policies.	X				
Ensure that a spill management plan is established and maintained that meets all applicable legal and corporate requirements.		X			
Co-ordination of the plans implementation, maintenance, auditing and review.		X			
Ensuring activities in their respective area of control are conducted in a manner to minimize spills and that spills are dealt with according to the Plan.			X		
Ensuring that spills triggering external reporting are reported to the applicable authority.		X			
Monitor hazardous chemical storage and transfer locations within the mine site.			X		
Immediately report any significant spill or potential spill condition.			X	X	
Investigate spill incidents and implement corrective actions.		X	X		
Leading and coordinating emergency response activities related to a spill.					X
Ensuring employees and contractors are adequately trained in spill response.		X			
Ensuring spill equipment and resources are adequate for the various departments. This includes auditing departmental spill kit maintenance.		X			
Ensuring that spill kits are monitored and re-stocked after use.			X		

12.2.1.18.4.13.16.11 Equipment

Spill response kits appropriate to the type and volume of material will be specified for each piece of equipment that handles or transports contaminant materials (including fuel), including:

- Pickup trucks;
- Dump trucks;
- Commercial transport trucks;
- Excavation equipment;
- Pickup trucks with mobile fuel tanks; and
- Fuel trucks.

Spill response kits will be located at appropriate material handling and storage locations, including:

- Process plant;
- Truck maintenance building;
- Fuelling areas;
- Equipment caches; and
- Storage tank areas.

Spill response kit contents will be based on the potential risk associated with the material, volume of material, and environmental sensitivity of the area. General kit contents will include:

- Oil absorbent pads;
- Absorbent socks;
- Granular absorbent; and
- Protective equipment (e.g., gloves, goggles, protective suits).

All kits will be stored in a visible location in an appropriate weather-resistant container. Regular inspections of the kits will be performed to ensure that kits are complete and all materials remain functional.

12.2.1.18.4.13.16.12 Mobile Spill Response Unit

A vehicle will be outfitted with a self-contained collection of spill response materials for rapid deployment to spill sites.

12.2.1.18.4.13.16.13 Emergency Response Team

An Emergency Response Team will be present on-site and will comprise personnel with advanced training in spill response techniques.

12.2.1.18.4.13.16.14 Reporting

A Spill Report will be completed for all reportable spills on-site. The report will be submitted to the EMBC (1-800-663-3456) if required within 24 hours of the spill event.

The following information would be typically recorded on the Spill Report:

- The reporting person's name and telephone number;
- The name and telephone number of the company;
- The location and time of the spill;
- The type and quantity of the substance spilled;
- The cause and effect of the spill;
- Details of action taken or proposed to comply with regulations;
- A description of the spill location and of the area surrounding the spill;
- The details of further action contemplated or required;
- The names of agencies on the scene; and
- The names of other persons or agencies advised concerning the spill.

Table 12.2.1-51 identifies reportable spill quantities, per the provincial *Spill Reporting Regulation.*

Statistics on incidents of spills will be provided to the Proponent's corporate group on a monthly basis and compiled for the Annual Reclamation Report and the Blackwater Sustainability Report on a yearly basis. The outcomes of investigations following significant spills will be used to prevent future occurrences.

Table 12.2.1-51: Reportable Spill Quantities (per BC Spill Reporting Regulations)

Item	Substance spilled	Dangerous Goods Classification	Reportable Quantity
1	Explosives	Class 1	Any
2	Flammable gases, other than natural gas	Class 2, Division 1	10 kg
3	Non-flammable gases	Class 2, Division 2	10 kg
4	Poisonous gases	Class 2, Division 3	5 kg
5	Corrosive gases	Class 2, Division 4	5 kg
6	Flammable liquids	Class 3	100 L
7	Flammable solids	Class 4	25 kg
8	Products or substances that are oxidizing substances	Class 5, Division 1	50 kg
9	Products or substances that are organic compounds that contain the bivalent “-0-0-“ structure	Class 5, Division 2	1 kg
10	Products or substances that are poisons	Class 6, Division 1	5 kg
11	Organisms that are infectious or that are reasonably believed to be infectious		Any
12	Radioactive materials	Class 7	All discharges or a radiation level exceeding 10 µSv/h at the package surface and 200 µSv/h at 1 m from the package surface
13	Products or substances that are corrosive	Class 8	5 kg
14	Miscellaneous products or substances	Class 9, Division 1	50 kg
15	Miscellaneous products or substances	Class 9, Division 2	1 kg
16	Miscellaneous products or substances	Class 9, Division 3	5 kg
17	Waste asbestos		50 kg
18	Waste oil		100 L
19	Waste containing a pest control product		5 kg
20	A substance not covered by items 1 to 19 that can cause pollution		200 kg
21	Natural gas		10 kg, if there is a break in a pipeline or fitting operated above 100 psi that results in a sudden and uncontrolled release of natural gas

Note: kg = kilogram; L = litre; m = metre; µSv/h = microsievert per hour; psi = pounds per square inch

12.2.1.18.4.13.16.15 Containment and Debris Removal/Disposal

General containment procedures, including recovery and disposal methods, will be created for each category of hazardous substance handled on site, including but not limited to:

- Diesel and gasoline fuel;
- Lubricating and hydraulic oil;
- Cyanide;
- Other mill reagents; and
- Antifreeze.

These procedures will describe the substance hazards, behaviour in the environment (i.e., soil, water, snow, etc.), potential environmental effects, and BMPs for recovery and disposal.

Senior staff will advise on appropriate cleanup procedures per site-specific conditions.

12.2.1.18.4.13.16.16 Follow-up Investigation

All spills will be reported and ranked for severity and corrective actions will be assigned. Significant events will trigger an incident investigation (root cause). Will be done be senior staff from relevant department. Remedial action may involve:

- Additional training for personnel;
- Enhanced equipment maintenance or inspection program; and
- Additional preventative infrastructure (containment berms, oil/water separators), etc.

The performance of the ESPRP will also be reviewed, and the plan will be updated as necessary.

12.2.1.18.4.13.16.17 Training

The Project will be in full compliance with the Mine Health Safety and Environment Code training requirements at the time of mine construction. All contractors, employees, and visitors will receive an orientation before commencing work on site. Training records will be maintained and contractors will be required to update their training if away from site for a specified period of time. Orientation will include details of this plan required to ensure employees are aware of emergency procedures on site.

Specific personnel will undergo environmental hazard awareness training as part of their orientation to the Project site. This training program will focus on spill prevention and hazard identification, as well as spill response and containment procedures. Employees will be educated on the following as applicable:

- ESPRP;
- Applicable regulations;

- Environmental receptors (i.e., soil, groundwater and surface water);
- Field application of appropriate spill response techniques;
- Initial response procedures; and
- Spill reporting procedures.

Regular on-site drills will be conducted to ensure effectiveness of the Plan is maintained. Drills will include:

- Evacuations;
- Large spill;
- HazMat;
- Fire; and
- Tailings emergencies.

Updates to the Plan should be made if required after drills are carried out. During drills employees will follow the emergency response structure to ensure all staff is trained in their responsibilities during an emergency.

For personnel trained as first responders, a component of the training program will focus on transportation incidents involving dangerous goods. The component will include procedures from the 2012 Emergency Response Guidebook (Transport Canada, 2012) developed for use by firefighters, police, and other emergency services personnel who may be the first to arrive at the scene of a transportation incident involving dangerous goods.

12.2.1.18.4.13.16.18 Plan Revision and Change Management

The ESPRP will be a dynamic document, updated periodically and as necessary. Triggers to update the plan may include:

- Chemicals or reagents on site;
- Infrastructure or processes;
- Operations phase;
- Response requirements;
- Regulations; and
- Incidents.

12.2.1.18.4.13.16.19 Plan Testing

Simulated practice drills involving hypothetical spills on-site, including access routes or other associated land, will be arranged and implemented by senior staff. A schedule and outline for the practice drills will be included in the final ESPRP. Following each drill, management will review the plan performance and revise the plan as appropriate.

12.2.1.18.4.14 Transportation and Access Management Plan

12.2.1.18.4.14.1 Introduction

Transportation and access management will be implemented for the movement of personnel and materials into and out of the mine for the duration of mine life. Transportation and access management includes planning and control for all transportation components of the Project, including construction of temporary roads for exploration, construction projects, and operations.

The Project will include transportation, with support facilities, by motor vehicle and air. Motor vehicle transport will include private and public roads. The TAMP includes the Traffic Management Plan, which will ensure the safe movement of all mine traffic on the Kluskus FSR which connects the mine site to Highway 16. The Traffic Management Plan describes management requirements for all vehicles using the FSRs, including oversize/overweight loads, and identifies characteristics and requirements for individual FSR segments.

12.2.1.18.4.14.2 Objective

The TAMP will comply with legislation addressing:

- Occupational health and safety;
- Potential release of contaminants and waste into the environment;
- Protection of archaeological and cultural sites;
- Protection of wildlife and their critical habitat; and
- Protection of streams and wetlands.

The TAMP will also provide management consistent with the intent of the Vanderhoof Access Management Plan for Forest Recreation (BC ILMB, 2008), and will incorporate measures identified in the WLMP (**Section 12.2.1.18.4.6**).

12.2.1.18.4.14.3 Linked Environmental Management Plans

Some of the management issues that the TAMP addresses are also addressed in other EMPs, including:

- WLMP (**Section 12.2.1.18.4.6**);
- ARMP (**Section 12.2.1.18.4.1.9**);
- SECP (**Section 12.2.1.18.4.1**);
- ESPRP (**Section 12.2.1.18.4.13**);
- AQEMP (**Section 12.2.1.18.4.9**);
- LSVMRP (**Section 12.2.1.18.4.4**);
- ISMP (**Section 12.2.1.18.4.5**);
- HMMP (**Section 12.2.1.18.4.12**);

- CYMP (**Section 12.2.1.18.4.19**);
- OHSMP (**Section 12.2.1.18.4.15**);
- AHRMP (**Section 12.2.1.18.4.7**); and
- RCP (**Section 2.6**).

12.2.1.18.4.14.4 Regulatory Requirements

The TAMP will comply with the BC *TDG Act* (Government of BC, 1996m), which includes the BC TDGR (Government of BC, 1985). The BC *TDG Act* describes the required classification system for hazardous materials, as well as safe transportation and handling procedures. The TAMP will also comply with the federal *TDG Act* (Government of Canada, 1992), which describes training requirements for persons handling or transporting dangerous goods in Canada. The federal *TDG Act* includes the federal TDGR (Government of Canada, 2001).

Transportation of dangerous goods such as reagents and fuels (e.g., cyanide and diesel) by road requires permitting under the BC *TDG Act*. The federal *TDG Act* has requirements for the transportation of dangerous goods by all transportation modes, and for their inter-jurisdictional movement. Other permit requirements may include, but not be limited to:

- Licenses under the *Radiocommunication Act* (Government of Canada, 1985) for Project communication development needs;
- Access Permit (MOTI-A) under the *Transportation Act (2004)* and *Motor Vehicles Act (1996)* (BC Ministry of Transportation and Infrastructure (MOTI));
- Approvals for oversize/overweight loads or bulk hauling under the *Motor Vehicle Act* (Government of BC, 1996n); and
- Road Use Permit under the *Forest and Range Practice Act* (Government of BC, 2002b).

12.2.1.18.4.14.5 Non-Regulatory Access Management Objectives

Section 12.2.1.18.4.14.8 describes the objectives of the Vanderhoof Access Management Plan for Forest Recreation and how they affect access road management for the Project footprint. The section also includes measures from the proponent's WLMP (**Section 12.2.1.18.4.6**) for management of access to exploration activities involving the Northern Caribou UWR.

12.2.1.18.4.14.6 TAMP Construction and Operation Phase Strategies

In addition to construction and operations phase strategies in this section, mitigation pertaining to Northern Caribou is provided in **Section 12.2.1.18.4.6**.

12.2.1.18.4.14.6.1 Current Access

Regional transportation facilities include Highway 16, Canadian National Rail and its port terminus in Prince Rupert, airports at Prince George and Smithers, and secondary airports at Burns Lake, Fraser Lake, Vanderhoof, and Fort St. James. A transload facility associated with the railroad may be established in Prince George to receive materials for use on the project, but is outside the scope of the Project EA. The materials received by rail will be transferred to trucks for transport to the mine site.

The location of the mine site is isolated, away from communities and rural residences, with the closest residence located more than 10 kilometres (km) away. Currently, access to the mine site is by road from Vanderhoof via an existing network of FSR and an 18-km exploration road that traverses the existing UWR. For mine access, the exploration road will be decommissioned and a more direct road from the FSR will be constructed, outside of UWR, as part of the Project.

12.2.1.18.4.14.6.2 Employee Transportation

The workforce will reach a peak of 1,400 employees during the construction phase. A construction camp will be sized to accommodate personnel, and will be modified and refitted into the operations camp, which will accommodate approximately 500 personnel. Air (construction only) and bus transportation will be provided for employees with the objective of minimizing personal vehicles on site. A helipad will be available on site for emergency response requirements.

12.2.1.18.4.14.6.3 Mine Site

The mine site will need a network of general vehicle access roads around facilities, service roads to remote structures, and haul roads. Mine site roads will be constructed to handle the material and equipment required during construction, including a road from the process plant to the pit area, and roads to the TSF and explosives plant. All mine site roads will be constructed of suitable rock fill and crushed surfacing material.

Mine site roads will be designed for two-way traffic. Designated turnaround areas for trucks and other equipment and vehicles will be constructed as necessary, using existing clearings where practical.

It has been assumed in Project planning that the main process plant road will be 15 metres (m) wide, as will roads to the TSF. The road between the process plant site and the truck shop will be 8 m wide; the road to the explosives storage facility will be 6 m wide. However, site conditions and avoiding of environmentally sensitive areas will determine the final width of roads.

Haul roads will be two-way and 29 m wide with an 8 m berm. The roads will generally be laid out with a cut-and-fill balance. Selected waste rock will be used for road bases and capping material after being tested and meeting the ARD/ML requirements. Roads within the ultimate waste dumps will be all fill construction. Haul roads will be designed at 10% maximum grade. The running width will be 31 m for permanent roads, and 40 m for temporary roads. Haul roads will include rock safety berms where required.

12.2.1.18.4.14.6.4 Airstrip

An airstrip will be constructed approximately 15 km north of the plant site. The airstrip will occupy a previously cleared forestry cut block that is already serviced by roads, which will require little or no upgrade in order to service the airstrip. The strip will be approximately 5,500 ft (1,675 m) long, which will allow use of Boeing 737-200 or turboprop aircraft of similar capacity required for meeting the heavy demands of crew rotations during the construction phase. Dash 8 Q100 aircraft have been recommended for the lesser capacity requirements of the pre- and post-construction phases.

Preliminary airstrip designs were produced from the following design criteria:

- Design aircraft = Boeing 737-200 or similar size turbo prop aircraft;
- ≤ 2% incline;
- ≥ 5500 ft (1675 m) strip length;
- ≥ 150 ft (45 m) strip width;
- ≥ 600 ft (185 m) right of way (ROW) width;
- No obstructions ≥ 30 m (100 ft) in height within 1 mile (1,609 m) of either end of the airstrip =1.8% = 1.62°;
- 3 flights per week, 52 weeks/y;
- Summer = May through mid-October= 24 weeks/y;
- Summer grading = once per week;
- Winter = mid-October through April = 28 weeks/y;
- Winter grading = once per flight; and
- Final surfacing will either be a calcium treatment (CalMag), pack-in place asphalt (cold rolled), or conventional hot asphalt treatment.

The frequency of flights have yet to be determined. Grading will vary to ensure the safe operation of the facility. Layout of the airstrip facility will include an approximately 1,700 m-long airstrip, aircraft apron area for loading/unloading, lighting, and radio and meteorological equipment suitable for all-season use.

12.2.1.18.4.14.6.5 New Mine Access Road

A new mine access road will be constructed to access the mine site, approximately 15 km long and starting at KM 124.5 of the Kluskus-Ootsa FSR. The new mine access road ROW will be 20 m wide, and will occupy approximately 28 ha. The Project access route will consist of the existing route through the Kluskus-Ootsa FSR and the new mine access road. Realignment of a short section (<2 km) and ~20 km of upgrades of the Kluskus-Ootsa FSR will be necessary to support the construction and operations of the mine.

12.2.1.18.4.14.6.6 Transmission Line Access Roads

This section discusses the preferred transmission corridor; alternatives are discussed in **Section 2.5**. From the connection point at Glenannan, the transmission line corridor runs approximately 136 km south to the termination point at the Blackwater Substation. Two types of roads are proposed for the transmission line: *branch roads* and *access roads*. Branch roads are defined as those roads accessing the transmission line ROW, and access roads are those roads located inside the ROW that are used to access proposed pole locations.

These roads will be designed to provide temporary access to the transmission line ROW and/or pole locations for the purpose of construction. The design road construction standard will be the minimum required for safe and efficient construction of the transmission line. Branch and access road specifications are listed below.

The transmission line ROW is accessible at numerous points through a combination of existing and proposed new roads. Existing roads have been developed to support local timber harvesting activities, and are generally considered acceptable for use on this project. Where necessary, new roads have been proposed to provide additional access. Typically, roads will be constructed using native soil by a combination of push Cat and end haul construction methods. Where ground conditions warrant, roads will be ditched and additional road material placed.

Proposed roads are intended to support temporary access for all construction activities including the removal of ROW timber and transmission line installation. Roads and drainage structures will be located and designed to meet BC MOTI and BC MOFR design specifications for BCL-625 load ratings. Stream crossing structures will comply with similar load ratings and include temporary roads and culverts.

12.2.1.18.4.14.7 TAMP Operations Phase Strategies

In addition to operations phase strategies in this section, mitigation pertaining to Northern Caribou is provided in **Section 12.2.1.18.4.6**, Access Management and Northern Caribou Management Plan. Also, as roads become obsolete, decommissioning will occur throughout the operations phase. Management of all Project roads including the management and decommissioning objectives of the Vanderhoof Access Road Management Plan for Forest Recreation described in **Appendix 12.2.1D**.

12.2.1.18.4.14.7.1 Access Management General Measures

Access management is critical for safety and mine security, and for preventing potential effects to local and regional wildlife populations and habitats. Only mine employees, contractors, and visitors on mine business will be allowed on the mine property. All activities along the transportation route and operation of on- and off-road vehicles, snowmobiles, heavy equipment, airplanes, and helicopters will be conducted in a safe and responsible manner to ensure that impacts to wildlife are minimized and safety of other road users respected. General access management requirements include the following:

- A security station and gate will be installed to prevent public use of the mine access road;
- All vehicles will be equipped with two-way radio communication systems;
- Minimum traffic levels will be maintained along the mine access road to the extent possible;
- Changing road conditions are expected to be communicated as part of safety meetings and as they arise between drivers;
- Speed limits on the access road will be posted. Travel speeds will be adjusted according to road conditions, weather, and wildlife presence when and where required;
- Signs will be posted to alert drivers of potential wildlife presence, particularly at sites associated with wildlife migration corridors, crossing points, sensitive habitats, or other high use areas. All mine site roads will have both regulatory and advisory signage warning drivers of speed limit changes, advisory corner speeds, road segments with limited visibility, and other identifiable hazards. Reduced travel speeds will be posted where required;
- Authorized use of on- and off-road vehicles will be restricted to established roads and designated trails, except as needed to access monitoring sites and remote communications equipment. Use of private recreational vehicles will be prohibited at all times;
- A road crew will maintain the roads to a suitable standard year-round. Snow will be ploughed from roads when necessary, and products having low environmental impact (e.g., sand, gravel, non-palatable salts) will be used as needed to ensure safe road conditions. Dust from mine access road and site roads will be controlled, through water spray dust suppressant as needed;
- Water on and around the roads will be managed in accordance with the MWAMP, SECP, ARMP, and WMP;
- Wildlife will be given the ROW along all roads associated with the mine;
- Wildlife sightings will be reported to supervisory personnel as soon as possible; and
- Wildlife incidents (e.g., traffic accidents) will be reported to supervisory personnel immediately.

Per commitments to First Nations in the Aboriginal Groups Consultation Plan (**Section 17** and **Table 17.3.1-1**), consultation will take place with respect to design and implementation of the final TAMP. As well, measures to mitigate impacts to wildlife developed in the wildlife management plan (**Section 12.2.1.18.4.6**) will be included in the final TAMP.

12.2.1.18.4.14.7.2 Vehicle Operators

All project personnel and contractors will receive suitable environmental and safety training before starting work. All project personnel, contractors, and visitors will comply with the transportation access restrictions in this plan, in addition to building security restrictions.

The following requirements will apply to vehicle operators:

- All vehicle operators will be properly licensed and trained according to their specific vehicle type and operating conditions with training records being maintained;
- All vehicle operators will determine the suitability of local road conditions before operating their vehicle;
- All vehicle operators will follow posted speed limits, which might vary depending on site-specific conditions;
- All vehicle operators will ensure that their vehicle is appropriately licensed according to vehicle type, and is maintained in good mechanical order to the manufacturer's specifications;
- All vehicle operators will complete inspections and maintain maintenance logs to ensure vehicles are safe to operate;
- Where required by the *Mines Act*, wheel chocks will be used for parked vehicles;
- All vehicle operators will abide by requirements set out for cell phone and radio use while operating a vehicle; and
- All vehicle operators will remain on established roads to reduce reclamation requirements, ecological damage, dust and the spread of invasive plants.

12.2.1.18.4.14.7.3 Vehicle Operator Training

Training will include topics such as:

- Machinery ROW;
- Light/Whip/other vehicle requirements (fire extinguisher, first aid kit);
- Brake tests;
- Pre-start checks; and
- Signalling requirements (for example, 1 honk forward, 2 honks reverse).

12.2.1.18.4.14.7.4 Traffic Management Plan

12.2.1.18.4.14.7.4.1 General

To ensure the safe use of all roads accessing the mine, a traffic management plan will be developed to cover the entire route of the Kluskus-Ootsa FSR between the mine site and the intersection of Highway 16 at Engen.

The Traffic Management Plan will be developed to ensure the safe movement of all mine traffic along the route. The Traffic Management Plan will be adopted by all mine traffic along the entire route. Because the route follows the Kluskus-Ootsa FSR, the traffic management plan will include signage to provide non-mine-related traffic with road use and safety information. Provision of a security station and gated access will allow for continued surveillance of all traffic accessing the mine site.

12.2.1.18.4.14.7.4.2 Traffic Management Plan Document

The main components of the Traffic Management Plan will include:

- Traffic Control Plan;
- Implementation Plan;
- Public Information/Communication Plan; and
- Reference to the ESPRP.

12.2.1.18.4.14.7.5 Traffic Control Plan

The purpose of the Traffic Control Plan is to ensure that all traffic movement on a project site or within a specified corridor conforms to a standard set of rules and guidelines, with the intent of protecting the public, enhancing driver safety, and protecting the environment. The traffic control plan will include, but may not be limited to:

- A description of activities within the project site or specified corridor;
- Identification of key personnel and contact information, such as traffic control personnel and security;
- A "Road Use Handout," which will include the rules to be followed by all traffic travelling on the existing access roads;
- Characteristics and requirements identified in the logistics study for individual segments of the route between the mine and the highway; and
- A road map, radio frequency map, and signage map.

12.2.1.18.4.14.7.6 Implementation Plan

The Implementation Plan will identify how the goals and objectives of the Traffic Control Plan will be implemented, and will describe procedures for updating or modifying the Traffic Control Plan.

12.2.1.18.4.14.7.7 Emergency and Spill Preparedness and Response Plan

Transportation accidents can result in injury, death, forest fire, or the release of hazardous materials into the environment. All relevant personnel will have access to the ESPRP, which provides guidance for preparedness and management for medical and environmental emergencies, including medical and environmental emergency contact information, spill response procedures, and incident reporting procedures. In addition, all carriers of hazardous materials are required to have emergency response plans under the TDGA.

Other EMPs that encompass emergency measures, or that specify environmental protection requirements for transportation of hazardous materials, include but are not limited to:

- OHSMP (**Section 12.2.1.18.4.15**);
- HMMP (**Section 12.2.1.18.4.12**); and
- Cyanide Management Plan (**Section 12.2.1.18.4.19**).

Materials transported to the mine site will include reagents such as cyanide, fuel and lubricants, explosives, and blasting agents. Chemicals will be trucked in closed containers, with all hazardous goods manifested and trucks labelled to meet provincial *TDGR* requirements. The International Cyanide Management Code (ICMC) will be applied for the storage, handling and transport of cyanide to minimize the risk of accidental spills during transport along the Project access route and within the mine site.

12.2.1.18.4.14.8 Road Decommissioning and Regional Policy

Road decommissioning will occur progressively as roads become obsolete reducing the potential for dust and erosion concerns. Project road management and decommissioning will also meet objectives of the Vanderhoof Access Road Management Plan for Forest Recreation described in this section.

12.2.1.18.4.14.8.1 Vanderhoof Access Road Management Plan for Forest Recreation

Management of access roads will support the Policy objectives of the Vanderhoof Access Management Plan (**Appendix 12.2.1D**). The Vanderhoof Access Management Plan is a map that identifies four *Access Management Designations* (zones) of recreational values (A, B, C, and D) and gives management objectives for each zone. The plan does not have legislative authority, but relies on voluntary compliance and commitment from government, industry, and public. The BC MFLNRO is responsible for maintenance of FSRs. The Proponent is responsible for the mine access road and its maintenance.

Under the plan, zones vary according to their degree of restriction against access by recreational vehicles. Zone A has no restrictions under the plan, while Zone D is the most restrictive. As described below, the project footprint occupies mostly areas of Zone A, and lesser areas of Zones B and C. No project component occurs in Zone D.

The Vanderhoof Access Management Plan does not prevent access to crown land for industrial development. Rather, it depends on voluntary compliance to manage access roads in such a way as to ensure the quality of recreational experience that can be expected when the purpose for access is for recreation.

Active deactivation techniques and measures to the running road surface must take place to meet the objective of reducing road density; and a road [no longer contributes to road density] when it is converted back into a productive Access Management and Northern Caribou Management Plan.

The proponent has developed a Wildlife Management Plan (**Section 12.2.1.18.4.6**), which is consistent with the intent of the *Measures* and *Guidelines* of the Order, and whose recommendations are largely consistent with the direction provided by the Order.

12.2.1.18.4.14.8.2 Construction and Operations Mitigation for Northern Caribou

12.2.1.18.4.14.8.2.1 Construction and Access Restrictions

- Construction of new roads and trails will be minimized;
- If there will be a period of one year or more without use of a new or newly passable road or trail, the road or trail will be deactivated and rendered impassable to pickup truck traffic, and made difficult or impossible to use by ATVs and snowmobiles. This is to avoid use by non-industrial traffic during long periods of exploration inactivity, and minimize the risk of use by snowmobiles and wolves:
    - During trail and drill site deactivation, pile slash a minimum of 2 m high across the trail at locations that would discourage summer and winter recreational ATV and snowmobile travel, and reduce lines of sight; and
- IP lines do not require deactivation measures, because they will have only discontinuous shrub hand-cutting, such that the lines cannot be used as ATV or snowmobile trails.

12.2.1.18.4.15 Occupational Health and Safety Management Plan

12.2.1.18.4.15.1 Introduction

The OHSMP has been established to ensure the protection, health, safety, and well-being of all workers in and near the Project. The OHSMP describes health and safety management, and the monitoring and mitigation practices whose implementation will ensure compliance with provincial and federal regulatory requirements for all workplace hazards. The OHSMP includes coverage of health and safety hazards that are relevant to the type of work encompassed by the Project. The OHSMP is subject to revision and continual improvement under the principles of adaptive management.

The plan applies primarily to mine operations. It will be reviewed and adapted as required to the construction phase. Contractors may have their own OHSMP. Contactor's plans will be consistent with the Project OHSMP.

12.2.1.18.4.15.2 Review of Regulatory Requirements

The health and safety of workers at mines in BC is regulated through the *Mines Act*, specifically through detailed provisions of the HSRC (BC MEMPR, Mining and Minerals Division, 2008), established under the *Mines Act*. The HSRC applies to all mines in the province of BC, and takes precedence over other general provincial and federal laws and regulations pertaining to workplace health and safety. Variance from any HSRC provision is permissible only under authorization from the Chief Inspector of Mines.

The OHSMP is not an exhaustive replication of the HSRC; rather, applicable elements of the HSRC are adapted in anticipation of a detailed OHSMP that will be developed before mining and processing operations start. The purpose of the detailed OHSMP is to fulfill the proponent's health and safety policy, and all requirements and provisions of the HSRC.

12.2.1.18.4.15.3 Linked Environmental Management Plans

Some of the emergency situations and ancillary concerns addressed in the OHSMP are also addressed in other EMPs, including but not limited to:

- ESPRP (**Section 12.2.1.18.4.13**);
- TAMP (**Section 12.2.1.18.4.14**);
- IDWMP (**Section 12.2.1.18.4.11**);
- HMMP (**Section 12.2.1.18.4.12**); and
- AQEMP (**Section 12.2.1.18.4.9**).

12.2.1.18.4.15.4 Policy Directive

The Proponent will establish a site health and safety policy that will provide an overview of requirements while working on site. This policy will be distributed to all employees and employees are expected to have an understanding of policy content.

12.2.1.18.4.15.5 Roles and Responsibilities

12.2.1.18.4.15.5.1 Mine Manager

The mine manager will have overall responsibility for the safety of persons employed at the Project, including the successful implementation of the OHSMP. Employee, contractor and visitor health and safety will take priority over all other aspects of mine construction and operations.

The mine manager will review health and safety issues as needed and as consulted, and will have the authority to reallocate resources and personnel to accomplish safely the fieldwork. The mine manager will appoint suitably qualified and competent persons to comply with statutory requirements and to ensure application of the OHSMP. The mine manager will recognise employees' rights to refuse work if believed to be unsafe. Responsibilities of the mine manager include:

- Managing all personnel involved in the Project; and
- Maintaining communications with all staff, as necessary;

12.2.1.18.4.15.5.2 Safety Manager

- Making available the resources that are necessary for a safe and healthy working environment;

- Establishing a joint occupational health and safety committee;
- Communicating all pertinent project developments and plans to the Joint Occupational Health and Safety Committee;
- Arranging for qualified persons to provide training sessions for the Joint Occupational Health and Safety Committee on three occasions during the year;
- The Joint Occupational Health and Safety Committee will have monthly meetings and will have members participate in accident investigations;
- Requiring the development and reviewing the adequacy of a Health and Safety Management System that conforms to the requirements of the HSRC; and
- Requiring that all personnel have received required training, are aware of the potential hazards associated with site operations, have been instructed in the work practices necessary for personal health and safety, and are familiar with the Health and Safety Management System procedures for all scheduled activities, including how to deal with emergencies.

12.2.1.18.4.15.5.3 Supervisors

Every supervisor will be responsible on a day-to-day basis for ensuring all workers conduct their work safely and in accordance with the relevant components of the OHSMP. Supervisors will be responsible for examining active workings of the mine to ascertain that they are in a safe working condition. Supervisors will record all unusual and hazardous conditions and all corrective actions taken or proposed. Supervisors will recognise employees' rights to refuse work if believed to be unsafe. Each mine shift supervisor will hold a valid open pit shift boss certificate.

12.2.1.18.4.15.5.4 Joint Occupational Health and Safety Committee

The mine manager will establish a joint occupational health and safety committee (JOHS) for the Project. The JOHS will consist of management and worker representatives, as described in the HSRC. Responsibilities of the JOHS include carrying out inspections and investigations of hazards in the workplace, and ensuring that safety hazards are corrected in a timely fashion. The JOHS will meet monthly and receive training three times per year. The JOHS will review the Health and Safety Management Systems and occupational health and safety training for completeness and effectiveness on an ongoing basis.

12.2.1.18.4.15.5.5 Mine Workers

All employees will be required to:

- Wear required personal protective equipment (PPE);
- Take reasonable precautions to prevent injury to themselves and to their fellow employees;

- Perform only those tasks that they can do safely, and immediately report accidents and/or unsafe conditions to their supervisor and the JOHS;
- Follow the procedures set forth in the OHSMP, and report to their supervisor and the JOHS any observed deviations from the procedures described in the plan; and
- Inform their supervisor and the JOHS of any physical conditions that might affect their ability to perform any part of their work.

12.2.1.18.4.15.5.6 Contractors

Contractors are required to meet all the safety requirements as specified by the proponent. Contractors will have health and safety responsibilities and procedures specific to their field of work (e.g., an explosives contractor will be responsible for the safe handling, operation, and maintenance of all explosives at the mine site).

12.2.1.18.4.15.6 General Safe Work Practices

All employees and contractors will receive appropriate occupational health and safety training before starting work. Daily safety meetings will be held (refer to **Section 12.2.1.18.4.15.8** of this plan) during which personnel will be required to plan all activities before starting any task that involves working with or around any hazardous or potentially hazardous substance or situation. Personnel will identify health and safety hazards involved with the planned work and consult their supervisor as to how the task can be performed in the safest manner.

General safe work practices which apply to transportation and mine site access will refer to the TAMP (**Section 12.2.1.18.4.14**). All employees, contractors and visitors will comply with the transportation and access restrictions and building security restrictions cited in the TAMP.

Measures supporting general safe work practices include, but are not limited to:

- Reporting to work Fit for Duty (**Appendix 12.2.1F**, New Gold Fitness for Duty Program);
- Implementation of a housekeeping program, with provision for monitoring for improvement;
- Implementation of a job safety assessment (JSA) procedure that involves:
  - Separating work into specific tasks;
  - Identifying hazards associated with each task; and
  - Identifying methods to eliminate or control each hazard;
- Safe handling of hazardous materials and hazardous waste (refer to HMMP Section 12.2.1.18.4.12, IDWMP Section 12.2.1.18.4.11);
- Storage of fuel in approved containers and at designated locations (refer to HMMP **Section 12.2.1.18.4.12**);
- Minimization of fugitive dust emissions (AQEMP, **Section 12.2.1.18.4.9**);

- Personnel will ensure they are familiar with the incident response procedures developed from the ESPRP;
- Personnel will ensure they have easy access to the first-aid kit and the fire extinguisher at the work site and in the work vehicle;
- Personnel will ensure they are familiar with the physical characteristics of their work site, including, as applicable:
    - Site access;
    - Location/accessibility of coworkers, vehicles, required tools, safety equipment; and
    - Location/accessibility of communication devices;
- Personnel will ensure they have easy access to safety reference materials that apply to their specific work activities (e.g., driving and lifting). Activity-specific reference materials include JSA forms, SOPs, safe work practices (SWPs), and material safety data sheets; and
- Personnel will be instructed in safe lifting technique for the prevention of back injuries, and for getting assistance for safe lifting when necessary. Instruction will include setting up a safe work station for the prevention of back injuries from extended sitting, and other potential site ergonomic hazards.

During the construction phase and continuing through operations, a security check-in procedure will be established. All employees and contractors must comply with the security check-in procedure. The security check-in procedure will be used to monitor the entrance and exit of people to and from the mine site and to account for people in the case of an emergency. Description of the security check-in procedure will be given to employees and contractors as part of their induction training before their first day of work at the Project.

Policy supporting general safe work practices includes but is not limited to the following:

- Every person will have the following three basic rights:
    - The Right to Know: Each employee has the right to know about anything that could affect their health and safety in the workplace;
    - The Right to Participate: Each employee has the right or responsibility to participate in making their workplace a safer place to work; and
    - The Right to Refuse: Each employee has the right to refuse any work practice that they deem unsafe, without repercussion;
- Only authorized persons will be permitted to enter the mine site, and notice to this effect will be posted at all road entrances to the mine;
- Unless authorized by the manager, no persons shall enter or leave the mine except by a recognized means of entry or exit;
- Personnel and equipment at any work site will be limited to the number necessary to perform the task at hand;

- Without approval of a variance, no worker will be scheduled to work more than an average of 50 hours per week. No worker will work for a period longer than 16 hours in any 24 hours. Rules for hours of work do not apply to emergency where life or property is in danger:
  - Where urgent work is essential to the continuation of the ordinary working of a mine, providing it is only on an infrequent basis, or
  - Where work schedules incorporate periodic shift changes within a 24-hour period;
- Using, being under the influence of or possessing Alcohol while on the job is prohibited;
- The manufacture, distribution, possession, use, sale, transfer, purchase, or transport of illegal Drugs while on the job poses unacceptable risks for safe, healthful, and efficient operations and will be considered a violation of this policy. Violations under this section will subject the Employee to progressive disciplinary action up to and including dismissal;
- Improper conduct will be prohibited (e.g., horseplay, scuffling, fighting, playing practical jokes, any kind of deliberate conduct that through commission or omission creates or has the potential to create a hazard of any kind);
- Personnel will be prohibited from wearing loose-fitting clothing, clothing with hoods, dangling jewellery, or long hair when working near machinery, equipment with moving parts, or equipment that is electrically charged;
- Personnel will wear correct PPE and any job-specific clothing as required by the proponent (hard hat, safety glasses, steel-toed boots, high visibility clothing, face masks, respirators etc.);
- Personnel will be prohibited from eating, drinking, or using tobacco in restricted work areas (e.g., where cyanide is used);
- Personnel will obey all posted traffic safety rules;
- Personnel will observe fuelling safety measures during fuelling of equipment; and
- Heat and ignition sources will be kept away from combustible liquids, gases, or any flammable materials. Only safe (non-sparking) equipment will be allowed for use in areas where combustible gases are present.

12.2.1.18.4.15.7 Communications

The Project mine site communications will be by two-way radio or internal telephone within the buildings, and cell phones where available.

Two-way radio use will be limited, when operating vehicles or machinery, to critical vehicle or machinery communication. All other communication that is not essential will only be done when the vehicle is at safe stop.

Cell phone use while operating vehicles or machinery will be subject to the BC *Motor Vehicle Act* or as designated in the site policy; whichever is more stringent (Government of BC, 1996n).

12.2.1.18.4.15.8 Safety Meetings and Inspections

Contractors and subcontractors are required to hold regular documented safety meetings at a frequency agreed to by Proponent project management. Safety meetings must focus discussion on hazards and risks specific to the work being performed and recent incidents within the workplace. Additionally, as a minimum discussions will include past meeting concerns, findings from workplace inspections, and reported near misses.

Proponent management will attend Contractor's safety meeting to reinforce their commitment to safety, provide opportunities for direct contact with site personnel, and monitor that the quality of meetings are adequate.

These meetings include but are not limited to:

- Daily Crew Talks;
- Daily Safe Act Observations (SAOs) by Supervisors;
- Daily Risk Assessment Inspection of Work Area;
- Weekly Management Meetings; and
- Monthly Management Meetings.

Documentation will include a Daily Safety Meeting form (**Appendix 12.2.1G**), which will be incorporated into the Health and Safety Management System.

12.2.1.18.4.15.9 Changes to Safety Procedures

Any changes to safety procedures should be discussed during the daily safety meetings if the changes affect the employee's position. Any changes to safety procedures will go through document control, which will include sign off to acknowledge any changes and distribution to employees to ensure they are aware of any changes. If changes are significant, employees may also be required to sign off to ensure that they understand the changes. Any changes to JSAs must be discussed with, and signed off by, relevant personnel.

12.2.1.18.4.15.10 Safety Equipment

All Project personnel and contractors must have the proper safety equipment for their specific work activities. Employees will be trained in the use, maintenance, and inspection of their safety equipment. Safety equipment includes but is not limited to the following:

- Appropriate clothing for the conditions;
- Appropriate PPE for specific job activities;
- First aid kits and fire extinguishers carried on all vehicles on site; and
- Communication equipment (e.g., radio).

All equipment must be used and maintained in accordance with manufacturers' specifications. Defective tools or equipment should never be used while performing work activities. If any employee has a question or concern regarding the proper use or maintenance of safety equipment for their specific work activity, then such matters should be brought to the attention of supervisory personnel before the equipment is used and the work is performed. All safety equipment matters that arise should be discussed and documented during the next daily safety meeting.

12.2.1.18.4.15.11 Hazard Mitigation Principles

Occupational health and safety management practices will mitigate risk through application of the hazard mitigation principles described in this section. Hazard mitigation principles are prioritized in the following order, from highest to lowest: Elimination or Substitution; Engineering Controls; and Administrative Controls.

12.2.1.18.4.15.11.1 Elimination or Substitution

The highest priority will be given to eliminating (to the extent that it is reasonable and practicable to do so) all potential workplace hazards from the Project site.

12.2.1.18.4.15.11.2 Engineering Controls

If it is not possible to completely eliminate a potential hazard from the Project site, then appropriate engineering controls will be implemented, where practicable, to prevent workers from being exposed to unacceptable levels of any physical, chemical, biological, or ergonomic hazard. All mine components and processing infrastructure will be designed, constructed, installed, and operated under the authority of a qualified person or persons, and will meet legislated standards of practice or better.

12.2.1.18.4.15.11.3 Administrative Controls

The Project will have appropriate administrative controls to ensure the protection, health, safety, and well-being of all workers at the Project site, and to ensure that workers are not exposed to unacceptable levels of any physical, chemical, biological, or ergonomic hazard. Administrative controls will encompass safety procedures, programs, and rules as described under General Safe Work Practices (**Section 12.2.1.18.4.15.6**). General safe work practices will be reviewed and *General Work Practices* will be updated accordingly as necessary.

12.2.1.18.4.15.12 Personal Protection Equipment

The use of prescribed PPE in risk mitigation is a last line of defence only. PPE is not a substitute for any of the hazard mitigation principles described in *Hazard Mitigation Principles* of this plan.

All workers will be required to wear appropriate PPE. Equipment will include hazard-appropriate personal pieces of head, foot, and eye protection, and hearing and respiratory protection. Other personal safety equipment will include weather-appropriate clothing; communication equipment (e.g., cell phone, satellite phone, radio); first aid kits; vehicle maintenance gear; and survival kits (e.g., blankets, food, and water). All safety equipment will be used and maintained in accordance with manufacturers' specifications.

12.2.1.18.4.15.13 Training Requirements

In addition to training sufficient for specific work activities, every employee will also receive training in workplace health and safety practices, including basic emergency and fire-fighting response. The training program will include all BMPs described in the HSRC and in this OHSMP, and will include WHMIS requirements, also described in the HSRC.

Training will include assurance that every employee understands he/she has the right and obligation to refuse unsafe work without repercussion, and that this includes work that they perceive to be unsafe.

Qualified personnel will provide all training. Records of all personnel (including supervisors) who have completed training will be maintained. All training records will be kept for the duration of the Project. Specific safety training requirements will be identified throughout construction and operations. These may include but are not limited to:

- Fall protection;
- Confined space;
- Lock out procedures;
- Cyanide management;
- Respirators; and
- Equipment specific training.

Training will include any necessary site-specific briefings. Site-specific briefings will be documented on a form similar to the Daily Safety Meeting form of the Health and Safety Management Systems, and will be submitted to the supervisor and JOHS.

12.2.1.18.4.15.14 Record-Keeping and Reporting

Occupational health and safety management will include development of a record-keeping and reporting system that will provide for any applicable recording requirements described in the HSRC. The record-keeping and reporting system will include, but not be limited to documentation of:

- Explosives use;
- Vehicle maintenance;
- Reports of "near misses", unsafe work sites, accidents, and dangerous occurrences;
- Daily safety meetings (e.g., a Daily Safety Meeting form which will be incorporated into the Health and Safety Management Systems);
- Details on worker training activities;

- Site-specific briefings given to workers during training;
- Corrective/preventative actions, hazard identification, inspections, incident investigations; and
- Other selected requirements described in the HSRC.

Occupational health and safety statistics for the site will be recorded and reported as necessary. Records will be maintained for the life of the Project and beyond, as applicable.

12.2.1.18.4.15.15 Reporting Procedure

Reporting will be used to ensure continual improvement with respect to safety on site. Reporting allows changes to be made, and the potential for incidents or accidents to be mitigated. All Project personnel and contractors must immediately report the following to supervisory personnel:

- Any potentially unsafe environmental conditions in the workplace;
- Any potentially unsafe procedures or activities in the workplace;
- Any potentially unsafe tools or equipment in the workplace;
- Any observations of fellow crew members conducting work in an unsafe manner;
- Any complaints; and
- Any accidents, incidents, or near misses.

12.2.1.18.4.15.16 Accidents, Incidents, and Near Misses

An incident (or emergency) response procedure will be developed based on **Section 10.8**, emergency response structure, and specific emergency response, of the ESPRP (**Section 12.2.1.18.4.13**). All Project personnel and contractors will be required to respond to emergencies following incident response procedures developed from the ESPRP. The ESPRP describes the response structure, from containment through notification and mobilization, for the most severe (Code One) emergencies, which include but are not limited to:

- Uncontrollable fire;
- Significant spill (>/=100 L) or any spill into waterway; or
- A significant first aid event.

12.2.1.18.4.15.17 Monitoring and Mitigation

12.2.1.18.4.15.17.1 Inspections of Work Sites

All work sites will be inspected regularly and proactively by shift supervisors, safety department, JOHS and by individual workers. Inspections will be formally documented and corrective actions will be agreed upon with the inspector the responsible person and their supervisor. Realistic due dates for corrective actions will be established and overdue actions will be reported to higher levels of management.

12.2.1.18.4.15.17.2 Inspections of Work Sites Reported as Unsafe

In situations where reports of unsafe work can be rectified immediately by a supervisor, a follow up inspection may not be necessary. If the issue cannot be rectified immediately, the safety department and in significant cases the JOHSC representative will become involved to help correct the situation. A hazard may be reported if corrective actions are required, or if the information is of value to the entire workforce.

12.2.1.18.4.15.17.3 Inspections of Accidents and Dangerous Occurrences

Any work site where an accident has occurred (e.g., any event that results in a worker seeking medical aid, or events where there is a loss of life), or any other dangerous event has occurred, will undergo a thorough inspection by persons knowledgeable in the type of work involved as well as the department manager, safety department and JOHSEC representative. Scenes of accidents or dangerous occurrences will not be disturbed without proper approval, unless it is for the purpose of saving life or relieving human suffering. Accidents and dangerous occurrences will be recorded and reported as necessary.

12.2.1.18.4.15.17.4 Inspections of Worker Health

Worker health may be inspected from time to time in a medical surveillance program. Workers at sites with dust, excessive noise, or chemical, physical, or radiation exposures will be notified of the nature of the health risks, that a medical surveillance program is available, that they may choose to participate in the program, and that they may attend the doctor of their choice to undergo examination and/or testing. Worker health records will be confidential, and will not be made available to anyone unless required by the HSRC.

12.2.1.18.4.15.17.5 Inspections of Equipment and Vehicles

Daily equipment and vehicle checks will be completed, and recorded in a logbook. Full inspections will be done regularly by qualified personnel.

12.2.1.18.4.15.17.6 Inspections of Explosives

Explosives will be inspected regularly to ensure that they are stored and handled safely. No person will be allowed to return to the scene of a blast until a safe period of time has elapsed. Misfired explosives will be recorded and reported as necessary.

12.2.1.18.4.15.18 Potential Hazards

12.2.1.18.4.15.18.1 Potential Physical Hazards

Physical hazards will be identified, evaluated, and controlled according to the hierarchy of hazard mitigation principles described in **Section 12.2.1.18.4.15.11** of this plan. Sources or causes of physical hazard include, but are not limited to:

- Fire;
- Explosives;
- Radiation;
- Electrical hazards;
- Working at heights;
- Working near water;
- Compressed air;
- Abrasive blasting;
- Heat;
- Noise;
- Illumination;
- Pit wall stability;
- Buildings and infrastructure; and
- Vehicles, machinery, and equipment.

12.2.1.18.4.15.18.2 Potential Chemical Hazards

Chemical hazards will be identified, evaluated, and controlled according to the hierarchy of hazard mitigation principles described in **Section 12.2.1.18.4.15.11** of this plan. Chemical hazards include airborne and inhalation hazards (e.g., dust, hydrogen cyanide gas, workplace contaminants, oxygen deficiency), adsorption, ingestion, and any other risks from hazardous materials and wastes that workers could come into direct contact with. Chemical hazards will be monitored, recorded, and reported as necessary to ensure that workers are not exposed to unsafe levels of such hazards. For potential hazards and abatement regarding cyanide, please refer to the CYMP. Hazardous materials and wastes will be managed in accordance with the WHMIS requirements specified in the Health and Safety Management Systems.

12.2.1.18.4.15.18.3 Potential Biological Hazards

Biological hazards will be identified, evaluated, and controlled according to the hierarchy of hazard mitigation principles described in **Section 12.2.1.18.4.15.11** of this plan. Sources of potential biological hazards include, but are not necessarily limited to:

- Potable water supply;
- Lunchroom conditions;
- Mine dry facilities;
- Toilet facilities; and
- Wastewater treatment.

12.2.1.18.4.15.18.4 Potential Site Ergonomic Hazards

Ergonomic hazards will be identified, evaluated, and controlled according to the hierarchy of hazard mitigation principles described in **Section 12.2.1.18.4.15.11**. Ergonomic hazards include, but are not limited to, activities that may cause musculoskeletal injuries, such as material handling, awkward body posture due to space, equipment size and design, and long hours at a desk due to long shifts.

12.2.1.18.4.15.19 Emergency Preparedness

The HASP will describe response procedures for occupational health and safety emergencies. HASP response procedures will incorporate appropriate sections of the ESPRP (**Section 12.2.1.18.4.13**). The HASP will include provisions for the following:

- Industrial first aid supplies and services;
- Emergency training and mine rescue;
- Accidental release of hazardous materials or wastes;
- General emergencies;
- Emergency communications; and
- Emergency equipment.

The HASP will also include a quick reference guide for emergency information. The quick reference guide will contain emergency phone numbers and a map showing the location of the nearest hospital (with directions). All contacts will be copied from Section 10.7 (Emergency Response Partners) of the ESPRP, which will be continuously updated for the duration of the Project.

12.2.1.18.4.16 Recruitment, Training and Employment Plan

12.2.1.18.4.16.1 Introduction

Recruitment, training, and employment management will reflect the proponent’s commitments to responsible mining, and will honour its relationships with neighbouring communities, recognising that employment opportunities are considered one of the primary social and economic benefits that the Project will provide.

A Project-specific RTEMP will be developed before the commencement of construction in consultation with the Aboriginal groups and local communities. The RTEP will include the following:

- Details regarding roles and responsibilities specific to recruitment, training and employment, procedures and training, and records and reporting, as required and guided by permit requirements; and
- Human resource policies and practices for all Project phases, shared with contractors, on-site workers, Aboriginal groups, and other stakeholders to ensure that there is a common

understanding of standards, as well as uniform and transparent application of human resource strategies.

12.2.1.18.4.16.2 Linked Environmental Management Plans

The RTEMP is linked to all other EMPs, because all EMPs include a training and awareness component. EMPs, which contain procedures for health and safety management, and for medical emergency management, are found in:

- OHSMP (**Section 12.2.1.18.4.15**); and
- ESPRP (**Section 12.2.1.18.4.13**).

12.2.1.18.4.16.3 Recruitment, Training, and Employment Objectives

A number of strategic objectives related to recruitment, training, and employment have been developed in alignment with expectations of potentially affected communities and other stakeholders, as well as legislated requirements. These objectives include:

- Provide employment opportunities for qualified Aboriginal or local workers and maintain equal employment standards without discrimination based on gender or age;
- Working with educational partners to provide training and education programs to develop a skilled pool of local employees, providing long-term sustainable benefits to the community and its members;
- Developing ongoing and collaborative working relationships to support future economic opportunities in the region;
- Providing a safe work environment for employees and contractors;
- Respecting cultural and regional diversity;
- Demonstrating fairness and mutual respect in all employment and business practices; and
- Upholding the Proponent values of Integrity, Creativity, Commitment, Develop our Employees and Teamwork.

These objectives form the foundation on which the policies, practices, and programs contained within the RTEMP are based.

12.2.1.18.4.16.4 Scope

The RTEMP covers recruitment, training, and employment of all employees that will work directly with Project-related activities during the construction, operations, and closure phases. The plan is broad-based because most of the work, both on-site and off-site, during the construction and operations phases will be carried out by contractors who will be required to meet conditions set by the Proponent with relation to hiring practices. The RTEMP covers all phases of the Project schedule, from construction through decommissioning and closure. The plan also sets out Project-level operational conditions. The RTEMP will encompass mining and service contractors. Because of the complex nature of the construction industry that is mobile at the industrial level, construction contractors are also expected to have their own individual recruitment, training, and employment management plans appropriately specifically designed for their industry and in alignment with the Proponent's policies and programs.

12.2.1.18.4.16.5 Regulatory Requirements

The RTEMP will provide a comprehensive approach to recruitment, training, and employment, recognising the interconnectivity of these areas of activity. The plan will be designed to:

- Meet or exceed the requirements of the Health, Safety and Reclamation Code for Mines in British Columbia (BC MEMPR, 2008);
- Meet or exceed the requirements under the BC *Employment Standards Act* (Government of BC, 1996o) and *Employment Standards Regulation* (Government of BC, 1995); and
- Meet or exceed the requirements under the BC *Mines Act* (Government of BC, 1996c).

12.2.1.18.4.16.6 Management Practices

In addition to meeting the regulatory and corporate requirements, the RTEP will be designed to:

- Mitigate potential direct and indirect adverse impacts identified in the impact assessment;
- Enhance opportunities related to potential positive direct and indirect impacts identified in the effects assessment; and
- Provide opportunities for local and regional communities as well as Aboriginal groups.

The RTEP will be developed with careful consideration of a number of key information sources. These may include but not be limited to:

- Feedback from Project consultation and Aboriginal engagement (including the BC EAO Working Group) activities to date;
- Potential impacts and benefits identified in the social and economic impact assessment; and
- Relevant provincial and federal legislation pertaining to labour standards and practices.

The Proponent intends to work toward negotiating and developing Participation Agreements (PA) with specific Aboriginal groups. Should such an agreement be negotiated, the RTEMP will be reviewed to ensure that it meets all relevant PA commitments. Based on other PAs negotiated between Aboriginal communities and mining companies, a PA could contain provisions for training, preferential hiring for qualified Aboriginal candidates, environmental matters, employment benefits, business opportunities, and support for scholarships. The RTEMP will consider each of these provisions.

The RTEMP will be a living document, and be updated and amended as required throughout implementation. Updates will consider information gathered through community consultation and negotiations as well as employee and contractor feedback.

12.2.1.18.4.16.7 Recruitment

The Proponent recognizes that employment opportunities are a key social and/or economic benefit that the Project will bring to the region and is committed to optimizing the use of local human resources in all phases of mine activity. Commitments made during the EA process and possible PA negotiations will be reflected within the recruitment strategy in future revisions of the RTEMP.

To the extent possible, the proponent will follow a transparent hiring policy and procedure that supports recruitment from Aboriginal groups and local communities.

12.2.1.18.4.16.7.1 Recruitment Goals

There are five key recruitment goals upon which the recruitment strategy will be based:

- Maximise employee recruitment from local Aboriginal and Non-Aboriginal communities and within the social and economic LSA and RSA;
- Work closely with employment and training officers to support the development of a multicultural workforce, and encourage their interest in employment with the Project;
- Brand the organisation as a local and regional employer of choice, offering competitive wages and desirable working conditions; and
- Attract workers by achieving a high level of employee engagement and satisfaction.

12.2.1.18.4.16.7.2 Recruitment Strategy

Recognizing that conventional recruitment strategies may not adequately meet the needs of local and Aboriginal communities, the Proponent will commit to implementing a range of strategies that consider the cross-cultural context. Planned recruitment strategies will include, but not be limited to:

- Hiring First Nations coordinator(s);
- Effectively communicating available positions locally and regionally;
- Implementing a recruiting network for the Project; and
- Partnering with Aboriginal communities, other local and regional communities, training institutions, and government agencies to assist in recruiting, developing and deliver training.

Each recruitment strategy is detailed in the following sections.

12.2.1.18.4.16.7.2.1 First Nations Coordinator(s)

The Project will employ a First Nations Coordinator(s) (or similar) to liaise with Aboriginal groups in the region. This person will work with senior staff to communicate employment opportunities using preferred local engagement methods.

12.2.1.18.4.16.7.2.2 Communicating Available Opportunities

Various mechanisms will likely be utilised by the proponent to communicate available employment opportunities. These may include, but not be limited to:

- Local and regional newspapers;
- Social media (Facebook, LinkedIn etc.);
- Posting opportunities in Aboriginal offices;
- Posting opportunities in Aboriginal group newsletters; and
- Career fairs held in Aboriginal and local communities.

12.2.1.18.4.16.8 Training

In the context of the RTEMP, training efforts will be focussed on pre-employment training and training of Project employees, as well as the contractor workforce.

12.2.1.18.4.16.8.1 Training Goals

Training goals that guide the development and implementation of the training strategy will include:

- Developing a workforce that meets recognised industry standards, competencies, and best practices;
- Developing the skills and capacity of Aboriginal workers and other local / regional workers;
- Developing transferable skills;
- Creating strong alliances and partnerships with community partners, learning institutions, and training providers; and
- Creating performance development plans for all employees that are linked to job competency requirements, personal development, and career aspirations.

12.2.1.18.4.16.8.2 Pre-Employment Training Strategy

A comprehensive training strategy and plan will be developed as operational planning progresses, negotiations with the Aboriginal groups continue, and a skills inventory has been completed for the targeted local and regional hiring area. Pre-employment training efforts will be based on an understanding of the employability skills and technical competencies required for Project construction and operations. The principles upon which the training strategy will be based may include, but not be limited to:

- Developing local and regional capacity to participate in mining employment;
- Developing locally involves training local people who do not have the skills required. Some ideas being considered include:
    - Working with training institutions such as College of New Caledonia and BC Aboriginal Mine Training Association to provide training programs;
    - Partnering with local contractors to provide the Proponent apprenticeship programs;
    - Sourcing and training under-represented groups; and
    - Offering scholarships as an incentive to high school graduation;
- Hiring locally, involves hiring local people who already have the skills to work in mining. Some ideas being considered include, but are not limited to:
    - Advertising all positions locally, in addition to the Proponent's common advertising sites (e.g., The Proponent's website, Infomine, MABC careers page, Facebook, LinkedIn, and Twitter);
    - Advertising jobs on the Proponent's Intranet to attract internal candidates; and
    - Asking existing employees if they are aware of suitable candidates;
- Relocation to the region:
    - Relocating staff to supplement the local labour force, provide skills not available locally, or when the local talent pool is exhausted.

Developing an understanding of the proponent's labour requirements in relation to the potentially available local labour force will help to inform the training plan. This understanding will be informed through information gathered about LSA and RSA social and economic conditions during the EA process as well as detailed information obtained through the skills database initiative.

The Proponent's corporate and site policies, work practices and training standards will be shared with all contractors to ensure alignment of safe and equitable work practices.

12.2.1.18.4.16.8.3 Scholarships

The Proponent recognizes that leaving a positive legacy of a trained and experienced workforce extends beyond typical recruitment, training, and employment practices. To foster the development of knowledge and skills within Aboriginal and local communities, the Proponent will consider offering scholarships to Aboriginal and local community members interested in pursuing education and careers in the resource development and environmental fields. The scholarship program will be defined, developed, and implemented in consultation with Aboriginal and local communities.

12.2.1.18.4.16.8.4 On-the-Job Training

A variety of mandatory and elective training initiatives is proposed for employees of the Project. All employees will undertake certain training programs as part of their conditions of hire. These may include, but not be limited to:

- Cross-cultural awareness training;
- Site-specific orientations; and
- A variety of short courses and training initiatives designed to meet occupational health and safety requirements (such as confined space, fall protection or cyanide awareness training).

When appropriate and feasible, employees who join the Project as apprentices will be able to continue their apprenticeship program and be supported to complete their apprenticeships. New apprenticeship opportunities will be offered to employees as Project workforce requirements permit.

Each employee of the Project will participate in an annual performance development review and development plan session with senior staff or a designate of senior staff. This will result in a performance development plan that identifies future career goals and training requirements. These plans will be tied to organisational succession planning efforts to ensure that the Project workforce continues to grow and develop as the Project progresses.

12.2.1.18.4.16.9 Employment Conditions

The following elements comprise overall employment planning for all phases of the Project:

- Human Resource (HR) policies;
- Conditions of employment;
- Preferential hiring;
- Occupational health and safety;
- Labour relations; and
- Worker accommodations.

12.2.1.18.4.16.9.1 Human Resource Policies

HR policies will be clearly written and accessible to all employees. To facilitate access by all employees, HR policies will be available in common areas such as SharePoint, employee housing, recreational areas, and human resources offices.

Policies will be developed to address a wide range of employment facets including, but not limited to, policies addressing:

- Recruitment processes;

- Hiring and orientation;
- Performance development reviews and individualised development plans;
- Shift work and work rotation schedules;
- Occupational health and safety; and
- Camp/site rules, including control of hunting, fishing, and firearms, and prohibition of alcohol, drugs, and other illegal substances.

HR policies and procedures will be subject to regular internal review.

12.2.1.18.4.16.9.2 Conditions of Employment

Terms of employment will be communicated to all employees in a written employment contract. This contract will identify and specify terms and conditions of employment (e.g., hours of work, overtime arrangements and compensation, and benefits including leave for illness, holidays, maternity/paternity, and employee and family assistance programs).

12.2.1.18.4.16.9.3 Hiring for Qualified Aboriginal Persons

The proponent will not engage in discriminatory hiring practices such as making employment decisions based on gender, race, ethnicity, religious affiliation, age, or sexual orientation. However, the Proponent will offer hiring priority to qualified individual members from Aboriginal groups and local communities in the region.

12.2.1.18.4.16.9.4 Occupational Health and Safety

The proponent recognizes that the success of an organisation is tied directly to the occupational health and safety of its workplace policies, practices, and actions of employees. The proponent is committed to providing a safe work environment for all employees, contractors and others working at or visiting the mine. Proponent polices presented in the OHSMP will be communicated to all employees, contractors, and contractor organisations.

Occupational health and safety standards will be followed through the adherence to safe work rules, effective communication, prevention, preparedness, and response measures, as well as ensuring that all workers are trained to meet the competency standards required of their various work roles.

Should a need for emergency medical care arise, experienced on-site medical personnel will facilitate treatment and transportation of ill or injured workers to the appropriate medical facility. Arrangements for plane/helicopter med-evac will be in place to transport workers with potentially life-threatening illnesses or injuries to the appropriate medical facility.

12.2.1.18.4.16.9.5 Labour Relations

The proponent recognizes the right to freedom of association for workers to form or join labour organisations that represent the collective interests of a group. The proponent will not prevent or discriminate against employees who participate in such groups or engage in collective bargaining practices.

A zero-tolerance policy will be in effect with respect to discrimination, workplace harassment, and violence. Appropriate mechanisms will be developed to ensure that employees are able to report incidents without fear of reprisal. Project employees will be informed of the Proponent's Diversity and Fair Labour practices as stated in their corporate Responsibility:

> *"Diversity – We strive to create a culture of inclusivity and acceptance—of gender, race, cultural background, age, and religion—that begins at the top, and carries through hiring, promotion, and worker-to-worker relationships. In our host communities, we are generally recognized as an employer of choice as a result of our competitive wages, above-average benefits and our policies of recognizing and rewarding employee performance and promoting from within.*
>
> *Fair labour practices – Our commitment to fair and equitable labour practices extends through every facet of our operations. We adhere to the labour principles of the UN Global Compact and have identified employee development and teamwork as corporate values. We strive to include all levels of employees in decision-making processes and have never experienced strikes or lockouts in our operations."*

Employees will be encouraged and obliged to report any potential or suspected violations of the code either through Human Resources or the Proponent Whistleblower Hotline. The Whistleblower Hotline is anonymous and handled by a third party to encourage employees who may not file reports otherwise. The specific methods for reporting a grievance will be communicated in a broad manner to all employees.

12.2.1.18.4.16.9.6 Worker Accommodation

Due to the remote location of the proposed mine site, on-site accommodation for employees and contractors will be in a camp. The camp will offer a full range of amenities in alignment with best practices across the mining industry in Canada and will include:

- Exploring feasibility of maximizing privacy for accommodations through room design and layout;
- Social activities and areas – may include barbecue area, movie theatre, coffee bar, games room, pool tables, etc.;
- Fitness/recreational facilities – may include gym, or spots areas, etc.;
- WiFi/cellular service for personal use;
- TV/DVD service in bedrooms; and
- Accommodations that offer suitable living standards for the periods employees are on site.

A Camp Code of Conduct will be developed to include policies and provide guidance on acceptable conduct to ensure an adequate living environment focussed on the safety, security, health, and wellbeing of employees. To facilitate a safe working and living environment, alcohol, illegal drugs, and other banned substances will be prohibited on site.

12.2.1.18.4.16.9.7 Work Rotation Schedules

Work rotation schedules are currently being developed for the construction and operations phases of the Project. Different types of workers will be required at various phases of the Project. Some workers may work during a single phase (e.g., construction), and others may transition from one phase to another (e.g., construction to operations).

The various work rosters may include:

- Construction schedule for workers and contractors (sourced from outside the region) is anticipated to be:
  - Time on site and time away will vary depending on job requirements and demands of construction workers – due to the competitive market for workers, companies have to adapt at times to attract desirable workers and access as many sources of skilled workers as possible;
  - The schedule may vary based on the needs of local hires, but all schedules will follow the same ratio of time worked to time off; and
  - 12-hour days;
- Operations schedule for workers and contractors:
  - One week on/one week off for workers;
  - Four days on/three days off for staff;
  - The schedule may vary based on the needs of local hires, but all schedules will follow the same ratio of time worked to time off; and
  - 10 to 12 hour shifts, depending on the position.

The Proponent may vary shift rotation in discussion with employees to suit operational needs in compliance with employment standards.

Bus transportation will be provided for regional and non-regional workers and for contractors to and from Vanderhoof, BC.

12.2.1.18.4.17 Mine Waste Management Plan

12.2.1.18.4.17.1 Purpose

This section provides an overview of the MWMP for the Project. The plan provides the basic concepts and scope of mine waste management proposed to safely contain process plant tailing, to segregate and contain waste rock in an environmentally safe manner and to prevent and control acid rock drainage and metal leaching (ARD/ML). The goal of mine waste handling engineering design will be to provide physically and geochemically stable long term storage of tailing and waste rock at the site during and after mining, i.e., to "design for closure."

A site-specific detailed MWMP and SOPs will be developed before the commencement of construction in consultation with relevant permitting agencies. The MWMP would include details regarding specific roles and responsibilities, procedures and training, and records and reporting as required.

The MWMP would be based on the principles of adaptive management and continual improvement, as described in the EMS (**Section 12.1.1**). The MWMP will work in conjunction with other management plans under the EMS for the Project as well as details presented in the EA. These include:

- Mine Plan (**Section 2.2.3.2**);
- MWAMP (**Section 12.2.1.18.4.17**); and
- Waste Rock Management Facility Geotechnical Design (**Appendix 2.2A-4**).

The following subsections describe the general objective of the MWMP, relevant regulatory requirements and guidelines, and general management practices.

12.2.1.18.4.17.2 Scope

The spatial scope of the MWMP is the mine site proper; mine wastes will not be generated at any off-site facilities associated with the Project.

The temporal scope includes construction Year -2 through end-of-mine at Year 17 and up to the discharge of surface water from the pit lake and TSF estimated to be 18 years (Year 35) after the end of pit mining in Year 15.

12.2.1.18.4.17.3 Objectives

The objectives of the MWMP are to:

- Provide for management of waste rock through sampling and analysis to ensure segregation of PAG and ML rock and to deposit this rock in the TSF. On land, storage of waste rock and overburden will be limited to non-PAG rock with low zinc (and cadmium) concentrations in locations where drainage can be directed to the TSF; (refer to **Section 12.2.1.18.4.18** for further discussion of mine tailing and water management). (Note that limited amounts of NAG, very low zinc containing waste rock and overburden might be used for construction off the mine site); and
- Provide for management of tailing in a secure location (TSF) designed for no surface water discharge during the operating life-of-mine.

12.2.1.18.4.17.4 Corporate Policy

The Proponent's corporate policy and 15 Guiding Principles are discussed in **Section 2.1**. Key commitments with respect to mine water management include:

- Principle 12 Stewardship: Initiatives are identified and implemented to maximize use of earth's resources, while reducing the environmental impact of operations; and
- Sites develop, implement and maintain land management plans, water management plans, energy conservations plans and greenhouse gas management programs, as required.

12.2.1.18.4.17.5 Roles and Responsibilities

12.2.1.18.4.17.5.1 Mine General Manager

- Provide resources and have overall responsibility for implementing this plan.

12.2.1.18.4.17.5.2 Mill Manager

- Implement tailings deposition plan and water recycle systems for the TSF; and
- Provide resources for external dam engineers when required.

12.2.1.18.4.17.5.3 Mine Manager

- Implement waste rock segregation and placement in waste dumps and transfer of appropriate waste rock and overburden to the TSF for construction of the dams;
- Conduct confirmatory ABA and metal assays of selected blast hol.e samples to verify accuracy of the ARD block model and segregation plans;
- Transport and place PAG and NAG/ML waste rock into the TSF basin where it will be flooded (within one year for PAG waste rock and within three years for NAG/ML waste rock);
- Maintain and monitor the stability of waste dumps and pit walls including safe operation and construction of these facilities;
- Ensure compliance with the mine's *Mines Act* Permit requirements;
- Maintain the ARD block model and integrate with mine plans;
- Conduct additional ABA and metal assays for exploration drill hole samples; and
- Maintain and repair mine waste management facilities.

12.2.1.18.4.17.5.4 Environment and Sustainable Resources Manager

- Conduct site water quality monitoring including testing water draining from the open pit walls, East and West waste rock dumps and TSF pond supernatant, dam runoff and seepage.

- Conduct site inspections, including of drains, ditches, ponds and dams to ensure they are operating properly.
- Monitor for permit and regulatory compliance and ensure appropriate follow-up on potential non-compliance matters.

Any major repairs to dams or waste dumps will be under the supervision of a qualified geotechnical engineer.

Figure 12.2.1-25 shows the roles and responsibilities; title of positions and responsibilities may change prior to construction and will be reflected in the Construction and Operating Tailing and Waste Management Plans.

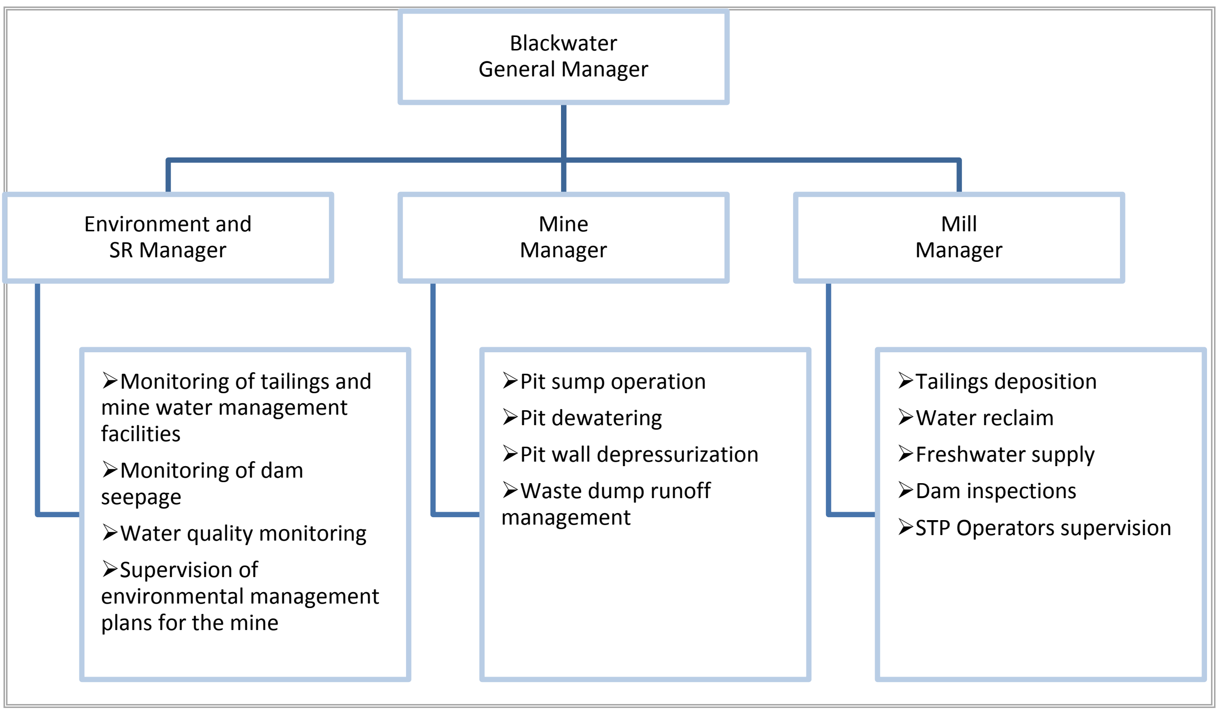


Figure 12.2.1-25: Mine Waste Rock and Tailing Management Responsibilities

12.2.1.18.4.17.6 Regulatory Requirements

Relevant legislative acts and guidelines that would apply to the MWMP include:

- BC *Mines Act* (Government of BC, 1996c);
- BC *Environmental Management Act* (Government of BC, 2003b);
- Federal *Fisheries Act* (Government of Canada, 1985d);
- *Canada Water Act* (Government of Canada, 1985a);

- BC *Water Act* (Government of BC, 1996d);
- BC *Water Protection Act* (Government of BC, 1996e);
- Canadian Environmental Protection Act, 1999 (Government of Canada, 1999);
- Federal Metal Mining Effluent Regulations (Government of Canada, 2002a);
- Federal *Explosives Act* (Government of Canada, 1985c) and associated Regulations; and
- Health and Safety Reclamation Code for Mines in British Columbia (BC MEMPR, 2008).

12.2.1.18.4.17.7 Mine Waste Management Process

12.2.1.18.4.17.7.1 Elements of the Mine Waste Management Plan

The major elements of the Mine Waste Management Plan are:

- Detailing and implementing the construction waste management plan described in the Project Construction Management Plan (**this section**);
- Implementing and verifying the ARD/ML management practices during all phases of mining;
- Monitoring waste rock for its potential to generate acid and leach metals through on-site and external laboratories;
- Ensuring compliance with *Mines Act* and *Environmental Management Act (EMA)* permits and authorizations;
- Verifying predictions of acid generating and ML potential of waste rock and implementing the closure phase of the waste management plan; and
- Developing and implementing SOPs and an Operations, Maintenance, and Surveillance Manual (OMS Manual) for the waste dumps and the TSF prior to construction.

12.2.1.18.4.17.7.2 Overburden and Waste Rock Types

For the purposes of management, deposit waste rock has been categorized into five types based on its potential to generate ARD/ML according to two parameters: neutralization potential ratio (NPR) and zinc concentration (**Table 12.2.1-52**) as described below:

- PAG 1 – NPR <1.0 (PAG);
- PAG 2 – 1.0 < NPR <2.0 (PAG);
- NAG 3 – NPR >2.0 and Zn >1,000 ppm (NAG);
- NAG 4 – NPR >2.0 and 600 < Zn <1,000 ppm (NAG); and
- NAG 5 – NPR >2.0 and Zn <600 ppm (NAG).

An NPR of less than two is considered potentially acid generating (Price, 1997). Additional discussion of derivation of the waste rock classification can be found in **Section 5.1.3.1**, Geochemistry Baseline Summary.

Overall, overburden was found to be non-acid generating based on ABA samples. However, testing of overburden samples near the bedrock interface identified 6 of 19 samples exhibiting an NPR less than two and two with a NPR less than one (**Figure 12.2.1-26**). All but one of these samples exhibited very low total sulphur (less than 0.05%). The one sample with somewhat elevated total sulphur (0.66%) likely incorporated at least some waste rock as the maximum and

95th percentile for all the other overburden samples (94) were very low at 0.11% and 0.04% respectively. The minimum paste pH for the 19 samples near the interface was 6.5 with a median of 7.2. Therefore, the overburden near the bedrock interface is not expected to be PAG.

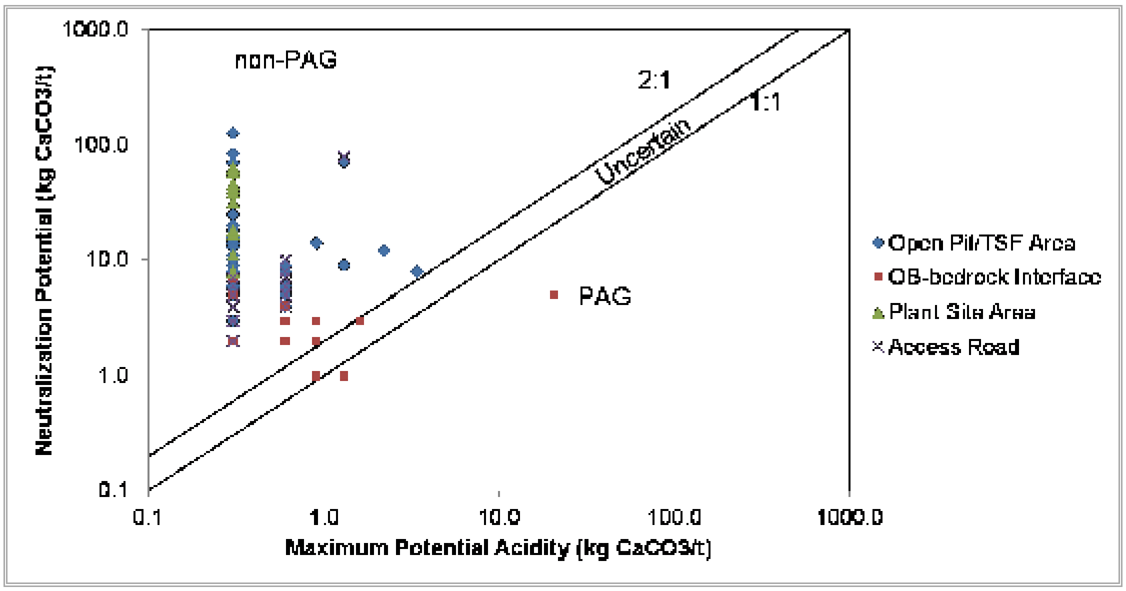


Figure 12.2.1-26: NP and MPA for Overburden Samples

Seven of the 19 samples of overburden near the interface exhibited total zinc concentrations greater than 1,000 ppm (**Table 12.2.1-52**). Since overburden is rather thin in many areas of the pit (no overburden is expected to be salvaged from the pit area), overburden near the bedrock interface currently could influence surface water quality near the pit. However, water quality in Creek 661 draining the pit area does not exhibit elevated metals on a mean monthly basis (occasional spikes raises the 95th percentile concentrations above BC protection of freshwater aquatic life 30-day average guidelines for cadmium and zinc). Therefore, significant ML is not expected.

Table 12.2.1-52: Deposit Waste Rock Types

Rock Classification	Median NPR (NP/MPA)	Median S Concentration (%)	Median Zn Concentration (mg/kg – ppm)
PAG1	0.34	0.6	1,700
PAG2	1.4	0.3	856
NAG3	3.8	0.2	1,585
NAG4	6.0	0.1	655
NAG5	9.0	0.04	124

Note: NAG = non-acid generating or non-potentially acid generation; PAG = potentially acid generating; NPR = neutralization potential ratio (neutralization potential/maximum potential acidity); S = sulphur; Zn = zinc

These conclusions regarding ARD and ML potential of overburden near the bedrock interface will be confirmed during mining by obtained additional specific samples. If some is found to be PAG or ML, the expected limited amounts of overburden will be identified, segregated and transferred to the TSF where it will be submerged.

The quantity and location of waste rock mining blocks was determined by an ARD block model based on a very extensive ABA and metal assay database as discussed in **Appendix 5.1.3.1A**.

12.2.1.18.4.17.7.3 Schedule for Mine Waste Rock Generation

The Project mine plan provides a schedule for the generation of waste rock by the ARD/ML rock classification discussed above. Mining will occur for 14 years with two years for construction and three years when processing of low grade ore from the stockpile will occur; no waste rock will be produced in construction Year -2.

Table 12.2.1-53 summarizes waste production by ARD type and **Table 12.2.1-54** describes ore, low-grade ore, and waste production and deportment. Annual plans for the on-land waste rock dumps and low-grade stockpile development are provided in the Detailed Project Description (**Appendix 2.2A-2**). Where possible, the low grade ore will be segregated into sulphide, transitional, and oxide types.

The location of storage piles for waste and overburden is shown on the Project site layout for Year 17, or end of mine life on **Figure 12.2.1-27**.

PAG1 and 2 and most NAG3 waste rock will be stored subaqueously in the TSF basin cells C and D; some of the NAG3 waste rock will be used in construction of the upstream portion of TSF Dam D and to create a buttress berm below the TSF Dam C where it will be flooded and encapsulated by tailings. NAG4 waste rock will be used for construction on-site. NAG5 waste rock and overburden will be used for construction on site. Very limited amounts of overburden and NAG5 might be used for construction off site (e.g., Camp pad). Any NAG5 and overburden waste rock used for off-site construction will be tested prior to its use.

The TSF Dam D downstream shell will be constructed primarily of NAG5 waste rock and overburden with limited NAG4 waste rock. Residual NAG4, NAG5 and overburden will be stored in the West Dump while the East Dump will comprise only residual NAG5 and overburden. A small 6 Mt overburden stockpile will be established near the TSF Dam D to facilitate dam core construction (**Figure 12.2.1-27**).

Table 12.2.1-53 Waste Production Schedule

Year	PAG1 and PAG2	NAG3	NAG4	NAG5	OVB	Total
Year -2	144,000	-	45,000	1,534,000	2,267,000	3,990,000
Year -1	5,488,000	1,787,000	2,015,000	8,985,000	12,373,000	30,648,000
Year 1	13,813,000	4,590,000	2,646,000	6,274,000	13,749,000	41,072,000
Year 2	26,936,000	3,548,000	2,583,000	8,488,000	13,697,000	55,252,000
Year 3	27,497,000	3,255,000	3,682,000	10,393,000	15,443,000	60,270,000
Year 4	37,004,000	5,400,000	3,664,000	11,425,000	5,896,000	63,389,000
Year 5	31,017,000	7,600,000	3,578,000	6,647,000	11,891,000	60,733,000
Year 6	39,175,000	7,875,000	3,804,000	8,031,000	7,882,000	66,767,000
Year 7	44,082,000	3,157,000	3,108,000	5,340,000	5,836,000	61,523,000
Year 8	37,925,000	10,078,000	3,789,000	7,440,000	2,558,000	61,790,000
Year 9	35,793,000	14,844,000	6,036,000	8,208,000	-	64,881,000
Year 10	26,581,000	9,895,000	5,865,000	14,556,000	-	56,897,000
Year 11	14,515,000	3,380,000	1,224,000	8,332,000	-	27,451,000
Year 12	10,741,000	1,400,000	1,205,000	1,550,000	-	14,896,000
Year 13	9,027,000	1,223,000	651,000	1,029,000	-	11,930,000
Year 14	6,961,000	1,303,000	278,000	167,000	-	8,709,000
Total	**366,699,000**	**79,335,000**	**44,173,000**	**108,399,000**	**91,592,000**	**690,198,000**

Source: NorWest Mining Corporation

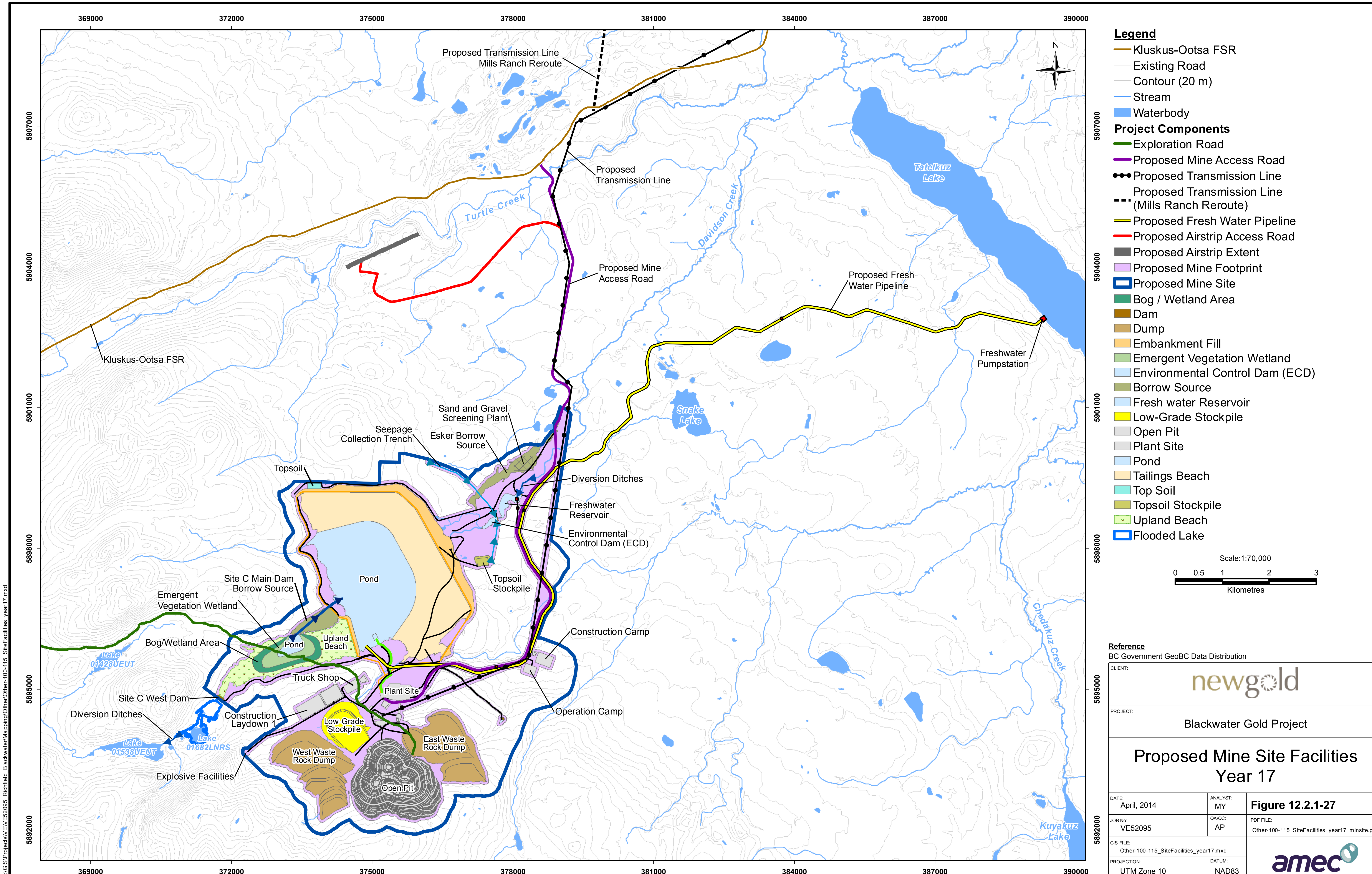
Nomenclature for the management of waste materials from the open pit will be simplified for operators to ensure that proper segregation is achieved. For example, PAG1 and PAG2 categories will be combined as both waste types will be deposited into the TSF and be flooded within one year. Overburden, NAG3, NAG4, and NAG5 types will remain separate as these waste types may have different destinations.

PAG1 and PAG2 types will continue to be used only as special tags in the block model and carried over to the dispatch database to assist engineering and senior pit supervising staff. These more refined categories will only be accessed and used by engineering, senior pit supervising, and geology staff.

Table 12.2.1-54: Mine Production and Placement Schedule

	Items	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Plant Feed	Tonnes			10,806,000	21,900,000	21,900,000	21,900,000	21,900,000	21,903,000	21,903,000	21,903,000	21,903,000	21,903,000	21,902,000	21,902,000	21,902,000	21,902,000	21,900,000	21,900,000	5,121,000
	Au grade (g/t)			0.900	0.906	1.000	0.710	0.750	0.827	0.803	0.936	0.839	0.688	0.609	0.634	0.687	0.879	0.399	0.399	0.399
	Au (g)			9,721,000	19,832,000	21,894,000	15,554,000	16,432,000	18,114,000	17,598,000	20,491,000	18,385,000	15,071,000	13,339,000	13,880,000	15,042,000	19,255,000	8,742,000	8,742,000	2,044,000
	Au (oz)			312,000	637,000	703,000	500,000	528,000	582,000	566,000	659,000	591,000	485,000	429,000	446,000	484,000	619,000	281,000	281,000	66,000
	Cumulative Au (oz)	0	0	312,000	949,000	1,652,000	2,152,000	2,680,000	3,262,000	3,828,000	4,487,000	5,078,000	5,563,000	5,992,000	6,438,000	6,922,000	7,541,000	7,822,000	8,103,000	8,169,000
	Au Recovered grade (g/t)			0.763	0.782	0.877	0.612	0.647	0.723	0.701	0.826	0.737	0.592	0.522	0.544	0.592	0.764	0.337	0.337	0.337
	Au Recovered (g)			8,245,000	17,130,000	19,214,000	13,397,000	14,176,000	15,826,000	15,347,000	18,086,000	16,145,000	12,967,000	11,425,000	11,911,000	12,960,000	16,726,000	7,380,000	7,380,000	1,726,000
	Au Recovered (oz)			266,000	551,000	617,000	431,000	456,000	509,000	493,000	581,000	519,000	417,000	367,000	383,000	417,000	538,000	237,000	237,000	55,000
	Ag grade (g/t)			5.545	5.383	5.842	5.416	4.958	6.155	4.255	6.706	6.123	3.835	3.400	2.982	3.272	2.351	10.282	10.282	10.283
	Ag (g)			59,916,000	117,898,000	127,937,000	118,603,000	108,576,000	134,821,000	93,192,000	146,877,000	134,103,000	83,995,000	74,459,000	65,307,000	71,669,000	51,496,000	225,186,000	225,186,000	52,657,000
	Ag Recovered grade (g/t)			3.193	2.859	3.137	2.921	2.523	3.147	1.935	3.059	2.746	1.677	1.483	1.295	1.421	1.010	5.200	5.200	5.200
	Ag Recovered (g)			34,502,000	62,618,000	68,709,000	63,975,000	55,245,000	68,922,000	42,386,000	67,002,000	60,148,000	36,742,000	32,485,000	28,358,000	31,128,000	22,123,000	113,873,000	113,873,000	26,628,000
	Ag Recovered (oz)			1,110,000	2,013,000	2,209,000	2,056,000	1,776,000	2,216,000	1,363,000	2,154,000	1,934,000	1,181,000	1,044,000	912,000	1,001,000	711,000	3,661,000	3,661,000	856,000
Stockpile	Tonnes		1,612,000	6,250,000	4,386,000	3,633,000	3,143,000	5,678,000	2,987,000	7,384,000	6,801,000	3,126,000	5,183,000							
	Au (g/t)		0.538	0.620	0.461	0.460	0.296	0.317	0.326	0.406	0.367	0.305	0.374							
	Au (g)		867,000	3,876,000	2,021,000	1,670,000	931,000	1,798,000	974,000	2,996,000	2,495,000	954,000	1,938,000							
	Ag grade (g/t)		5.361	5.842	4.704	5.196	16.796	14.235	9.998	3.156	22.450	21.855	3.569							
	Ag (g)		8,642,000	36,514,000	20,630,000	18,877,000	52,790,000	80,827,000	29,865,000	23,307,000	152,685,000	68,320,000	18,496,000							
Direct Feed	Tonnes			10,286,000	21,159,000	21,900,000	21,900,000	21,900,000	21,903,000	21,903,000	21,903,000	21,903,000	21,903,000	21,902,000	21,902,000	21,902,000	21,902,000			
	Au (g/t)			0.905	0.910	1.000	0.710	0.750	0.827	0.803	0.936	0.839	0.688	0.609	0.634	0.687	0.879			
	Au (g)			9,313,000	19,249,000	21,894,000	15,554,000	16,432,000	18,114,000	17,598,000	20,491,000	18,385,000	15,071,000	13,339,000	13,880,000	15,042,000	19,255,000			
	Ag (g/t)			5.507	5.352	5.842	5.416	4.958	6.155	4.255	6.706	6.123	3.835	3.400	2.982	3.272	2.351			
	Ag (g)			56,646,000	113,245,000	127,937,000	118,603,000	108,576,000	134,821,000	93,192,000	146,877,000	134,103,000	83,995,000	74,459,000	65,307,000	71,669,000	51,496,000			
PAG (tonnes)	to Site C Storage (tonnes)	144,000	5,488,000	13,813,000	0	0	0	0	0	0	0	0	0	0	0	0	0			
	to Site D Storage (tonnes)	0	0	0	26,936,000	27,497,000	37,004,000	31,017,000	39,175,000	44,082,000	37,925,000	35,793,000	26,581,000	14,515,000	10,741,000	9,027,000	0			
	Backfilled (tonnes)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,961,000			
NAG3 (tonnes)	to D Dam Construction (tonnes)	0	800,000	2,500,000	2,000,000	2,435,000	4,008,000	3,696,000	3,245,000	2,013,000	3,029,000	2,598,000	1,527,000	1,470,000	983,000	978,000	1,025,000			
	to Site C Storage (tonnes)	0	987,000	2,090,000	0	0	0	0	0	0	0	0	0	0	0	0	0			
	to Site D Storage (tonnes)	0	0	0	1,548,000	820,000	1,391,000	3,904,000	4,630,000	1,144,000	7,049,000	12,246,000	8,369,000	1,911,000	417,000	245,000	0			
	Backfilled (tonnes)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	278,000			
NAG4 (tonnes)	to C Dam Construction (tonnes)	0	1,000,000	997,000	0	0	0	0	0	0	0	0	0	0	0	0	0			
	to D Dam Construction (tonnes)	0	0	0	1,500,000	0	2,445,000	0	0	0	0	0	0	0	0	0	0			
	to West Dump (tonnes)	45,000	1,015,000	1,647,000	1,083,000	3,682,000	1,219,000	3,578,000	3,804,000	3,108,000	3,789,000	6,036,000	5,865,000	1,224,000	1,205,000	651,000	278,000			
NAG5 (tonnes)	to C Dam Construction (tonnes)	0	5,800,000	1,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0			
	to D Dam Construction (tonnes)	0	200,000	2,412,000	6,768,000	7,500,000	9,100,000	5,000,000	4,897,000	3,904,000	2,881,000	1,830,000	552,000	554,000	41,000	771,000	151,000			
	to East Dump (tonnes)	259,000	2,282,000	582,000	1,106,000	2,893,000	2,325,000	1,647,000	1,500,000	718,000	2,279,000	3,189,000	7,002,000	3,889,000	754,000	129,000	8,000			
	to West Dump (tonnes)	1,274,000	703,000	1,780,000	614,000	0	0	0	1,634,000	718,000	2,279,000	3,189,000	7,002,000	3,889,000	754,000	129,000	8,000			
OVB (tonnes)	to C Dam Construction (tonnes)	0	2,000,000	2,499,000	0	380,000	380,000	380,000	0	0	0	0	0	0	0	0	0			
	to D Dam Construction (tonnes)	0	1,200,000	3,500,000	9,232,000	8,864,000	3,480,000	4,265,000	933,000	2,075,000	2,023,000	0	0	0	0	0	0			
	to East Dump (tonnes)	337,000	3,583,000	1,756,000	3,364,000	2,300,000	1,636,000	3,331,000	2,000,000	924,000	268,000	0	0	0	0	0	0			
	to West Dump (tonnes)	1,930,000	5,590,000	5,994,000	1,100,000	3,899,000	0	3,915,000	1,449,000	924,000	268,000	0	0	0	0	0	0			
	OVB to Stockpile	0	0	0	0	0	400,000	0	3,500,000	1,913,000	0	0	0	0	0	0	0			
Total Waste tonnes		3,989,000	30,648,000	41,070,000	55,251,000	60,270,000	63,388,000	60,733,000	66,767,000	61,523,000	61,790,000	64,881,000	56,898,000	27,452,000	14,895,000	11,930,000	8,709,000	0	0	0
Total Ore tonnes		0	1,612,000	16,536,000	25,545,000	25,533,000	25,043,000	27,578,000	24,890,000	29,287,000	28,704,000	25,029,000	27,086,000	21,902,000	21,902,000	21,902,000	21,902,000	0	0	0
Total tonnes		3,989,000	32,260,000	57,606,000	80,796,000	85,803,000	88,431,000	88,311,000	91,657,000	90,810,000	90,494,000	89,910,000	83,984,000	49,354,000	36,797,000	33,832,000	30,611,000	0	0	0

Source: Norwest Corporation. ovb = overburden



Proposed Transmission Line
Mills Ranch Reroute
Proposed
Transmission Line
Turtle Creek
Davidson Creek
Tatelkuz
Lake
Proposed Mine
Access Road
Proposed Fresh
Water Pipeline
Freshwater
Pumpstation
Kluskus-Ootsa FSR
Snake
Lake
Sand and Gravel
Screening Plant
Seepage
Collection Trench
Esker Borrow
Source
Topsoil
Diversion Ditches
Freshwater
Reservoir
Environmental
Control Dam (ECD)
Topsoil
Stockpile
Pond
Site C Main Dam
Borrow Source
Emergent
Vegetation Wetland
Bog/Wetland Area
Pond
Upland
Beach
Construction Camp
Truck Shop
Plant Site
Operation Camp
Site C West Dam
Diversion Ditches
Construction
Laydown 1
Low-Grade
Stockpile
East Waste
Rock Dump
West Waste
Rock Dump
Lake
01428UEUT
Lake
01538UEUT
Lake
01682LNRS
Explosive Facilities
Open Pit
Chedakuz Creek
Kuyakuz
Lake
369000
372000
375000
378000
381000
384000
387000
390000
5907000
5904000
5901000
5898000
5895000
5892000
N
Legend
Kluskus-Ootsa FSR
Existing Road
Contour (20 m)
Stream
Waterbody
Project Components
Exploration Road
Proposed Mine Access Road
Proposed Transmission Line
Proposed Transmission Line
(Mills Ranch Reroute)
Proposed Fresh Water Pipeline
Proposed Airstrip Access Road
Proposed Airstrip Extent
Proposed Mine Footprint
Proposed Mine Site
Bog / Wetland Area
Dam
Dump
Embankment Fill
Emergent Vegetation Wetland
Environmental Control Dam (ECD)
Borrow Source
Fresh water Reservoir
Low-Grade Stockpile
Open Pit
Plant Site
Pond
Tailings Beach
Top Soil
Topsoil Stockpile
Upland Beach
Flooded Lake
Scale:1:70,000
0 0.5 1 2 3
Kilometres
Reference
BC Government GeoBC Data Distribution
CLIENT:
newgold
PROJECT:
Blackwater Gold Project
Proposed Mine Site Facilities
Year 17
DATE:
April, 2014
ANALYST:
MY
Figure 12.2.1-27
JOB No:
VE52095
QA/QC:
AP
PDF FILE:
Other-100-115_SiteFacilities_year17_minsite.pdf
GIS FILE:
Other-100-115_SiteFacilities_year17.mxd
PROJECTION:
UTM Zone 10
DATUM:
NAD83
amec

12.2.1.18.4.17.7.4 NAG Disposal Areas and Low-Grade Ore Stockpile

Waste dump areas have been identified and subsequently refined and optimized to minimize surface water control requirements. NAG waste rock (NAG4 and NAG5) and overburden will be combined and placed in two permanent engineered dumps adjacent to the pit—the East Dump and the West Dump. The dump foundations will be cleared in preparation for fill placement. A 30 m strip along the advancing dump toe will be stripped, and the upper layer will be spoiled in a windrow and buried beneath the dump. A total of 63 Mm^3 of material will be stored in these waste rock dumps outside of the TSF. Water that infiltrates through the East Dump will be collected at the base of the dump in a collection pond and directed by gravity to the TSF. The dumps will be developed with overall slopes to facilitate reclamation with growth media at closure. Surface water runoff during operations and at closure will be diverted around the dump to the TSF. These surface water diversions will be field-fit with the advancing fill platforms.

The location of the LGS has been optimized to minimize the risk of impacts to the surrounding environment and limit surface water control requirements to the maximum extent practical. Additional details about the surface water and seepage control infrastructure for the LGSs are included in **Appendix 2.2A-2**.

The stability ratings for the East Dump, West Dump, and LGS have been assessed using the rating system described in the interim guidelines provided by the BC Mine Waste Rock Pile Research Committee (BC MWRPRC, 1991). All three areas have been classified as “Class II” low failure hazard dumps (rating of 500). The development of the stability rating for each facility is shown in **Table 12.2.1-55**.

Stability analyses have been carried out for each of the facilities in accordance with the recommended level of effort indicated in the guidelines. The analyses were conducted using the limit equilibrium computer program SLOPE/W and a similar methodology used (refer to following paragraph). The stability of each dump was assessed for a deep-seated failure surface propagating a minimum of 100 m from the crest of the pile, a mid-sized failure surface propagating a minimum of 50 m from the crest, and a smaller-scale failure surface allowed to form just at the crest of the pile. The results of the analyses satisfy the requirements for factors of safety indicated in the guidelines. The seismic analyses showed that any embankment deformations during earthquake loading from the OBE and MDE would be minor and would not result in significant displacement in the piles.

The guidelines (BC MWRPRC, 1991) specify the following recommended level of effort for investigation and design of mine rock and overburden piles with a low failure hazard rating:

- Thorough site investigation;
- Test pits, sampling may be required;
- Limited lab index testing; and
- Basic stability analyses.

Table 12.2.1-55: Waste Dump and Stockpile Stability Rating Summary

Key Factors Affecting Stability	Point Rating					
	West Dump		**Low-Grade Ore Stockpile**		**East Dump**	
Dump Height	75	50	70	50	90	50
Dump Volume	Medium	50	Medium	50	Medium	50
Dump Slope	Flat	0	Flat	0	Flat	0
Foundation Slope	Flat	0	Flat	0	Flat	0
Degree of Confinement	Moderately Confined	50	Moderately Confined	50	Moderately Confined	50
Foundation Type	Competent	0	Competent	0	Competent	0
Dump Material Quality	Moderate	100	Moderate	100	Moderate	100
Method of Construction	Mixed	100	Mixed	100	Mixed	100
Piezometric & Climate Conditions	Intermediate	100	Intermediate	100	Intermediate	100
Dumping Rate	Slow	0	Slow	0	Slow	0
Seismicity	Moderate	50	Moderate	50	Moderate	50
Dump Stability Rating		**500**		**500**	**500**	
	Class	**Failure Hazard**	**Class**	**Failure Hazard**	**Class**	**Failure Hazard**
Dump Stability Class	**II**	**Low**	**II**	**Low**	**II**	**Low**

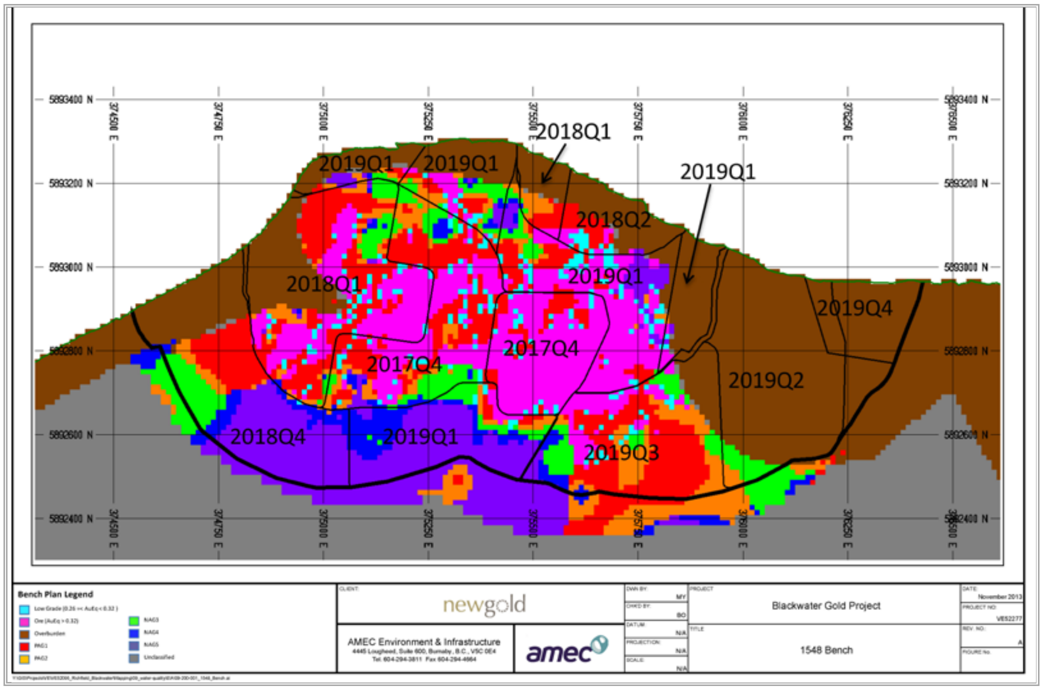
Source: Knight Piésold

The level of effort completed to date for the East Dump, West Dump, and LGS meets the guideline recommendations.

12.2.1.18.4.17.7.5 Segregation of Waste Rock

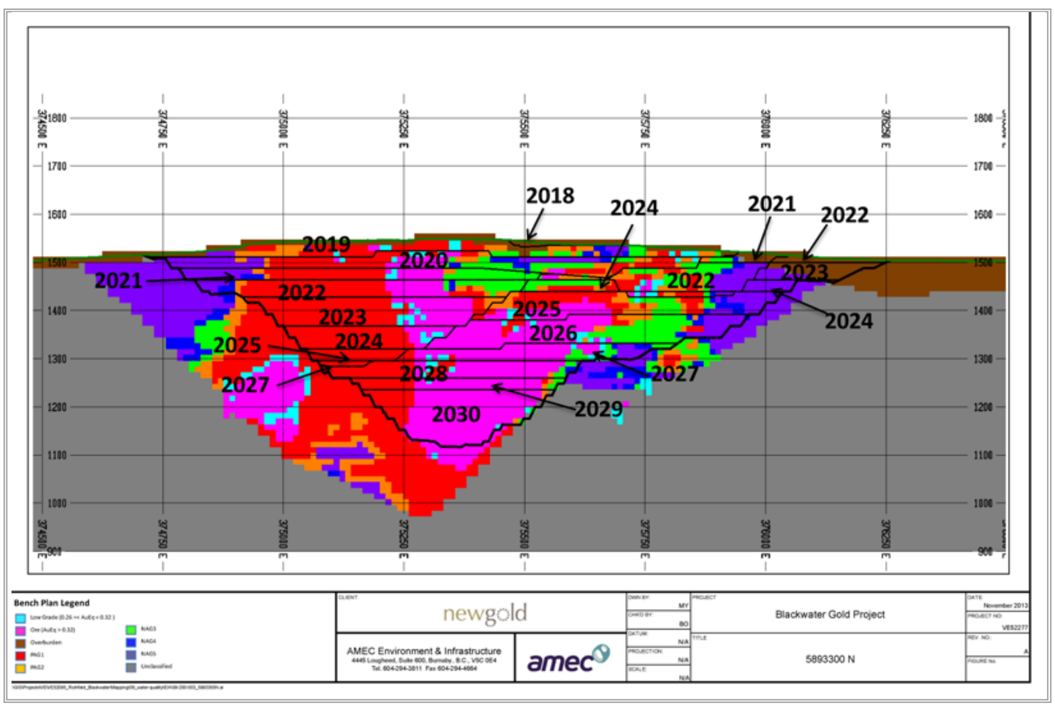
The ARD block model to categorize the waste rock developed as part of the feasibility study is robust as it incorporates 805 ABA analyses and 281,826 ICP analyses for sulphur and calcium (surrogate for NP).

An example bench plan (1548) and cross-section (5893000 N) based on the ARD block model showing shovel cuts by quarter or year are shown on **Figure 12.2.1-28** and **Figure 12.2.1-29**.



Source: NorWest Mining Corporation

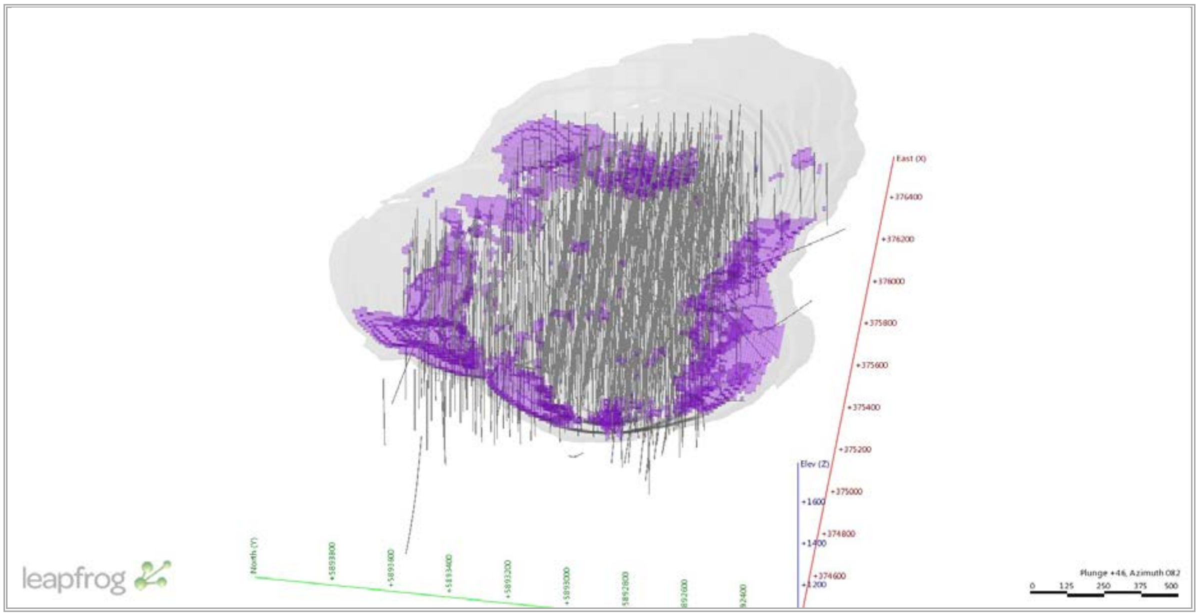
Figure 12.2.1-28: Bench Plan with Shovel Cuts and ARD Types



Source: NorWest Mining Corporation

Figure 12.2.1-29: Cross-Section with Shovel Cuts and ARD Types

The bench plan and section generally show broad zones of similar ARD category waste material. The location of NAG5 blocks (purple), drill hole traces and ultimate pit shell is shown in **Figure 12.2.1-30**. The NAG5 blocks reside primarily in the upper benches of the pit and are contiguous around the outer edges. Their location facilitates relatively simple mining and segregation. Blocks peripheral to NAG5 blocks, particularly in the east and south (top and right in figure) are mainly overburden that can also be easily identified and mined.



Source: NorWest Mining Corporation

Figure 12.2.1-30: Location of NAG5 Blocks in ARD Block Model

Bench plans relevant to the mining phase based on the ARD block model will be prepared prior to the advance of mining and will include pierce points for both exploration and blast holes that have been tested previously for ABA, sulphur, calcium and zinc. These data will be plotted to verify the block model accuracy.

Blast hole ARD and metal data will be collected as part of the grade control process. The on-site assay laboratory will include instruments and equipment to test blast hole and geological exploration drill hole samples:

- Inductively-coupled plasma (ICP) mass spectrometer for zinc, cadmium and calcium assays; and
- Leco furnace for sulphur assays.

It is estimated that around 500 blast holes samples will be tested per year for sulphur, calcium, and zinc in the on-site laboratory. The actual number of samples tested will vary based on the predicted and measured variability in ARD and ML characteristics of the blocks to be mined. In addition, about 100 of those samples per year will be sent to an external laboratory for verification although the number of samples will vary based on characteristics of the waste. The sampling program will be reviewed and possibly modified based on results and verification of the ARD block model during the early years of mining.

The NPR will be routinely determined based on the total sulphur and calcium assays as was done for the feasibility study ARD block model. External laboratory verification will involve standard ABA analyses including the modified Sobek neutralization potential determination. The results of the modified Sobek method, where available, will take precedence over the NP calculated from the calcium assays.

All data from analyses of samples in the pit will be plotted on bench and daily dig plans and reviewed with the pit foreman and pit crews.

A GPS dispatch system will be installed in every piece of production equipment (e.g., shovels, haul trucks, track dozer, etc.) and used to manage block segregation and placement. Bench plans will be transmitted by the engineering department to the shovel and track dozer operators. Plans with waste characterization boundaries will be displayed on screens in the operators' cabs. The screens will also show the location of the piece of equipment relative to the bench plan. The shovel and/or track dozer will segregate waste units according to the bench plan and once segregated the material will be loaded into haul trucks.

As haul trucks are loaded, the dispatch system will transmit the nature of the material and the required dump location for each load to screens in the operators' cabs. Truck drivers will follow instructions to ensure proper placement of materials. Records will be kept of dispatch information so that proper segregation and management of waste can be confirmed.

12.2.1.18.4.17.7.6 Waste Rock Segregation Contingency Plans

In general, preventing ARD and ML at the Project will be achieved by segregating waste rock according to its potential to generate ARD and leach metals and by placing the reactive materials within the TSF basin where they will be submerged.

While the described management plans are expected to be effective, it is possible that errors could occur in identifying potentially reactive blocks and placing them in their proper disposal locations. These errors could, for example, result in limited PAG and ML waste rock being placed in the downstream TSF Dam D shell or in the East or West waste rock dumps.

As discussed previously, the ARD block model is based on a very extensive metals (from ICP) and ABA database and is expected to reasonably represent the actual ARD and ML potential of the blocks. Moreover, examination of ARD categories from the block model in 3D (Leapfrog software) and in bench plans indicates that the materials primarily used for construction of the TSF Dam D downstream shell (overburden and NAG5) occur within large contiguous areas. These contiguous zones will be targeted for construction while avoiding to the extent possible overburden or NAG5 blocks near boundaries with NAG3, PAG1 or PAG2 blocks. This will reduce the potential for PAG or ML blocks being placed in the downstream TSF Dam D shell.

12.2.1.18.4.17.7.7 TSF Dam D Downstream Shell

Overall, 54% and 41% of the TSF Dam D downstream shell will comprise NAG5 and overburden respectively. Only 5% of the shell will be NAG4 and these blocks will be placed early in the mine life (2018 and 2020) where they will be located deep within the shell and encapsulated by overburden and NAG5. If inadequate overburden or NAG5 is found in the pit, then additional NAG4 will be used in the interior of the downstream TSF dam D shell and covered with a minimum 5 m facing of overburden and NAG5. Although somewhat higher in zinc content, geochemical testing has found little difference in ML of NAG4 compared to NAG5 waste rock.

Despite the management systems in place, a limited number of PAG or NAG3 truck loads might be improperly placed in the TSF Dam D downstream shell due to dispatch or truck/shovel errors. These incidents should be very limited given the management systems in place and robustness of the ARD block model.

Dispatch records will be reviewed daily so any errors will be identified at that time. If NAG3 is found to be improperly placed in the TSF Dam D shell during the previous day it will be left in place as the daily lift will very limited in size, the material will be non-PAG and be surrounded by overburden/NAG5 waste rock such that the overall zinc concentration in the region of the shell will be low.

An average of 46% (range 23% to 85%) of the TSF downstream shell built from construction Year 2 to Year 8 of mine operations will be overburden. Therefore overburden is available during this period to encapsulate any improperly placed NAG3 waste in the dam shell. Moreover, significant experience with the ARD block model and waste management will be gained during the first nine years that will be applied in the last six years of TSF dam D shell construction when no overburden is mined from the pit.

From Years 9 to 14 (when construction of the TSF Dam D is complete), the shell will be constructed entirely of NAG5 waste rock. This waste will be carefully selected and will reside in the upper lifts of the dam. Any infiltration from the limited amount of NAG3 waste rock in upper lifts of the dam shell will pass through the lower thick sections of NAG5 and overburden in the dam shell where metals could be precipitated or adsorbed.

If PAG waste rock were placed in the shell during the previous day by error it will be excavated and placed into the TSF. The excavated area will be backfilled with overburden or NAG5 waste rock. Lifts in the TSF will be accessible the day after placement given the long dump face of the dam shell.

Knowledge of the actual ARD/ML characteristics of the waste gained during the early years of operations will be used to refine the management plan including rehandling triggers of any improperly placed waste in the shell after Year 8.

Regardless, drainage from the TSF Dam D shell will be monitored and captured in the ECD and returned to the TSF during operations and closure until the pit lake is full. The actual leaching characteristics of material placed in the downstream TSF Dam D shell will be known by the time the pit lake overflows. As a further contingency, TSF dam runoff and seepage could continue to be collected after the pit lake overflows with treatment applied as required.

12.2.1.18.4.17.7.8 East and West Waste Rock Dumps

Drainage from the East and West waste rock dumps will flow by gravity in ditches to the TSF significantly reducing the risk of ARD or ML impacts on receiving environment water quality. At closure, drainage from the East Dump might be returned to Creek 661 pre-mining catchment depending upon its quality. The East Dump will have only overburden and NAG5 waste rock.

Overburden comprises a significant portion of the East and West Dumps from Year 2 of construction to Year 7 of operations (59% average for East Dump and 43% average for West Dump). Therefore, overburden is available to encapsulate any improperly placed PAG or NAG3 waste in the dam shell during those years. In Year 8, 11% and 4% of the West and East Dumps respectively will comprise overburden whereas no overburden will be placed from Year 9 to the end of waste dump construction in Year 14, about 25 Mt and 19 Mt of overburden that will ultimately be in the West and East Dumps respectively (much of which will be accessible).

Excavation of the possible limited quantities of improperly placed NAG3 and PAG into the on-land dumps is not practical given the 20 m dump height. Dump drainage will be monitored during operations and into closure to confirm the effectiveness of management plans. If required a thick overburden cover could be placed on one or both of the waste rock dumps to significantly reduce oxygen and water infiltration. In addition, drainage from the dumps could be treated in wetlands or by active chemical treatment or discharged at depth into the anoxic zone of the pit lake at closure.

12.2.1.18.4.17.7.9 Waste Segregation Contingency Summary

Overall, the risk of ARD and significant ML occurring is low even with some errors in waste placement given the robustness of the ARD block model and the waste segregation/management plans for the project. The MWAMP including directing all site water to the TSF, no surface water discharge during operations and early closure (while pit lake fills), recycle of TSF Dam D drainage to the TSF and post-closure wetland treatment systems minimizes the potential for impacts on receiving waters. Additional water management contingency plans are available including active chemical treatment and discharge at depth into the pit lake at closure.

12.2.1.18.4.17.8 Closure Management of Waste Rock

The RCP (**Section 2.6** and **Section 12.2.2**) provides details on mine waste handling on closure; a summary is provided for waste rock in this section:

- Overburden will be placed on top of exposed PAG1, PAG2, and NAG3 waste rock stored in the TSF to isolate tailing supernatant prior to flooding at closure;
- The West and East waste rock dumps will be covered with a minimum 0.3 m overburden cover at closure to facilitate reclamation to further reduce infiltration and possible ML;

- About 63 ha of the West Dump will be progressively reclaimed with 0.3 m overburden cover and revegetated during the mine life;
- Drainage from the East Dump will be monitored during operations, and, if found to have acceptable quality, will be released to the Creek 661 drainage after closure; and
- About 7 Mt of waste rock (comprising 94% PAG and 6% NAG3) will be left in the pit as backfill during the last year of mining (Year 14). If any low-grade ore is not processed it will also be placed in the open pit, with lime as required to neutralize acidity that might have accumulated during on-land storage. This backfilled rock will be placed in the lower levels of the pit and flood quickly as the pit fills.

12.2.1.18.4.17.8.1 Processed Tailings

The process plant will utilize a whole ore leach flowsheet (**Section 2.2**). Cyanide will leach gold from the milled ore. The raw tailing from the whole ore leach process will be treated in a SO_2/air cyanide destruction plant (**Section 2.2**). The cyanide destruct plant will lower the tailing cyanide concentration to levels well below those required in the *International Cyanide Code* for both total cyanide and weak acid dissociable cyanide.

Results of bench-scale tests are provided in the SGS Lakefield test report.

12.2.1.18.4.17.9 Management of Tailings during Operations

12.2.1.18.4.17.9.1 TSF Design and Construction

TSF construction was designed by Knight Piésold. A summary of their design details is provided below.

The design and operating criteria for the proposed mine waste storage facilities are presented in **Table 12.2.1-57**.

Table 12.2.1-56: SO_2/air 39-Day Free Water Chemistry

General Parameters	Unit		Total Metals	Unit		Dissolved Metals	Unit	
pH	pH units	7.90	T-Aluminum	mg/L	0.051	D-Aluminum	mg/L	0.021
Conductivity	mS/cm	84.08	T-Antimony	mg/L	0.063	D-Antimony	mg/L	0.062
TDS	mg/L	68.3	T-Arsenic	mg/L	0.007	D-Arsenic	mg/L	0.007
TSS	mg/L	3.3	T-Barium	mg/L	0.050	D-Barium	mg/L	0.052
Turbidity	mg/L	1.8	T-Beryllium	mg/L	0.0001	D-Beryllium	mg/L	0.0001
Total hardness	mg/L	38.1	T-Boron	mg/L	0.025	D-Boron	mg/L	0.025
Total alkalinity	mg/L	43.1	T-Cadmium	mg/L	0.0035	D-Cadmium	mg/L	0.0036
Fluoride	mg/L	0.06	T-Calcium	mg/L	11.5	D-Calcium	mg/L	11.3
Sulphate	mg/L	2.75	T-Chromium	mg/L	0.0004	D-Chromium	mg/L	0.0010
Chloride	mg/L	0.44	T-Cobalt	mg/L	0.064	D-Cobalt	mg/L	0.065
Ammonia	mg/L	0.02	T-Copper	mg/L	0.012	D-Copper	mg/L	0.009
Nitrate	mg/L	0.04	T-Iron	mg/L	0.46	D-Iron	mg/L	0.38
Nitrite	mg/L	0.004	T-Lead	mg/L	0.0020	D-Lead	mg/L	0.0004
TKN	mg/L	0.21	T-Lithium	mg/L	0.012	D-Lithium	mg/L	0.012
Ortho-phosphate	mg/L	0.015	T-Magnesium	mg/L	3.09	D-Magnesium	mg/L	3.23
Total dissolved phosphorus	mg/L	0.02	T-Manganese	mg/L	0.364	D-Manganese	mg/L	0.362
TOC	mg/L	7.49	T-Mercury	mg/L	0.000009	D-Mercury	mg/L	0.00001
DOC	mg/L	7.22	T-molybdenum	mg/L	0.11	D-Molybdenum	mg/L	0.11
Temp	°C	3.17	T-Nickel	mg/L	0.003	D-Nickel	mg/L	0.003
Cyanide	**Unit**		T-Phosphorus	mg/L	0.010	D-Phosphorus	mg/L	0.011
Total Cyanide	mg/L	0.01	T-Potassium	mg/L	65.9	D-Potassium	mg/L	69.5
Cyanide WAD	mg/L	0.01	T-Selenium	mg/L	0.0006	D-Selenium	mg/L	0.0006
Cyanate	mg/L	0.2	T-Silicon	mg/L	6.4	D-Silicon	mg/L	6.1
Thiocyanate	mg/L	0.5	T-Silver	mg/L	0.00003	D-Silver	mg/L	0.00001
			T-Sodium	mg/L	3.00	D-Sodium	mg/L	2.97
			T-Strontium	mg/L	0.52	D-Strontium	mg/L	0.52
			T-Thallium	mg/L	0.0001	D-Thallium	mg/L	0.0001
			T-Tin	mg/L	0.017	D-Tin	mg/L	0.01766
			T-Titanium	mg/L	0.0027	D-Titanium	mg/L	0.00024
			T-Uranium	mg/L	0.0021	D-Uranium	mg/L	0.0021
			T-Vanadium	mg/L	0.00016	D-Vanadium	mg/L	0.00009
			T-Zinc	mg/L	0.0846	D-Zinc	mg/L	0.0778

Note: °C = degree Celsius; D = Dissolved; mg/L = milligrams per litre; mS/cm = milliSiemens per centimetre; NTU = Nephelometric Turbidity Unit; T = Total; TDS = total dissolved solids; TOC = total organic carbon; TSS = total suspended solids; *italic* = method detection limit used

Table 12.2.1-57: Design and Operating Criteria for the Project Mine Waste Storage Facilities

ITEM	DESIGN CRITERIA	
1.0 GENERAL		
Site Coordinates	• Approximately 375 000 E , 5 895 000 N (UTM NAD 83) and in NTS sheet 93F/02	
Site Elevation	• Approximately 1000 to 1700 masl	
Codes and Standards	• Health Safety and Reclamation Code for Mines in British Columbia (2008), Mines Act (RSBC 1996), ASTM, CDA Dam Safety Guidelines (2007) and related codes.	
Mine Production	• Total ore milled = 344 million tonnes (Mt)	
	• Throughput = 60,000 tonnes per day (tpd).	
	• Open pit stripping ratio = approximately 2:1 (excluding rehandle).	
	• Mine Life = approximately 17 years	
Climate Conditions	• Mean Annual Precipitation = 636 mm	
	• Mean Annual Evaporation for the Project Site = 443 mm	
Rainfall Storm Events	• 1 in 10 year 24 hour precipitation = 50 mm	
	• 1 in 50 year 24 hour precipitation = 61 mm	
	• 1 in 200 year 24 hour precipitation = 71 mm	
	• Probable Maximum Precipitation 24 hr rainfall = 195 mm	
2.0 MINE WASTE MANAGEMENT		
2.1 Waste Properties		
Tailings	• Total tailings production = 344 Mt	
	• Dry density = 1.30 t/m^3.	
	• Specific Gravity of Solids = 2.79	
Potentially Acid Generating (PAG) Waste Rock - PAG1 and PAG2	• PAG co-disposed with tailings = 366 Mt	
	• Waste Rock Specific Gravity = 2.7	
	• Dry density = 2.2 t/m^3.	
Potentially Metal Leaching Waste Rock - NAG3	• NAG3 (Total 79 Mt) - co-disposed with tailings = 47 Mt and Used to construct upstream zone of TSF embankments = 32 Mt	
	• Waste Rock Specific Gravity = 2.7	
	• Dry density = 2.2 t/m^3.	
Non-Acid Generating (NAG) Waste Rock - NAG4 and NAG5	• NAG4 (Total 44 Mt) - Disposed in stockpiles = 42 Mt and Used to construct TSF embankments = 2 Mt	
	• NAG5 (Total 108 Mt) - Disposed in stockpiles = 54 Mt and Used to construct TSF embankments = 54 Mt	
	• Waste Rock Specific Gravity = 2.7	
	• Dry density = 2.2 t/m^3.	
Non-Acid Generating (NAG) Overburden	• Overburden (Total 87 Mt) - Disposed in stockpiles = 47 Mt and Used to construct TSF embankments = 40 Mt	
	• Overburden Specific Gravity = 2.7	
	• Dry density = 1.9 to 2.0 t/m^3.	
Low Grade Ore (LGO)	• 50 Mt stockpiled in an engineered facility for processing during Years 15-17	
	• Specific Gravity = 2.7	
	• Dry density = 2.2 t/m^3.	
2.2 Tailings Storage Facility (TSF)		
Function	• Two impoundments (Site C and D) provides for secure and permanent storage of tailings and management of decanted water for reuse in the process.	
Concept	• Total tailings storage codisposed with 366 Mt of PAG and 79 Mt NAG-ML waste rock within two impoundments formed by three embankments. Embankments raised in stages and constructed using the centreline method.	
Storage Capacity	• Site C - 2 years of tailings production and co-disposed waste rock, allowance for minimum 10 M m^3 process water pond, plus IDF and freeboard.	
	• Site D - remaining tailings production and co-disposed waste rock, allowance for minimum 10 M m^3 process water pond, plus IDF and freeboard.	
	• Raised Embankment - next year of tailings and co-disposed waste rock, 10 M m3 process water pond, plus IDF and freeboard.	
	• Ultimate Embankment at Closure - Total tailings production and co-disposed waste rock plus storage and freeboard to attenuate	
CDA Consequence	• Very High	
Inflow Design Flood (IDF)	• 2/3 between the 1/1000 year and Probable Maximum Flood (PMF), calculated in accordance with CDA Guidelines - Section 6.4	
Flood Management - Catchment Areas	• Site C Catchment Area = approximately 7.1 km^2	
	• Site D Catchment Area = approximately 41.5 km^2	
Inflow Design Flood (IDF) Volumes	• Site C = 5 M m^3 (based on catchment area and 681 mm IDF runoff depth)	
	• Site D = 28 M m^3 (based on catchment area and 681 mm IDF runoff depth)	
Design Freeboard	• Minimum 1 m above design storage capacity for wave runup; assumes tailings beaches developed at 0.5% slope from dam crest.	
Operational Criteria	• Flood management: Inflows are contained within the impoundment. The storage volume assumes any diversion systems are non-functional during the IDF.	
	• Supernatant water reclaimed for re-use in mill process.	
	• Excess water monitored and TSF raises managed appropriately.	
Closure Criteria	• Surface runoff of non-contact water routed to natural streams.	
	• TSF Closure Spillways: Pass PMF sized for the 24 hour PMP and 1/100 year snowmelt (459 mm) without consideration of the runoff attenuation provided by storage below the spillway crest.	
Seepage	• Measures to control seepage include: - lower permeability core zone with filter/transition zones for raised embankments - lower permeability tailings deposit - downstream seepage collection ponds, interception trenches and wells, and pump-back systems	
	• Collected seepage is monitored and managed appropriately.	
Seismic	• Magnitude = 8.5	
	• Peak horizontal ground acceleration = 0.08g (mean hazard value)	
	• Earthquake Design Ground Motion (EDGM) = 1/5,000 year event	
Embankment Stability	• Permanent embankment slopes to be no steeper than 2H:1V to facilitate reclamation, and achieving the minimum required Factors of Safety (FOS_{min}) for the following loading conditions:	
	• End of construction (starter dam and dam raises)	FOS_{min} = 1.3
	• Long term (at closure)	FOS_{min} = 1.5
	• Seismic (Pseudo-static loading condition)	FOS_{min} = 1.0
	• Seismic (Post-earthquake loading condition; full liquefaction of tailings	FOS_{min} = 1.5
Embankment Crest Width	• Minimum 30 m during contractor construction periods and 50 m during mine fleet construction periods to facilitate 2-way haul traffic and reduce turn and dump time.	
	• Minimum 40 m working surfaces during downstream stepouts.	

Source: Knight Piésold

Additional considerations for development of the TSF design are summarized as follows:

- TSF located on Project site;
- Norwest detailed mine schedule (summarized in **Table 12.2.1-54**);
- Annual staging of the TSF dam lifts to allow for storage of the next year of tailings and waste rock disposal, an operational pond volume of 10 Mm^3, and storage of the inflow design flood (IDF) during operations with at least 1 m of freeboard for wave run-up;
- Conventional, thickened tailings disposal with tailings solids content of 50% by weight;
- TSF filling schedule based on the detailed mine schedule including material movements to dam construction and waste disposal;
- Overburden dry density of 1.9 t/m^3 when placed in on-land dumps and in the embankment shell zones, and 2.0 t/m^3 when placed and compacted in the dam core zone; and
- Water for the process plant sourced from the TSF supernatant ponds at a flow rate of 3,200 m^3/h closure spillway from TSF Site C constructed in Year 5 to allow passage of the PMF without consideration for attenuation provided by storage below the spillway crest.

12.2.1.18.4.17.9.2 Seismicity

A seismicity assessment was carried out for the Project, including a review of the regional seismicity and a probabilistic seismic hazard analysis, to provide seismic design parameters for the TSF and other facilities at the Project site, including mine waste dumps and water management dams. Design ground motion parameters provided by the seismic hazard analysis include peak ground acceleration, spectral acceleration (defining the uniform hazard spectrum), and earthquake magnitude. A design earthquake magnitude 8.5 has been selected for earthquake return periods of 500, 5,000, and 10,000 years, based on the review of regional tectonics and historical seismicity. This represents large magnitude earthquakes along the Queen Charlotte fault system and Cascadia subduction zone. The potential for shallow crustal earthquakes closer to the Project site was also considered for longer return period events of 5,000 and 10,000 years, representing earthquakes of up to about magnitude 7.5 along Coastal BC. Additional discussion is provided in **Appendix 2.2A-4**.

12.2.1.18.4.17.9.3 Tailings Dam Hazard Classification

The Canadian Dam Association Dam Safety Guidelines (CDA, 2007) were used to determine the dam classification and suggested minimum inflow design flood (IDF) and earthquake design ground motion (EDGM) for the Project tailings dams. The tailings dams were classified by considering the potential incremental consequences of a failure. The dam safety classification for the Project tailings dams is Very High.

The following suggested design flood and earthquake levels were adopted from the CDA guidelines for the construction and operational phases of the Project:

- IDF – 2/3 between 1/1,000 year and probable maximum flood (PMF); and
- EDGM – 1/5,000 year return period.

A draft bulletin released by the CDA in 2013 (CDA, 2013) indicates that a mining dam with a dam safety classification of Very High will be designed for the PMF and maximum credible earthquake (MCE) in the closure phase. The following design flood and earthquake levels were adopted for the closure phase of the Project:

- IDF – PMF; and
- EDGM – MCE (one in 10,000-year event).

12.2.1.18.4.17.9.4 Tailings Storage Facility

The TSF was designed to permanently store tailings, PAG1 and PAG2 potentially acid generating (PAG) waste rock, and NAG3 potentially non-acid generating waste rock (NAG/ML) generated during the operations of the mine. The TSF has two adjacent sites, Site C and Site D, as shown on **Figure 12.2.1-31**.

The filling schedule for TSF Site C and Site D was based on the detailed mine schedule for the Project. A filling curve was developed for each site that takes into account the storage characteristics of the facility and includes the approximate rate of rise of the tailings and waste rock horizon, supernatant pond allowance, and IDF freeboard. The filling curves for Site C and Site D are presented on **Figure 12.2.1-32** and **Figure 12.2.1-33**, respectively.

Specific overall features of the TSF include:

- Cofferdams and sediment ponds to manage water during construction by either routing water around the TSF or directing water to the TSF for collection;
- Three zoned water-retaining earth-rockfill dams referred to as the Site C Main Dam, Site C West Dam, and Site D Main Dam;
- Designated PAG/NAG3 waste storage areas within the TSF;
- ECD and interception trenches to capture seepage downstream of the Site D Main Dam and direct water to the TSF;
- Collection channels that route water to the TSF;
- Tailings distribution system;
- Reclaim water system;
- Tailings beaches; and
- Supernatant water pond.

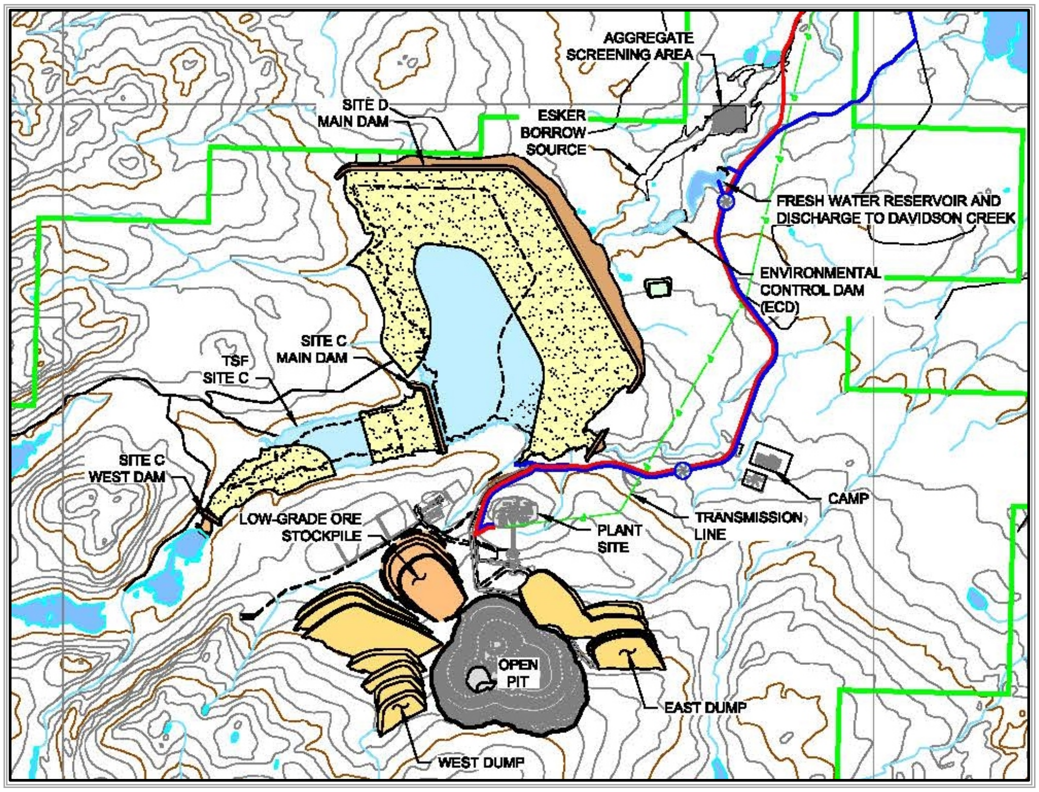
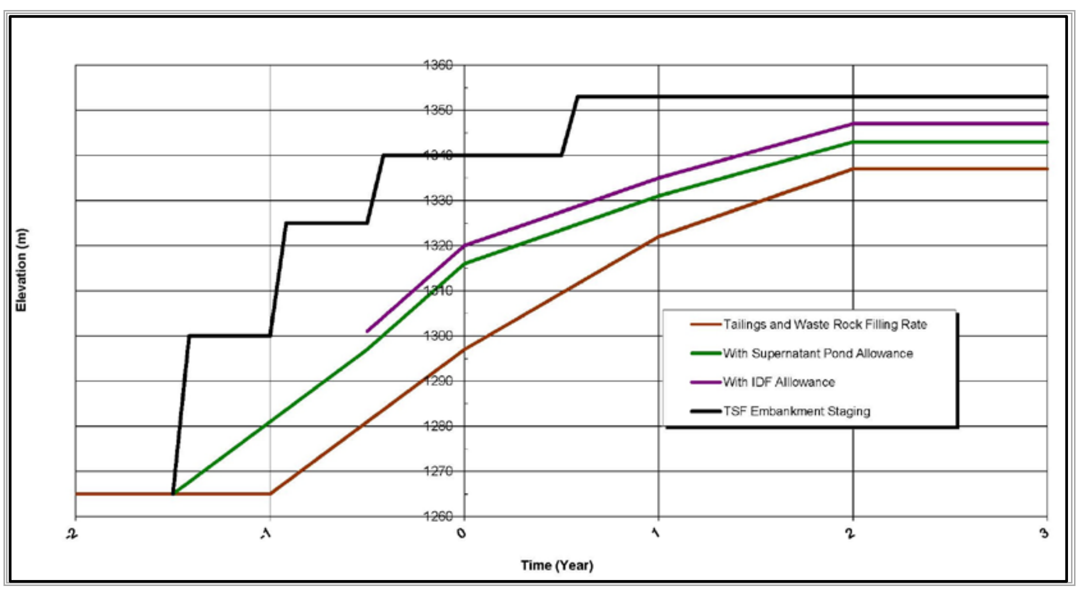
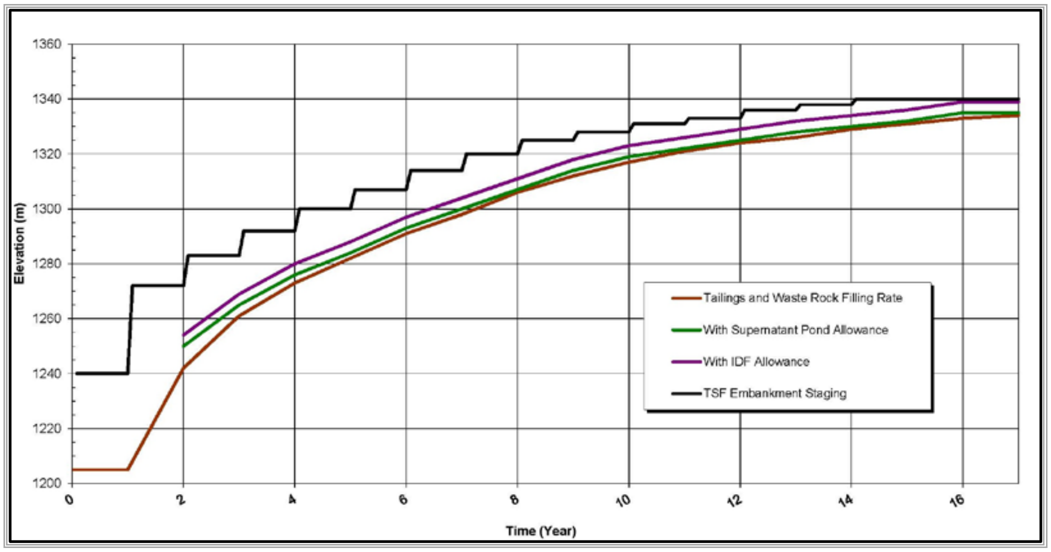


Figure 12.2.1-31: TSF Simplified General Arrangement



Source: Knight Piésold

Figure 12.2.1-32: Filling Curve for Site C



Source: Knight Piésold

Figure 12.2.1-33: Filling Curve for Site D

12.2.1.18.4.17.9.5 PAG and NAG3 Disposal Area

The PAG and NAG/ML waste rock disposal area (referred to as the PAG disposal area) within the TSF footprint will be developed as part of preproduction construction to provide a location for PAG disposal from the pit stripping to expose the orebody. The PAG disposal area will be developed at the same or similar rate of rise as TSF filling level but will be several metres higher to provide a dry, stable placement surface for truck traffic. The design objective for the PAG area is to flood the waste rock within one year of placement. The NAG3 waste rock has a low ARD potential but may be ML; it will be flooded within five years of placement. The maximum elevation of the waste storage area will remain at an elevation where it can be flooded by the supernatant pond in the case of premature closure. At closure, this waste storage area will be covered by 0.3 m of overburden and submerged below the final closure tailings elevation.

The PAG disposal area during preproduction and Year 1 of operations will be within and near the centre of TSF Site C. The disposal area will expand as a fill platform with overall slopes at angle of repose. The tailings beaches will provide a low-permeability barrier between the coarse, permeable waste rock and the tailings embankments.

The PAG disposal area beginning in Year 2 will be within TSF Site D. Waste placement will commence near the upstream zone of the TSF Site D Main Dam below an elevation of approximately 1,240 m and will extend west up the valley as a lobe. Beginning in Year 3, the PAG fill platform will be located in the east and north areas of the facility. The fill platform will rise slightly above and with the TSF filling level from Year 3 until Year 14 with the when mining ceases. The PAG disposal fill platform will typically rise at a rate that stays at least 5 m below the current dam crest elevation. The fill platform will typically meet the advancing tailings beach approximately 500 m to 1,000 m away from the dam.

Tailings and the supernatant pond between Year 15 and Year 17 will progressively cover the surface of the PAG disposal area during low-grade ore processing when waste rock production has ceased.

12.2.1.18.4.17.10 TSF Construction and Operating Methodology

12.2.1.18.4.17.10.1 Construction Materials

The TSF Site C Main Dam will be constructed to elevation 1,353 m and the TSF Site D Main Dam to elevation 1,340 m. The total fill requirement for the tailings dam construction is 73.9 Mm^3, of which 8.1 Mm^3 is required for TSF Site C and 65.8 Mm^3 is required for TSF Site D. Construction material will be sourced from pit stripping and external borrow areas. TSF Site C will use 6.6 Mm^3 of material from pit stripping and 1.5 Mm^3 from external borrow sources. TSF Site D will use 59.2 Mm^3 of material from pit stripping and 6.6 Mm^3 from external borrow sources. A total of 65.8 Mm^3 will come from pit stripping and 8.1 Mm^3 from external borrow areas, which equates to 89% of materials from pit stripping.

The earth-rockfill dams will comprise the following zones:

- The core zone (Zone S) will be constructed from low-permeability glacial till from nearby external borrows and from pit stripping. The material will consist of well graded silty sand with some gravel with a fines content of 20% to 60% passing the #200 sieve. This material will generally require no processing except for the removal of oversized particles. The material will be placed in maximum 300 mm lifts loose and compacted by combination of smooth drum vibratory rollers and pad foot compactors to 95% standard proctor maximum dry density;
- The filter zone (Zone F) will be constructed with clean, fine to coarse sand. It will be placed adjacent to and downstream of the core zone to prevent piping of the core zone material and to reduce pore pressures within the embankment. This material will be a processed non-reactive sand material from the aggregate screening area in the esker deposits downstream of TSF Site D. Zone F will be placed and spread in maximum 600 mm lifts loose and compacted by four to six passes with smooth drum vibratory rollers;
- The transition zone (Zone T) will be constructed adjacent to and downstream of the filter Zone F. It will be constructed with processed non-reactive fluvial, colluvial, or selected NAG5 waste rock. The transition zone will prevent the migration of fines from the core zone and Zone F into the pervious downstream shell zone (Zone C). Zone T will be placed and spread in maximum 600 mm lifts loose and compacted by four to six passes with smooth-drum vibratory rollers;

- Shell zones (Zone C) will be constructed on both the upstream and downstream sides of the dam with random fill consisting of overburden and specific waste rock material types. Compaction will be done with trucks across the main fill by routing haul truck patterns to produce a uniformly compacted lift. A vibratory smooth drum roller will be used on the edges of lifts with a minimum four to six passes. The lift thickness and specified maximum particle sizes will be based on the truck placement fleet as follows:
    - Contractor fleet: placed and spread in maximum 1,000 mm lifts with a maximum particle size of 1,000 mm; and
    - Mine fleet: placed and spread in maximum 2,000 mm lifts with a maximum particle size of 2,000 mm.

12.2.1.18.4.17.10.2 TSF Site C

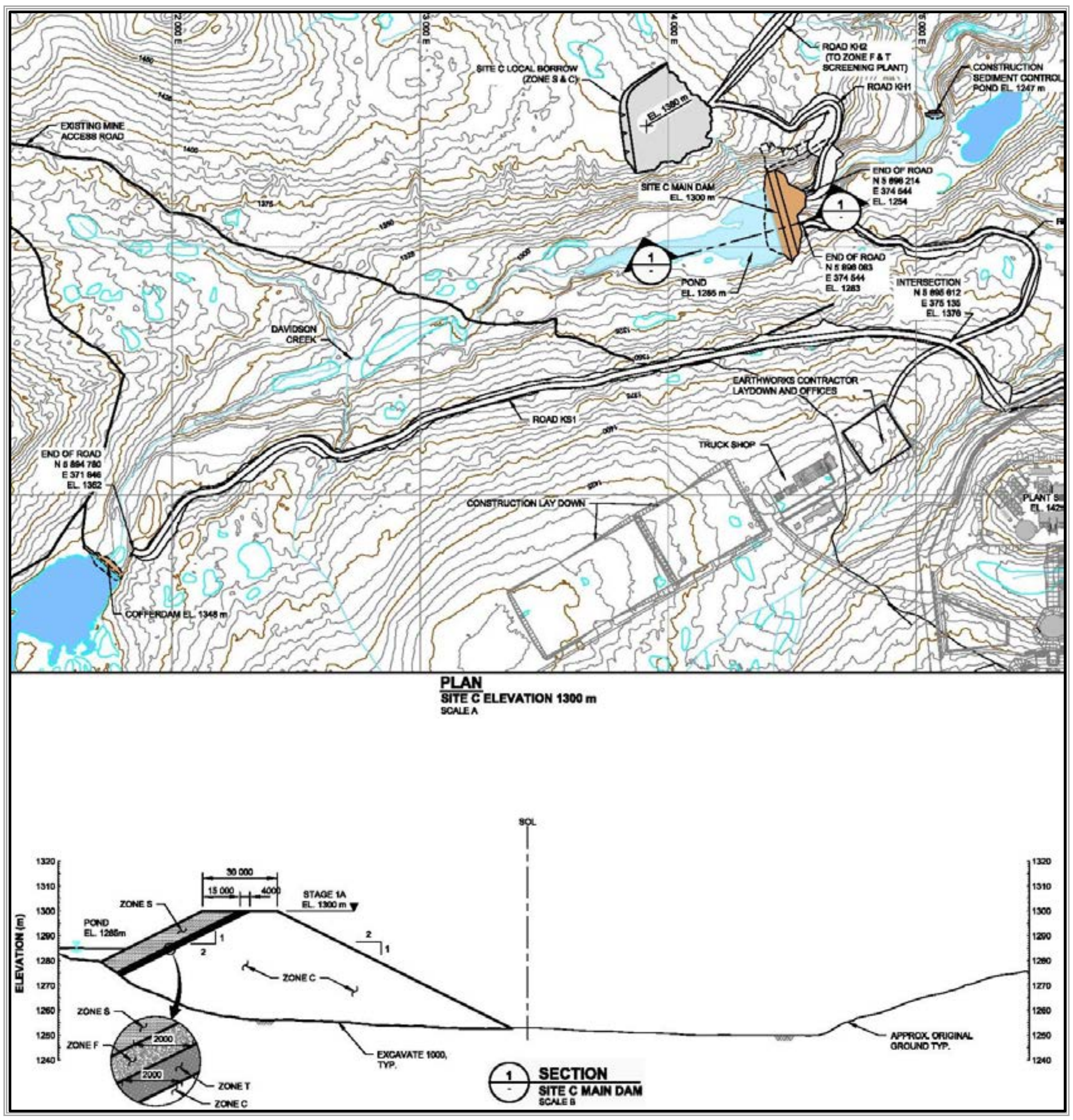
TSF Site C will be constructed first to provide storage capacity for start-up of the process plant. The facility was designed to contain the first two years of tailings and PAG waste rock. The embankment foundations will be cleared and stripped in preparation for fill placement for each stage.

Initially, two cofferdams and a downstream sediment pond will be constructed. The first cofferdam for the Site C Main Dam will be built into the dam footprint and sized to contain flows from a one in 10-year wet August through October period and a one in 10-year, 24-hour storm, with 2 m of additional freeboard. A sediment pond will be constructed downstream of the Site C Main Dam footprint to allow for collection and pumpback of sediment laden construction runoff. The second cofferdam will be constructed upstream of the Site C West Dam and will create and isolate the TSF from the fish compensation pond and channel to be constructed in the upstream part of the catchment.

Construction of the Stage 1A dam will commence following completion of the sediment and erosion control features. The dam will be built to elevation 1,300 m by the end of Year -2. Construction of Stage 1A will require 820,000 m^3 of construction material from nearby external borrow sources.

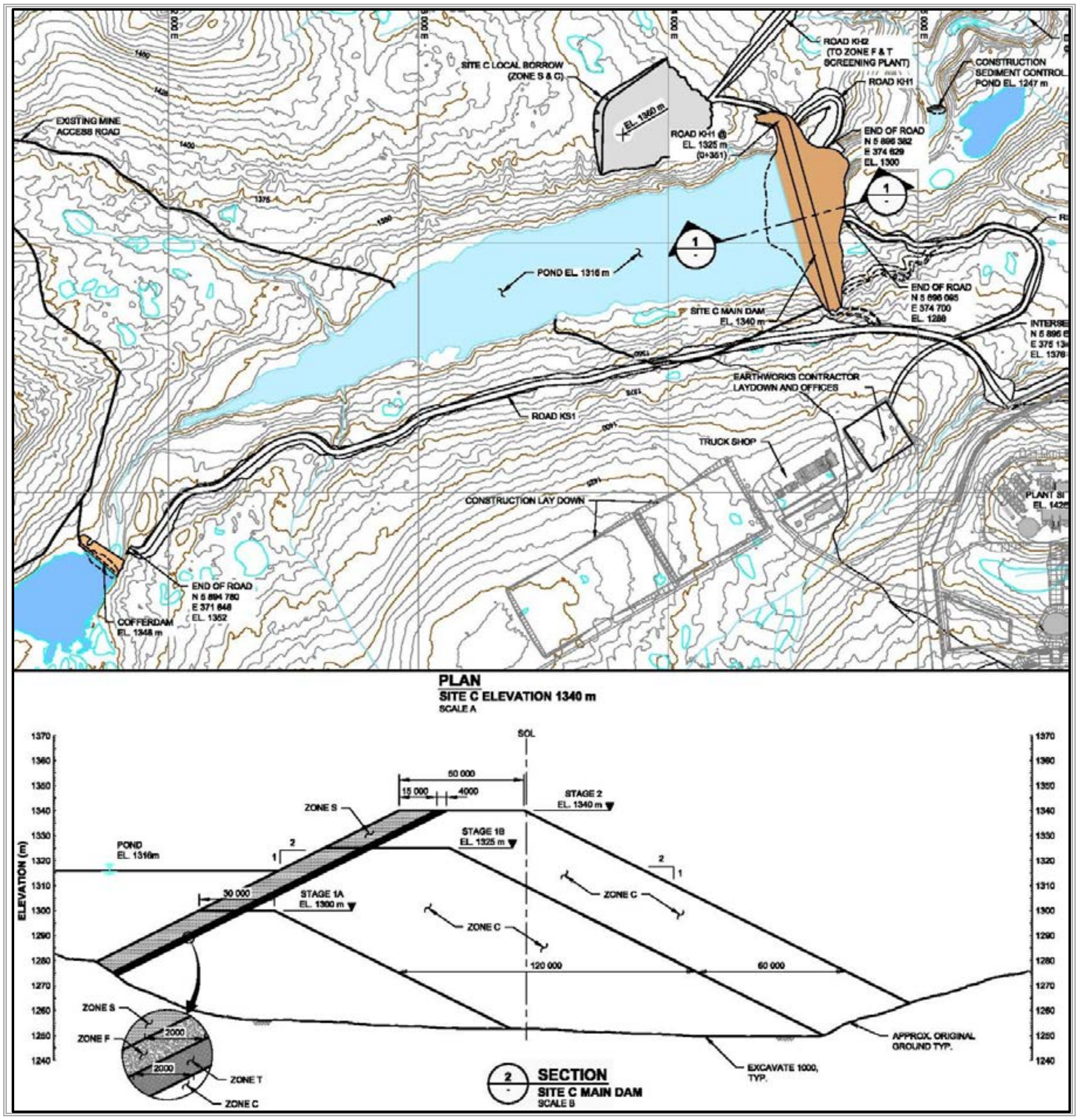
Construction of the Stage 1B dam will begin in early Year -1, immediately following completion of Stage 1A. The dam will be raised to elevation 1,325 m to provide sufficient capacity to impound PAG waste rock generated during preproduction pit stripping and a start-up pond up to 10 Mm^3, with additional capacity to contain the IDF. Construction of Stage 2 will commence thereafter and will be completed by the end of Year -1. The dam will be raised to elevation 1,340 m, providing the additional capacity required to contain the first year of tailings and PAG waste rock. The Year -1 construction plan is shown on **Figure 12.2.1-35**. Construction of Stage 1B and 2 will require a total of 4.4 Mm^3 of construction material from pit stripping (4.0 Mm^3) and external borrow sources (0.4 Mm^3). Stage 1B will include a buttress below Dam C of NAG3 rock which will be covered with tailings deposited in Site D with three to five years.

In the first year of operations, the final lift (Stage 3) on the Site C Main Dam will be completed to elevation 1,353 m. Construction of the final lift will commence in early Year 1 with a downstream shell zone step-out of approximately 50 m. The step-out will be constructed by the mine fleet during the first three quarters of the year, with the actual dam raise taking place late in the year. Construction of Stage 3 will require 2.7 Mm^3 of construction material, with 2.5 Mm^3 coming from pit stripping and the balance from external borrow sources (0.2 Mm^3). In addition, the Site C West Dam will be constructed to elevation 1,353 m. The construction of the West Dam will require approximately 200,000 m^3 of material obtained entirely from external borrow sources. This includes a 5 m deep cutoff trench down to bedrock. The cutoff trench will be backfilled with Zone S material (39,000 m^3) and Zone F material (2,500 m^3).



Source: Knight Piésold

Figure 12.2.1-34: TSF Site C Year -2 Construction Plan



Source: Knight Piésold

Figure 12.2.1-35: Site C Year -1 Construction Plan

12.2.1.18.4.17.10.3 TSF Site D

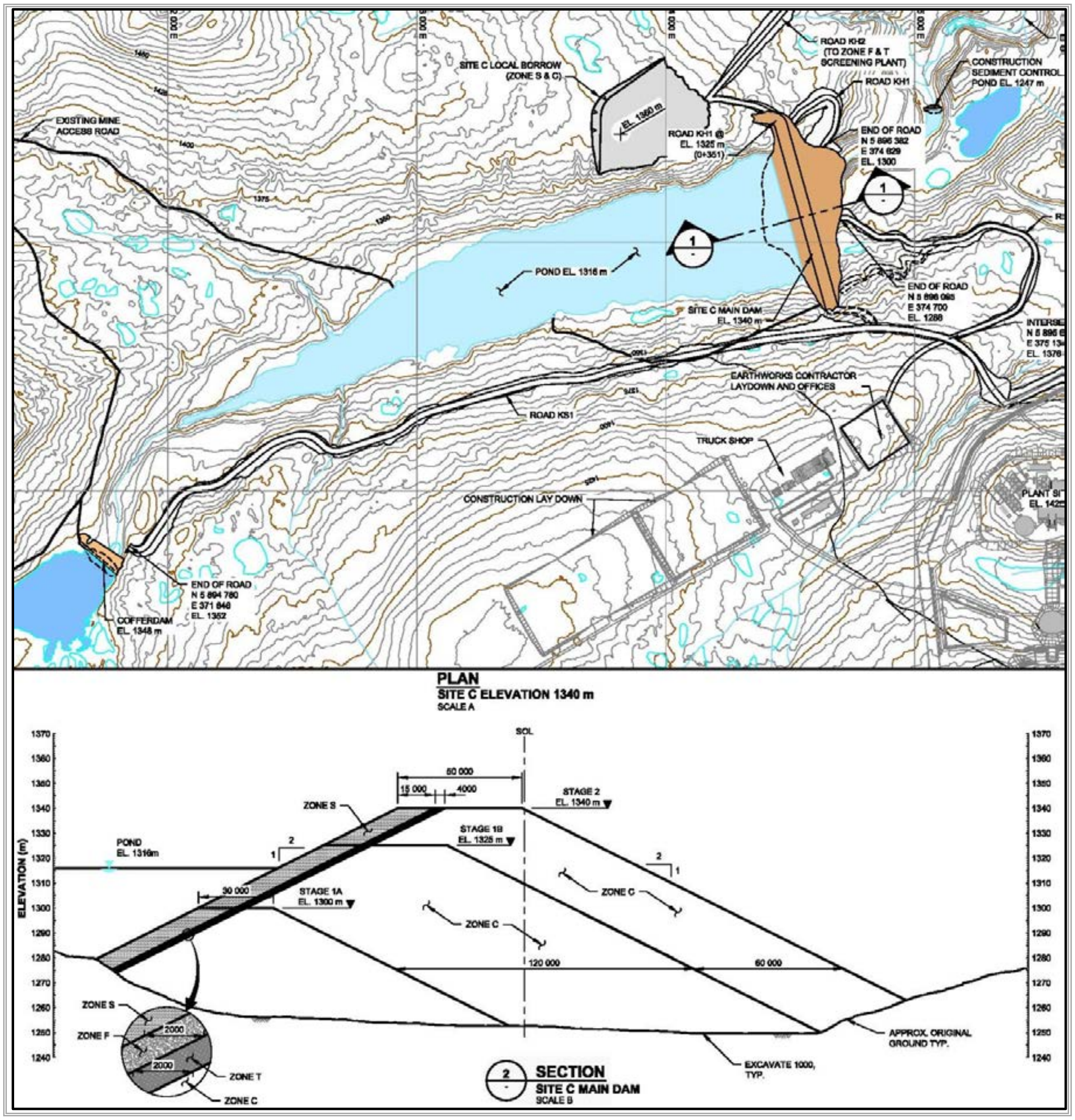
TSF Site D will be constructed to provide storage capacity for the rest of the operational life of the Project (Years 3 to 17). The facility is designed to contain tailings, PAG waste rock, and an operational supernatant pond of at least 10 Mm^3, with additional capacity to contain the IDF. The embankment foundations will be cleared and stripped in preparation for fill placement for each stage. A cutoff trench (COT) will be excavated through the surficial sands and gravels and keyed into the low-permeability foundation soil horizon. The COT will be 7 m wide at the base of the excavation and will typically range from 5 m to 20 m deep, averaging approximately 15 m. The total excavation requirement for the COT is about 6 Mm^3. The COT excavation will be backfilled with approximately 5.8 Mm^3 of Zone S backfill and 0.2 Mm^3 of Zone F material.

Initially, a cofferdam and a downstream sediment pond will be constructed for water management purposes. The cofferdam will be built into the ultimate dam footprint and sized to contain flows from a one in 10-year wet October through December period and a one in 10-year 24 hour storm, with 1 m of additional freeboard. A spillway to bypass the construction area has been sized to manage a one in 200-year storm event. The cofferdam and spillway will be constructed in late Year -2 to allow for water collection from the TSF Site D drainage area. A temporary pump system and pipeline sized to move 1,500 m^3/h of water has been designed for this location to route the spring and summer high flows up to TSF Site C to build the start-up water pond.

Construction of Stage 1A for TSF Site D will commence in Year -1. The COT will be excavated on the abutments first during the earlier months, with in-creek works taking place during the summer low flow period beginning in August. The dam will be built to elevation 1,240 m by the end of Year -1, as shown on **Figure 12.2.1-36**. Construction of Stage 1A will require 2.1 Mm^3 of construction material, provided from pit stripping (1.1 Mm^3) and external borrow sources (1.0 Mm^3).

Construction of the Stage 1B dam will commence beginning in early Year 1, immediately following completion of Stage 1A. The dam expansion will consist of upstream and downstream step-outs of the shell zone (Zone C) at elevation 1,240 m. The step-outs will be constructed in approximately 65 m wide sections and be completed by the mine fleet using select material from pit stripping. Construction of Stage 1B will require 2.7 Mm^3 of material from the pit. The detailed mine plan shows the mine fleet will deliver 4.1 Mm^3 during Year 1, and the additional 1.4 Mm^3 will be used to begin construction of the next downstream step-out to support future dam stages.

Construction of Stage 2 will commence in Year 2 and the tailings dam will be raised to elevation 1,272 m, providing enough capacity to impound PAG waste rock generated during Year 2, tailings and PAG waste rock generated during Year 3, and a pond of up to 10 Mm^3 with additional capacity to contain the IDF. Construction of Stage 2 will require a total of 7.2 Mm^3 of construction material, comprising 6.2 Mm^3 from pit stripping and 1 Mm^3 from reuse of COT excavation material and other external borrow sources.



Source: Knight Piésold

Figure 12.2.1-36: TSF Site D Year -1 Construction Plan

The tailings dam will be raised annually thereafter to maintain the storage capacity of the TSF. Each raise is designed to provide enough storage for the following year of tailings and PAG waste rock and to maintain a pond allowance of at least 10 Mm^3 with additional capacity for storage of the IDF. The staged expansion of the Site D Main Dam is shown on **Figure 12.2.1-37**.

The mining fleet will provide material from pit stripping for all Zone S (core) and Zone C (shell) requirements for raising the dam. The filter (Zone F) and transition (Zone T) materials will be sourced from the aggregate screening area downstream of the TSF. Overburden will be stockpiled near the TSF during the initial eight years of pit stripping and be rehandled by the mine fleet in the later years of dam expansion to provide Zone S material for the core zone and COT.

12.2.1.18.4.17.10.4 Static Stability and Seismic Deformation

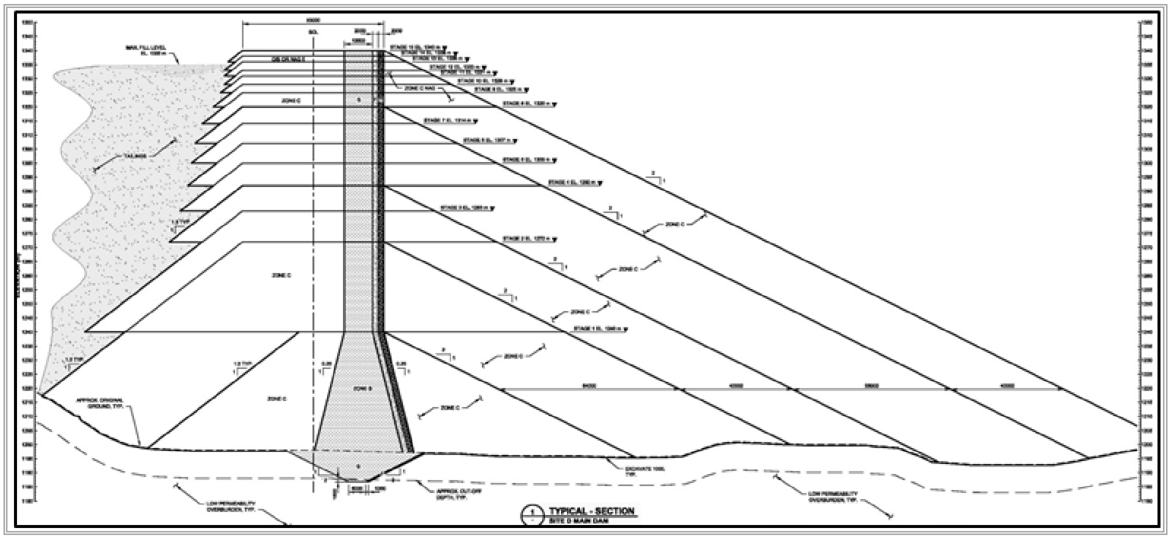
Analyses were carried out to investigate the stability of the embankment under both static and seismic loading conditions. These comprised checking the stability of the embankment arrangement for each of the following cases:

- Static conditions during operations and post-closure;
- Earthquake loading from the operating basis earthquake (OBE) and the maximum design earthquake (MDE); and
- Post-earthquake conditions using residual (post-liquefaction) tailings strengths.

The stability analyses were carried out using the limit equilibrium computer program SLOPE/W. In this program a systematic search is performed to obtain the minimum factor of safety from a number of potential slip surfaces. Factors of safety have been computed using the Morgenstern-Price method.

In accordance with international recommendations (ICOLD, 1995) and standard industry practice, the minimum acceptable factor of safety for the tailings embankment under static conditions is 1.3 for short-term operating conditions and 1.5 for long-term (steady-state and post-closure) of the TSF. A factor of safety of less than 1.0 is acceptable under earthquake loading conditions, provided that calculated embankment deformations resulting from the seismic loading are not significant and that the post-earthquake stability of the embankment maintains a factor of safety greater than 1.2, implying there is no flow slide potential.

The seismic stability assessment of the TSF included an estimation of seismically induced deformations of the dam from the OBE and MDE events. The OBE has been defined as the one in 500-year earthquake with a mean peak ground acceleration (PGA) of 0.04 g and design earthquake magnitude of 8.5. The MDE corresponds to the one in 5,000-year earthquake with a mean PGA of 0.08 g and design earthquake magnitude of 8.5. To demonstrate the robustness of the embankment design to seismic loading, the one in 10,000-year earthquake was also considered. The PGA for the one in 10,000-year event is 0.11 g.



Source: Knight Piésold

Figure 12.2.1-37: TSF Site D Main Dam Staged Expansions

The results of the stability analyses satisfy the requirements for factors of safety and indicate that the proposed design is adequate to maintain both short-term (operational) and long-term (post-closure) stability. The seismic analyses indicate that any embankment deformations during earthquake loading from the OBE, MDE and one in 10,000-year event would be minor and would not have a significant impact of the available embankment freeboard or result in any loss of embankment integrity. The results also show that the embankments are not dependent on tailings strength to maintain overall stability and integrity.

12.2.1.18.4.17.10.5 Instrumentation and Monitoring

Geotechnical instrumentation will be installed along one plane through the Site C West Dam, Site C Main Dam, and freshwater reservoir, and in five planes through the Site D Main Dam. The instrumentation will be installed during construction and over the life of the Project. The geotechnical instrumentation will consist of vibrating wire piezometers, slope inclinometers, and movement monuments, and will be installed in the foundations, embankment fill, and embankment crests.

Instrumentation monitoring will be carried out routinely during construction and operations. Daily measurements will be taken and analyzed during construction to monitor the response of the embankment fill and the foundation from the loading of the embankment fill. The frequency of monitoring for the piezometers and inclinometers may be decreased to bi-monthly readings once the effects of initial construction have dissipated. Surface monuments will be surveyed at least twice per year during operations.

12.2.1.18.4.17.10.6 Tailings Handling

12.2.1.18.4.17.10.6.1 Tailings Properties

A laboratory testing program has been conducted to determine the geotechnical and physical characteristics of the tailings. The Proponent provided a sample of ground, thickened tailings for testing. The program included Index Testing to enable geotechnical classification of the materials, and slurry settling, air-drying, consolidation, and permeability testing to determine the characteristics of the tailings for a range of conditions expected to be representative of field conditions.

The specific gravity of the tailings solids was determined to be 2.79, and the material can be described as non-plastic sandy-silt with trace clay. The particle size distribution of the tailings sample was approximately 44% fine sand, 46% silt, and 10% clay.

The tests were performed for a target solids content equal to 50%; the main findings are as follows:

- Undrained settling dry density is 1.19 t/m^3;
- Drained settling dry density is 1.35 t/m^3;
- Supernatant water recovery is expected to be around 52% for undrained conditions and 62% for drained settling conditions; and
- Air dried final dry density is 1.49 t/m^3 and took approximately four days to complete.

12.2.1.18.4.17.10.6.2 Tailings Deposition

Tailings from the process plant will be thickened and delivered by gravity through a pipeline from the thickener to either the TSF Site C or the TSF Site D TSF. The pipeline will be laid parallel to a service road from the process plant to an energy-dissipating drop box where the tailings distribution pipelines to TSF Site C and Site D will separate. The tailings drop box is designed to reduce the extra head for early stages or for discharge at closer locations along the dams. The design includes a bypass pipeline around the tailings drop box to ensure sufficient head is available for delivery of tailings to the far ends of Site C and Site D.

The tailings pipelines are sized to ensure gravity flow for the entire duration of the mine life while dissipating as much energy head through friction as possible. Energy dissipation is necessary because of the substantial elevation difference between the plant site and the TSF, which varies from 161 m to 80 m throughout operations. Most of the tailings distribution pipelines will be 30 inch HDPE DR13.5.

Additional pipelines extending from the drop box to either TSF Site C or Site D will be constructed to allow for emergency discharge to each TSF area. The discharge locations will be far enough away from the reclaim barges to ensure that the reclaim water intakes are free of sediment.

The tailings distribution pipeline will initially extend along a service road to the Site C Main Dam where tailings will be deposited during the first two years of operations. Spigots will be placed every 150 m along the dam crest. The tailings beach will provide a low permeability transition zone between the coarse, permeable waste rock in the centre of the TSF and the tailings embankments, and will provide seepage control.

The pipeline to Site C will be extended to the West Dam in Year 1. Spigots will be placed every 150 m along the Site C West Dam and along the service road on the south perimeter of the TSF to enable tailings deposition around the perimeter of the TSF. Selective tailings distribution methods will be used to hydraulically separate the supernatant pond from the West Dam with the benign oxide tailings, and to cap the PAG tailings and waste rock with more benign oxide tailings in Years 2 and 3.

The tailings pipeline will be extended from the drop box to the Site D Main Dam along a service road in Year 2 of operations to allow for deposition of tailings at Site D beginning in Year 3. Spigots will be placed every 150 m along the dam crest. The tailings beach will provide a low-permeability transition zone between the coarse, permeable waste rock fill platform in the center of the TSF and the tailings embankments and will provide seepage control.

The pipeline that runs to the Site C West Dam will be decommissioned in Year 4, removed, and placed along a service road on the west side of TSF Site D, extending to the north of the Site C Main Dam. This will allow for the distribution of tailings on the west side of the facility during dam raises on the Site D Main Dam and for selective tailings distribution to manage the size and location of the supernatant pond.

The tailings distribution pipeline along the Site D Main Dam will typically be raised with each stage of the dam. The dam crest elevation will reach 1,300 m in Year 5 of operations, and the tailings pipeline will be extended fully around TSF Site D to allow for deposition along the majority of the perimeter. In Year 8 of operations, part of the service road and tailings distribution pipeline running from the drop box to the Site D Main Dam will be relocated to allow access to the advancing dam crest elevation along the southeast side of the facility. This service road will then allow for the expansion of the TSF to the ultimate dam crest elevation of 1,340 m.

Tailing will be deposited for the first three years in TSF Cell C, and after that in TSF Cell D. **Table 12.2.1-54** provides the schedule of tailings deposition; all processed ore (except the extracted gold and silver) will be routed to the TSF.

- Whole ore leach (WOL) tailings are expected to be PAG during operations and will be stored underwater or covered with fresh saturated tailing within one year of production; and
- Towards the end of the mine life, tailings will be discharged into the centre of the pond to flatten and reduce the exposed beach.

12.2.1.18.4.17.11 Management of Tailings after Closure

The primary objective of the closure and reclamation initiatives will be to return the TSF to a self-sustaining facility that satisfies the end land use objectives. The TSF is designed to maintain long-term stability, protect the downstream environment, and manage surface water.

Upon mine closure, surface facilities will be removed in stages and full reclamation of the TSF will be initiated. The RCP (**Section 2.6**, **Section 12.2.2**) is compatible with a premature closure event. General aspects of the Closure Plan include:

- Selective discharge of tailings around the facility during the final years of operations to establish and flatten the final tailings beach to facilitate surface water management and reclamation;
- Placing an oxide tailings cover up to 3 m thick on Site C beaches such that transition and sulphide tailings are submerged;
- Placing an oxide tailings/overburden cover up to 5 m thick on the Site D beach such that transition and sulphide tailings are submerged;
- Covering the exposed tailings beaches and PAG waste rock with approximately 30 cm of overburden;
- Establishing wetlands in the submerged and saturated areas of the tailings surface and revegetating the upland beaches;
- Pumping the tailings pond supernatant to the pit for about 18 years to expedite the development of the pit lake and flooding of the majority of PAG rock in the ultimate pit walls;
- Dismantling and removing the tailings and reclaim delivery systems, all pipeline structures, and equipment not required beyond mine closure;
- Constructing spillways and overflow channels;
- Removing the seepage collection pumpback systems at such time that suitable water quality for direct release is achieved;
- Establishing polishing wetlands for treatment of seepage in the former sediment pond, ECD, and freshwater reservoir downstream of Site D dam;
- Removing, regrading, and revegetating access roads, ponds, ditches, and borrow areas not required beyond mine closure; and
- Long-term stabilization of all exposed erodible materials.

The ECD and pumpback system will be retained until monitoring results indicate that any seepage from the TSF is of suitable quality for release to downstream waters. The groundwater monitoring wells and all other geotechnical instrumentation will be retained for use as long-term dam safety monitoring devices.

Post-closure requirements will include an annual inspection of the TSF and ongoing evaluation of water quality, flow rates, and instrumentation records to confirm design assumptions for closure.

12.2.1.18.4.17.12 Low-Grade Ore

- LGS ore will be placed on a compacted till pad sloped towards the TSF. A seepage and runoff collection and freshwater diversion system will be established;
- Where possible, LGS ore will be separated into oxide, transition and sulphide ore zones to facilitate possible use of oxide and oxidized transition tailings as a partial cover for the Cell D beach (Detailed Project Description **Appendix 2.2A**);
- Drainage from the LGS and the temporary ore stockpile will be collected and neutralized with lime to about pH 10 for zinc and cadmium precipitation prior to discharge to the TSF; and
- The LGS ore will be processed through the process plant following the completion of mining in the pit to remove its long-term liability. The LGS will be placed where it can be moved to the pit (or alternatively to the TSF) and flooded at closure if it is not processed. As mentioned previously, it may be necessary to add lime to the low-grade ore before submergence to ensure neutral to alkaline interstitial water, and reduce metal loadings; this will be determined during mine operations.

12.2.1.18.4.17.13 Training

The Proponent's corporate policy and the overall approach to training are discussed in **Section 12.2.1.17**, RTEMP, as well as described in the EMS. This section provides a brief summary specific to mine tailing and water management.

All employees will undergo an environmental orientation prior to working on site. The orientation will include basic aspects of mine waste management such as:

- Significant aspects for mine waste management; and
- Responsibilities for mine waste management for all personnel.

Experienced personnel will be engaged in senior supervisory positions at the Project. A formalized training program will be developed for mine employees requiring specific waste management training. Specific modules will be developed for all positions to be filled and a system of mentoring set up for on-the-job training. Safety and environmental awareness will be key components of all mine training.

For mine waste management, specific training will be provided in operation of the facilities discussed in this plan. Personnel that will require specific mine waste management training may include; mine haul truck drivers, mine engineers, environmental staff, surface crews and management. Emphasis will be placed on the correct operating parameters and the early recognition and reporting of problems and emergency procedures to initiate should accidents or malfunctions be encountered.

Once the OMS Manuals have been developed, training for required personnel will occur before commencing construction of the waste dumps and TSF.

12.2.1.18.4.17.14 Standard Operating Procedures

Standard operating procedures and inspection templates will be developed during construction that assists employees in carrying out job tasks in compliance with this plan.

12.2.1.18.4.17.15 Monitoring and Reporting

Trained environmental personnel will be employed to carry out environmental monitoring during construction, operations, and closure. Environmental monitoring will include:

- Surface water and groundwater quality;
- Stability of overburden stockpiles and waste dumps;
- Sampling and analysis of waste rock and overburden for potential ARD/ML;
- Progress and success of reclamation or covers; and
- Any regulatory compliance monitoring.

The field test barrels established during the EA process will be continued until steady state conditions are achieved and further data are no longer of value. Additional field test barrels and field test waste piles will be constructed as required. Monitoring of the LGS and East and West waste rock dumps seepage and runoff will be conducted at least quarterly. Pit wall wash stations will be established on exposures of each ARD category waste rock when ultimate pit faces are available.

Environmental staff will be responsible for compiling regulatory reports as required, reviewing baseline data against monitoring data and reacting to unexpected changes in monitoring results. Results of the ARD/ML analytical monitoring will be included in the Annual Reclamation Report submitted to BC MEM. A copy of the Report will also be submitted upon request to other agencies, First Nations, and the Sustainability Committee established for the Project.

12.2.1.18.4.17.16 Audit and Review

Regular review of environmental monitoring results against baseline data will assist in identifying trends and potential areas of concern as part of continual improvement. An annual audit of controls in place for mine waste management will be conducted, which will include review of this plan.

Results of blast hole ARD/ML testing will be checked against the ARD block model predictions and the model updated as required.

Other developments may trigger a review of this plan including, a significant change in mine waste generation, identification of contamination, or water quality changes. Corrective and preventative actions may be assigned after an incident or inspection, which may also trigger a review of this plan.

12.2.1.18.4.18 Mine Water Management Plan

The design engineering details for the MWAMP are based on information provided by Knight Piésold, geotechnical design engineers for the Project.

12.2.1.18.4.18.1 Purpose

The MWAMP provides concepts and scope of mine water mitigation measures proposed to minimise, avoid, or mitigate potential effects. A site-specific MWAMP will be developed before the commencement of construction in consultation with relevant permitting agencies. The MWAMP for construction will include details regarding roles and responsibilities specific to tailings and mine water management, procedures and training, and records and reporting as required by environmental certificate and permit requirements.

The MWAMP will be based on the principles of adaptive management and continual improvement, as described in the EMS (**Section 12.1**). The plan will work in conjunction with other management plans under the EMS for the Project. These include:

- Project Description (**Section 2.2**);
- Construction Management Plan (**this section**);
- SECP (**Section 12.2.1.18.4.1**);
- ESPRP (**Section 12.2.1.18.4.13**);
- ARMP (**Section 12.2.1.18.4.2**);
- HMMP [including hazardous wastes] (**Section 12.2.1.18.4.12**);
- IDWMP (**Section 12.2.1.18.4.11**);
- WQLMP (**Section 12.2.1.18.4.10**); and
- RCP (**Section 2.6**).

The general objective of the MWAMP, relevant regulatory requirements and guidelines, and general management and mitigation practices are described below. A description of the planned Aquatic Effects Monitoring and Follow-Up Program is provided in **Section 12.2.1.18.4.2**.

12.2.1.18.4.18.2 Scope and Objectives

12.2.1.18.4.18.2.1 Scope

The temporal scope of the Project MWAMP covers all mining phases from construction through post-closure. The proposed mine will require two years for initial construction followed by 17 years of operations. Initial closure will take approximately two years to remove infrastructure and conduct reclamation. Once the open pit is mined out at Year 13, it will begin to fill. Filling is estimated to require about 20 years. At that point, the pit will overflow to a constructed channel where the water will join with discharge of tailings supernatant into Davidson Creek. Water is forecast to meet receiving environment guidelines or site-specific objectives at the permitted compliance point.

The spatial scope of the MWAMP includes the proposed mine site and all site facilities, the freshwater supply pipeline, and the airstrip (**Figure 12.2.1-38**). The airstrip will be approximately 1 km north of the mine site and will have an access road off the main access road west of the airstrip. Water management for construction of new and improved sections of the access road and the transmission line are included in the scope of this EMP.

12.2.1.18.4.18.2.1.1 Objectives

The objective of the MWAMP is to minimise interaction between the Project components or activities and surface and ground water, while acknowledging operational requirements and the safety of employees and contractors. This objective is targeted through a series of actions designed to prevent and manage tailings and mine water as a result of Project activities from interacting with the surface water in the surrounding area. The broad principles to achieve this will include but not be limited to:

- Prevent to the extent practical or treat surface runoff during construction to minimize suspended sediment export to surface waterbodies;
- Operate the proposed mine with no surface water discharge through its operating life and for approximately 18 years post-closure;
- If seepage meets water quality objectives it will be released earlier as dictated by monitoring results;
- Use within site water sources to the extent possible through recycling;
- Ensure the reliability of water supply for all process and potable needs;
- Protect the operations from flooding, erosion, interference from groundwater, precipitation, and runoff; and
- Control, collect, and treat water that comes into contact with the Project facilities in an environmentally sound manner.

The key elements for water management will include:

- Spillways;
- Collection and diversion ditches;
- ECD;
- Freshwater reservoir;
- Seepage collection and pump back systems;

- Freshwater supply system;
- Surface and groundwater monitoring systems; and
- Sediment and erosion control measures for the facilities listed above.

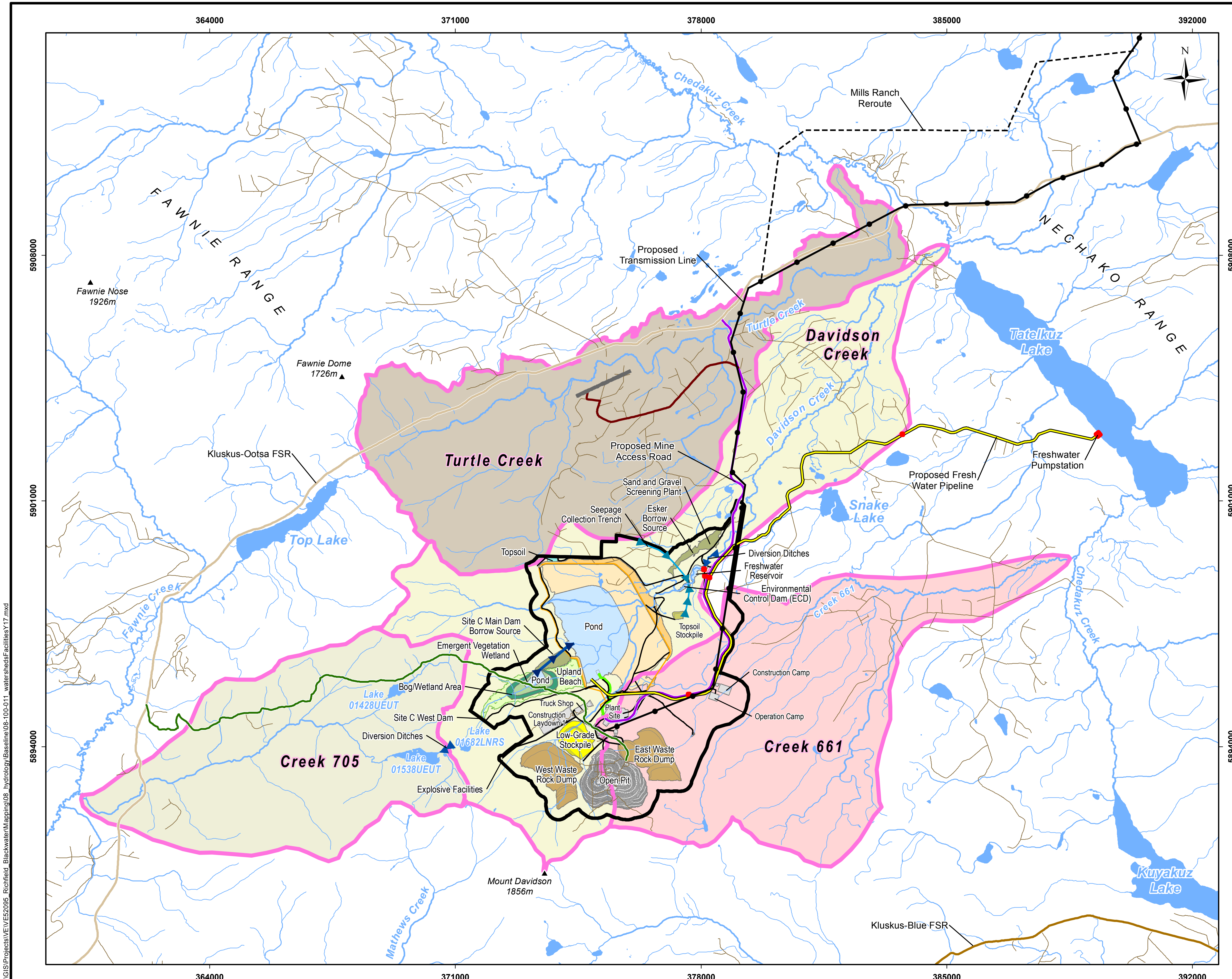
Water within the Project area will be used to the maximum practical extent by collecting and managing site runoff from both undisturbed and disturbed areas. Site runoff water will be collected and stored on site within the TSF and used to inundate the PAG and NAG3 waste rock and tailings solids to prevent ARD and minimize ML. Water will be stored in the supernatant ponds within the TSF and recycled to the mill for use in the process. The water supply sources for the Project will include:

- Direct precipitation onto the TSF and runoff from the mine site facilities;
- Water recycled from the TSF supernatant ponds;
- Groundwater from open pit dewatering and depressurization;
- Water extracted from two wells east of the camp area for potable and firewater use;
- Freshwater pumped from Tatelkuz Lake for plant freshwater needs, and to mitigate flow reductions in lower Davidson Creek for downstream fisheries; and
- Periodic water supply from Tatelkuz Lake to supplement requirements for processing or to saturate PAG and NAG3 waste rock within the TSF, if required.

12.2.1.18.4.18.3 Corporate Policy

Key commitments with respect to mine water management will include:

- Initiatives are identified and implemented to maximize use of earth's resources, while reducing the environmental impact of operations; and
- Sites develop, implement, and maintain land management plans, water management plans, energy conservations plans, and greenhouse gas management programs, as required.



Reference
BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Proposed Mine Site Facilities (Year 17) with Watershed Boundaries

DATE: February, 2014	ANALYST: WR	Figure 12.2.1-38
JOB No: VE52077	QA/QC: JL	PDF FILE: 08-100-011_watershedsFacilitiesY17.pdf
GIS FILE: 08-100-011_watershedsFacilitiesY17.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

12.2.1.18.4.18.4 Roles and Responsibilities

12.2.1.18.4.18.4.1.1 Mine General Manager:

- Provide resources and have overall responsibility for implementation of this plan.

12.2.1.18.4.18.4.1.2 Mill Manager:

- Responsibility for water management associated with the TSF and its operations;
- Provide resources for external dam engineers when required; and
- Sewage treatment plant operation (depending on final resourcing).

12.2.1.18.4.18.4.1.3 Mine Manager:

- Responsibility for water management associated with pit and waste dumps; and
- Maintenance and repair of water management facilities.

12.2.1.18.4.18.4.1.4 Environment and Sustainable Resources Manager:

- General site water management and water quality monitoring;
- Site inspections, including drains, ditches, ponds and dams; and
- Permit and regulatory compliance.

Any major repairs to dams will be under the supervision of an independent geotechnical engineer.

Roles and responsibilities listed above may change prior to construction and will be reflected in the Construction Tailings and MWAMP.

12.2.1.18.4.18.5 Regulatory Requirements

Relevant legislation and guidelines applicable to the Tailings and MWAMP include:

- BC *Mines Act* (Government of BC, 1996c);
- BC *Environmental Management Act* (Government of BC, 2003b);
- Federal *Fisheries Act* (Government of Canada, 1985d);
- *Canada Water Act* (Government of Canada, 1985a);
- BC *Water Act* (Government of BC, 1996d);
- BC *Water Protection Act* (Government of BC, 1996e);
- Canadian Environmental Protection Act, 1999 (Government of Canada, 1999);
- Canadian Water Quality Guidelines (CCME 2007, 2012);
- BC Approved Water Quality Guidelines (BC MOE, 2006a; 2006b; 2008; 2009; 2012); and

- Federal Metal Mine Effluent Regulations under the *Fisheries Act* (Government of Canada, 2002a).

12.2.1.18.4.18.6 Mine Water Management Process

12.2.1.18.4.18.6.1.1 Environmental Risks

Evaluation of environmental risks is included as per EMS in **Section 12.1.** Significant risks associated with water management will include:

- Groundwater pollution (metals);
- Surface water pollution (metals or sediment);
- Reduced flow of Davidson Creek; and
- Releases from the TSF.

12.2.1.18.4.18.6.1.2 Management Practices Overview

The MWAMP describes strategies and design elements, and provides guidance for the control of water from the Project area during construction, operations, closure, and post-closure. The objective of the MWAMP is to manage water in a manner that provides sufficient water to support the milling process while mitigating environmental impacts to the area. This includes minimising erosion in disturbed areas, preventing the release of sediment laden water to receiving environments, and maintaining existing fish habitat downstream of the Project footprint.

The strategies used in the MWAMP are delineated and briefly described below:

- Operational water management strategy:
  - Utilise the water within the Project area to the maximum practicable extent by collecting and managing site runoff from disturbed areas, maximising the recycle of process water, and storing surplus water within the TSF;
  - Pump water as required from Tatelkuz Lake through a freshwater supply pipeline to a water reservoir downstream of the TSF main dam to provide process plant make-up water and to maintain in stream fish needs in Davidson Creek;
  - Operate the TSF with no surface water discharge during operations; and
  - Collect all (except minimal) TSF seepage downstream of the TSF D Dam during operations and post-closure until the pit overflows or acceptable for direct discharge to Davidson Creek;
- Sediment and erosion control strategies:
  - Manage sediment mobilization and erosion by installing sediment controls prior to land disturbance, limiting land disturbance to the minimum practicable extent, reducing water velocities across the ground, progressively rehabilitating disturbed land, ripping areas to promote infiltration, and restricting access to rehabilitated areas; and

  - Install appropriate temporary erosion and sediment control measures or BMPs prior to and during construction activities;
- Additional environmental protection strategies:
  - Monitor groundwater quality, maintain fish habitat, develop compensatory fish habitat, and reclaim disturbed areas; and
  - Monitor surface and groundwater quality and quantity to verify EIA predictions.

Numerous design elements were developed to achieve the objectives of the site wide MWAMP. These design elements are identified and described below, and in more detail in the following sections:

- Construction erosion prevention and control through minimizing disturbance and sediment control ponds at strategic locations;
- Two-pond TSF to permanently store process plant tailings;
- Seepage control for all tailings dams;
- Pump station on Tatelkuz Lake, pipeline and freshwater reservoir to supply the process plant, flooding of PAG rock in TSF and instream flow needs for Davidson Creek;
- Site contact water drainage containment; and
- Segregation and sub aqueous disposal of PAG and NAG3 waste rock (**Section 12.2.1.18.4.17**).

12.2.1.18.4.18.7 Elements of the Mine Water Management Plan

The major elements of the MWAMP will include:

- Describing and implementing the construction water management described in the Project Construction Sediment and Erosion Control Plan (**Section 12.2.1.18.4.18.8**);
- Monitoring site water flows and pond levels, seepage and groundwater quality and flow, and receiving stream flows and water;
- Calibrating and verifying the site water balance model, site ground water model, and drainage basin watershed model;
- Implementing contingency measures, including additional seepage recovery as required;
- Ensuring compliance with *EMA* and *Fisheries Act* permits and authorizations;
- Ensuring the mine remains a no surface water discharge during operations throughout operating mine life;
- Verifying predictions of post-mining water quality and implementing the closure phase of the MWAMP; and
- Developing and implementing an OMS Manual for the TSF.

12.2.1.18.4.18.7.1.1 Construction Mine Water Management Plan

Major construction will occur in Years -2, -1 and 1. Facilities and schedule are listed in **Table 12.2.1-58**. **Figure 12.2.1-6** to **Figure 12.2.1-8** provide conceptual site layouts for these construction years.

Sewage and grey water management and treatment are discussed in the WQLMP (**Section 12.2.1.18.4.10**) and are not considered in this plan.

Table 12.2.1-58: Mine Site Facilities and Year of Construction

Year	Facility
-2	TSF Dam C starter dam, associated sediment control ponds (2) in Davidson Creek, and east and west coffer dams
-2	Construct Freshwater Reservoir and berm
-2	Process Plant site clearing and sediment control pond downslope to the south
-2	Construction laydown
-2	Truck shop
-2	Overburden stockpile
-2	Construction camp
-2	Sand and gravel borrow areas (two at the mine site)
-2	Water supply pipeline service road and new mine access road
-2	A diversion berm will be constructed on the tributary to Creek 661 east of the open pit to divert headwaters that drain the pit area prior to pit and East non-PAG Dump construction
-1	TSF Dam C completion
-1	TSF Site C West Dam augments the West coffer dam
-1	Reverse flow of Davidson Creek headwater Lake 1682 to Creek 705
-1	Increase the level of Creek 705 headwater Lake 1428
-1	Reclaim barge installed in Site C to supply Process Plant
-1	TSF Dam D foundation construction
-1	Low Grade Ore Stockpile
-1	Commence pit pre-stripping
-1	West non-PAG Dump
1	Complete Dam D starter dam
1	Tailings deposition in Site C commences
1	Continue building of West non-PAG Dump
1	Commence construction of the East non-PAG Dump
2	Complete Dam D including downstream seepage control
2	Environmental Control Dam constructed (or Year 3)

12.2.1.18.4.18.8 Construction Sediment and Erosion Control

Section 12.2.1.18.4.1 discusses a conceptual SECP. The objectives and strategies that will be implemented to manage water and mitigate erosion throughout the construction phase of the Project between Year -2 and Year 1 include the following key objectives:

- Reduce the extent of land disturbance, where practical;
- Isolate disturbed areas and contain the sediment; and
- Collect water for storage within the TSF for use during operations.

Six discrete areas of development have been identified within the Project boundary for the SECP. These areas include:

- Construction laydown, truck shop, and earthworks contractor laydown and offices;
- Plant site and crusher;
- Construction camp;
- Aggregate screening area;
- TSF; and
- Open pit and waste dumps.

Specific surface water control elements and measures will be implemented to minimize erosion and prevent sediment discharge into surrounding areas. Surface water sediment mobilization and erosion will be managed throughout the site by:

- Installing sediment controls prior to construction activities;
- Limiting the disturbance to the minimum practical extent;
- Reducing water velocity across the ground, particularly on exposed surfaces and in areas where water concentrates;
- Progressively rehabilitating disturbed land and constructing drainage controls to improve the stability of rehabilitated land;
- Scarifying applying slope roughening to the surface in rehabilitation areas to promote infiltration;
- Protecting natural drainages and watercourses by constructing appropriate sediment control devices such as collection and diversion ditches, sediment traps, and sediment ponds;
- Installing rock rip-rap, rock channel lining, sediment filters or other suitable measures on steep gradients, as required;
- Restricting access to rehabilitated areas;

- Directing all surface runoff from plant site grading, open pit development, TSF construction, and waste rock storage area development to the TSF basin;
- Implementing soils bioengineering techniques to contain sediment and enable disturbed surfaces to recover; and
- Constructing appropriate temporary BMP measures (e.g., silt fences, hay bales) downslope of disturbed sites (where more permanent sediment control measures are not appropriate, or in combination with more permanent measures).

Subsurface water will be controlled by the use of sump pits, wells, or removable pumping stations to draw down the natural water table and provide dry, stable construction areas. Excavations will be kept stable and workable by pumping water collected in the excavation sump pits to sediment control devices such as temporary holding ponds, sediment basins, or sediment filter bags where required.

An adaptive management approach will be implemented that allows sediment and erosion control works to be field-fit to suit conditions encountered during construction. BMPs will be implemented prior to and during construction. Regular monitoring and maintenance of implemented BMPs will ensure success of the plan. The temporary sediment and erosion control features will be reclaimed after the soils and sediments have stabilized. The following is a summary of BMPs that may be used at the Project site depending upon conditions encountered:

- Vegetation management and revegetation;
- Mulching;
- Rolled erosion control products;
- Surface roughening;
- Re-contouring;
- Silt fencing;
- Temporary sediment traps and sediment basins;
- Filter bags;
- Flocculants;
- Collection or diversion ditches;
- Culverts; and
- Exfiltration areas.

In addition to the BMPs described above, a sediment control pond (SCP) has been designed for each major area of disturbance (seven total to be constructed in Years -2 and -1). The SCPs for each major area, sequence of construction, and duration of use are discussed in the following sections.

12.2.1.18.4.18.9 Design Criteria

The SCPs were designed in accordance with based on the Guidelines for Assessing the Design, Size, and Operation of Sedimentation Ponds Used in Mining (BC MOELP, 1996). The ponds were designed to accommodate a live storage equal to the one in 10-year, 24-hour storm event with 0.5 m of freeboard, and to settle out sediment particles sized 0.01 mm (and larger), while providing a detention time of at least 24 hours. Each pond and pond outlet spillway was designed to withstand a one in 200-year, 24-hour storm event, in accordance with the aforementioned guidelines above. AMEC conducted studies on overburden samples from the Project site to identify an appropriate flocculent to aid sediment settling, if required. Any surface water discharges to receiving streams from the SCPs will meet federal and provincial discharge standards.

The collection and diversion ditches were designed for the one in 10-year, 24-hour storm event. All ditches will be accompanied by a silt fence installed downslope of the ditch to prevent potential residual sediment movement along undisturbed slopes.

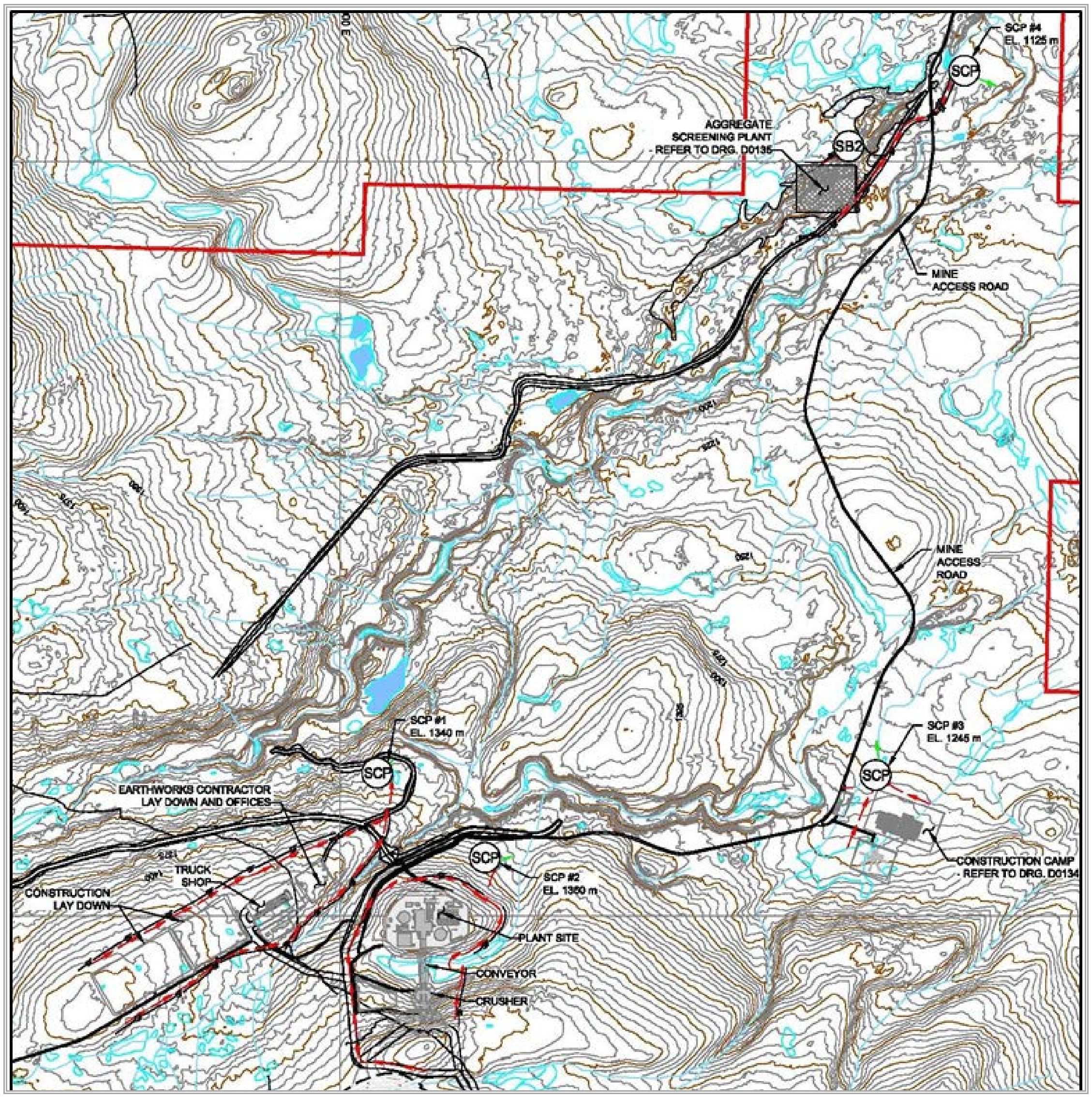
A flocculent study has been conducted to determine the most effective flocculent for site conditions (**Appendix 12.2.1H**). The TSS in sediment control pond discharge will meet Metal Mine Effluent Regulation limits of 15 mg/L monthly average and 30 mg/L maximum grab concentrations. Pursuant to permit conditions, TSS will be monitored weekly during discharge events and turbidity daily. A correlation will be developed between TSS and field turbidity measurements to allow a daily estimate of probable TSS from field turbidities.

12.2.1.18.4.18.10 Early Sediment Control Activities

The sequence of construction of the mine facilities was evaluated as part of construction sediment and erosion control planning. Construction will initially commence in the following four areas:

- Construction laydown areas (SCP #1);
- Plant site and crusher area (SCP #2);
- Construction camp area (SCP #3); and
- Aggregate screening area (SCP #4).

A SCP has been designed for each of these areas and will be constructed prior to disturbance at the sites. DA discharge is expected from the pond at each location. These four SCPs are shown on **Figure 12.2.1-39**.



Source: Knight Piésold

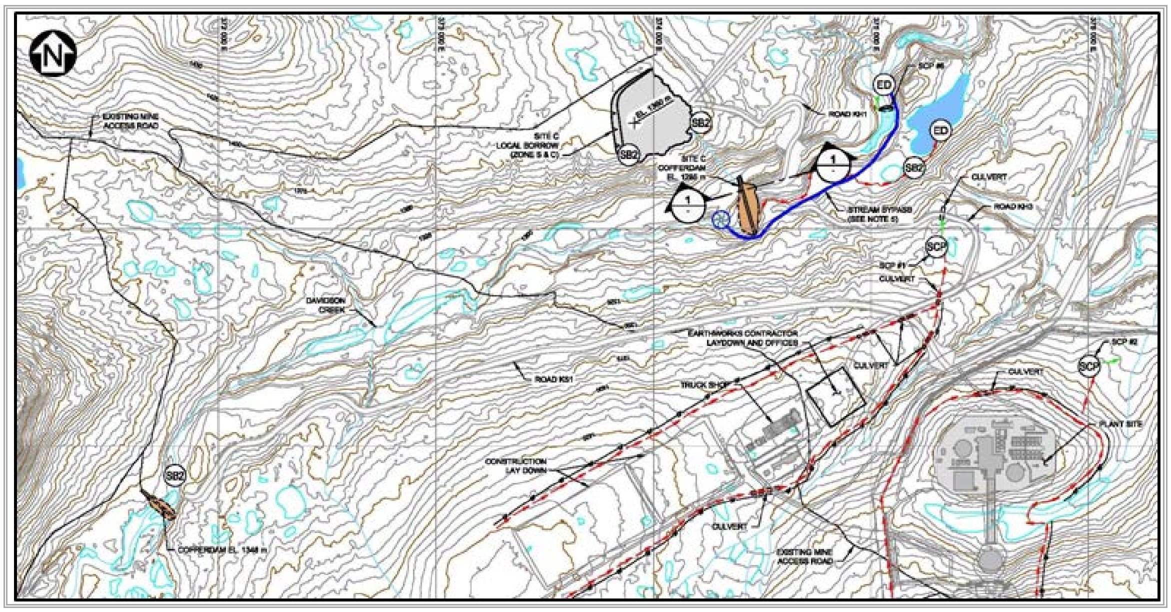
Figure 12.2.1-39: Sediment and Erosion Control – Start of Year -2

The following is the typical sequence of activities for construction of SCPs will be followed:

- Construct access roads into each area and install appropriate BMPs along the routes;
- Construct SCPs and discharge channels;
- Construct collection ditches around the perimeter of each area reporting to the SCP;
- Construct the facilities in each area; and
- Monitor and maintain the SCP and BMPs until construction is complete or the TSF is available to collect and contain site runoff.

12.2.1.18.4.18.11 TSF Construction

Construction of the TSF Site C cofferdam will commence as soon as permits are received. The cofferdam is expected be in service until October of Year -2, at which point the construction of Stage 1A of the Site C Main Dam elevation will rise above the cofferdam, rendering the cofferdam obsolete. The cofferdam is designed to store the one in 10-year, 24-hour storm event, as well as the one in 10-year wet August, September, and October water volumes. The sediment control pond (SCP #6), located downstream of the dam, will be constructed before prior to the commencement of the Site C cofferdam construction begins. **Figure 12.2.1-40** shows the arrangement.



Source: Knight Piésold

Figure 12.2.1-40: Site C Cofferdam and SCP #6 – August of Year -2

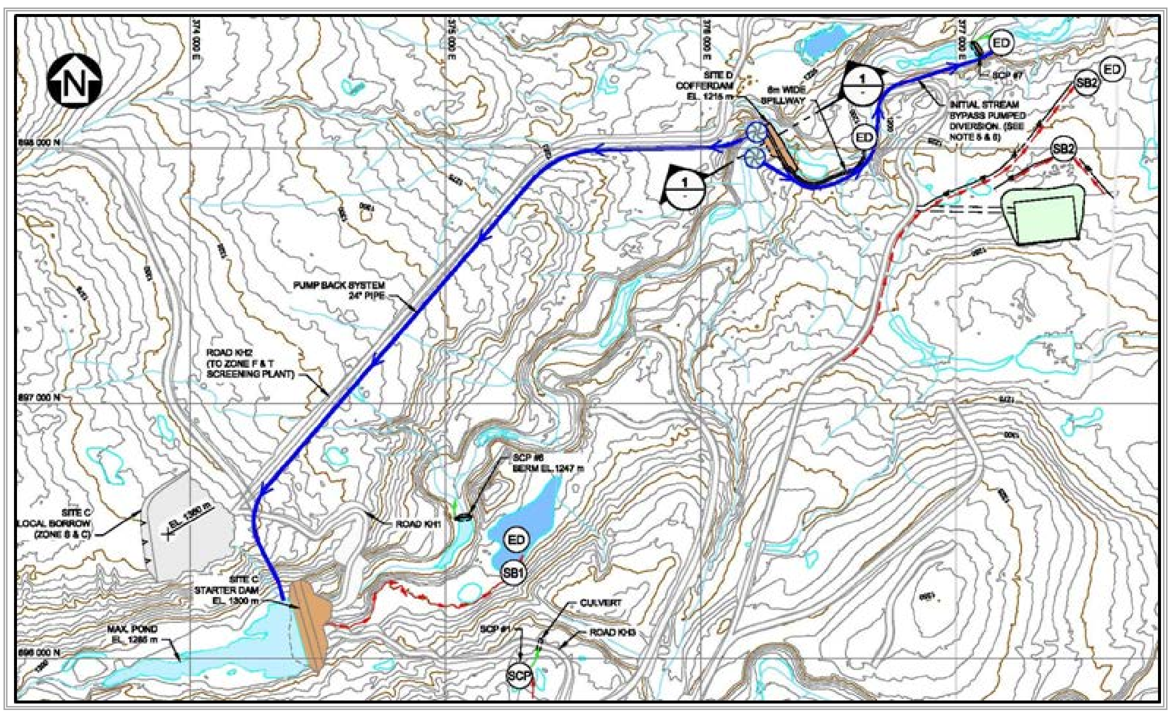
The construction MWAMP for the TSF Site C Dam includes the following sequence of activities:

- Construct access roads (KH1, KH2, and KH3) employing temporary sediment and erosion control BMPs;
- Install a temporary bypass diversion pumping system on Davidson Creek to provide clean water diversion while the SCP and cofferdam are constructed. The temporary stream diversion will direct water into a pipeline and subsequently downstream of the work area. A rip-rap-lined outfall will be used at the end of the pipeline for energy dissipation;
- Install BMPs and establish site isolation using collection ditches around the Site C cofferdam area;
- Construct the SCP downstream of the construction area;

- Strip the foundation area for the cofferdam and store material in a topsoil stockpile that drains to the SCP; and
- Construct the cofferdam from Zone S material to an elevation of 1,285 m.

Construction of the TSF Site D cofferdam will commence during construction of the Site C Main Dam in October of Year -2. It is designed to store the one in 10-year, 24-hour storm event, as well as the one in 10-year wet October, November, and December water volumes. The cofferdam includes a spillway, which has been designed to safely pass the one in 200-year, 24-hour storm event peak flow. The sediment control pond (SCP #7), located downstream of the cofferdam, will be constructed prior to any disturbance in the vicinity of the Site D cofferdam.

Construction of the Site D Main Dam will not commence until Year -1. The Site D cofferdam, constructed to elevation 1215 m, will initially function as a water collection reservoir during Year -1. Water collected behind the Site D cofferdam will be pumped back to TSF Site C to build the start-up water pond. The pumpback system is designed to pump 1,500 m^3/h of water in order to capture a large portion of the spring and summer freshet flows. At lower flow times of year, the water behind the cofferdam will accumulate at a slower rate and can be pumped down as required. The spillway will pass flows that exceed the design pumping capacity of the system or from passive spilling of a full pond before the pumpback system is in prior to operation, or during inactive periods of the pumpback system. The Site D cofferdam, pumpback system, and SCP #7 arrangement is shown on **Figure 12.2.1-41**.



Source: Knight Piésold

Figure 12.2.1-41: Site D Cofferdam and SCP #7 – April of Year -1

The pumpback system will consist of five installed Godwin HL160M Dri-Prime skid-mounted diesel drive pumps. A spill containment area will be prepared around the diesel tanks for this pump system. The pumps will feed a single 24" HDPE DR9 pipeline that will convey the water just over 3 km at 170 m of total dynamic head (TDH).

The Site D cofferdam will function until the end of Year -1 when Stage 1A at the Site D Main Dam is completed. The bulk excavation for the cutoff trench and construction of the main dam will take place between August and December, with an exposure period between October and December for completion of the in-creek cutoff trench section and main dam construction to an elevation above the cofferdam. The final Stage 1A elevation will be 1,240 m. The cofferdam will remain in place during Year 1 until it becomes part of the expanded upstream footprint of the Site D Main Dam. The pumpback system will remain in place during Years 1 and 2 to provide additional make-up water, if required, in the TSF Site C supernatant pond.

The CWMP for the TSF Site D Dam includes the following sequence of activities:

- Construct access roads (KH2 and KH4) employing temporary sediment and erosion control BMPs;
- Install a temporary bypass diversion pumping system on Davidson Creek to provide clean water diversion while the SCP and cofferdam are constructed;
- Install BMPs and establish site isolation using collection ditches around the Site D cofferdam area;
- Construct the SCP downstream of the construction area;
- Strip the foundation area for the cofferdam and store material in a topsoil stockpile;
- Construct the cofferdam from Zone S material to an elevation of 1,215 m; and
- Pump back sediment-laden water from the downstream SCP for storage above the cofferdam.

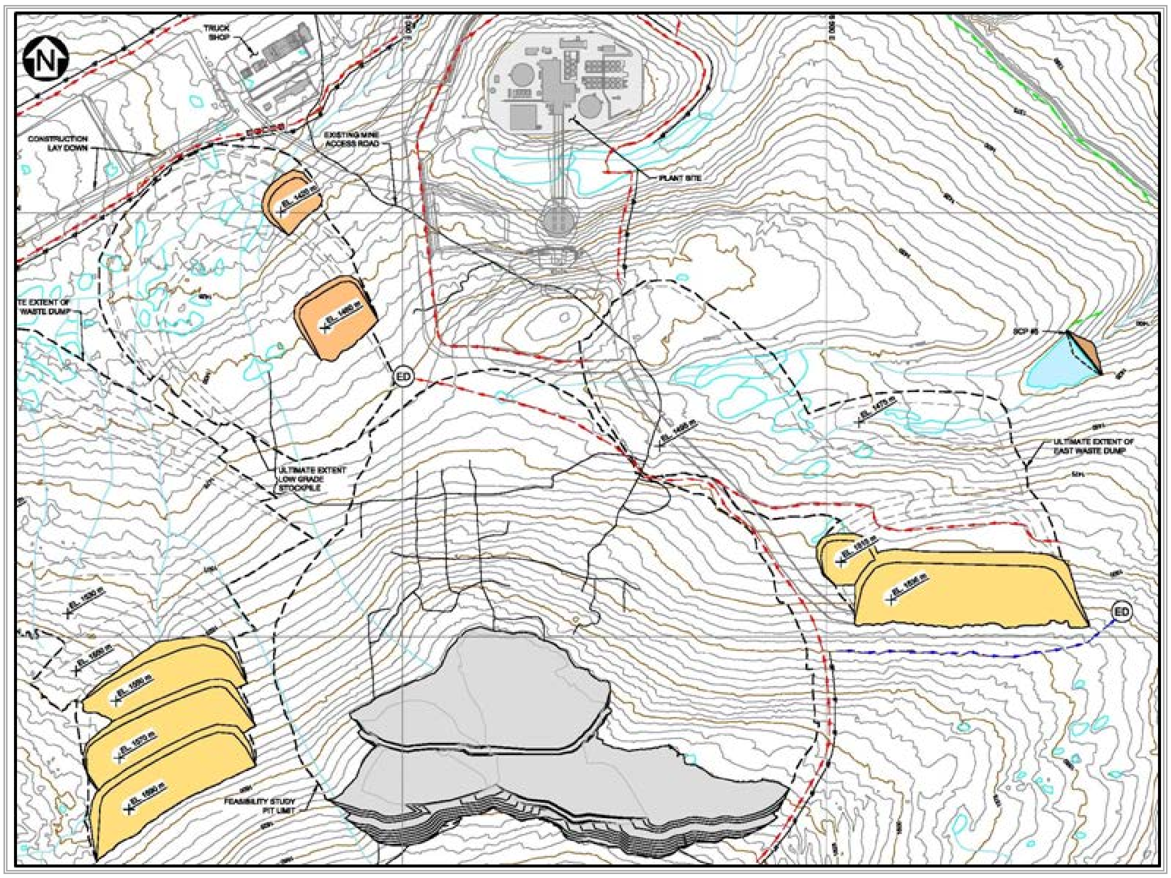
Prior to starting Dam C construction and the concomitant reduction in Davidson Creek flows, the freshwater supply line from Tatelkuz Lake and the Freshwater Reservoir Dam will be constructed to allow filling of the reservoir and controlled release of water to Davidson Creek to maintain water levels on Davidson Creek to support instream fish needs. Construction will follow BMPs (available at http://www.env.gov.bc.ca/wld/BMP/bmpintro.html) whereby sedimentation caused by erosion will be prevented where practical and controlled with sediment control ponds where not. The freshwater supply pipeline will be above ground, thus ground disturbance will be limited to site clearing and access. Details of the TSF and freshwater supply pipeline construction is provided in **Section 2.2.3**.

12.2.1.18.4.18.12 Open Pit Sediment Control

Pre-stripping of the open pit will commence in late Year -2. The pre-stripped material will be used in dam construction or disposed of in the East and West Dumps. A SCP (SCP #5) will be constructed before any disturbance in the open pit area.

The pond is designed to manage runoff from the east side of the open pit and the ultimate extents of the East Dump, as shown on **Figure 12.2.1-42**. The SCP will accommodate a live storage equal to the one in 10-year, 24-hour storm and will provide a detention time of over 24 hours for settling of suspended sediments. The spillway is designed to manage the one in 200-year, 24-hour storm in accordance with BC guidelines (BC MOELP, 1996) and Dam Safety Guidelines (CDA, 2007) for a “Significant” consequence dam.

The SCP will discharge to a diversion channel and the water will subsequently flow to collection at the TSF Site D cofferdam for storage and re-use in processing.



Source: Knight Piésold

Figure 12.2.1-42: Open Pit and East Dump SCP #5 – October of Year -2

12.2.1.18.4.18.13 Operations and Closure Mine Water Management Plan

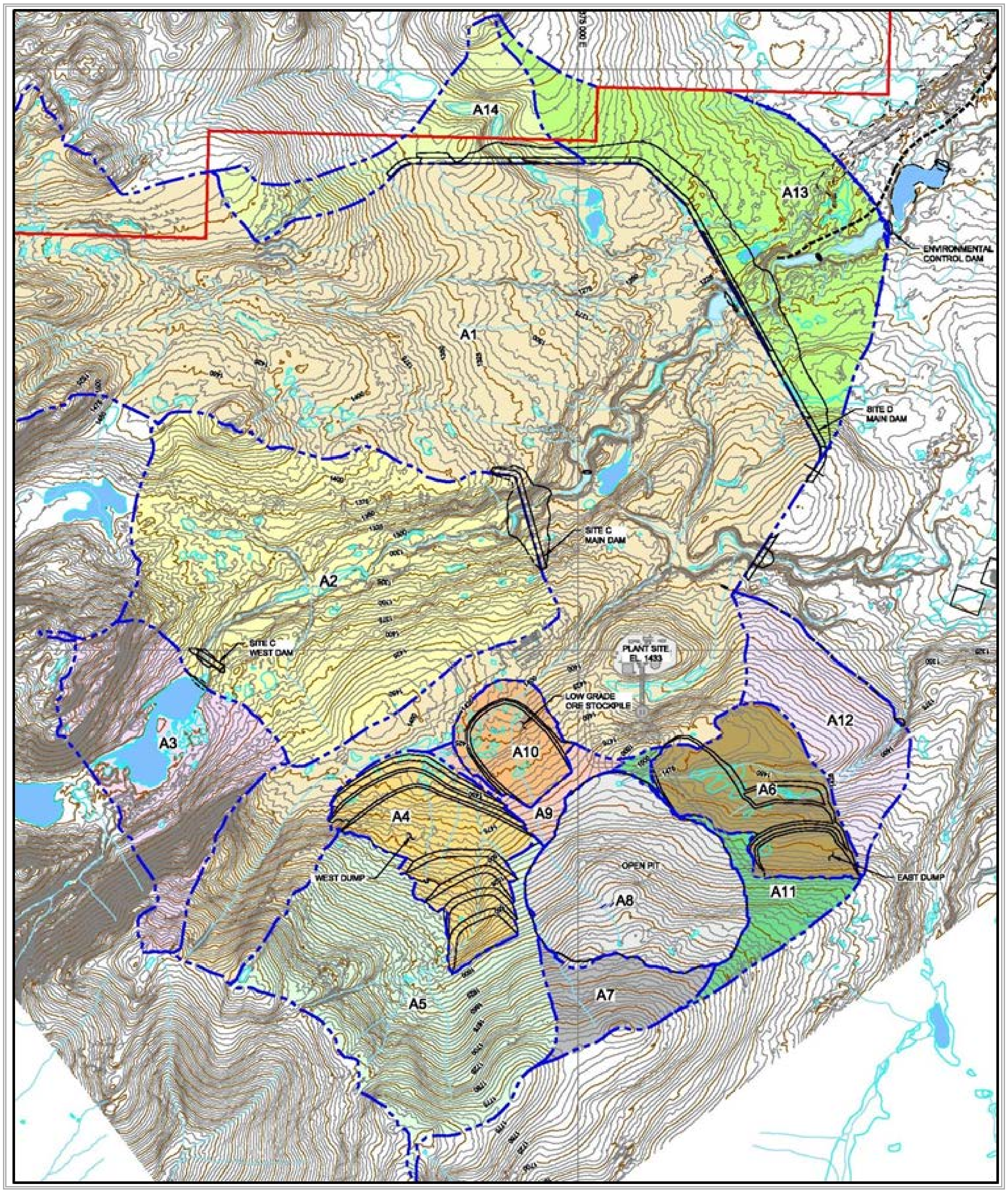
The construction, operations, and closure water management strategies for the Project have been developed by identifying the size and position of the planned mine site facilities, and establishing estimated catchment area boundaries based on the mine site development concept. All site drainage during operations and closure will drain by gravity to the TSF. Virtually all the seepage from the TSF and waste rock dumps will also be collected and directed to the TSF. This simplifies water management, spill control, and closure in addition to as well as providing water for the process. The proposed facilities and resulting catchment boundaries are shown on **Figure 12.2.1-43**.

The TSF Site C Main Dam will be constructed in the upper Davidson Creek catchment and capture runoff from the upstream catchment A2, as shown on **Figure 12.2.1-43**. Catchment A3, upstream of the TSF Site C West Dam will be redirected to Creek 705 to the southwest, away from TSF Site C, by a cofferdam built in Year -2, which will permanently change the natural catchment divide in this area. Catchment A3 does not contribute to the water balance for the mine site.

As described above, a cofferdam will be constructed on Davidson Creek within the TSF Site D Main Dam footprint in Year -1 to capture runoff from catchments A1 and A14. The accumulated water behind the TSF Site D cofferdam will then be pumped to the TSF Site C start-up pond beginning in the second quarter of Year -1.

The starter dam for the TSF Site D Main Dam will be completed at the start of operations in Year 1, and will begin to capture catchment runoff from the contributing areas of the West Dump (A4), East Dump (A6), and LGS (A10), as well as the corresponding upstream catchment areas (A5, A9, and A11) and area downstream of the East Dump (A12). The ECD will be constructed in Year 1 to capture seepage and surface runoff (A13) from the TSF Site D Main Dam. Unless of acceptable quality for direct discharge, the recoverable seepage (approximately 96% of TSF seepage by the end of operations) and surface runoff will be collected at the ECD and pumped back to TSF Site D during mine operations and into closure until the open pit is full and TSF Site D spills to Davidson Creek via the closure spillway and discharge channel.

The water stored in the TSF Site C start-up pond will serve as the primary process water source at the start of mill operations until the end of Year 2, with additional water being drawn from the TSF Site D pond (via the pump system at the cofferdam), as necessary. Once tailings deposition in TSF Site D commences in Year 3, and until the end of mining operations in Year 17, the TSF Site D pond will be the primary source of process water. Additional make-up water, if required during that time, will be provided by the TSF Site C pond. The pond in TSF Site C, as of Year 3, will be allowed to accumulate naturally to the closure spillway elevation at or below 1,343 m, and until then overflow into the pond of TSF Site D in approximately Year 27. Freshwater required for the mill (e.g., gland and reagent mixing water) and any additional process water to ensure PAG waste rock in the TSF remains inundated will be supplied by the freshwater supply pipeline from Tatelkuz Lake.



Source: Knight Piésold

Figure 12.2.1-43: Project Catchment Area Boundaries

Groundwater inflow and surface runoff to the open pit, including water from the vertical depressurization wells, will be collected and discharged to TSF Site D and will be recycled for use in the milling process until the cessation of open pit mining in Year 15. The pit dewatering system will be decommissioned in Year 15 and the pit will begin to fill with water while the low low-grade ore is processed through the mill from Year 15 to Year 17. Once mill operations cease in Year 17, the surplus inflow to TSF Site D (inflow minus losses) will be pumped to the open pit to accelerate pit filling and associated flooding of PAG rock exposed in the ultimate pit walls. Once the open pit is full (predicted in Year 35), it will overflow via a spillway to the TSF Site D pond. Subsequently, the TSF Site D pond will overflow via the closure spillway and discharge channel to a plunge pool in Davidson Creek downstream of the ECD.

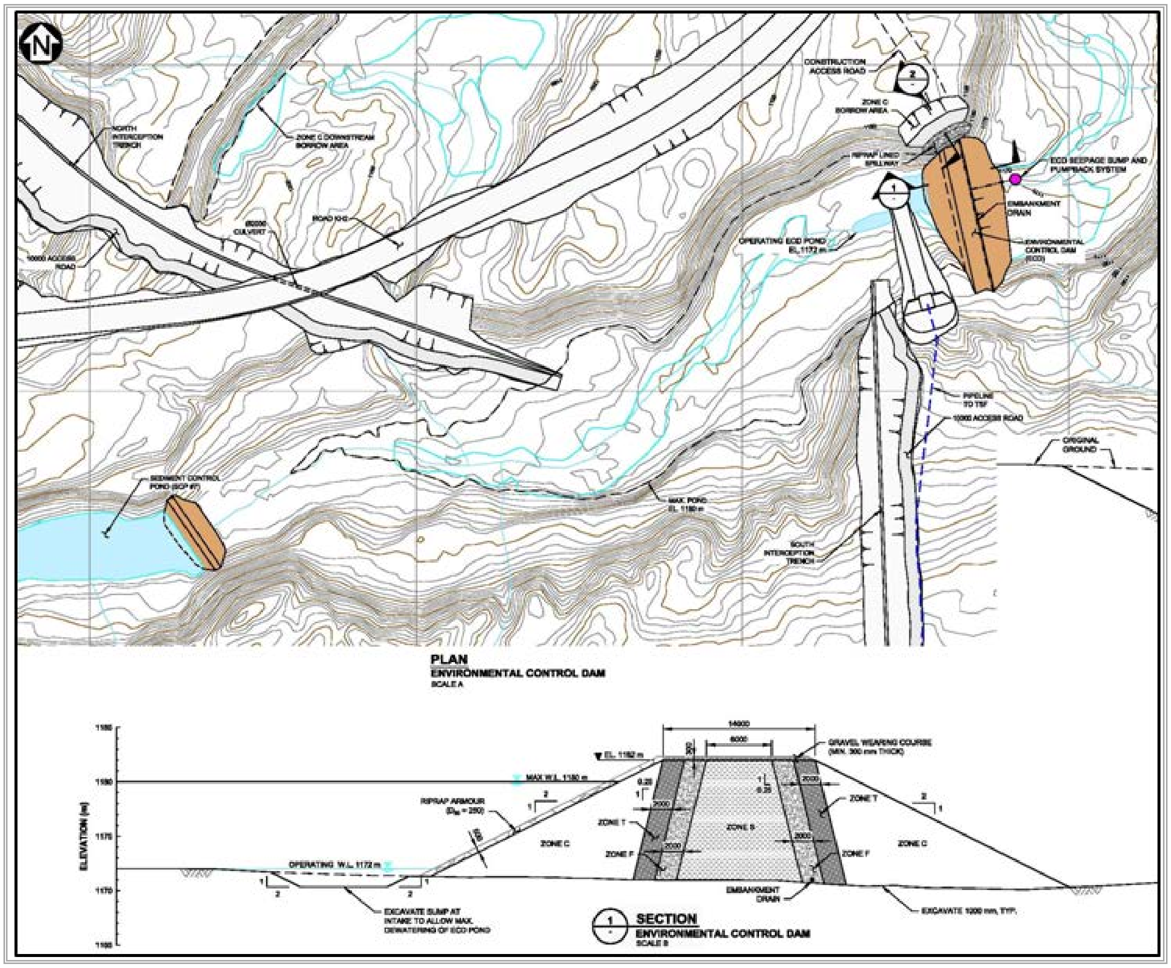
During closure, wetlands will be constructed during closure in the sediment pond, ECD, and water reservoir downstream of TSF Dam D to polish TSF seepage. Additional wetlands will also be constructed on the surface of TSF Site C in Years 4 and 5 and on the surface of TSF Site D in Years 18 and 19.

12.2.1.18.4.18.14 Water Management Systems

12.2.1.18.4.18.14.1 Environmental Control Dam

The primary seepage collection point downstream of the TSF will be located approximately one kilometre downstream at a topographic low point in Davidson Creek. The collection pond will be created by constructing a 12 m high dam (i.e., ECD) across Davidson Creek. The dam is designed to contain continuous seepage and runoff from events up to the one in 100-year, 24-hour storm. A spillway is designed to pass the one in 200-year, 24-hour storm. The pond will be fed by two interception trenches, TSF Seepage Control Measures. The ECD concept is shown on **Figure 12.2.1-44**. The primary pumpback system at the ECD is designed to maintain the pond at a minimum water level to reduce the potential for seepage. The intake is a concrete structure equipped with stoplogs and trash racks and is set at elevation 1,170 m. The pumpback system consists of four 500 horsepower (HP) vertical turbine pumps (three operating, one installed spare) and requires at least 2 m submergence to operate. The system is designed to pump a maximum of 1,080 m^3/h to the TSF through an 18" standard steel pipeline. The design flow rate is equivalent to a 10-day pump-out of the ECD pond following the one in 100-year design storm. The pumping system would normally operate intermittently using one or more pumps when the ECD pond exceeds the minimum operating depth of 2 m but remains at less than maximum capacity.

The ECD will have an embankment drain system, seepage collection sump and monitoring device, and secondary pumpback system to collect and recycle seepage.



Source: Knight Piésold

Figure 12.2.1-44: Environmental Control Dam

12.2.1.18.4.18.14.2 Water Reclaim System

Water reclaimed from the tailings ponds at TSF Sites C and D will be delivered to the reclaim water tank at the mill. The water will consist of supernatant from the settled tailings and runoff from precipitation and snowmelt within the reporting catchment areas. The reclaim pipeline will consist of 30" diameter standard steel pipe for the initial high-pressure sections closest to the reclaim pumps and 32" diameter HDPE DR17 pipe for the rest of the line.

The reclaim water system will initially utilize a barge-mounted pump station equipped with four 1,000 HP vertical turbine pumps sized to deliver 3,200 m^3/h of reclaim water. The reclaim barge will be anchored in TSF Site C during Years 1 and 2 of operations and then moved to TSF Site D late in Year 2 for the remainder of mine operations and closure. A reclaim structure will be constructed in TSF Site C during Year 2. The reclaim structure design is similar to the ECD pump station design, consisting of a concrete intake structure with stoplogs and trash racks. The structure will be set at elevation 1,337 m and requires 3 m of submergence to operate. The pumping system will include four vertical turbine pumps of the same type and motors as the barge-mounted system for consistency of spare parts and ease of maintenance.

The reclaim structure has been designed to operate within a 3.5 m fluctuation in TSF pond level, which equates to a 5 Mm^3 fluctuation in pond volume. The TSF pond level will be controlled passively with a spillway to the north of the Site C Main Dam. The spillway will have an invert at elevation 1,343 m, which will allow for long-term availability of the Site C reclaim structure as a backup system.

12.2.1.18.4.18.14.3 Pit Dewatering System

Water inflows to the open pit will include both groundwater and surface water runoff. The contributions from groundwater will progressively increase as the pit extends below the groundwater table. The contributions from surface water will be direct precipitation into the pit and runoff from the limited contributing catchments around the pit excavation. The inflows from direct precipitation will increase with increasing pit area in conjunction with groundwater inflows as the pit increases in depth.

The open pit area increases over time to a maximum size of approximately 240 ha (2.4 km^2). At this maximum extent, the undisturbed catchment area providing potential surface water inflows to the open pit is only approximately 80 ha (0.8 km^2).

The one in 100-year return period storm has been used to size the pit surface water dewatering system and was estimated to be approximately 142,000 m^3. The estimated runoff coefficient inside the open pit surface area was conservatively assumed to be 100%.

The groundwater model of the open pit takes into account baseline hydrometeorology monitoring, extensive geotechnical and hydrogeological site investigations, field observations, and in-situ hydraulic testing. The model was used to evaluate groundwater inflows into the open pit. The configuration of the groundwater model is summarized as follows:

- The pit is generally overlain by overburden, a low-permeability that will not contribute substantial groundwater inflows to the pit;
- High- and low-permeability bedrock are present. The high-permeability rock is generally limited to the deposit area, has a hydraulic conductivity of 5×10^{-6} m/s, and is surrounded by a lower-permeability zone with a hydraulic conductivity of 1×10^{-7} m/s;
- The groundwater table is relatively close to ground surface and the groundwater flows to the northwest. Groundwater levels within the highly permeable zone are relatively flat and currently are at elevation 1,540 m; and
- Recharge to groundwater is estimated at up to 120 mm per year.

The pit dewatering design is based on lowering the groundwater table within the highly permeable zone to approximately 15 m below the pit base elevation, considering both removal of groundwater from storage and from recharge.

A combination of in-pit and perimeter pumping wells will be used for slope depressurization and pit dewatering. All pumping wells will be installed to a nominal depth of approximately 350 m below ground level.

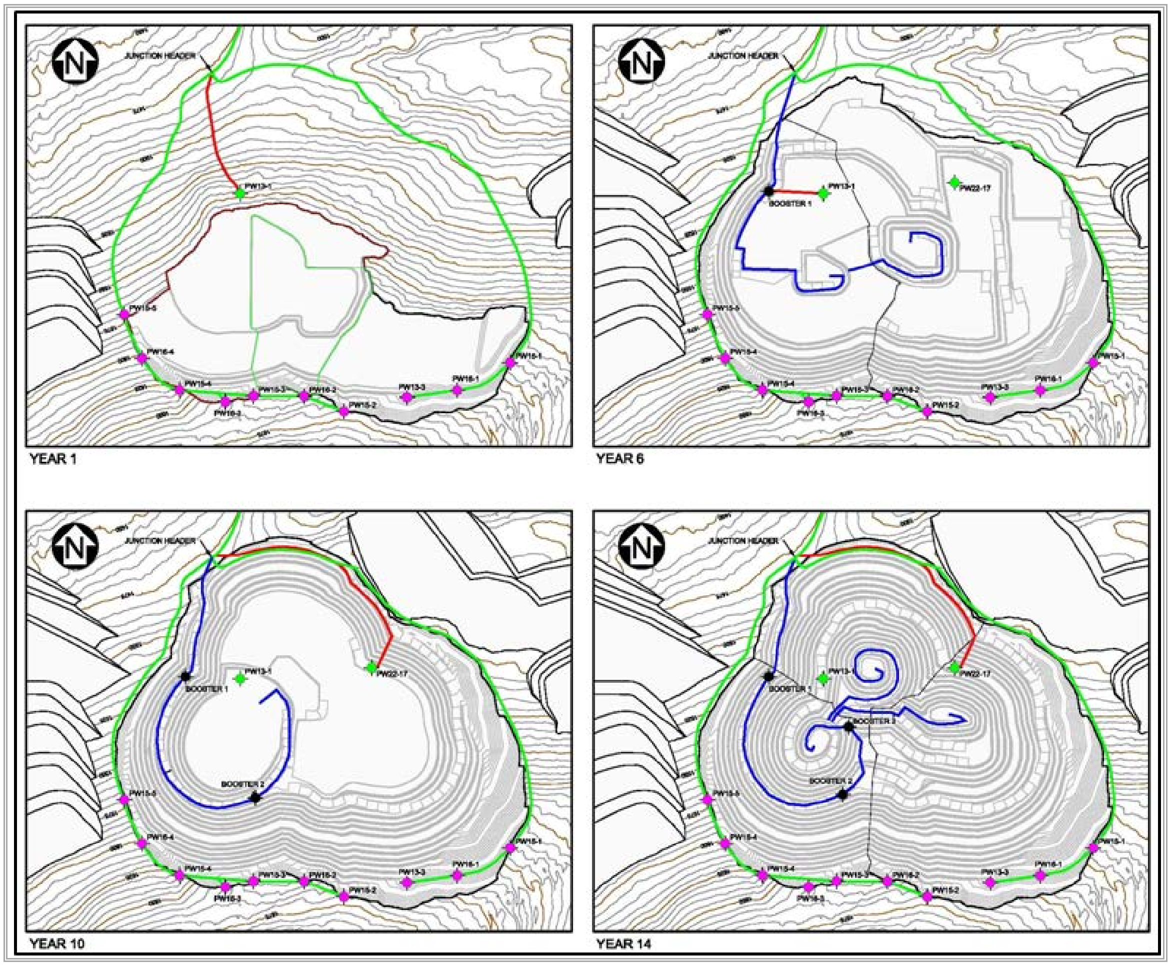
The in-pit groundwater wells will remove water from storage in the highly permeable zone. This will also draw down water in the surrounding rock mass as the groundwater flows toward the highly permeable zone. Perimeter dewatering wells will be established along the south high wall to lower and extend the cone of depression beyond the pit walls where drainage to the permeable zone is not adequate for slope depressurization. There will be approximately 10 dewatering wells spaced at 200 m to 250 m intervals to achieve an adequate cone of depression to lower the groundwater level.

A summary of the dewatering system stages and sequence of development includes the perimeter dewatering wells and pipeline (green), in-pit dewatering well and pipeline (red), and in-pit surface dewatering system (blue).

The sequence of dewatering well development for the pit is provided below.

Year -2:

- Re-develop existing pumping wells PW13-1 and PW13-3 for inclusion in the dewatering system;
- Install five perimeter pumping wells in Year -2 (PW15-1 to PW15-5) along the south wall;
- Install 11 observation wells to measure groundwater levels around the open pit perimeter (OW1 to OW10 and OW19); and
- Commission dewatering wells PW15-1 to PW15-5 and PW13-3 in the last quarter of Year -2.



Source: Knight Piésold

Figure 12.2.1-45: Pit Dewatering System

Year -1:

- Install four perimeter pumping wells in Year -1 (PW16-1 to PW16-4) along the south wall; and
- Commission in-pit well PW13-1 in Year -1.

Years 1 to 3:

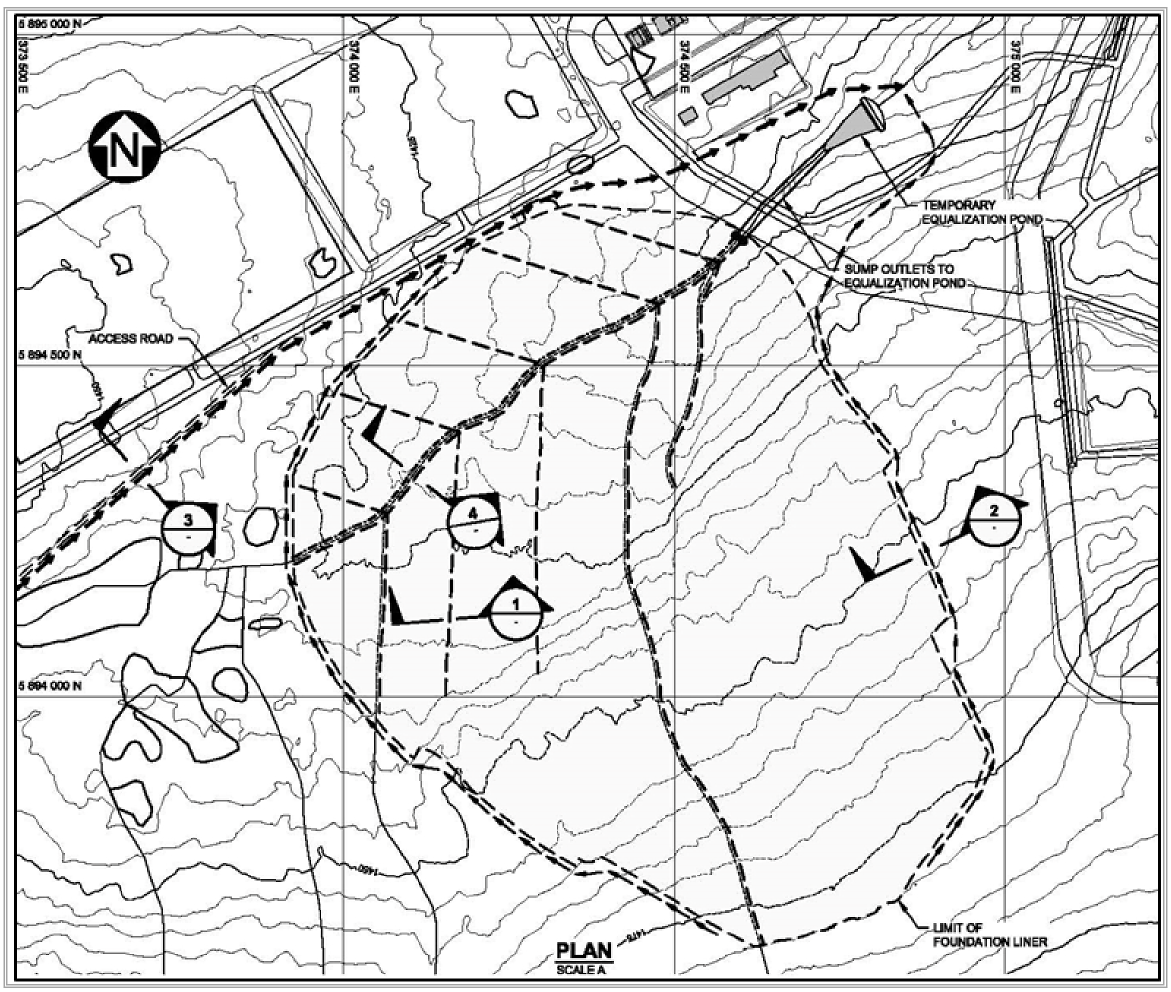
- Install backup pumping wells for all pre-existing perimeter pumping wells;
- Install remaining observation wells (OW11 to OW18) around the northern sections of the ultimate open pit; and
- Install secondary in-pit well PW22-17 and decommission PW13-1.

Year 6:

During operations, pit water is predicted to be neutral pH with relatively low metal levels. Pit water will be collected in a sump and discharged separately to the TSF.

12.2.1.18.4.18.14.4 Low-Grade Ore Stockpile

The LGS will be developed over a prepared low-permeability foundation with surface water and seepage collection and monitoring systems. Drainage from the LGS is expected to be acidic and contain elevated metals. Therefore, the drainage will be collected, neutralized in with lime, and discharged to the TSF. The MWAMP is shown in **Figure 12.2.1-46**.



Source: Knight Piésold

Figure 12.2.1-46: Low-Grade Ore Stockpile Water Management

Runoff from the upslope undisturbed catchment will be diverted around the stockpile by a 3 m wide diversion channel excavated adjacent to a 6 m wide access road. Foundation drains will be installed in areas of existing drainage lines or in any areas of seepage encountered during topsoil stripping. A 500 mm layer of compacted Zone S material from overburden stripping in the pit will be placed on the LGS foundation. The subgrade treatment will extend approximately 10 m beyond the stockpile edge to allow for collection of runoff from the stockpile. A collection drain will be placed above the low-permeability subgrade in the low point of the pad to facilitate collection of seepage. The collection drain and foundation drains will report to their respective seepage sumps near the edge of the stockpile. Seepage quality of both systems can be monitored at this location before discharge to an equalization pond. A perimeter diversion ditch measuring 1 m wide will wrap the ultimate extents of the stockpile to divert non-contact water around the stockpile.

The LGS foundation will be prepared in three stages: the first stage during Year -2 and Year -1 and covering approximately 50% of the area; and the two last stages distributed into Years 2 and 4 for the remaining 50%.

12.2.1.18.4.18.14.5 NAG Disposal Areas

The East and West Dump layouts have been refined to minimize surface water control requirements. Foundation drains will be installed in areas of existing drainage lines or when excessive seeps or springs are encountered during clearing and grubbing. Non-contact surface water will be diverted around the dumps during operations and closure and will be field-fit with the advancing fill platforms. Water that infiltrates through the dump will be collected in ditches near the toe of the dumps and routed to a sediment basin before discharge to the TSF.

12.2.1.18.4.18.14.6 Freshwater Supply System

A freshwater supply system has been designed to convey freshwater via pipeline to the mine site from Tatelkuz Lake, approximately 20 km to the northeast. The freshwater supply system includes the following major components:

- Tatelkuz Lake intake and pumps;
- Freshwater supply pipeline;
- Booster pump stations; and
- Freshwater reservoir.

The freshwater supply system is designed to provide:

- Constant freshwater supply from Tatelkuz Lake to provide for plant freshwater needs and to mitigate flow reductions in lower Davidson Creek; and
- Occasional and contingency freshwater supply from Tatelkuz Lake to supplement requirements for processing or to saturate PAG waste rock within the TSF, if required.

12.2.1.18.4.18.15 Water Balance

12.2.1.18.4.18.15.1 Introduction

A monthly operational and closure water balance was developed for the Project using the GoldSim™ software package. The model estimates the magnitude and extent of any water surplus and/or deficit conditions in TSFs based on a range of possible climatic conditions. The model period included one year of preproduction (Year -1) and 17 years of operations, at a nominal milling rate of 60,000 tonnes per day (t/d) dry, and 16 years of closure until the TSF discharges to Davidson Creek. The Project layout and catchment areas used in the model are shown in **Figure 12.2.1-43**. The model incorporates the following major Project components:

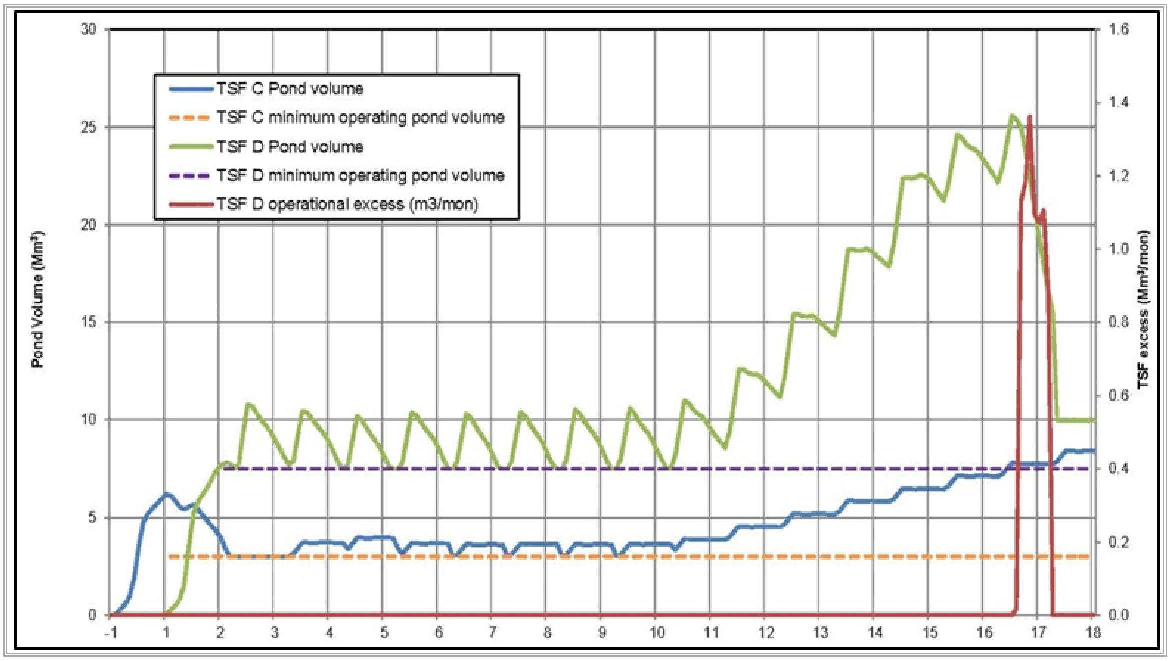
- Open pit;
- Mill;
- LGS;
- TSF Site D;
- TSF Site C; and
- East and West waste rock and overburden dumps.

12.2.1.18.4.18.15.2 Results

The water balance model assumed that a start-up pond of at least 6 Mm^3 (under average conditions) will accumulate in TSF Site C in the year before mill start-up. Of this amount, 1.0 Mm^3 will accumulate behind the TSF Site C Main Dam based on runoff from its contributing upslope catchment (7.1 km^2), and the other 5.0 Mm^3 will be from undisturbed contributing catchments (25 km^2) at TSF Site D. This latter runoff will be collected behind a cofferdam at the TSF Site D Main Dam location and be pumped to the TSF Site C pond until the start of operations. The minimum operating pond volumes for TSF Sites C and D were assumed to be 3.0 Mm^3 and 7.5 Mm^3, respectively. **Figure 12.2.1-47** presents the predicted pond volumes available from construction to closure for both facilities, based on average precipitation conditions.

The facilities are in a balance or surplus condition throughout operations, given that the water accumulated within the supernatant ponds in TSF Sites C and D, including from open pit dewatering, will satisfy the mill process requirements under average precipitation conditions. Freshwater required for the mill (1.05 Mm^3/y) will be provided by pumping from Tatelkuz Lake. From Years 5 to 10, when tailings are being deposited in TSF Site D, reclaim water will be withdrawn from both the supernatant ponds of both TSF Site D and Site C to meet the process water requirements. The additional process water requirement from TSF Site C is largely needed during the winter months, when precipitation falls as snow. Excess water becomes available with snowmelt during the spring freshet period, and the system then operates in a surplus condition.

The amount of surplus increases over time due to increasing runoff from the expanding disturbed areas of the mine facilities and also from decreases in waste rock production and corresponding decreases of water storage in waste rock voids for the mine rock stored within TSF Site D.



Source: Knight Piésold

Figure 12.2.1-47: Predicted Pond Volumes for TSF C and D Sites – Average Conditions

The maximum operating pond volume for TSF Site D was based on a spillway elevation of 1,336 m. TSF Site D is predicted to exceed its maximum operating pond volume in the last year of operations; therefore, a portion of the upstream contributing catchment might be diverted around the facility to Davidson Creek in the later years of mine life.

The open pit begins filling in Year 15 when the dewatering system is decommissioned after open pit mining has ceased. At the end of mill operations in Year 17 (after processing the LGS), the surplus inflow to TSF Site D (inflow minus losses) is pumped to the open pit to aid in pit filling.

TSF Site C continues to overflow naturally into TSF Site D via a closure spillway in Year 27. The open pit takes approximately 18 years (Year 35) from the end of mining to fill based on average precipitation conditions. TSF Site D is predicted to begin discharging via the closure spillway in that same year. Therefore, it will take a total of 18 years after the end of mill operations before the system discharges to Davidson Creek.

A stochastic analysis was completed to analyze the range of possible cumulative pond volumes available in TSF Site C and TSF Site D over the mine life, as defined by the 95th percentile wet and dry values (5% and 95% chance of being equalled or exceeded in any month, respectively).

This range of volumes also indicates possible active or live storage capacity in the TSF ponds for a reasonably large range of anticipated climatic conditions. The stochastic water balance highlights the sensitivity of the TSF pond volumes to the assumed climatic inputs and pond minimum/maximum operating capacities. The stochastic results indicate that for extreme conditions (5th percentile), the accumulated TSF ponds, open pit, and associated contributing catchments are not able to supply enough water to meet the process water requirements until Year 11, and the system will operate in a deficit condition until that time, as indicated in **Table 12.2.1-59.**

Table 12.2.1-59: Annual Stochastic Volume of Makeup Water Requirement

Mine Life	Annual Volume of Makeup Water Required to Supplement TSF Reclaim (m^3/y)			Annual Volume of Makeup Water Required from Freshwater Source (m^3/y)
	5th Percentile	50th Percentile (Median)	95th Percentile	
-1	0	0	0	0
1	0	0	0	1,051,200
2	2,014,900	0	0	1,051,200
3	2,375,400	0	0	1,051,200
4	2,859,600	0	0	1,054,080
5	2,619,400	0	0	1,051,200
6	2,885,600	0	0	1,051,200
7	2,896,300	0	0	1,051,200
8	2,711,900	0	0	1,054,080
9	2,675,100	0	0	1,051,200
10	1,780,900	0	0	1,051,200
11	964,510	0	0	1,051,200
12	0	0	0	1,054,080
13	0	0	0	1,051,200
14	0	0	0	1,051,200
15	0	0	0	1,051,200
16	0	0	0	1,054,080
17	0	0	0	259,200

Source: Knight Piésold
Note: m^3/y = cubic metres per year

The stochastic analysis indicates that under extreme dry conditions the supplemental makeup water requirement to support operations of the mine is less than 3 Mm^3/y. The freshwater supply system has enough design capacity to augment this deficit.

The TSF operational pond capacity is sufficient to manage a reasonable range of surplus water conditions. Water levels will be monitored to ensure that the water balance assumptions are accurate and that an operational surface water discharge from the TSF does not occur until closure. As a contingency, non-contact surface water diversions can be created to divert runoff around the TSFs, and the TSF dams can be raised more frequently if required.

12.2.1.18.4.18.15.3 Exceptional Events

Dry seven day, 10 year return period (7dQ10) and normal storm events (up to the design maximum of the TSF) will not affect the site water management because the only discharge will be a small amount of seepage that is projected to pass the ECD and equal to 63,000 m^3/y or 2 L/s on average. In an extreme storm event, i.e., greater than a probable maximum precipitation (PMP) return event, water can be pumped back to Site C or temporarily to the open pit if required.

12.2.1.18.4.18.16 Closure and Post-closure Mine Water Management Plan

Changes in water management will occur at mine closure (after Year 17) and post-closure when the pit overflows and the TSF discharges (approximately Year 35). Pumping of water from Tatelkuz Lake will continue to maintain instream flow needs in Davidson Creek unless seepage quality is acceptable for direct discharge as determined by water quality monitoring and is meeting site water quality objectives. A spillway will be constructed in the south side of Dam D to allow water to discharge to a constructed channel leading to Davidson Creek downstream of the dam. The Dam D spillway will be sized to carry the probable maximum flood event to protect dam integrity post-closure when there is no longer continuous active water management at the site.

Figure 12.2.1-45 is a conceptual site arrangement at the time of pit overflow. A wetland will be constructed in Site D to augment tailings supernatant water polished in Site C. An overflow spillway will be constructed on the southeast side of Site D. Between the constructed wetlands and the residual pond in Site D, emergent vegetation will be planted to assist in supernatant water polishing. A 30 cm overburden layer is proposed for the TSF as cover material for tailings and PAG waste rock. The purpose of this layer is to provide physical separation of underlying ML materials from the pond water column, thereby minimizing contamination to surface water discharges from the TSF. A 30 cm think overburden layer will provide an effective means to minimize the influences from tailings and PAG waste rock on water cover chemistry. Firstly, hydraulic gradients through the TSF are predicted to be vertically downward (Lorax, 2013). This will promote the downward transport of tailings and waste rock porewaters through the bottom of the TSF, with the discharge reporting as seepage. Secondly, a 30 cm thick overburden layer will provide an effective barrier to the upward migration of dissolved solutes from underlying tailings and waste rock porewaters via molecular diffusion. Since diffusional transport is only relevant over short pathways (few centimetres), a 30 cm barrier will effectively curtail the potential for diffusive loadings into the water cover. The vertically-downward hydraulic gradients will also serve to minimize the potential for upward diffusional transport.

Selenium and mercury bioaccumulation are not expected given the very low concentrations in the ore. Should either prove to be problematic during mine operations, contingencies such as use of the open pit for treatment will be explored well in advance of mine closure.

Prior to pit overflow, a channel will be constructed between the north end of the open pit and the south side of Site D. A channel will also be constructed (or upgraded for permanent unmonitored operation) from the berm on the headwaters of Creek 661 tributary to the southeast side of Site D (dotted line northeast of the non-PAG East Waste Rock Dump on **Figure 12.2.1-10**). Finally, a channel will be constructed from the Site D spillway to Davidson Creek downstream of a contingency constructed wetland in Davidson Creek which will be downstream of Dam D after closure. The channel will, to the extent possible, follow natural drainage courses thereby assuring minimal maintenance requirements. Erosion potential of this TSF discharge drainage channel will be evaluated as part of closure engineering and rip-rap or other erosion protection such as willow cuttings added where necessary. An energy dispersion structure will be required at the outlet end of this channel to protect Davidson Creek integrity. The system will be designed so that the discharge from the closed mine site will satisfy instream flow needs for Davidson Creek. Again, this potential need will be evaluated at the time of closure engineering.

In the event water quality monitoring in the TSF and filling pit indicate the potential need for further polishing of the discharged tailings supernatant water, an additional wetland could be constructed in Davidson Creek downstream from the TSF discharge channel outfall. Should selenium or mercury bioaccumulation prove problematic, other treatment options such as in-pit or in-TSF pond treatment for sequestering of selenium and/or mercury in the solid (precipitated) phase or a separate treatment plant upstream of the TSF discharge could be considered. Other treatment options may be available at post-closure.

An amendment to or a new *EMA* discharge permit may be required for the mine to allow discharge from the TSF post-closure, and permit-level construction details for all diversion structures will be required to support the permit application.

Closure water balance calculations (AMP) indicate that instream flow needs to maintain fish habitat will be provided by TSF discharge on post-closure. Pumping from Tatelkuz Lake will cease, the freshwater supply pipeline, including all appurtenances, will be removed, and the ROW will be reclaimed. **Section 2.6** RCP provides further discussion of reclamation measures. Should discharge from the TSF prove inadequate to maintain natural (preconstruction) flows in Davidson Creek, active water management measures for the TSF spillway will be implemented, e.g., installing removable stoplogs to increase or decrease flows.

12.2.1.18.4.18.17 Open Pit Closure Water Management

The open pit will be filled rapidly at closure by pumping Tatelkuz Lake water to minimize ARD and metal release from exposed PAG walls. After filling, drainage from the pit lake will be directed to the TSF. Treatment of pit water during filling may be required by adding nutrients (e.g., fertilizer) to the pumped TSF supernatant to facilitate algal growth and metal removal from the near-surface layers.

12.2.1.18.4.18.18 Design Principles, Risks, and Contingencies

Table 12.2.1-60 lists the Water Management Design Principles, Risks, and Contingencies for the Project water management.

Table 12.2.1-60: Water Management Design Principles, Risks, and Contingencies for Site Facilities

Element	Key Design Principles	Key Risks	Risk Management	Contingencies
Sediment Ponds	Designed to BC Guidelines with provision for flocculation	Excessive TSS in discharge	Implement erosion control BMPs Monitor to provide early warning of compliance	Implement/increase flocculent addition Implement additional BMPs to reduce erosion Pump water to eskers for infiltration
Pit	Collection system and pumping to TSF	Increased acidity and/or metals	Monitor pit sump to provide early warning of contamination	Combine pit water with LGS and COS for lime neutralization Add nutrients during closure for pit lake treatment (continue to add nutrients in post-closure as required)
LGS	Constructed till pad with drainage collection system and drains by gravity to TSF	Excessive acidity and/or metals Contaminated groundwater LGS not processed	Collect surface and subsurface water and neutralize with lime prior to discharge to TSF Monitor surface and subsurface water	Increase lime addition Install groundwater recovery wells Place LGS underwater in TSF or pit
East Dump	NAG5 and overburden Drainage collection system	Acidity and/or metals Contaminated groundwater	Lowest ARD and ML potential waste rock Drainage flows by gravity to TSF Monitor drainage and groundwater	Combine with LGS and COS for lime neutralization Deepen collection ditch or install groundwater recovery wells Construct wetland for polishing Install compacted till covers
West Dump	NAG4/5 and overburden	Acidity and/or metals	Low ARD and ML potential waste rock Drainage flows by gravity to TSF Monitor drainage and groundwater	Combine with LGS and COS for lime neutralization Install groundwater recovery wells Construct wetland for polishing Install compacted till covers
COS	Constructed till pad with drainage collection system	Excessive acidity and/or metals Contaminated groundwater	Collect surface and subsurface water and neutralize with lime prior to discharge to TSF Drains by gravity to TSF Monitor surface and subsurface water	Increase lime addition Install groundwater recovery wells Rotate stockpile more frequently
Topsoil	Constructed upslope of collection ditches	Sloughing	Collect drainage in SCP (construction) and recycle to TSF (operations) Temporary vegetation of stockpile	Add armouring, additional ditching, and/or erosion control
Water Supply	Pump water from Tatelkuz Lake to Davidson Creek to mitigate flow reductions for fisheries	System failure (e.g., power, pumps, or pipeline)	Sufficient water in reservoir to provide flows to Site D; Creek for 7 days minimum	Obtain freshwater (gland & reagent) water for mill from reclaimed Site C pond (after Year 3)
TSF	No surface water discharge during operations All site facilities drain by gravity to TSF	Elevated water level Seepage unacceptable for discharge at post-closure TSF supernatant unacceptable for discharge at post-closure	Monitor TSF water level and inflows Reduce makeup water pumped from Tatelkuz Lake to TSF TSF surface wetland and ECD/water reservoir wetland	Accelerate TSF dam construction Construct upslope TSF diversion ditches Continue to pump seepage back to TSF or to pit lake Construct PRB downstream of TSF Construct downstream TSF contingency wetland Construct lime neutralization treatment plant

Note: TSS = total suspended solids; BMPs = best management practices; TSF = tailings storage facility; LGS = low-grade stockpile; ARD = acid rock drainage; COS = coarse ore stockpile; SCP = sediment control pond; ECD = environmental control dam; PRB =

12.2.1.18.4.18.18.1 Construction

During construction, any erosion and sedimentation will be controlled with sediment control ponds. These ponds will be sized for a 10-hour storm event and any exceedance of the design storm can be handled with flocculent addition. If storage capacity routinely becomes problematic, pond berms will be raised to accommodate additional settling time. This can be relatively easily accomplished because of the typically low height of pond berms.

12.2.1.18.4.18.18.2 Operations

The TSF is designed to hold a one in 200-year storm event. Should a greater than one in 200-year storm event occur that threatens to overtop the ponds, water can temporarily be pumped to the open pit, which will have more than adequate capacity to store such storm events. As well, during an extreme storm event the pumping rate from Tatelkuz Lake can be reduced by approximately the amount of makeup process water needed as adequate water will be available from the TSF.

Actions and contingencies for dam failure are discussed under Accidents and Malfunctions, **Section 10**. The TSF dams will be inspected annually by an independent geotechnical engineering firm and any recommendations made by the inspecting engineer will be implemented.

Any failure on internal diversion ditches could mean temporary flooding of some mine areas but would be repaired immediately.

12.2.1.18.4.18.18.3 Closure

Contingencies for closure are essentially the same as for operations, except that with the site reclaimed site runoff becomes much less of a potential issue. The TSF will operate as per operations except that reclamation will proceed with construction of a wetland on Pond D beaches.

12.2.1.18.4.18.19 Water Management for the Airstrip, Access Road, Freshwater Supply Pipeline Right-of-Way, and Transmission Line Right-of-Way

12.2.1.18.4.18.19.1 Construction

Construction of the airstrip, new and upgrade sections of the access road, the freshwater supply line ROW, and the transmission line ROW will involve land disturbance and stream crossings needing management of site runoff to prevent sediment entering surface waterbodies. Best management plans will be implemented. As well, the Best Management Practices to Protect Water Quality (BC MOE, 2013b) will be followed where applicable.

The following practices (or similar) will be implemented:

- The potential sources of sediment will be minimized by limiting ground disturbance as much as is practical;

- Runoff will be controlled by diverting incoming flows to disturbed areas with clean water ditches where practical;
- Sediment will be prevented or limited from entering waterbodies from disturbed sites through retention structures on site, such as retention basins, silt fences, hay bales, sediment traps, or other facilities;
- Disturbed areas that will no longer be required after construction will be revegetated as soon as the season allows;
- Standard and proven mitigation measures will be employed adjacent to fish-bearing streams to retain riparian vegetation;
- Water quality at stream crossings will be monitored during active construction and periodically after construction;
- Portable fuel storage tanks, if required, will not be placed closer than 30 m to waterbodies;
- Refuelling of vehicles will be within a controlled area where any accidental spills cannot reach waterbodies and where spills that could occur can be readily controlled and cleaned up; and
- Vehicles will not be washed where the water can enter a surface waterbody.

More specific control measures will be developed and implemented for a construction MWAMP prior to commencement of construction of the subject facilities.

12.2.1.18.4.18.20 Maintenance

12.2.1.18.4.18.20.1 Airstrip

The airstrip will be graded to facilitate runoff of precipitation, which is expected to infiltrate the ground surrounding the strip and apron. The airstrip will be located in a flat area and erosion from precipitation is not expected to be problematic. Effects of runoff will be monitored and ditches constructed if necessary to carry water away from the strip but not directly into surface waterbodies. It was not known at the time of writing whether aircraft would be de-iced at the airstrip. De-icing is not likely given aircraft will normally have a relatively short turnaround. Should de-icing be anticipated, de-icing will be carried out in a contained area where de-icing chemicals can be collected and disposed of as waste.

During winter, snow will be plowed from the strip and piled up where meltwater will infiltrate the ground in spring.

12.2.1.18.4.18.20.2 Transmission Line

BMPs will be employed during transmission line construction to eliminate or strictly limit impacts to waterways, vegetation, and wildlife during construction. Transmission line maintenance, other than repair or replacement of the line or poles due to storm or ice damage, will consist of vegetation management where required. Vegetation management will be minimized by planting the ROW with shrubs or relatively low-growing trees. Riparian areas adjacent to fish-bearing streams will be periodically inspected as previously noted.

12.2.1.18.4.18.20.3 Mine Access Road

BMPs will be employed during access road construction to eliminate or strictly limit impacts to waterways, vegetation, and wildlife during construction. An access road sharing agreement will be negotiated with the Province or primary licence holder for the Kluskus FSR and maintenance carried out under that agreement. The following general practices will be implemented as required under the road agreement:

- Ditches will be routinely inspected to assure proper functioning and repaired as required; additional armouring, beyond that anticipated during construction, will be added if indicated;
- Culverts will be routinely inspected to ensure they are not blocked, frozen in winter, or otherwise rendered non-functional;
- Bridges and abutments will be routinely inspected and repaired if required as soon as practical;
- Any problematic surface areas causing erosion and sedimentation will be repaired as soon as practical;
- If practical, considering the access road will not be paved, sand rather than de-icing chemicals will be used to improve traction during winter freezing; and
- If road watering is required to control dust, non-contact water or approved chemical dust suppressants, will be used.

More specific control measures will be developed and implemented for an operations water management plan relevant to actual site conditions prior to commencement of operations of the subject facilities.

12.2.1.18.4.18.20.4 Freshwater Supply Line

BMPs will be employed during freshwater supply pipeline construction to eliminate or strictly limit impacts to waterways, vegetation, and wildlife during construction. The freshwater supply pipeline will be constructed beside the access road where practical. Once the line is constructed and disturbance reclaimed by revegetating the site, no further maintenance is expected to be required.

12.2.1.18.4.18.20.5 Closure

Facilities not required post-closure or by third parties under signed agreement with the mine operator will be reclaimed and revegetated following practices discussed in the RCP (**Section 2.6**).

12.2.1.18.4.18.21 Training

The Proponent's corporate policy and the overall approach to training are discussed in the EMS (**Section 12.1**) and the RTEMP. This section provides a brief summary specific to mine water management.

All employees will undergo an environmental orientation prior to working on site. The orientation will include basic aspects of water management such as:

- Significant aspects for water management; and
- Responsibilities for water management for all personnel.

Experienced personnel will be engaged in senior supervisory positions at the Project. A formalized training program will be developed for mine employees requiring specific water management training. Specific modules will be developed for all positions to be filled and a system of mentoring will be set up for on-the-job training. Safety and environmental awareness will be key components of all mine training.

For water management, specific training will be provided in operation of the facilities discussed in the MWAMP. Personnel that will require specific water management training may include TSF operators, mine engineers, environmental staff, surface crews, and management. Emphasis will be placed on the correct operating parameters and the early recognition and reporting of problems and emergency procedures to initiate should accidents or malfunctions be encountered.

Once the OMS Manual has been developed, training for required personnel will occur before commencing use of the TSF.

12.2.1.18.4.18.22 Operating Procedures

Operating procedures and inspection templates will be developed during construction to assist employees in carrying out job tasks in compliance with this plan.

12.2.1.18.4.18.23 Monitoring and Reporting

Monitoring and follow up is discussed in **Section 13**. A summary is provided below.

Trained environmental personnel will be employed to carry out environmental monitoring during construction, operations, and closure. Environmental monitoring will include but is not limited to:

- Surface water and groundwater quality;
- Water table and piezometric levels;
- Stream flows;
- Freeboards; and
- Any regulatory compliance monitoring.

Environmental staff will be responsible for compiling regulatory reports as required, reviewing baseline data against monitoring data, and reacting to unexpected changes in monitoring results.

12.2.1.18.4.18.24 Audit and Review

Regular review of environmental monitoring results against baseline data will assist in identifying trends and potential areas of concern and will lead to continual improvement. An annual audit of controls in place for water management will be conducted and will include a review of this plan.

Other incidents may trigger a review of this plan, including significant change in water use or process, identification of contamination, regulatory non-compliance, flooding, or a significant incident. Corrective and preventative actions may be assigned after an incident or inspection, which may also trigger a review of this plan.

12.2.1.18.4.19 Cyanide Management Plan

12.2.1.18.4.19.1 Introduction

This CYMP describes the measures the Project will implement in order to minimize the risk to employees, adjacent communities, and the environment associated with the use of sodium cyanide (NaCN) during all phases of the Project when cyanide is present on site.

The Proponent acknowledges the use of cyanide in the gold recovery process at the Project and will implement the international BMPs within the mining industry to protect its employees, adjacent communities, and the environment from the hazards associated with the use of cyanide. Since July 2012, the Proponent is a signatory to the *International Cyanide Management Code* (International Council on Metals and the Environment (ICME), 2014), and intends to implement and certify to the Cyanide Code for the Project.

The Project may also seek conditional certification prior to operational start-up when it is sufficiently advanced in its planning and design phases so that its site plans and proposed operating procedures can be audited for conformance with the Cyanide Code's Principles and

Standards of Practice. An independent, third-party auditor would then assess whether the pre-operational Project could be conditionally certified, based on the expectation that it will meet the Cyanide Code's Principles and Standards of Practice.

The Cyanide Code is innovative in that, for the first time within the global mining industry, a global voluntary standard had been developed that included the entire supply chain of cyanide, from production and transportation to use and disposal. The Cyanide Code is a voluntary industry program designed to assist the global gold mining industry and the producers and transporters of cyanide used in gold mining in improving cyanide management practices. The Cyanide Code is intended to reduce the potential exposure of workers and communities to harmful concentrations of cyanide, to limit releases of cyanide to the environment, and to enhance response actions in the event of an exposure or release.

The Cyanide Code was developed to improve the management of cyanide at gold mines and during the production and transport of the cyanide used at gold mines. Spills and other incidents involving cyanide solutions at gold mines such as the January 2000 incident at Romania's Baia Mare Gold Mine demonstrated to the gold mining industry, governments, and the public that better management of cyanide was needed, particularly at operations with limited experience or in countries lacking adequate regulatory programs.

There has not been an environmental incident involving a release of cyanide at a Cyanide Code–certified mining operation with a certified supply chain and certified production operation since the full implementation of the Cyanide Code in 2005. More than 30 gold mining companies are signatories to the Cyanide Code, including major, mid-tier, and junior operating companies.

The CYMP emphasizes the Proponent's commitments to full public disclosure of cyanide-related information for the Project. It also requires the manufacturer and the transporters of cyanide used at the Project to fully comply with the Cyanide Code and demonstrate their commitment to use of BMPs for the safe and environmentally responsible use of cyanide for gold recovery.

12.2.1.18.4.19.2 Purpose and Scope

The fully developed CYMP will serve as a stand-alone document for the management of cyanide during the production, transportation, and use at the Project. The CYMP will incorporate its own emergency preparedness and response plan. In addition, parts of the CYMP will supplement the ESPRP that has been prepared to encompass the objectives of the Mine Emergency Response Plan (MERP) (BC Ministry of Energy, Mines and Natural Gas, 2013) as required by the HSRC (BC Ministry of Energy, Mines and Petroleum Resources, 2008).

The ESPRP provides guidance for responding to all types of mine emergencies and will identify roles and responsibilities in discovery of and response to emergencies.

The CYMP covers management objectives in areas, such as:

- Transportation of NaCN (requirements to be adhered to by the CN transport contractor);
- Storage of NaCN;
- Use of cyanide within the milling process;
- Inspections and maintenance of cyanide bearing facilities;
- Treatment and disposal of cyanide tailings;
- Decommissioning and closure of cyanide bearing facilities;
- Wildlife management;
- Environmental monitoring;
- Document and records management;
- Emergency preparedness;
- Effective and appropriate training;

- Stakeholder awareness and communication; and
- Continual improvement.

12.2.1.18.4.19.3 Roles and responsibilities

12.2.1.18.4.19.3.1 Proponent/Corporate

- Compile a corporate Sustainability Report annually.
- Maintain relevant corporate Policies.

12.2.1.18.4.19.3.2 General/Mine Manager

- Have overall responsibility for the safe management of cyanide.
- Communicate as required to stakeholders and communities of interest.

12.2.1.18.4.19.3.3 Mill Manager

- Ensure training for mill staff is adequate and appropriate.
- Manage this plan and any supporting SOPs.
- Work with regulatory bodies in the case of a cyanide-related incident.

12.2.1.18.4.19.3.4 Mill Operators

- Perform inspections on equipment and work areas.
- Report any issues immediately.

12.2.1.18.4.19.3.5 Environmental and Sustainable Resources Manager

- Be responsible for environmental monitoring and regulatory compliance;
- Carry out regulatory, internal, and external reporting; and
- Carry out regular management inspections.

12.2.1.18.4.19.3.6 Safety Manager

- Have responsibility for Fire and Mine Rescue Team;
- Assist in coordinating drills; and
- Maintain records of training and drills.

12.2.1.18.4.19.4 Phases of Mine Development

12.2.1.18.4.19.4.1 Construction Phase

Up to 1,500 personnel may be housed in a camp on site for two years during construction of the mine and processing facility. Many sub-contractors will be operating on site during construction, and specific procedures will be developed to ensure that appropriate emergency planning and safety precautions are adhered to.

Construction of cyanide facilities will be reviewed against design to ensure compliance with the Cyanide Code and as-built requirements. Cyanide will not be present on site until commissioning of the mill is scheduled to start.

The Project may also complete a pre-operational conditional certification audit prior to operational start-up when it is sufficiently advanced so that its site plans and proposed operating procedures can be audited for conformance with the Cyanide Code.

12.2.1.18.4.19.4.2 Operations Phase

An operations camp will provide accommodation for up to 500 personnel during operations. The anticipated LOM is 17 years. Transport and handling of chemical reagents, including NaCN, and the operation of the processing facility, where cyanide will be used in the gold recovery process, represent the primary differences between this and other phases with respect to cyanide management. As a Cyanide Code signatory, the Project will have 12 months from the start of operations to complete a certification audit.

12.2.1.18.4.19.4.3 Decommissioning/Closure Phase

Site conditions will be restored during the decommissioning/closure phase. The number of employees on site and the support services available will be reduced dramatically. A revision of the CYMP will be required when active mining operations are completed to assist with decommissioning and disposal of processing equipment that had contained cyanide solution and any residual cyanide reagent.

12.2.1.18.4.19.5 Policy Directive

The Proponent has a publicly available Health, Safety, Environment and Corporate Social Responsibility (HSE & CSR) policy that describes requirements for all operating mine sites. This policy works in conjunction with the HSE & CSR 15 Guiding Principles. Each principle has specific requirements in order to comply with the Policy. Some relevant requirements under these principles include:

- Principle 6 Health and Hygiene: Potential community health hazards relevant to Project operations are identified, assessed, and communicated. Public health and other relevant authorities are engaged, as appropriate, and control measures are implemented to manage the risks, as appropriate;

- Principle 9 Design, Construction, and Commissioning: The design of projects and selection of equipment and processes take into account HSE & CSR requirements, as well as provide for decommissioning, disposal, and closure;
- Principle 10 Operations and Maintenance: Design data, operating limits, and certifications are documented, understood, applied, and available for all facilities and are regularly reviewed. Systems are established and maintained to ensure the ongoing integrity of plant and equipment. These include procedures for maintenance, inspection, testing, calibration, and certification of equipment as appropriate for the level of risk. Systems are in place to test and maintain the availability and effectiveness of protective systems;
- Principle 11 Suppliers, Contractors, and Partners: Contracts include appropriate HSE & CSR obligations specifically requiring contractors to comply with the Proponent's Code of Business Conduct and Ethics, Human Rights and Anti-Corruption policy, HSE & CSR policy, and relevant HSE & CSR legislation;
- Principle 12 Stewardship: Closure plans are established, costed, documented, and reviewed as appropriate. Consideration is given to how these plans translate into current operational decisions and the interests of local communities; and
- Principle 14 Crisis Management and Emergency Response Plans: Systems are in place to identify potential emergency situations and their impacts, including those associated with neighbouring activities. Employees, contractors, visitors, and external parties, as appropriate, are trained in and understand the emergency response plans, their roles and responsibilities, and the use of emergency response resources.

12.2.1.18.4.19.6 Regulatory and Voluntary Requirements

A general discussion of regulatory requirements potentially applicable to procurement, transportation, and use of cyanide at the Project is presented below. The Proponent is committed to meeting or exceeding all applicable regulatory requirements for cyanide use at mine sites in BC.

The EMS includes a process for regular review of regulatory changes that may impact the Project. A register of applicable federal, provincial, and municipal regulatory requirements will be maintained and this plan will be updated, as necessary, to reflect the applicable changes in the legal and regulatory framework.

12.2.1.18.4.19.6.1 Summary of Regulatory and Voluntary Requirements

The primary pieces of legislation and regulations and voluntary guidance governing cyanide use at the Project are as follows:

12.2.1.18.4.19.6.2 Federal

- Canada-British Columbia Agreement Respecting Administration of the *Transportation of Dangerous Goods Act*, 1992 (Transport Canada, 2004);
- Canadian Environmental Protection Act (Government of Canada, 1999):
  - *Environmental Emergency Regulation* (Government of Canada, 2003); and
- Federal *TDG Act* (Government of Canada, 1992):
  - Transportation of Dangerous Goods Regulations (Government of Canada, 2001).

12.2.1.18.4.19.6.3 Provincial

- Environmental Management Act (Government of BC, 2003b):
  - *Contaminated Sites Regulation* (Government of BC, 1996h);
  - *Spill Cost Recovery Regulation* (Government of BC, 1998); and
  - *Spill Reporting Regulation* (Government of BC, 1990);
- BC HSRC for Mines in BC (BC MEMPR, 2008);
- Provincial *Transport of Dangerous Goods Act* (Government of BC, 1996m):
  - *Transport of Dangerous Goods Regulation* (Government of BC, 1985); and
- *Water Act* (Government of BC, 1996d):
  - BC *Dam Safety Regulation* (Government of BC, 2011b).

12.2.1.18.4.19.6.4 Municipal

- City of Prince George Highways Bylaw (City of Prince George, 2008); and
- City of Prince George Transport of Dangerous Goods (City of Prince George, 2009).

12.2.1.18.4.19.6.5 Voluntary Guidance

- International Cyanide Management Code (ICME, 2014).

It will be noted that the Cyanide Code does not supersede any existing legislation or regulations but supplements them.

12.2.1.18.4.19.6.6 Federal Requirements

The Canada-British Columbia Agreement Respecting Administration of the *Transportation of Dangerous Goods Act* provides that BC will administer all on-highway inspection enforcement activities. The federal government will administer all other inspection and enforcement activities (Transport Canada, 2004).

The Environmental Emergency Regulation under the *Canadian Environmental Protection Act, 1999,* includes quantities of materials that trigger requirements for creation and submittal of a material-specific Emergency Response Plan to federal agencies if the material is stored on site on a permanent or semi-permanent basis (Government of Canada, 2003).

The federal *TDG Act* and the federal TDGR are focused on the prevention of incidents when dangerous goods are imported, handled, offered for transport, and transported in Canada. Recent (2009) amendments to the federal *TDG Act* have expanded the response capability of the Canadian Government in the event of a security incident involving dangerous goods.

Part 7 of the federal *TDG Act* requires that, before a person offers for transport or imports certain dangerous goods, the person must have an approved Emergency Response Assistance Plan (ERAP) (Government of Canada, 1992). Part 7 and Column 7 of Schedule I of the federal TDGR prescribe the dangerous goods and the concentration or quantity for which an ERAP is required (Government of Canada, 2001).

An ERAP is required for the rail and road transportation of NaCN as it is listed in Column 7 of Schedule I of the federal TDGR. The intent of an ERAP is to provide on-site assistance to local authorities in the event of an accident involving the dangerous goods. The assistance provided would include, without being limited to, the provision of emergency response advice first by telephone, then by a knowledgeable person attending the accident site, and the supply of specialised equipment and a response team to mitigate the effect of the dangerous goods at the accident site (Government of Canada, 2001).

12.2.1.18.4.19.6.7 Provincial Requirements

The BC *Contaminated Sites Regulation* includes numerical standards for contaminant concentrations in soil, groundwater, surface water, or sediment following a release to the environment. The regulation also provides guidance on remediation requirements and risk assessment for contaminated sites (Government of BC, 1996h).

The *Spill Reporting Regulation* includes spill quantities for numerous materials that must be reported to the province, with details on required content of the report. Sodium cyanide is classified as a Class 6.1 dangerous good (products or substances that are poisons). As such, a spill of 5 kg of solid material or 5 L of cyanide solution is reportable in BC (Government of BC, 1998).

The *Spill Cost Recovery Regulation* describes the fees that may be recovered from any party that engages provincial resources in spill response activities (Government of BC, 1990).

The HSRC describes the occupational health and safety requirements for the protection of workers in mines in BC (BC MEMPR, 2008).

BC's *TDG Act* (Government of BC, 1996m) and the *Transportation of Dangerous Goods Regulation* (Government of BC, 1985) describe the required classification system for dangerous goods as well as safe transportation and handling procedures.

The *Water Act* (Government of BC, 1996d) governs dams and holds dam owners liable for any damage caused by the construction, operation, or failure of their dam. The BC Dam Safety Regulation applies to all owners of licensed dams. Dams 9 m or higher are the responsibility of the BC MFLNRO (Government of BC, 2011b).

The objective of the Dam Safety Regulation is to mitigate loss of life and damage to property and the environment from a dam breach by requiring dam owners to: inspect their dams, undertake proper maintenance, report incidents, take remedial action, and ensure that the dams meet current engineering standards (Government of BC, 2011b).

12.2.1.18.4.19.6.8 Municipal Requirements

The City of Prince George Highways Bylaw regulates the use of highways within the city boundaries. Under section 4 of the Bylaw, any person who, without a permit or written approval from the city, operates any vehicle transporting dangerous goods on any highway on which the movement of dangerous goods is restricted by the city, commits an offence (City of Prince George, 2008).

The City of Prince George Transport of Dangerous Goods restricts the transport of dangerous goods on certain highways in the city in order to reduce the risk to public health and safety, the natural environment, and public works. Designated dangerous goods routes are listed in Schedule A and shown in Schedule B of the bylaw.

Under section 2 of the bylaw, carriers of dangerous goods may depart and return to a designated dangerous goods route using the closest and most direct route possible:

- For the purpose of picking up or delivering dangerous goods to a destination indicated on a bill of lading for those dangerous goods;
- For the purpose of accessing a permitted vehicle storage location;
- To obtain emergency repairs or service to the road vehicle carrying dangerous goods at the vehicle repair shop nearest to the place where the carrier determines that such emergency repairs or service is necessary; and
- Provided that the carrier does not travel on residential roads in a vehicle with five or more axles and a gross vehicle weight over 13,500 kg (City of Prince George, 2009).

12.2.1.18.4.19.6.9 Voluntary Requirements

The purpose of the Cyanide Code is to improve the management of cyanide used in gold mining and assist in the protection of human health and the environment.

The Cyanide Code is a third party independently audited, voluntary program for gold mining companies, cyanide producers, and transporters. It focuses exclusively on the safe management of cyanide and cyanidation mill tailings and leach solutions. Companies that adopt the Cyanide

Code must have their mining operations audited by an independent third party to determine the status of Cyanide Code implementation.

Those operations that meet the Cyanide Code requirements can be certified. The Cyanide Code is intended to complement but not substitute for operations' existing regulatory requirements. Compliance with the rules, regulations, and laws of the applicable local, provincial, and federal jurisdictions is mandatory.

The Cyanide Code assesses areas including production, transport, storage, use, financial assurance, accident prevention, emergency response, training, public reporting, stakeholder involvement, and verification procedures (ICME, 2014).

12.2.1.18.4.19.6.10 The Proponent's Approach to Use of Best Management Practices

The Proponent is a signatory to the Cyanide Code and is committed to employ BMP designs, construction techniques, and operating practices, policies, and procedures into the Project, as currently defined by the Cyanide Code. More specifically, this plan has been developed to document the measures that will be taken to comply with the Cyanide Code's Principles and Standards of Practice in a manner consistent with the Code's Implementation Guidance.

Adhering to the Cyanide Code's Implementation Guidance is designed to ensure that internationally recognized BMPs are employed in the management of cyanide and fulfills the Proponent's obligations as a Cyanide Code signatory.

12.2.1.18.4.19.6.11 Cyanide Production and Purchasing

The Proponent will use its internal procurements processes and procedures to ensure responsible production processes for cyanide. Sodium cyanide will be purchased as solid NaCN briquettes from manufacturers who are signatories to the Cyanide Code and will contractually require that the producer is certified to the Cyanide Code.

The capability to receive liquid cyanide will be included, for the rare instances where suppliers are unable to provide solid briquettes. Liquid suppliers will also be required to be certified to the Code. In addition, the Proponent will include in the contract documentation the right to conduct its own independent inspections of the suppliers' production operations.

Copies of external audits and auditor credentials for cyanide production facilities used to generate cyanide for the Project will be available at the Cyanide Code website (ICME, 2014).

12.2.1.18.4.19.6.12 Transportation of Cyanide

All cyanide delivered to the Project will be delivered by Cyanide Code–certified transporters in containers approved by the United Nations International Organization for Standardization (ISO) from the certified production facility via rail and road. These so-called ISOtainers

(**Figure 12.2.1-48**) will be dedicated to cyanide transport and are designed for controlled dissolution upon delivery to the site. All ISOtainers will be returned to the supplier for re-use.

The Proponent will require transportation contractors to be Cyanide Code–certified and will meet all storage requirements for cyanide at the transfer facility. Depending on the certified supplier selected, the entire supply chain from the production facility to the Project may be included under one certification. Alternatively, the supplier and the rail and road transporters may be certified separately.

12.2.1.18.4.19.6.13 Transportation Routes

The dangerous goods assessment will include risks associated with the rail and road transportation routes to the site, rail and road conditions, possible impacts with sensitive environmental areas on these routes, the overall environmental risk associated with sections of the transportation routes, and recommendations for controls to be in place to reduce the environmental risks.

The City of Prince George has certain routes through the City that have been identified for the transportation of dangerous goods. These routes will be used for movement of cyanide from the transloading facility in Prince George to Highway 16.

Figure 12.2.1-48: An ISOtainer Carrying Solid Sodium Cyanide Briquettes

12.2.1.18.4.19.6.14 Responsibilities during Transportation

The Proponent will use due diligence and ensure rail and road transporters are certified to the Cyanide Code, are reliable, have well-trained employees, use modern and well-maintained freight equipment, and can demonstrate a commitment to not only limiting the exposure of its employees to cyanide, but also to preventing, controlling, and/or responding to releases of cyanide to the environment.

The Proponent will contractually require that the transporters are certified to the Cyanide Code. The Proponent will also include in the contract documentation the right to conduct its own independent inspections of the transporters' operations.

12.2.1.18.4.19.6.15 Route Survey

Detailed surveys for two transportation routes were completed by AMEC in July 2013 (AMEC, 2013).

Transporters will submit brief reports from each delivery to the Project and will be required to contact the facility's Logistics and Transportation group if unsafe rail/driving conditions or significant hazards are observed on access routes to Prince George and the Project site.

12.2.1.18.4.19.7 Storage and Handling of Cyanide

12.2.1.18.4.19.7.1 Off-Loading and Storage Facility Design

The Project will primarily receive solid NaCN in ISOtainers which will be mixed with water directly upon arrival to site. The empty ISOtainers will be returned to the cyanide manufacturer for re-use. Approximately one weeks' supply of ISOtainers will be maintained on site to ensure supply. During instances where solid NaCN briquettes are unavailable, liquid NaCN will be bought directly to site. It is not expected that liquid cyanide will be required; however, provisions to accept liquid cyanide will be included as a contingency.

A dye will be added to the NaCN so that high concentration cyanide will be immediately identifiable throughout the plant. Any spills would also be contained and identifiable as high concentration cyanide. On-site storage, mixing, and use of cyanide will be up-gradient from the TSF, so that any drainage from the mill or spills of cyanide-containing tailings will be captured by the TSF.

ISOtainers containing solid or liquid NaCN for storage will be off-loaded from trucks parked on a bermed concrete pad and stored within the reagent storage area. When NaCN is required, an ISOtainer would be moved to a concrete, bermed area near the mixing tank where one of two scenarios would take place: Either water (pH adjusted) is added to dissolve the solid NaCN and the solution is pumped to the mixing tank or the liquid contents are transferred directly to the mixing tank. Both the unloading and storage areas will include sumps, sloped concrete pads, and other engineered features to facilitate the recovery of any spilled materials by pumping them back to the mixing tank.

The mixing tank will be located in the mill reagent building within a secondary containment area constructed with concrete walls and floor, providing sufficient capacity to hold at least 110% of the largest tank within the containment in addition to any piping that drains back to the tank. This area will be covered to protect sump capacity from precipitation. All fixed piping for reagent/processing cyanide solutions will be constructed from materials known to be compatible with high pH cyanide–containing solutions. Double walled piping will be used at concentrated addition points. Cyanide solutions of greater than 1% (10,000 ppm) will require steel piping.

Contractual conditions for the CM contractors responsible for the design and the construction of cyanide off-loading and storage facilities will specifically include requirements for the implementation of quality management programs to recognized international standards, in order to provide a high measure of confidence that the facilities will function as designed. Design and construction quality management records and as-built certifications of these facilities will be retained.

12.2.1.18.4.19.7.2 Off-Loading and Storage Facility Operation

Cyanide off-loading and storage facilities will be located away from surface waters, within the access-controlled boundaries of the reagent storage area. All off-loading activities will be supervised by trained and authorized personnel, so that immediate response is available in the case of an emergency. The cyanide off-loading and storage facility will itself be enclosed by locked security fencing, accessible only to authorized personnel. No acids, oxidizers, or other reagents that may be incompatible with cyanide will be stored within cyanide off-loading and storage containment system areas. Storage areas will be well ventilated.

A fixed unit hydrogen cyanide (HCN) gas detector will be located at each end of the off-loading and storage area. The detector will be designed to sound a highly audible evacuation alarm and initiate a flashing beacon if the airborne cyanide concentration reaches levels specified in the BC HSRC. It will also send an electronic alert signal to the appropriate operations control room. Personnel working in designated high potential areas will also be required to carry portable HCN gas detectors triggered to provide warning and evacuation alarms.

Signage will be posted at the necessary facilities detailing the procedures for operation of the dissolution transfer equipment and requirements for response to releases, minimum PPE required, and first aid in the event of an emergency. All pipes containing cyanide will be labelled as such and will show the direction of flow.

The cyanide mixing tank will be equipped with a visible level gauge and a high-level alarm that will sound in the control room to prevent over-filling. Any cyanide solution accidentally released during off-loading will be captured in the sump and pumped back to the tank; no spill kits (i.e., neutralizers and dry absorbent materials) will be required and no spill cleanup waste will be generated.

In addition to the general emergency response equipment specified in the ESPRP, medical oxygen, a resuscitator, a cyanide antidote (to be administered only by medical personnel or trained emergency response team members), a source of potable water, an eye wash/safety shower station, a non-acidic (dry chemical) fire extinguisher, and portable self-contained breathing apparatus equipment will be available in close proximity to the mixing tank area for use in the event of a cyanide release. A manually activated alarm will also be located at the dissolution area. Furthermore, authorized personnel will be required to have a two-way radio set on a specified channel with them during off-loading and dissolution activities in order to summon immediate assistance in any emergency situation.

An SOP will provide specific instructions for cyanide mixing and transfer to the storage tank. This procedure will contain the specific checklist to be completed prior to the dissolution of solid NaCN; discuss PPE requirements; describe the method to ensure that the solution is at the appropriate pH; include a requirement that a trained observer be present during these activities to respond in the event of an emergency; and outline emergency procedures. Pre-work inspections will also be conducted prior to each shift. Detailed plans for emergency response to cyanide releases and exposures at the off-loading and storage facilities are provided in the ESPRP and are summarized in this plan (**Section 12.2.1.18.4.13**).

A training program for personnel involved in management of cyanide will be prepared and will be further addressed in the training section of the EMS. Elements of the training program related specifically to the handling of cyanide are discussed in **Section 12.2.1.18.4.15.19**.

12.2.1.18.4.19.7.3 Preventive Maintenance for Storage and Handling Facilities

All pumps, hoses, and other critical equipment for cyanide dissolution and storage will be included in the preventive maintenance program for the Project. The preventive maintenance program will generate work orders on a predetermined schedule so that process equipment can be inspected and maintained or replaced as necessary to assure its continued proper functioning and to prevent cyanide exposures and releases.

An SOP will be prepared to describe the necessary measures for decontamination of this equipment prior to maintenance, sale, or disposal. All decontamination rinsate will be routed to the detoxification or processing circuit.

12.2.1.18.4.19.7.4 Inspections for Storage and Handling Facilities

Formal inspections of the cyanide off-loading and storage facilities will be completed monthly in accordance with an SOP that will describe how these inspections are to be completed and documented on an inspection checklist and how follow-up corrective actions are to be initiated and tracked. Use of a detailed checklist is meant to focus the attention of the inspector on the specific items that must be observed.

Tank and pipeline inspections will focus on structural integrity, signs of corrosion and leakage, and legibility of labels indicating piping or tank contents and the direction of flow in pipelines. Secondary containment systems and associated supply and discharge piping components will be inspected for their integrity, the presence of fluids, or evidence of leakage, cracks, and available capacity.

Any noted releases of cyanide solution or suspected unsafe conditions will prompt immediate corrective action, as appropriate for the observed condition. Examples of such actions could include pumping the solution to the production process, repairing leaking equipment (and inspecting similar equipment to prevent like occurrences), increasing testing/inspection frequencies, conducting more rigorous types of leak detection tests, or performing other measures commensurate with the nature and significance of the observed release. Because of the critical nature of these systems to the safe operation of the facility, any such occurrences will be documented as nonconformities and formal corrective and preventive actions will be undertaken in accordance with EMS requirements.

Cyanide off-loading and storage area security fencing will also be inspected at monthly intervals to evaluate its integrity, to ensure that access restriction signs are legible, and to ensure that access to this area is restricted to authorized personnel only. All inspection records will be retained in accordance with EMS requirements.

12.2.1.18.4.19.7.5 Operational Use of Cyanide

Cyanide is the only lixiviant capable of extracting the gold to its full extent and is also considered the most environmentally acceptable. Compliance with the Cyanide Code is considered international best practice and significantly reduces the risks associated with cyanide use.

The production facilities will be designed, constructed, operated, monitored, inspected, and maintained at the Project to prevent unplanned cyanide releases and exposure of employees, contractors, and surrounding communities and to minimize the impacts from such releases if they do occur. Detailed written SOPs and training programs for workers managing cyanide in the production process will be implemented to further minimize the potential for and impacts of cyanide releases and exposures.

12.2.1.18.4.19.7.6 Process Plant Design

The ore processing facilities will be designed and constructed to accepted engineering specifications consistent with the Cyanide Code, other international BMPs, and all applicable regulatory requirements. All tanks and pipelines for process solutions will be constructed of materials known to be compatible with slurry containing cyanide. Tanks holding cyanide will be enclosed within impermeable secondary containment designed to hold 110% of the largest tank in the containment. Any pipelines operating under pressure and containing cyanide will include continuous monitoring to alert operators to a breach of these pipelines. Such vessels and piping will be coloured and marked to comply with necessary Cyanide Code requirements.

The sections of the processing plant where any solid cyanide, cyanide solution, or slurry containing cyanide is used will be located within concrete secondary containment areas, with sufficient capacity to hold at least 110% of the largest tank within the containment as well as any piping that drains back to this area. Secondary containment structures for any tanks that are external to buildings will have additional capacity for a design storm event.

Sumps within the containment areas will be equipped with dedicated sump pumps to return any released slurry or solution to the processing circuit. Float switches or other high-level indicators will be placed at key locations within the secondary containment areas to identify the presence of slurry or solution and to alert operators in the process control room. Pump failure will trigger alarms in the control room. Operators will make regular shift rounds of the process equipment and will record their observations on standardized inspection forms that will be retained at the Project.

Portable electrical generators will be maintained on site to supply back-up power to critical pumps, motors, and control systems in the event of a power failure. An SOP will be prepared that will discuss the frequency for generator maintenance and testing and will describe the procedures for automatically starting and supplying back-up power to keep critical pumps and equipment operating during a power outage.

The process plant will be within the controlled perimeter of the overall site; access to the process plant and other critical areas of the operation will be strictly controlled. Restriction signage will be inspected regularly to ensure they are legible. Any site drainage is directed to the TSF from the mill, which may act as additional containment.

Contractual conditions for the CM contractors responsible for the design and the construction of processing facilities will specifically include requirements for the implementation of quality management programs to recognized international standards in order to provide a high measure of confidence that the facilities will function as designed. Design and construction quality management records and as-built certifications of these facilities will be retained in accordance with EMS requirements.

12.2.1.18.4.19.7.7 Management of Cyanide in Ore Processing

The deposit will be mined by the conventional open pit (truck and shovel) method while the ore will be processed using conventional cyanide leaching.

The primary crushing plant is a conventional gyratory crusher facility designed to crush run-of-mine (ROM) ore at an average rate of 3,333 t/h. This facility will also be equipped with a rock breaker to break oversize rocks and with dust suppression and dust collection systems.

The concentrator is a 60,000 t/d facility employing a conventional whole ore cyanide leach process to produce gold doré. It will consist of a primary crushing plant, a COS, a semiautogenous/ball mill/crusher grinding circuit, pre-leach thickening, cyanide leaching, carbon-in-pulp (CIP), elution and carbon regeneration, tails thickening, and cyanide destruction. The ability for future gravity concentration and an intensive leach reactor as well as carbon-in-column will be available for addition.

The ore will be ground in cyanide to 80% passing 150 µm and the thickener underflow will be leached for 30 hours in four parallel lines followed by a CIP gold and silver extraction. The CIP residue will be thickened for cyanide recovery and the thickener underflow sent to cyanide destruction using the SO_2/air process. Loaded carbon will be acid washed, stripped, and regenerated. The pregnant solution will be processed by electrowinning to produce gold and silver sludge for smelting into doré bullion.

Cyanide will be added at the following places throughout the circuit. The Project will monitor cyanide use throughout mine operations and aim to minimize its use, where possible. The following indicate target concentrations at addition locations:

- Ball mill, approximately 95 ppm (from tailings thickening);
- WOL circuit, approximately 500 ppm;
- CIP circuit, approximately 175 ppm; and
- Elution circuit, approximately 250 ppm.

While cyanide will not be added at other stages such as thickening or electrowinning, residual concentration will still be present at potentially hazardous levels. Appropriate signage and PPE will be required throughout all areas where cyanide may be present.

The tails thickener underflow will be diluted to 45% solids using reclaim water. The cyanide destruction circuit will use a one-stage SO_2/air process. The system will consist of three parallel reactors, SO_2 storage and feed system and lime, copper sulphate, and air or oxygen feed systems.

Airborne HCN detectors will be located in critical areas within the processing plant, including the cyanide unloading/storage area, thickener area, carbon leach tanks, carbon desorption area and cyanide destruction process. The detectors will sound an evacuation alarm and initiate a flashing beacon if the airborne cyanide concentration reaches 4.7 ppm. These detectors will also send an alert signal to the operators in the process control room.

A cyanide antidote kit as well as medical oxygen and resuscitators (to be administered only by medical professionals or trained staff on the Project's emergency response teams) will be available at the processing plant in the event of any such occurrence. Potable water sources, eye wash/safety shower stations, and dry powder fire extinguishers will also be located at strategic locations throughout the processing plant.

12.2.1.18.4.19.7.8 Control of Cyanide Addition

Conventional bottle roll tests will be used to determine the optimum cyanide addition rates, based upon bench-scale testing of pre-operational ROM ore samples. During operations, changes in ore characteristics will be accounted for with an automated system to monitor the use of cyanide in the leach process and to adjust cyanide addition rates accordingly. Cyanide use represents a significant portion of operation costs so its use will be optimized.

The goal of including such a system is to maximize the efficiency of the leaching process and reduce the potential for use of excess cyanide. This will lower overall cyanide requirements, minimize the amount of cyanide being transported to the site and used at the operation, and reduce overall occupational health, safety, and environmental risks.

12.2.1.18.4.19.7.9 Preventive Maintenance for Process Equipment

The preventive maintenance program will include all primary and backup pumps and power generators and other critical equipment for handling cyanide solution. The preventive maintenance system will generate work orders on a predetermined schedule so that this equipment can be inspected and maintained or replaced as necessary to assure its continued proper functioning, thereby preventing cyanide exposures and releases.

An SOP will be prepared to describe the necessary measures for decontamination of any equipment that has been in contact with cyanide solution prior to its maintenance, sale, or disposal.

12.2.1.18.4.19.7.10 Inspections of Process Equipment

The processing plant will be subject to regularly scheduled inspections that will be documented, and records of the inspections will be maintained at the Project. Pre-work inspections will be conducted prior to each shift in accordance with the applicable SOP. Operators will be required to complete visual inspections of areas that are monitored through the control room and to ensure monitors are performing adequately and results are correct. Inspection records will be maintained as required by the Cyanide Code and the EMS.

12.2.1.18.4.19.8 Treatment and Disposal of Tailings

Facilities for the treatment and disposal of cyanidation tailings will be designed, constructed, operated, maintained, and inspected to prevent cyanide releases and exposure and to minimize environmental impacts if they do occur.

Detailed written SOPs and training programs for workers managing reagent-strength cyanide and detoxification chemicals will be implemented to further minimize the potential for and impacts of chemical releases and exposures. These measures are addressed in greater detail in the following sections of this plan.

12.2.1.18.4.19.8.1 Detoxification Plant

The SO_2/air detoxification process unit (the unit) will be located within the process plant area and will be designed and constructed to address the requirements of the Cyanide Code, international BMPs, and internationally-accepted engineering specifications and to meet all applicable regulatory requirements. It will be designed to meet or exceed the specific regulatory targets identified for the unit. Sulphur dioxide would be generated on site and sulphur managed in accordance with the HMMP.

Process pH control will be maintained via lime addition. Iron-complexed cyanides are reduced to the ferrous (Fe^{2+} or reduced) state and precipitated as insoluble copper-iron-cyanide complexes. Residual metals liberated from the weak acid dissociable (WAD) cyanide complexes are precipitated as their hydroxides. Thiocyanate (SCN^-) is partially oxidized to cyanate. Hydrolysis of cyanate (addition of water) produces bicarbonate (HCO_3^-) and ammonia (NH_3^+). Ammonia will typically oxidize slowly in the tailings pond to nitrate (NO_3^-).

The effluent from the cyanide destruction circuit will be pumped to the TSF. Water from the TSF will be reclaimed and recycled to the concentrator. No surface effluent will be discharged to the environment from the TSF during operations. Seepage from the TSF will be collected at the ECD and recycled.

Lime addition equipment will be employed, as well as backup power generators in the case of power failure. Within the detoxification facility, tanks and pipelines for process solutions will be constructed of materials compatible with slurry containing cyanide and cyanide solution.

The detoxification facility will be built within concrete secondary containment structures with sufficient capacity to hold at least 110% of the largest tank within the containment as well as any piping that drains back to the tank. Sumps within the containment will be equipped with sump pumps to return any released solution to the treatment process. Float switches or other high-level indicators will be placed at key locations within the secondary containment to identify the presence of solution and alert operators in the detoxification facility control room.

Backup generators and automatic control and shutdown systems will be used to prevent any release of tailings prior to detoxification.

As previously noted, the unit will be designed to reduce the level of WAD cyanide in the spent leaching slurry and in the tailings subsequently discharged to the TSF in order to meet applicable regulatory limits, consistent with internationally recognized BMP guidelines, such as the WAD cyanide limits described in the Cyanide Code.

An SOP will provide specific instructions for operation of the unit. In addition, the SOP will identify cyanide-related risks, list the necessary PPE, require pre-work safety inspections, and reference employee training requirements. The SOP will address how plant operations are to be

monitored to ensure effective detoxification of cyanide before the tailings are discharged to the TSF. Contingency actions for any observed process upsets in the detoxification facility will also be defined in the procedure.

An HCN gas detector will be located at the detoxification facility. The detector will sound a highly audible evacuation alarm and initiate a flashing beacon if the airborne cyanide concentration reaches levels specified in the BC HSRC. It also will transmit an alert signal to the process facility control room. Medical oxygen, resuscitation equipment, and a cyanide antidote (to be administered only by medical professionals or trained staff on the emergency response team) will be readily available. Potable water sources, eye wash/safety shower stations, and dry powder fire extinguishers will also be located in strategic locations throughout the plant.

Procedures for emergency response to potential cyanide releases and exposures at the processing facilities are further discussed in **Section 12.2.1.18.4.13**.

12.2.1.18.4.19.8.2 Tailings Storage Facility Design and Operation

The TSF will be designed, constructed, and operated to standard accepted engineering specifications consistent with international BMPs and all applicable regulatory requirements. Design and construction records for the TSF will be retained in accordance with regulatory requirements. Additional discussion is provided in **Section 2.2.3.4**.

All earthworks and placement of materials for dam and impoundment construction will be subject to construction quality management practices that conform to international standards as a condition of the procurement with the earthworks and/or CM contractor. Design, construction, and quality management records and as-built certifications of these facilities will be retained in accordance with regulatory requirements.

Pipelines for delivery of tailings to the TSF and return of water to the process will be constructed of HDPE and/or lined or coated steel, as required, and will include appropriate secondary containment. The tailings pipeline may be constructed with both aboveground and buried sections to suit topographical and roadway conditions and the operational safety needs of particular pipeline sections (e.g., need for protection in high traffic areas, protection from high-pressure releases, minimization of expansion and contraction from direct sunlight). Aboveground sections will be laid in till-lined trenches, with backup catch basins provided periodically to facilitate the capture and retrieval of tailings in the event of a rupture. Underground sections will be double-walled. Process plant site and TSF flowmeters will be installed to monitor leak detection to alert the process plant operations control room in the event of a leak.

Operation of the TSF is discussed in detail in the Mine Waste Management Plan and will provide the background for the OMS Manual. The Mine Waste Management Plan describes how and when raises of the dam will be built so that the facility's design containment capacity is continually maintained and requires a regular determination of freeboard to ensure that this

capacity is always available. The Mine Waste Management Plan also refers to minimum requirements for contingency actions to be taken in response to the potential occurrence of the following events:

- Detection of insufficient freeboard in the primary TSF impoundment;
- Detection of cyanide levels in excess of specified limits identified at the tailings pipeline discharge point;
- Severe weather conditions;
- Evidence of damage or failure of the dam;
- A power outage or seepage return/reclaim system pump failure (primary or backup);
- Detection of cyanide in routine groundwater monitoring points down gradient of the TSF;
- Temporary cessation of mining and processing operations; or
- TSF closure activities.

Access to the TSF will be carefully controlled to minimize the potential for unauthorized entry or exposure to potentially hazardous conditions.

12.2.1.18.4.19.8.3 Tailings Pipeline and Spill Contingency Plan

Low-flow or low-pressure sensors will be installed on the tailings and reclaim water pumps to alert process facility control room operators regarding potential leaks or pipeline ruptures. The pipelines will also be designed to ensure that any solution released from the tailings pipeline and the portion of the reclaim water pipeline between the impoundment and the storage tank will flow by gravity into the TSF.

The probability of overtopping of the TSF will be prevented by operating within its design storage capacity at all times and by confirming the availability of this capacity through daily monitoring. Contingency measures included in the Mine Waste Management Plan and related SOPs will address power outages, primary or backup pump failures, severe weather conditions, or other situations that if left unmanaged could result in excess water or insufficient freeboard within the TSF.

In general, routine and planned actions to correct upset conditions before they result in spills or releases to the environment, exposure to workers, or other major accidents are described in the Mine Waste Management Plan. Releases of tailings water from the TSF are also addressed in the ESPRP (**Section 12.2.1.18.4.13**).

12.2.1.18.4.19.8.4 Preventive Maintenance for Detoxification Unit and TSF

The preventive maintenance program for the detoxification unit and the TSF will include primary and backup pumps for reclaim water and reagent; backup generators; level gauges; cyanide detoxification process monitoring devices; and other critical equipment.

The preventive maintenance system will generate work orders on a predetermined schedule so that this equipment can be inspected and maintained or replaced as necessary to assure its continued proper functioning, thereby preventing or minimizing the likelihood of any cyanide exposures or releases. An SOP will be prepared describing the necessary measures for decontamination of equipment that has been in contact with cyanide solution prior to its routine maintenance, sale, or disposal.

12.2.1.18.4.19.8.5 Monitoring and Inspection of Detoxification Plant and TSF

The detoxification plant and TSF will be subjected to daily inspections. Any unsafe conditions will be noted in an operator's logbook and appropriate actions will be taken to address the deficiency. Significant safety problems or any releases of cyanide solutions will also require documentation as a nonconformity and formal resolution to meet EMS requirements. Any wildlife mortality will also be documented and reported.

All tanks, piping, valves, and secondary containment structures at the detoxification facility will be subject to periodic formal inspections. An SOP will be prepared that describes how the inspections will be conducted and documented on inspection checklists and how follow-up corrective actions will be initiated and tracked. Detailed checklists will be used to focus the inspector on specific items to be observed.

Tank and pipeline inspections will focus on structural integrity of the original system plus all authorized modifications; signs of corrosion and leakage; legibility/adequacy of labels, colour coding, or other markings indicating pipeline contents and direction of flow; and any evidence of unauthorized and/or undocumented system modifications. Secondary containment structures and associated piping systems will be inspected for their integrity, indications of cracks or leakage, presence of fluids, and available capacity. All inspection records will be retained in accordance with regulatory and EMS requirements.

A monitoring program will be implemented to confirm that the detoxification facility is functioning as designed, i.e., reducing residual WAD cyanide to required concentrations.

At a minimum, detoxification plant influent and effluent will be monitored for the following parameters, at the frequencies indicated:

- pH (continuous monitor and alarm);
- WAD cyanide (multiple times during each shift);
- Total cyanide(weekly at the process plant, end of pipe, and TSF or reclaim water); and
- Copper, iron, and zinc (during each shift).

The adequacy of the monitoring program will be specifically evaluated in view of any proposed process modifications, and this plan and related SOPs will be adjusted accordingly.

Process plant security practices will be reviewed regularly to ensure that access to the cyanidation and detoxification facilities remains restricted to authorized personnel only.

12.2.1.18.4.19.9 Wildlife Management Plan

Access to cyanide solutions great enough to cause wildlife death will be strictly limited. In order to further minimize any exposure possibility, the capture and cleanup of any releases of cyanide solution, including any solutions released to secondary containments that are not within buildings, will be expedited.

Wildlife mortality from cyanide exposure is not anticipated at the TSF because operation of the SO_2/air plant will reduce the concentration of total and WAD cyanide in the tailings to concentrations well below levels found to be toxic to wildlife (approximately 0.2 mg/L total cyanide).

No adverse impacts to aquatic resources are expected from trace cyanide within the deposited tailings, because the TSF is designed and operated to prevent discharges to surface waters during the operations and closure phases of the mine. Weak acid dissociable cyanide in the TSF prior to any degradation is predicted to be 0.008 mg/L. The BC freshwater guideline for WAD CN is 0.005

mg/L; the TSF will not support aquatic organisms (excluding bacteria). Expected seepage that escapes collection is 2 L/s; diluted in Davidson Creek will put WAD CN well below the 0.005 mg/L guideline even without path degradation of CN WAD which will occur before the seepage front discharges to the creek.

At post-closure, any TSF decant pond water is predicted to meet or be less than protection of aquatic life guidelines for cyanide due to closure management of the TSF which includes creation of wetlands in the ponds, and capping of tailings with overburden and pumping of the TSF supernatant and runoff water to the open pit. As well there will be 18 years for CN degradation to occur prior to release of TSF decant. Finally, constructed wetlands are proposed downstream of the TSF. The polishing system planned is robust and redundant and can reasonably be expected to produce better than guideline compliant water for CN (see further discussion in **Section 5.3.3**).

Employees in the process area will be trained to observe their workplace for incidents of wildlife activity or mortality in cyanide areas and to immediately report any such observations to their supervisors in accordance with the applicable SOP.

TSF operators will monitor wildlife mortality in their inspections in accordance with applicable portions of an appropriate SOP that will establish such inspections as part of the TSF operator's routine and will require a notation of such observations consistent with the WLMP. The SOP will require immediate notification of supervisory personnel if any mortality is observed and will outline the specific incident reporting and corrective and preventive action procedures to be followed. Records of the inspections will be retained in accordance with EMS requirements. This SOP will allow for the cause of the mortality to be determined and will be modified as needed to minimize the potential for recurrence.

Environmental staff will also conduct wildlife monitoring at scheduled times at the TSF. This monitoring will provide insight as to how wildlife may be accessing the TSF. Inspections will include mapping locations, identifying species, recording the number of sightings, and detailing how the wildlife is using the TSF.

12.2.1.18.4.19.10 Environmental monitoring

A comprehensive water-monitoring program will also be established to confirm that the TSF or processing plant is not adversely impacting ground and surface water. The TSF will be routinely monitored for the presence of trace cyanide in the supernatant reclaim water throughout the operations phase of the Project. Cyanide-specific operational monitoring actions will include the following:

- Routine sampling for total and WAD cyanide at the discharge from the detoxification plant;
- Routine sampling for total and WAD cyanide in the reclaim pond, i.e., a grab sample from the pond perimeter or appropriate sampling points on the reclaim pump line (giving due consideration to the safety of the sampling technician); and

- Routine sampling for total and WAD cyanide in monitoring wells, the ECD pond, or seepage recovery measures.

Groundwater will also be routinely monitored for cyanide and other parameters through operations and closure phases at a series of wells installed down-gradient of the main embankment of the TSF and the processing facilities. In the event that cyanide is detected at concentrations above 0.1 mg/L total cyanide, confirmatory sampling and other appropriate corrective actions will be initiated, such as converting the TSF monitoring wells to pumping wells and pumping the intercepted water back to the TSF reclaim pond for re-use in the production process, or for treatment and discharge as necessary, to intercept or divert affected groundwater so that it does not migrate to Davidson Creek. Relevant regulatory reporting will be done as soon as cyanide is confirmed in groundwater samples.

Details on sampling locations, sample preservation protocols, chain of custody procedures, and analytical methods will be included in the applicable SOP. Same-day analytical results for all total and WAD cyanide analyses will be provided on site using a dedicated cyanide analyzer. Records of all monitoring activities and associated analytical results will be retained in accordance with EMS requirements.

An SOP will be prepared to address the daily inspection of the TSF to confirm that the design freeboard is being maintained. Tailings and reclaim water pipelines, valves, and couplings will also be periodically inspected for deterioration or leakage. Dams will be inspected on a regular basis and after any significant storm or runoff events. The SOP will also describe how routine, formal inspections will be conducted and documented on an inspection checklist and how follow-up corrective actions will be initiated and tracked. All inspection records will be retained in accordance with EMS requirements.

The Project will also monitor precipitation daily at the site meteorological and air quality station in order to validate the assumptions used in the water balance and to ensure that the TSF will operate as designed. An SOP will describe the precipitation monitoring process and the use of these data in validating or updating the site's water balance.

Cyanide monitoring in surface water or soil will occur after any spill to determine the extent of contamination and ensure cleanup has been carried out sufficiently.

12.2.1.18.4.19.11 Documents and Records Management

Documents and records will be managed as per EMS and Cyanide Code requirements. All documents will be maintained in a way that allows employees and contractors to access the most recent copies of documents.

All records will be maintained for the following: monitoring, inspections, incidents, training, audits, stakeholder engagement or feedback, and certifications. Employees working in potential cyanide areas will understand how to access these records for reference if required. Records will be maintained in an auditable and clear format.

12.2.1.18.4.19.12 Decommissioning and Closure of Cyanide Facilities

The cyanide facilities will be included as part of the overall mine closure activities discussed in the Mine Closure Plan. Decommissioning and closure of cyanide facilities will entail the removal or detoxification of unused reagent cyanide and the cleanup of cyanide-containing residues in process tanks and equipment. The measures to accomplish these tasks are included in the Mine Closure Plan, as are the cost estimates and information on financial assurance for decommissioning and closure required by the Cyanide Code.

As noted in the Mine Closure Plan, all cyanide process tanks and piping systems will be triple flushed with water to remove residual cyanide and the effluent routed to the detoxification circuit for reduction of residual cyanide concentrations to levels accepted by the Cyanide Code or regulatory requirements. Detoxified washwater will then be released to the tailings pipeline for deposition in the TSF. The decommissioned process plant tanks and piping systems will then be cut up and recycled for their scrap metal value.

The TSF supernatant pond will be pumped to the pit to facilitate pit filling (about 18 years). Cyanide concentrations in the pit will be below detection when the pit is full due to natural degradation and dilution. The water balance as included in the MWAMP demonstrates how water will be managed throughout decommissioning.

12.2.1.18.4.19.13 Emergency Response Plan

Measures will be incorporated into the design, construction, and operations of the processing facilities to prevent cyanide releases to the natural environment as well as workplace exposures. The unloading, storage, mixing, and use of cyanide in the mineral extraction process will be completed within contained areas. The plant design requires individual containment areas to be sized to accept 110% of the volume of potentially reporting material and design storm if no weather protection is included.

All spills within the containment area are amenable to being returned directly to the cyanidation process, and no residual spill material will be generated in normal operations that will require management or disposal as a waste. Spills of dry NaCN briquettes or granules in the unloading or storage area will be captured and deposited in the mixing tanks. Any spills of process solution will be captured with portable suction pumps and returned to appropriate locations in the process, i.e., areas that will not contribute to a process upset. Containment areas associated with cleaned-up spills will be washed into sumps within the containment, and the collected effluent will be pumped back to the process.

These preventive measures (and the low probability of cyanide-related accidents or emergencies) notwithstanding, it is both prudent and necessary to plan for emergency situations and to be prepared to respond rapidly and effectively in the event that emergencies do occur.

12.2.1.18.4.19.13.1 Emergency Response Team / Off-site Responders

The ESPRP identifies responsibilities for responses to emergency Code One situations. These same personnel are also the appropriate responders for cyanide and hazardous materials emergencies, and will have received the training specified in **Section 12.2.1.18.4.13**. The ESPRP includes contact information and call-out procedures for response personnel. The ESPRP also requires that any local community responders that may be called to assist in the event of an emergency be familiarized with the contents of the plan, the nature of the risks present, including cyanide, and the planned response actions.

12.2.1.18.4.19.13.2 Response Equipment and Maintenance / Inspection Requirements

A documented SOP will be prepared to ensure the availability of emergency response equipment in the event it is needed. A list of equipment items required for the management of cyanide exposures and releases will be included in the SOP and it will address items necessary for containment and cleanup of spillage, traffic control, first aid, PPE, special equipment for response vehicles, and necessary items for documentation and communication.

12.2.1.18.4.19.13.3 Internal and External Notification Requirements

Reporting of cyanide releases and exposures will follow the same procedures established in the ESPRP for the internal and external reporting of accidents and incidents. In the event of a major accident, the Proponent will comply fully with all applicable reporting requirements and will provide the competent authorities with the following information:

- Circumstances of the accident;
- Identification and volume of the hazardous materials involved;
- Information to enable an assessment of the effects of the accident on human health and the environment;
- Emergency measures taken; and
- Measures to be taken to alleviate medium- and long-term effects of the accident, as well as to prevent recurrence.

12.2.1.18.4.19.13.4 Remediation of Releases and Management of Contaminated Materials

As previously noted, the unloading, storage, mixing, and use of cyanide will be conducted within full containment. The plant design will require individual containment areas to be sized to accept 110% of any reporting solid or liquid. Any spills within the containment area are amenable to being returned directly to the cyanidation process, and no residual spill material will be generated in normal operations that will require management or disposal as a waste.

Spills of dry NaCN or granules in the unloading or storage area will be captured and deposited in the mixing tanks. Any spills of process solution will be captured in containment sumps and returned to appropriate locations in the process, i.e., areas that will not contribute to a process upset, using portable suction pumps. Containment areas associated with cleaned-up spills will likewise be washed into containment sumps, from which the collected effluent can be pumped back to the process. While unlikely, spills that occur outside the containment will be removed using machinery and deposited in the TSF.

Because any potential spills are captured and returned directly to the cyanidation process and no residual spill material will be generated during normal operations, a potential waste stream is eliminated and no waste disposal actions are required. In the unlikely event that solid NaCN briquettes spill to the ground surface beyond the mine property during delivery to the site, the Environmental Superintendent will contact and coordinate necessary response actions with local, regional, and national officials, as indicated by the community emergency plans from the affected transportation corridor community.

12.2.1.18.4.19.13.5 Cyanide Emergency Response Drills

On-site and off-site emergency drills for response to cyanide exposures and/or releases will be completed at least annually. Corporate Crisis Management simulations may also cover the requirements for drills depending on the scenario. The drills will be designed to simulate one or more of the types of releases and exposure scenarios noted in this plan; scenarios selected for such drills will not be repeated until all of the noted scenarios have been tested.

Each drill will be evaluated to determine the adequacy of response procedures and responder training. Written documentation of the scope and evaluated results of each drill will be retained in accordance with internal reporting requirements.

The CYMP, the ESPRP, and the MWMP will subsequently be revised, as necessary, based on evaluation of drill results.

12.2.1.18.4.19.14 Occupational Health and Safety

12.2.1.18.4.19.14.1 Measures to Limit Exposure

To the extent practicable, the facilities will be engineered and the operational practices designed to limit worker exposure to HCN gas levels below 4.7 ppm.

The pH will be maintained in the various cyanide-bearing process solutions and slurries throughout its operation to minimize the release of HCN to protect workers and keep the HCN levels below regulatory limits.

Routine safety meetings and regularly scheduled formal safety meetings will be held to solicit worker input to occupational health and safety issues and to ensure that employees perform their tasks in a manner that is protective of their health and safety and those of their co-workers. At each meeting, employees will have the opportunity to ask questions and identify health and safety concerns.

The structure and content for safety meetings will be discussed in an SOP and subject to amendment as indicated by the mine Health and Safety Committee.

12.2.1.18.4.19.14.2 PPE Requirements

While not anticipated to be of concern, should any situation arise where it is determined that the potential for cyanide exposure cannot be adequately eliminated, reduced, or controlled with process changes and the use of engineering or administrative controls, then employees performing such tasks will be required to use appropriate PPE. A comprehensive program for the use of such equipment will be discussed in the OHSMP and the SOP for PPE.

The program will identify the necessary PPE required for each work area, job function, and task that presents the potential for worker exposure to cyanide, after all practical process changes and/or engineering controls have been implemented to eliminate, reduce, or control the exposure. The program will also describe the training necessary for use of the PPE.

12.2.1.18.4.19.14.3 HCN Monitoring Equipment and Calibration

The cyanide facilities will be monitored to protect the health and safety of its workers in accordance with the specific information provided in this plan and the SOPs referenced herein. Fixed airborne cyanide detection monitors will be located at the cyanide off-loading, dissolution, and storage area; the processing plant; and the detoxification facility. Monitors will be set to sound a highly audible evacuation alarm, initiate a flashing beacon (light), and alert control room personnel if the concentration of HCN reaches 4.7 ppm.

Confirmatory monitoring with portable personal monitors will also be conducted periodically, as noted in the OHSMP in order to ensure that employees are not exposed to potentially harmful concentrations of HCN. All monitoring results will be retained in accordance with EMS requirements.

Fixed and portable cyanide monitoring equipment will be maintained, tested, and calibrated as directed by its manufacturer. Records of these activities will also be retained in accordance with EMS requirements.

12.2.1.18.4.19.14.4 Antidotes and First Aid Requirements

First aid equipment for cyanide exposure, including medical oxygen and a resuscitator, located at the off-loading, storage and dissolution area; in the process plant; and at the detoxification facility will be maintained in the event that a worker is exposed to cyanide. First aid kits will be routinely inspected to ensure that required equipment and materials are available and in good condition.

A cyanide antidote acceptable under applicable regulations will also be available on site and will be stored and replaced with new antidote kits at intervals recommended by the manufacturer. When determining the antidote to be used, provisions will be made for the type of administration required and training requirements. Inspection records will be retained in accordance with EMS requirements.

First aid procedures for response to cyanide exposure will be included in an SOP. All workers who may be called upon to respond to cyanide exposures will be trained in these procedures and will take part in routine drills to test and improve their response skills. Because antidotes must be provided intravenously or intramuscularly, administration of antidotes is restricted to qualified medical personnel or specially trained members of the Emergency Response Team. Appropriate training programs will be implemented and documented in accordance with EMS requirements.

Guidelines for transport of exposed workers to local medical facilities that have adequate, qualified staff, equipment, and expertise to provide additional treatment will be included in an SOP. Any incidents involving cyanide exposure will be documented and investigated. Specific procedures for accident and incident investigations, reporting, and recordkeeping will be addressed in an SOP.

Because of the intrinsic hazards associated with cyanide operations, any incidents involving cyanide exposure will also be addressed as nonconformities and formally investigated and resolved in accordance with internal and EMS requirements. Regardless of the circumstances of any such incident, programs and procedures to protect worker health and safety will always be reviewed to ensure that responses to cyanide exposures remain adequate and appropriate. Procedural modifications or improvements will be implemented where necessary to minimize the potential for future recurrence.

12.2.1.18.4.19.14.5 Other OHS Equipment

Low-pressure safety shower/eye wash stations and non-acidic, dry powder extinguishers will be located at strategic locations throughout the operation where cyanide is present, including the off-loading, storage and dissolution area; the process plant; and the detoxification facility. A site plan will be prepared and posted in the control room and at all major cyanide work areas, showing the locations of safety equipment.

The equipment will be maintained and inspected on a routine basis, using an inspection checklist; inspection records will be retained in accordance with EMS requirements.

12.2.1.18.4.19.14.6 Cyanide Signage

Warning signs will be placed on perimeter fencing and in all areas where cyanide is stored or used to: alert workers that cyanide is present; that smoking, open flames, eating, and drinking near sources of cyanide are not allowed under any circumstances; and that necessary levels of PPE must be worn.

Copies of the MSDS for NaCN and for HCN will also be available at strategic locations throughout the process plant, as well as in the emergency response data packages prepared for the emergency response teams and cyanide delivery truck drivers.

All tanks and piping containing cyanide will be identified either by colour coding or by signs, labels, tags, or decals to alert workers regarding their contents. Labels, signs, tags, arrows, or other means will be used to indicate the direction of flow in pipes carrying solutions containing cyanide.

12.2.1.18.4.19.15 Cyanide Awareness and Training

12.2.1.18.4.19.15.1 General Cyanide Awareness

All employees and contractors will undergo general site orientation prior to commencing work on site and will be required to repeat this awareness training if away from site for a period of time. Employees and contractors that are required to perform work in the Mill will undergo a specific Mill Orientation that includes details on cyanide risks. As part of their standard job-specific training, employees directly involved with cyanide management tasks will also receive specific training on how their job responsibilities must be performed to prevent unplanned releases of cyanide; to minimize cyanide-related risks to their own health and safety and to the health and safety of their co-workers; and to minimize environmental impacts of cyanide.

Training topics will include a general introduction to this plan, including specific emergency response requirements as detailed in this plan; the SOPs applicable to individual work assignments; and applicable portions of the ESPRP. All workers will be trained in what to do when a Code One emergency is observed as described in the ESPRP. A Code One emergency is dictated by an event that requires immediate external assistance such as Mine Rescue Team, evacuation, and alerts.

Training will include recognition of the cyanide or cyanide-bearing materials that may be present at the site, information regarding the health effects of cyanide, symptoms of cyanide exposure, and procedures to follow in the event of exposure. The documents will be made available to all employees via the controlled document distribution and records management requirements of the EMS.

Training will be provided by knowledgeable personnel who are experienced in effective communication techniques. All employees receiving cyanide worker training will be required to pass a written test to ensure their understanding of the subject matter covered. Refresher training will also be conducted for all cyanide workers at least annually.

12.2.1.18.4.19.15.2 Emergency Response Training Requirements

Workers having access to cyanide will receive training in the procedures to be followed if a cyanide release is discovered, including notification of the appropriate site personnel, ensuring co-worker and public safety, and taking direct action to control or contain the release wherever possible.

Site personnel who may be called upon to respond to workplace exposures to cyanide will be trained in the neutralization, decontamination, and first aid procedures noted in the ESPRP. This training will include the procedure for notifying appropriate site personnel and will stress that the responder must first ensure their own protection through use of cyanide-specific PPE. Specialized training will also be provided to those workers designated as members of the Emergency Response Team.

All employees receiving specialized cyanide-related emergency response training will be required to pass a written and practical test to assure their understanding of the subject matter. The Emergency Response Team will also include qualified medical staff or other trained personnel who will be authorized to administer cyanide antidotes, if required.

Emergency drills simulating worker exposures and environmental releases will be conducted at least annually to provide practical, hands-on training for all categories of workers having access to cyanide during the performance of a particular job function. Emergency simulation results will be evaluated from a training perspective to confirm that personnel have the knowledge and skills required for rapid, safe, and effective response. The training requirements of this plan, the OHSMP, and/or the ESPRP will be revised if any deficiencies or nonconformities are identified. Records of these drills will be retained in accordance with the EMS requirements.

12.2.1.18.4.19.15.3 Training Records

Records documenting all levels of training related to the use of cyanide in the workplace will be retained in accordance with site requirements Training records will include the names of the employee and the trainer, the date of training, the topics covered, and employee proficiency test results, where required. Training records will be maintained by the safety or training department.

12.2.1.18.4.19.16 Public Engagement and Dialogue

The following sections discuss the commitments to disseminate information regarding the use and management of cyanide.

12.2.1.18.4.19.16.1 Material Safety Data Sheet

The cyanide supplier will provide MSDSs that will be made available to all employees in either electronic or paper format in all areas where cyanide is managed and will be used to support hazard recognition training programs for employees and contractors. MSDSs will also be made available upon request.

12.2.1.18.4.19.16.2 External Emergency Response

The Project will engage external emergency responders such as the RCMP, fire department, and medical personnel to ensure they are included in any emergency response planning. Regular discussions regarding the Project and its capacities for response will occur to ensure full understanding of requirements in the case of an incident.

12.2.1.18.4.19.16.3 Corporate Sustainability Report

The Proponent reports against the Global Reporting Initiative to ensure suitable "sustainable reporting guidelines" are followed. An annual corporate Sustainability Report would include information on any confirmed cyanide exposure incidents, especially on those that resulted in any hospitalization, injury, or wildlife deaths and on any cyanide releases discussed in **Section 2.1.**

12.2.1.18.4.19.17 Continual improvement

The Proponent will drive continual improvement for cyanide management through the programs described in this plan. Training, drills, audits, and inspections will form the basis of continual improvement. Records will be maintained for all activities that are carried out with respect to cyanide, and programs will be developed annually to improve on performance.

12.2.1.18.4.20 Wildfire Management Plan

12.2.1.18.4.20.1 Introduction

Due to the nature and location of the Project, various activities have the potential to initiate a forest fire. Planning the work to ensure prevention of these incidents and developing emergency plans in case of any incidents are crucial.

12.2.1.18.4.20.2 Linked Plans

The following EMPs are linked to the Wildfire Management Plan:

- OHSMP (**Section 12.2.1.18.4.15**); and
- ESPRP (**Section 12.2.1.18.4.13**).

12.2.1.18.4.20.3 Objective

The objective of the Wildfire Management Plan is to detail, for the Proponent or its designate and for BC MFLNRO, the personnel, procedures, and equipment available for prevention, detection, and suppression of forest fires within the Project. The Wildfire Management Plan is in effect for the fire season (which is calculated by the fire rating) during each year of clearing and construction of the ROW, or as otherwise determined by the Proponent or its designate, and will be subject to annual or periodic updates to supersede the previous year's Plan.

12.2.1.18.4.20.4 Regulatory Requirements

The provincial *Wildfire Act*, Wildfire Regulation, and Occupational and Health and Safety Regulations are referenced to develop the Wildfire Management Plan:

- As per *Wildfire Act* s.6 (3), if a fire starts at, or within 1 km of, the site of an industrial activity, the person carrying out the industrial activity must immediately carry out fire control and extinguish the fire, if practicable, and continue with fire control until the fire is extinguished, it becomes impracticable to continue with fire control, or an official relieves the person in writing from continuing (Government of BC, 2004b);
- As per Wildfire Regulation s.13 (1) (2), a person carrying out an industrial activity must make available to fight the fire, if started on Crown land, all of the person's workers who are working within 30 km by road of the site of the industrial activity, fire suppression systems located within 30 km by road of the site of the industrial activity, heavy

equipment located within 30 km by road of the site of the industrial activity, and firefighting hand tools. However, if the fire started on land other than Crown land, a person carrying out an industrial activity must make available to fight the fire all of the person’s workers who are working on the land on which the fire started, fire suppression systems located on that land, heavy equipment located on that land, and firefighting hand tools (Government of BC, 2005); and

- As per Wildfire Regulation s.13 (3), a person carrying out an industrial activity is exempt from section 6 (3) of the *Wildfire Act* in respect of a fire that starts at or within 1 km of the site of the industrial activity if the site is within a protected area, or on private land that is not owned by the person or another who acts on the person’s behalf/direction (Government of BC, 2005).

Operations must be able to demonstrate that they comply with the provincial Occupational Health and Safety Regulation. Part 26.3.1 (1) of the Regulation states that before fighting a forest fire, workers must be trained in their firefighting duties in accordance with a standard that is acceptable to the Board, and be physically capable of performing their duties safely and effectively. Part 26.3.1 (2) states that workers required to fight forest fires must be retrained annually (Government of BC, 1997).

12.2.1.18.4.20.5 Management

The Project is located within G4-VanJam Fire Zone, part of the Prince George Fire Centre Branch. It will be the Policy of the Proponent to take immediate initial action to suppress any or all fires, whether classed as wild or occupational, which may occur on or immediately adjacent to Project activities. Responsibility for cause will be secondary to immediate and direct responsive action by staff and contract personnel. In circumstances where lack of road access or restrictive topographic features increase fire control problems, the Proponent will not hesitate to call upon additional Fire Centre personnel and/or aerial tanker support services. Subsequent interpretation of the cause and source of such fires will determine the appropriate assessment and financial responsibility.

The Proponent will subscribe to and be responsible for all conditions and provisions under the *Wildfire Act* and *Wildfire Regulation*, regarding its obligations and commitments for wildfire control and regulation of operational activities within its planned Project footprint. Any deviation from the *Wildfire Act* and Wildfire Regulation will be part of an approved exemption from the Prince George Fire Centre.

Fully equipped weather stations are provided by the BC MFLNRO through the Fire Centre at the Kluskus weather station. Information will be obtained from the Wildfire Management Branch system and will be used to calculate fire hazard ratings, which in turn will be used to determine operational restrictions and the application of required exemption measures.

12.2.1.18.4.20.5.1 Forest Fire Prevention

The BC MFLNRO requires that fire prevention and fuel hazard concerns be addressed throughout vegetation management contracts. The Proponent or its designate must ensure that clearing and slashing/brushing contractors are appropriately certified for each new project for fire safety reasons.

The Proponent will establish initial contact with the Prince George Fire Centre and the VanJam Fire Zone and maintain a regular contact with them. Information will be given to the Fire Zone as to when, where, and for how long clearing contractors are operating during the fire season.

It is a strict requirement of the BC MFLNRO that contractors comply with all aspects of the *Wildfire Act* and *Wildfire Regulation*. The Proponent and contractors will familiarize themselves with this legislation and comply with those provisions that regulate the activities of the contract.

High risk activities, for the purposes of vegetation management are slashing; pruning; mowing; all debris management activities, including bucking, scattering, and chipping; pile and burning; grooming; and grubbing activities. These are considered high risk activities as defined under the Regulation and therefore must comply with the legislation pertaining to operational restrictions as well as to fire tool and fire suppression system requirements. This legislation applies but is not limited to:

- Mechanical brushing;
- Preparing and using explosives;
- Using fire- or spark-producing tools, including cutting tools;
- Grinding;
- Mechanical land clearing;
- Clearing and maintaining ROWS;
- Operating power saws;
- Mechanical tree felling, woody debris piling, or tree processing;
- Welding;
- Skidding logs or log forwarding; and
- Yarding logs.

Field personnel must be trained in fire suppression and safety practices (S-100 equivalent [OHS Regulation Part 26.19 MOFR Forest Protection Branch S100 Course,]) under WorkSafeBC requirements. The Proponent will maintain training records of all certified staff working on the Project.

12.2.1.18.4.20.6 Monitoring

12.2.1.18.4.20.6.1 Determining the Fire Season

The Wildfire Regulation requires that a person conducting high-risk activity must, during the fire season, determine the Fire Danger Class and comply with any restrictions applicable to that Danger Class. The fire season begins on:

- The third day after the area is snow free; or
- In areas where snow cover is often absent, the third consecutive day that the temperature at noon is at least 12 degrees.

During the fire season, provisions that govern high-risk activities (fire watcher, early shift requirements, fire tools, and "cease activity in high fire danger") must be strictly adhered to. A specific exemption from the Prince George Fire Centre Manager is required if activities are to continue during periods of high risk.

12.2.1.18.4.20.6.2 Determining Risk of Fire Starting and Spreading

The Wildfire Regulation requires:

- Fire tools to be on site;
- Mobile engines to be maintained and properly equipped;
- High-risk activities to have an adequate fire suppression system; and
- Persons conducting a high-risk activity to comply with Danger Class restrictions when there is a risk of a fire starting and spreading.

According to the Wildfire Regulation, there is a risk of a fire starting and spreading when the area is snow-free and the:

- Daily fine fuel moisture code value exceeds 75;
- Duff moisture code value exceeds 6; or
- Drought code value exceeds 15.

These code values are weather-driven indices obtained through the BC Ministry of Forests and Range (now BC MFLNRO). Once any one of these values has been exceeded, there is a risk of a fire starting and spreading and preventive precautions must be in place.

12.2.1.18.4.20.6.3 Weather

It is the responsibility of the Proponent to ensure it is complying with the necessary shutdown and restricted work activities as dictated by Schedule 3 of the Wildfire Regulation and/or any specific exemptions the corporation obtains in writing from the BC MFLNRO. This requirement is determined by weather data taken from a representative weather station, compiled and followed in accordance with Schedule 3 of the *Wildfire Regulation*.

12.2.1.18.4.20.6.4 Inspections

Periodically during moderate fire danger, the Proponent or its designate will determine during site inspections the fire danger for a given worksite and ensure that the contractor has the appropriate equipment and is complying with any restrictions. During high hazard periods, and in certain periods of moderate hazard, these checks will be frequent.

The Proponent or its designate will also ensure that the contractor has identified all water sources near its activity site and these water sources have been made known to its employees.

12.2.1.18.4.20.6.5 Fire Prevention Practices

Contractors can contact the Prince George Fire Centre prior to starting work to obtain guidance on necessary equipment and work requirements. The contractor must ensure, when required, that:

- An adequate fire suppression system is on site;
- A personal fire extinguisher is carried with all power saw or power tool operations;
- Sufficient fire tools are available on site;
- Representative weather data are collected and appropriate restrictions are identified and implemented;
- Emergency procedures are in place and known to all; and
- Smoking is restricted to designated areas.

The contractor will also follow these fire prevention practices:

- The contractor must be familiar with measures required to work safely in the woods (early shift, fire watcher, appropriate equipment, etc.);
- The contractor must by law report all forest or grassland fires to the BC MFLNRO;
- The contractor must by law attempt to extinguish any fire in or within 1 km of the ROW. This applies to all fires except those on other private property or within a protected area (such as parks). These fires need only be reported to the BC MFLNRO;
- The contractor must ensure smoking during moderate, high, or extreme fire danger is restricted to designated smoking areas only. These designated smoking sites must be in fuel-free areas (gravel pit, road, rock outcroppings, or large exposed areas of mineral soil) that have been identified to all employees prior to starting the day’s work. Smoking materials will be collected daily and disposed of at suitable locations. The contractor must identify and communicate these designated smoking areas to their employees;

- The contractor must ensure refuelling or maintenance of powered equipment, in addition to being at least 15 m from any waterbody, must also be carried out in areas free of surface fuels (gravel pit, road, rock outcroppings, or large exposed areas of mineral soil);
- From time to time and usually during extreme fire danger, the BC MFLNRO may close or restrict forest activities, restrict the use of specific equipment, or curtail travel in specified forested areas. The contractor must monitor TV, radio, or newspapers for these announcements and follow the restrictions noted;
- The contractor must comply with the necessary shutdown and restricted work activities in Schedule 3 of the Wildfire Regulation. This requirement is determined by weather data taken from a representative weather station, compiled and followed in accordance with Schedule 3;
- The contractor must ensure that all roads and trails within the ROW, as well as access roads, must have all slash removed and the debris laid flat for a minimum of 2 m from each road edge;
- The contractor must ensure that all main public roads crossing or running under the ROW must have all slash removed for a minimum of 5 m from each road edge;
- The contractor must ensure that Fuel loading conditions within the ROW must be consistent with Debris Management Standards;
- If there is a risk of a fire starting and spreading, the contractor must ensure that:
  - Equipment is regularly maintained to ensure the engine does not cause a fire;
  - Engines are equipped with a safe and effective device for arresting sparks; and
  - Sufficient fire tools and an adequate fire suppression system are on-site;
- The contractor must ensure that a fire watcher is maintained if required under Schedule 3 of the *Wildfire Regulation*.

12.2.1.18.4.20.7 Awareness and Training

There is a legal obligation for all industrial activities (this is applicable to ROW clearing) to fight any fire they cause or any unattended fire burning in or within 1 km of their activity. All employees who are working within 30 km, by road, of the site of the industrial activity must be made available to fight the fire. This imposes a separate legal obligation under the *Workers Compensation Act* (Occupational Health and Safety Regulation section 26.19) that requires all employees involved in firefighting be trained in fire suppression safety. This applies to the Proponent as well as to contractors. WorkSafeBC requires that the training must meet the BC MFLNRO S-100 Basic Fire Suppression and Safety standard or equivalent. This is the requirement under legislation; if the Proponent requires an exemption from any aspect of the *Wildfire Act* or Wildfire Regulation, then this must be obtained from the Senior Protection Officer at the Prince George Fire Centre.

12.2.1.18.4.21 Fish Salvage Plan

12.2.1.18.4.21.1 Introduction

Unless mitigated, construction of the Project will result in “serious harm to fish” that reside in streams within the mine site. This “serious harm” includes the direct mortality of fish due to construction activities as well as permanent alteration or destruction of fish habitat in the Davidson Creek and Creek 661 watersheds, including some streams used by rainbow trout for spawning and rearing. Because rainbow trout are considered a component of recreational and Aboriginal fisheries in the aquatics LSA and RSA, the Proponent will require a Section 35(2) *Fisheries Act* authorization from DFO before proceeding with the Project. Mitigation measures were incorporated into all phases of the Project to further eliminate or reduce potential “serious harm to fish.” Prior to construction, mitigation measures will include fish salvage within Davidson Creek and Creek 661.

The following is a fish salvage program for streams of upper and middle Davidson Creek and some headwater streams of Creek 661. This program was developed based on existing DFO guidelines for mining developments (e.g., lake fish salvages described by Tyson, 2011) as well as other fish salvage plans for streams that have been developed for other mining developments such as Kerr-Sulphurets-Mitchell (KSM) and Mount Milligan. Rainbow trout (mainly fry and juveniles less than 150 mm long) will be the only species salvaged from Davidson Creek and Creek 661 because it is the only fish species present in the middle and headwater sections of those two watersheds (**Section 5.1.2.6; Appendix 5.1.2.6A; Appendix 5.1.2.6B**).

12.2.1.18.4.21.1.1 Objectives

The overall objectives of the Fish Salvage Plan include the following:

- Fulfill the Proponent’s obligations to conduct a fish salvage program in order to avoid “serious harm to fish”;
- Allow for the survival of fish within the Project’s mine site footprint;
- Ensure that fish are removed from the affected watersheds and are relocated to downstream reaches of their natal watersheds using methods that maximize long-term survival; and
- Use the decline in catch-per-unit-effort (CPUE) over the duration of the salvage period as the primary method of confirming that the fish salvage program successfully removed fish from the target locations within the Project’s mine site footprint.

12.2.1.18.4.21.2 Project Environmental Commitments

A total of 161,218 m^2 of stream area will be either destroyed or isolated by construction of the mine site in Davidson Creek and Creek 661 watersheds (**Table 12.2.1-61**). Baseline stream inventories conducted in 2011 and 2012 showed that mean densities of juvenile rainbow trout within streams in the mine site are between 2.84 and 3.74 fish/100 m^2, depending on watershed (**Table**

12.2.1-61). Therefore, a total of 4,809 juvenile rainbow trout may require salvaging prior to construction.

Table 12.2.1-61: Estimated Number of Juvenile Rainbow Trout that may Require Salvaging Prior to Construction of the Blackwater Mine

Watershed/Habitat	Habitat Area Affected (m^2)	Mean fish density (number/100 m^2)	Estimated Number of Fish to be Salvaged
Davidson Creek Mainstem	102,859	2.84	2,921
Davidson Creek Tributaries	32,628	2.84	926
Creek 661	25,731	3.74	962
Total	***161,218***		***4,809***

Note: Areas and fish densities were based on **Table 6-5** of **Appendix 5.1.2.6C** and **Table 5.1.2.6-39** of **Section 5.1.2.6**).

12.2.1.18.4.21.3 Schedule

Commencement of fish salvage will depend on the Blackwater construction schedule and permit approvals. Fish salvage efforts will be staged according to the construction schedule and will occur prior to any migration and spawning of rainbow trout and kokanee in the affected reaches and/or after any outmigrations have been completed (as outlined in **Section 5.3.8**), where applicable. Data analysis and reporting will begin once fieldwork is completed.

12.2.1.18.4.21.4 Permitting

Fish salvage will be subject to approval by the British Columbia Ministry of Environment (BC MOE) and DFO and will be subject to the conditions of those approvals.

12.2.1.18.4.21.5 Salvage Location

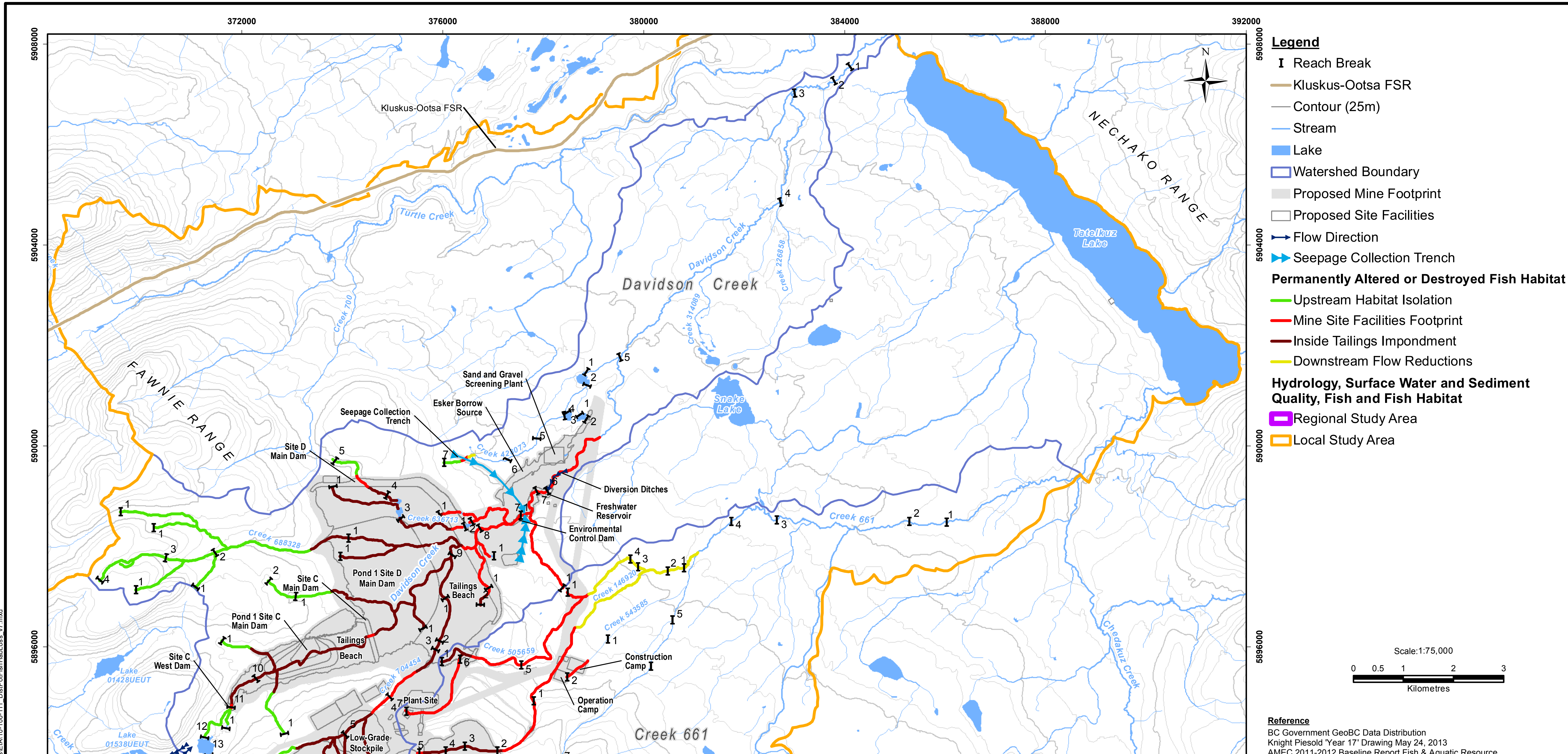
The Proponent proposes to conduct fish salvages in affected streams within upper and middle Davidson Creek and within headwaters of Creek 661. Affected streams in the Davidson Creek Watershed will include the upper and middle sections of the mainstem, Creek 688328, Creek 704454 and various tributary streams (**Table 12.2.1-62** and **Figure 12.2.1-49**). Affected streams in Creek 661 Watershed will include Creek 505659, Creek 146920, and various tributary streams.

Table 12.2.1-62: Streams Affected in the Mine Site

Watershed	Watershed ID	Stream Name	Reaches	Stream Classification(1)	Fish Presence(2)
Davidson Creek	100-567134-610692-522527	Davidson Creek	6, 7, 7.1, 8, 9, 10, 11, 12	Reaches 6-7.1: S2 Reaches 8-10, 12: S3 Reach 11: S4	RB
	100-567134-610692-522527-428073	Unnamed	1	S6	None
	100-567134-610692-522527-616152	Unnamed	1	S4	None
	100-567134-610692-522527-636713	Unnamed	1, 2, 3, 4, 5	Reaches-2: S3 Reaches 3-5: S4	Unconfirmed RB
	100-567134-610692-522527-636713-214958	Unnamed	1	No data	None
	100-567134-610692-522527-636713-214958-727555	Unnamed	1	No data	None
	100-567134-610692-522527-636713-637972	Unnamed	1	S4	Unconfirmed RB
	100-567134-610692-522527-670952	Unnamed	1	No data	None
	100-567134-610692-522527-674890	Unnamed	1, 2	S4	Reach 1: Unconfirmed RB Reach 2: None
	100-567134-610692-522527-688328	Creek 688328	1, 2	S3	RB
	100-567134-610692-522527-688328-175057	Unnamed	1	NVC	None
	100-567134-610692-522527-704454	Creek 704454	1, 2, 3, 4, 5, 6	S3	Reaches 1-5: RB Reach 6: Unconfirmed RB
	100-567134-610692-522527-704454-503067	Unnamed	1	S4	Unconfirmed RB
	100-567134-610692-522527-704454-569241	Unnamed	1	S4	Unconfirmed RB
	100-567134-610692-522527-704454-569241-068254	Unnamed	1	S4	Unconfirmed RB
	100-567134-610692-522527-704454-569241-076095	Unnamed	1	S3	Unconfirmed RB
	100-567134-610692-522527-704454-686326	Unnamed	1	S4	Unconfirmed RB
	100-567134-610692-522527-758727	Unnamed	1	NVC	None
	100-567134-610692-522527-776798	Unnamed	1	S4	Unconfirmed RB
	100-567134-610692-522527-896157	Unnamed	1	S4	Unconfirmed RB

Watershed	Watershed ID	Stream Name	Reaches	Stream Classification[1]	Fish Presence[2]
	100-567134-610692-522527-899664	Unnamed	1	S4	Unconfirmed RB
Creek 661	100-567134-610692-671007-505659	Creek 505659	5, 6, 7	Reach 5: S3 Reach 6-7:S4	Reach 5: RB Reach 6-7: Unconfirmed RB
	100-567134-610692-671007-505659-146920	Creek 146920	2, 3, 4, 5	Reach2: S3 Reach 3: S4 Reaches 4-5: NCD	Reaches 2-3: Unconfirmed RB Reaches 4-5: None
	100-567134-610692-671007-505659-348488	Unnamed	1	No data	None
	100-567134-610692-671007-505659-764541	Unnamed	1	No data	None
	100-567134-610692-671007-543585	Unnamed	1, 2	NVC	None

Note: (1) Fish streams are classified S1–S4. Class S1 streams are >20 m wide; S2 streams are >5 - 20 m wide; S3 streams are 1.5 - 5 m wide; and S4 streams are <1.5 m wide. Streams without fish are classified S5 or S6. Class S5 streams are >3 m wide, and S6 streams are <3 m wide. NCD = non-classified drainage, NVC = no visible channel, No data = stream classification data not available
(2) RB = Rainbow Trout; NFC = no fish caught.



Reference
BC Government GeoBC Data Distribution
Knight Piesold 'Year 17' Drawing May 24, 2013
AMEC 2011-2012 Baseline Report Fish & Aquatic Resource

CLIENT: newgold

PROJECT: Blackwater Gold Project

Distribution of Permanently Altered or Destroyed Fish Habitat in the Davidson Creek and Creek 661 Watersheds

DATE: May, 2014	ANALYST: WR	Figure 12.2.1-49
JOB No: VE52420	QA/QC: BM	PDF FILE: 10-100-111_DistPotFishHabLoss_v7.pdf
GIS FILE: 10-100-111_DistPotFishHabLoss_v7.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

12.2.1.18.4.21.6 Personnel and Coordination

The Proponent will assemble a team comprised of qualified individuals, including a Registered Professional Biologist, who have experience in all aspects of the proposed work.

12.2.1.18.4.21.6.1 Project Management

A Registered Professional Biologist will oversee this fish salvage plan, including coordination of permits and field crews.

The Proponent will be responsible for meetings with regulatory agencies (DFO, BC MOE), First Nations (i.e., Lhoosk'uz Dene Nation (LDN) and Ulkatcho First Nation (UFN)).

12.2.1.18.4.21.6.2 Salvage Field Crew

A designated Project fisheries biologist shall coordinate all fish salvage activities with the salvage personnel. Salvage personnel will include local biologists/technicians who are familiar with the area. Most of them will have backpack electrofishing and First Aid certifications. Field crews will include at least one experienced fisheries biologist or field technician at all times. These individuals will be in the field at all times and ensure consistency and be responsible for field QA/QC. A fish salvage and safety (**Section 12.2.1.18.4.21.7.9**) briefing for all participants involved will be held prior to each activity. The briefings will outline responsibilities for each participant in the salvage.

12.2.1.18.4.21.7 Salvage Plan

The salvage plan will use non-lethal techniques that include backpack electrofishing, minnow trapping, beach and lip seining, as applicable for the habitat being salvaged. The plan will be refined and finalized, after a site reconnaissance conducted by the lead biologist and team members prior to conducting the salvage. The main fish collection method will use multiple-pass electrofishing with blocking nets in 100 m sections until no more fish are captured. Minnow traps will then be placed within each section and fished over a 24-hr period to catch any residual fish that were not collected during electrofishing. Other methods, such as beach and lip seining may also be used to best suit the channel size, substrate and specific habitat identified for salvage (**Section 12.2.1.18.4.21.7.2**). Hazards and constraints will be documented and the most suitable safety and collection equipment, along with required resources, will be endorsed by Proponent project management prior to commencement.

Based on local knowledge and information provided in the Application, it is expected that migratory fish will not be present in Davidson Creek and Creek 661 during the proposed fish salvage. Rainbow trout fry and juveniles will be the main life stage and species expected to be salvaged, although other species will be salvaged if captured. Field sampling, sample handling, and analysis will follow standard methods and quality control. The final sampling protocol may be adjusted to meet unexpected daily field conditions.

12.2.1.18.4.21.7.1 Isolation

Construction will be staged so fish salvage will also be staged. Each work area will be isolated by installing a seine stop net or an impenetrable barrier at upstream and downstream ends within a 100 m area to prevent fish escapement. The entire bankfull width will be blocked to prevent fish immigration and emigration to/from the site during the entire removal process. Block nets will remain in place to prevent fish from re-entry from downstream locations that may be outside the removal sites. Isolation of work areas, fish removal, and release of fish will be conducted or directed by a fisheries biologist who possesses the competence to ensure safe handling of all fish and other aquatic organisms, and who is also experienced with work area isolation techniques.

12.2.1.18.4.21.7.2 Equipment

The Proponent will use backpack electrofishing units, dip nets, minnow traps, beach seines, lip seines, and other standard fish sampling equipment as appropriate. Fish sampling equipment will include a dissection kit (tweezers, scalpel, scissors etc), camera, knife, small and large measuring boards, tape measure, duct tape, pliers, electronic balances, scale and fin ray envelopes, vials, pencils, sharpies, all weather notebooks, field binders, field data sheets, whirl bags, zip lock, clove oil, formalin and ethanol solutions, and fish keys. Fish Handling Equipment will include gloves, hand-held fish nets, seines, fish buckets, dip baskets, and fish transportation tanks and vehicles. Support equipment includes items such as hard-hats, boots, flashlights, portable radios, and any other equipment required for the salvage.

All Project field equipment will be maintained in good condition on a regular basis according to manufacturer's suggested maintenance schedules. All field equipment that may have been previously used in other parts of the province, or Canada, will be disinfected prior to use to prevent the spread of exotics, disease, and Didymo. All electronic equipment will be tested and calibrated prior to operation to ensure proper functioning and accurate data collection.

The subsections below outline the fish collection gear and general methodology proposed for the salvage plan.

12.2.1.18.4.21.7.2.1 Electrofishing

As discussed above, backpack electrofishing will be the main method for fish removal. Electrofishing will be conducted in an upstream direction within blocked off stream sections and cover both banks. Four consecutive passes will be conducted in each section, one hour apart, to reduce fish electrofisher avoidance/concealment behaviour. If fish are captured after the fourth pass, then additional passes will be conducted until no fish are captured. Consistent with provincial guidelines, electrofishing will only be pursued when conditions are such that water temperatures do not fall below 5°C. Electrofishing is known to be less effective and the risk of mortality is known to increase in water temperatures below 5ºC. However, despite these drawbacks at lower temperatures, electrofishing may be carried on a trial basis in conjunction with the other specified methods to achieve a more complete salvage and reduce the risk of fish mortality. If electrofishing results in unacceptable mortality or is ineffective in the trials, then it will be discontinued.

12.2.1.18.4.21.7.2.2 Minnow Traps

Gee-style minnow traps will be deployed within each delineated 100 m section after electrofishing is complete. Traps will be baited with dry cat food and set for 24-hr in appropriate habitats, where available. Minnow traps will be checked daily to retrieve and process captured fish.

12.2.1.18.4.21.7.2.3 Beach and Lip Seines

Beach and lip seines may be used during fish salvage activities where electrofishing and/or minnow traps are deemed to be ineffective based on the habitats being sampled. Lip seines may be used in conjunction with electrofishing in high velocity areas where fish capture is difficult. Beach seines may be used after electrofishing is completed to more adequately sample suitable habitats where minnow traps are deemed ineffective.

12.2.1.18.4.21.7.3 Fish Handling

The primary fish handling objective will be to collect and transport fish to release sites with minimal stress and without injury or mortality to any fish. Therefore, personnel will provide a healthy environment for the stressed fish. The following methods will be employed during fish processing:

- Netting of fish will be minimized whenever possible;
- For the period between capture and release, all captured aquatic life will be immediately put into buckets filled with clean creek water;
- Fish will not be crowded in the holding containers. Larger containers will be used as necessary, where feasible;
- All fish will be relocated to lower reaches of their natal streams (Davidson Creek or Creek 661) as soon as possible. Fish will not be held in containers for more than 2 hours under any circumstances;
- Fish will be carefully released into the release point with a short vertical drop; and
- The water temperature in the transport tank will be monitored so that the temperature will not be more than 2°C different from the creek water.

12.2.1.18.4.21.7.4 Data Collection

An on-site processing station to record fish data will be established. The priority will be to minimize handling of live fish to reduce stress. Processing of fish will be as described below:

- Fish holding tubs will be placed in a pick-up or ATV's for transport to the fish processing station;
- Fish processing will be completed as quickly and carefully as possible to minimize handling mortality;
- Fish captured will be identified to species and life history stage;

- Subsamples of captured fish will be measured for fork length to the nearest 0.1 mm and weight to the nearest 0.1 g; and
- All fish will be given a cursory external examination for signs of parasitism, injury or other abnormalities, and for previous fin clips or tags prior to release.

Further processing and data collection will be conducted for any fish mortalities as outlined in **Section 12.2.1.18.4.21.7.6**.

12.2.1.18.4.21.7.5 Fish Release Location

Fish are proposed to be relocated to readily-accessible locations within mainstem habitats of lower Davidson Creek and lower Creek 661. Fish will be prevented from re-entry into salvaged areas by maintaining isolation equipment in applicable locations.

12.2.1.18.4.21.7.6 Examination of Fish Mortalities

Fish mortalities will be measured for length and weight (as above) and examined internally to determine sex, reproductive status, and evidence of parasitism or other abnormalities. Data will include collection of age structures (otoliths and scales from trout) and stomachs preserved in formalin (for diet analysis) and liver weights and gonad weights from trout greater than 70 mm long.

12.2.1.18.4.21.7.7 Salvage Duration

Salvage will continue until fish have been removed from the mine site. Within each electrofishing section CPUE will be calculated by dividing the total number of fish captured (all species) by the total time allocated for fishing. The declining CPUE, to a target of zero catch during the removal phase, will be used to confirm removal of fish from each stream section.

12.2.1.18.4.21.7.8 Safety Equipment

Each field crew working in isolation will be equipped with a cell phone, satellite phone, a survival kit, a first aid kit, GPS, and bear spray. A regular check-in call will be required at a predetermined time. Personnel will be required to wear a life jacket at all times while working near water, when practical. A safety kit, throw-bags, as well as a fire extinguisher will be on board any boats, if used for the project. Survival suits will be used as necessary.

12.2.1.18.4.21.7.9 Safety Plan

All personnel will be provided with a Project site orientation and will follow the Project safety procedures and policies. The project safety plan will be reviewed before beginning any field activities and crews will provide a written signature acknowledging that they have read the plan. Copies of the safety plan will be kept in all vehicles and the safety plan will contain:

- Project health and safety policies and procedures;

- Project location map;
- Best management practices for reducing risks associated with local hazards, including weather, wildlife, and working in and near water;
- Daily tailgate meeting and check-in requirements; and
- Local emergency services and contact information.

Standardized tailgate meeting and check-in forms will be used as part of the safety plan and will be kept on file.

12.2.1.18.4.21.8 Adaptation to Unforeseen Problems

The Project will ensure the highest level of safety when conducting fish salvage activities. Frequent communication will be maintained between field crews and the field lead. Personnel will also be aware of the effects of inclement weather and storm events. Local experience will enable personnel safely and efficiently to the nearest muster point in the event of an emergency.

12.2.1.18.4.21.9 Salvage Report

A report on the fish salvage plan will be prepared and will include:

- Maps of the work area;
- A description of the methods used;
- Number of crews and personnel involved in the salvage effort;
- Sites surveyed (total number and locations);
- Description of each site including:
  - Time surveyed;
  - Water temperature;
  - Number of fish (live, dead, salvaged);
  - Fish species and measurements;
- Any pertinent observations;
- CPUE calculations for each site/segment sampled;
- A data summary in Excel format shown in appendices; and
- Photographs and maps embedded in the document, where applicable.

The BC MOE also requires reporting for all fish collection permits that are issued. DFO may also require additional reporting as a permit condition of the authorization for Blackwater offsetting plans.

TABLE OF CONTENTS

List of Tables

12.2.2 Closure Management Plan

This section presents the Closure Management Plan (CLMP), a key component of the Environmental Management System (EMS) through which the Proponent will ensure protection of the environment and application of regulatory compliance for the duration of the Closure Phase. The Construction and Operations Management Plan and Fisheries Mitigation and Offsetting Plan (FMOP) are not referenced in the CLMP because these plans will be implemented before the CLMP. At the end of the operations phase, the CLMP will supersede the CMP.

12.2.2.1 Introduction

Environmental Management Plans (EMPs) are a core component of the CLMP. EMPs provide documentation for verifying Project potential effects identified in the EA and for managing, monitoring, and auditing Project effects mitigation. The EMPs will be based on the principle of adaptive management, will implement Best Management Practices (BMPs), and will include appropriate environmental management practices described in the Environmental Code of Practice for Metal Mines (EC, 2009) document. Activities or mitigation proposed for the closure and post-closure phases, including the Landscape Design and Restoration Plan, Soil Salvage and Site Reclamation Plan, and Facilities Decommissioning Plan, are presented in the Reclamation and Closure Plan (RCP) (**Section 2.6**).

This ISO 14001 compliant document will be used to organize and guide all activities during the closure phase of the Project to ensure orderly, safe, compliant, and environmentally and socially responsible operations at the mine site and to ensure the execution of environmental compliance requirements associated with Project work. The processes and procedures within the CLMP, while based on regulatory and the Proponent's requirements and standards, have also been developed to leverage lessons learned from previous and currently active mining activities as well as improvements in overall environmental management processes.

12.2.2.1.1 Planning

Planning for the CLMP started with the development of the Environmental Assessment (EA), which identified existing (baseline) conditions, assessed potential effects of the Project, and developed conceptual closure mitigation strategies and the measures through which they will be implemented. Conceptual strategies and measures will continue to be elaborated upon and executed throughout the closure phases. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the CLMP at least twice in a calendar year. CLMP updates will incorporate relevant feedback from the public, obtained during the public consultation program.

12.2.2.1.2 Scope and Objectives

The scope of the CLMP encompasses all Project closure activities, including the cessation of mining, closure of mine site facilities, closure of off-site infrastructure projects, and closure of the mine wastewater management system. More detailed information can be found in the RCP (**Section 2.6**).

The CLMP will be reviewed and updated as necessary prior to the closure phase. This is necessary because, although the scope of future closure activities is defined, the execution schedule for each activity is not. Review and update will also include Project-wide demobilization arrangements as required.

The objectives of the CLMP are to:

- Describe the processes that the Proponent will use to administer its environmental responsibilities in a manner that complies with regulatory requirements, corporate commitments and policies, contractual obligations, and terms and conditions attached to permits, approvals, authorizations, and licences;
- Outline the processes that the Proponent will implement to monitor and verify environmental compliance and performance;
- Set the standard by which further, more detailed, activity-specific plans and procedures will be reviewed and endorsed; and
- Define the processes that the Proponent will implement to track and report environmental data.

12.2.2.1.3 Related Documents

The CLMP describes how the Proponent will comply with environmental requirements associated with the Project during the closure phase. Many of the requirements and elements in the CLMP are referenced from the CMP and RCP. In particular, elements of several of the EMPs for construction and operation are relevant to closure (e.g., solid and hazardous waste management) but will require modification specific to closure conditions prior to the initiation of closure activities.

12.2.2.1.4 Management Review

Management review procedures are discussed in the CMP and will continue through the closure phase.

12.2.2.1.5 Continuous Improvement

Continuous improvement developed for construction will continue to be relevant during closure phase. For further discussion, refer to **Section 12.2.1.8**.

12.2.2.1.6 Legislative and Policy

The legislative and policy context for the Project will not change from the construction phase to the closure phase although any new regulatory requirements developed during the operations phase will be incorporated into the RCP and CLMP. Refer to **Section 12.2.1.10** for further discussion and a list of relevant legislation and regulations.

12.2.2.1.7 Master Commitments Table

As brought forth in the CMP, the Master Commitment Table will continue to be used during the closure phase. The table will be reviewed monthly and used, as required, to update status, incorporate new conditions, and edit or remove conditions that have changed and no longer apply.

A template for the MCT is provided below in **Table 12.2.2-1**.

Table 12.2.2-1: Master Commitments Table Template

Administering Agency	Legislation	Permit Type and No.	Commitment	Status	Responsibility

12.2.2.1.8 Management of Change

Management of change procedures established during construction and operations will be continued in the closure phase. Further discussion can be found in the CMP.

12.2.2.1.9 Document Control

Document control procedures designed and implemented in the construction and operations phase will continue (adapted as required) during the closure phase.

12.2.2.2 Closure Schedule and Sequence

This section outlines the schedule and sequence of the closure period. The closure phase of the Project is estimated to last about 18 years from the end of mill operations to discharge to the Tailings Storage Facility (TSF). The post-closure phase will continue indefinitely from the start of TSF discharge. For the purposes of the discussion herein, closure refers to 18 years until TSF discharge plus another 15 years of monitoring in post-closure (to Year 50).

Below is a tentative schedule after cessation of mill operations during Year 17:

- The pit and mine buildings will be decommissioned (Year 17 and Year 18);
- TSF site D, waste rock dumps, Esker borrow area, and airstrip will be reclaimed (Year 17 and Year 18);
- Post-closure phase, specifically overflow of the TSF once pit lake is full (Year 35); and
- Water, soil, vegetation, and wildlife parameters will be monitored (Year 35 to Year 50).

12.2.2.2.1 Detailed Description of Closure Activities and Sequence

A description of the closure phase along with mitigation activities during this phase can be found in the Mine Water Management Plan (MWAMP) in **Section 12.2.1.18.4.18**, Water Quality and Liquid Discharges Management Plan (WQLDMP) in **Section 12.2.1.18.4.10**, Cyanide Management Plan (CYMP) in **Section 12.2.1.18.4.19**, Invasive Species Management Plan (ISMP) in **Section 12.2.1.18.4.5**, Landscape, Soils, and Vegetation Management and Restoration Plan (LSVMRP) in **Section 12.2.1.18.4.4**), and Sediment and Erosion Control Plan (SECP) in **Section 12.2.1.18.4.1**. The Aquatic Resources Management Plan (ARMP) in **Section 12.2.1.18.4.2**), focuses on mitigation specific to fish and fish habitat during all phases of the Project.

12.2.2.2.2 Environmental Management Team

Following the first two to three years of the closure phase once site infrastructure has been removed and site reclaimed, the environmental management team will be reduced to a superintendent and a limited number of technical staff (number dependent on the amount of monitoring required, which will be determined in the final years of mining). The Environment and Sustainable Resources Manager will be designated the mine manager under the *Mines Act* and will report to corporate management.

12.2.2.2.3 Operational SOPs

A number of standard operating procedures (SOPs) will be required for the closure phase to cover all closure activities. These SOPs will either be adopted in their entirety from construction management and operation SOPs, adapted from construction and operation SOPs, or developed specifically for the closure activities they describe and govern. Reviews of SOPs during construction, operations and lessons learned will be important adaptive management changes (where required) to construction and operation SOPs and identify the need for additional closure SOPs. Since operation activities will continue during progressive reclamation, relevant operation SOPs will continue to guide these operation activities linked to the RCP.

12.2.2.3 Environmental Protection

The specifics of environmental protection at the Project will be detailed in **Section 12.2.1.18** under the individual EMPs. EMPs applicable to construction and operation and detailed in **Section 12.2.1.18** will, with some modification, be equally applicable through closure. Environmental Management Plans are not repeated in detail in this section. Further discussion can be found in **Section 12.2.1.18**.

12.2.2.3.1 Valued Components

Valued Components (VCs) relevant to the Project were developed and justified as part of the EA. Further discussion can be found in **Section 12.2.1.18.1**.

12.2.2.3.2 Environmental Risk Management

The Proponent acknowledges that management of risks and preparation for unexpected events (accidents and malfunctions) are integral to the effective governance of the organization. The Proponent's Corporate Health, Safety, Environment and Corporate Social Responsibility Committee is responsible for ensuring that principal areas of health, safety, environmental, and community risk and impacts are identified and that sufficient resources are allocated to ensure that environmental and social impacts are moderated. Site environmental staff will maintain a risk registry during the operations phase and it will be updated and continued for closure.

In addition to the EMPs, **Section 10**, Accidents and Malfunctions, forms part of the EMS. Accidents and Malfunctions addresses specific potential events that could have a significant environmental effect and that have a reasonable probability of occurring during the life of the Project.

12.2.2.4 Compliance Monitoring and Verification

Environmental compliance and monitoring procedures established for the construction period will continue to be employed, as appropriate, through the closure period. Compliance monitoring is discussed further in **Section 13**.

12.2.2.4.1 Site Environmental Reporting

Project monitoring and reporting will be based on the RCP, **Section 2.6.9** Standards and Monitoring.

12.2.2.4.2 Site Environmental Interfaces

Most of the activities discussed in this section will occur only in the early years of the closure phase when decommissioning and site reclamation is very active. Some of the decommissioning work will be conducted by a reduced mine operations workforce but specialized contractors (e.g. electrical and mechanical) will be employed as required.

Communication links at site are particularly critical to ensure effective CLMP implementation. The interface between the Environmental and Sustainable Resources Manager and the Project management established during the operations phase is of primary importance. Through formal and informal meetings and updates, the Environmental and Sustainable Resources Manager, supported by staff, will apprise the Mine Manager, and site managers as appropriate, of any regulatory or environmental issues or concerns associated with work underway or planned. Mine management will then ensure that the mine personnel are taking appropriate steps to comply with the approvals and CLMP. Conversely, through discussions with the site managers, the Environmental and Sustainable Resources Manager will be informed of planned work and any practical operations issues that may impact environmental performance.

Site kick-off meetings and readiness reviews, including pre-job risk assessments, will be held prior to the initiation of work. The meetings will include a review of regulatory and environmental requirements and commitments. The Environmental and Sustainable Resources Manager, Environmental Monitor(s), applicable mine personnel, and mine management representatives will attend these sessions as appropriate. Any issues or discrepancies between the planned work and the environmental requirements will be discussed and resolved prior to the start of work.

Environmental Monitor(s) may be asked to provide environmental input to the site managers and to help them develop and implement work processes where environmental issues or concerns associated with a planned activity are evaluated and where necessary mitigation measures are developed and approved. This may take the form of attendance at a pre-activity Job Safety Assessment (JSA) or other process prearranged by mine management. Documentation of any JSA, or equivalent process, will be made available to affected employees.

Other communications will include the following:

- The Environmental and Sustainable Resources Manager and Environmental Monitor will participate in site operations meetings and report on incidents and other matters of significance from the previous week;
- The Environmental and Sustainable Resources Manager will interact on a daily basis with site managers and contractor senior staff to ensure that environmental and regulatory issues are understood and effective systems and approaches are in place to address them; and
- The Environmental and Sustainable Resources Manager will also be consulted frequently when mine staff or contractors encounter specific environmental issues during planning or field operations.

As mentioned previously, once the site is largely rehabilitated, site staff will be reduced to a skeleton crew responsible for monitoring and maintenance; all staff will report to the Environmental and Sustainable Resources Manager who will be responsible to corporate senior management. The Environmental and Sustainable Resources Manager will be designated as the Mine Manager under the *Mines Act* once site decommissioning and reclamation is complete.

12.2.2.4.2.1 Specialty Monitoring

The Proponent will retain specialist consultants to provide supportive environmental services (e.g., monitoring or conducting investigations), where necessary to supplement the disciplinary expertise or experience of the Project environmental personnel. Specialist consultants may provide services in the following areas: geotechnical, fisheries and aquatics, water quality, wildlife, vegetation, archaeology, cultural heritage, and acid rock drainage/metal leaching (ARD/ML). The Proponent will incorporate results of specialist consultants' work into its environmental planning and report results to regulatory agencies as appropriate. The need for specialists on site during the closure phase will focus on reclamation and revegetation, as well as on independent geotechnical evaluation of dams and waste dumps.

12.2.2.4.2.2 Inspection and Verification Tools

The Proponent's environmental personnel will produce field inspection forms and checklists to guide environmental field monitoring activities. These documents will be populated according to the conditions of the required activity and will continue to be generated to facilitate inspections of high priority environmental activities.

12.2.2.4.2.3 Potential or Actual Non-compliance Findings

If a potential or actual non-compliance event is discovered during monitoring or inspection, the Environmental and Sustainable Resources Manager will address the issue with the Mine Manager and managers and contractor senior staff, as appropriate, and corrective action will be determined. All items will be recorded in daily site environmental logs and used as a lagging indicator of environmental performance.

The Environmental and Sustainable Resources Manager will also ensure that the non-compliance is reported in accordance with Project procedures and that appropriate and timely investigation and follow-up activities are executed. The Environmental and Sustainable Resources Manager will also participate in spill incident investigations and in the development, execution, and close-out of follow-up actions.

12.2.2.4.2.4 Spill Reporting

All spill and environmental incidents will be communicated by the affected mine employees or contractors using the spill notification procedure described in **Section 12.2.1.18.4.13**, Emergency and Spill Preparedness and Response Plan (ESPRP).

12.2.2.4.3 Internal/External Audits

CLMP performance will be confirmed through conducting periodic audits. Regular internal audits will be performed annually in the first few years of the closure phase and then less frequently when site activities are reduced to monitoring and maintenance. In addition to conformance, internal audits also function to assess the effectiveness of the CLMP and to identify opportunities for improvements.

External audits will be conducted by third parties at the request of the Environmental and Sustainable Resources Manager or New Gold Corporate. The purpose of these audits is to give senior management an independent assessment of the effectiveness of the internal system and a report card on compliance with legal requirements, corporate policies, and operating procedures and controls at the Project.

Government regulators or other third parties with regulatory responsibilities for Project closure may, at their discretion, also conduct external audits.

12.2.2.4.4 Key Performance Indicators

Project key performance indicators (KPIs) will be finalized prior to the start of closure. However, the Proponent will commit environmental personnel to track and analyze leading and lagging KPIs throughout the duration of the Project as a means of measuring and communicating environmental performance to internal and external stakeholders. The Proponent's environmental personnel will determine appropriate KPIs for each phase of mine development. Examples of KPIs that the Proponent may use during the first 2 to 3 years of closure are provided below:

- Leading KPIs:
  - Number of JSAs per 50,000 personnel hours;
  - Environmental field reporting/near miss cards;
  - Work plans reviewed and comments provided to mine staff and contractors; and
  - Number of completed daily environmental monitoring forms/checklists received;
- Lagging KPIs:
  - Regulatory excursions;
  - Spills (L) per 50,000 personnel hours;
  - Number of environmental incidents per 50,000 personnel hours; and
  - Monitoring results compared to permit conditions.

12.2.2.5 Environmental Data Collection and Reporting

Environmental data collection and reporting will continue to follow procedures established for the operations phase, as appropriate, through the closure phase. This will include environmental incident reporting, communications, data management, and Quality Assurance/Quality Control (QA/QC).

12.2.2.6 Training and Awareness

Procedures during the closure phase will follow those established for construction.

12.2.2.6.1 Environmental Management Plans

As mentioned previously, EMPs provide documentation for verifying Project effects identified in the EA and for managing, monitoring, and auditing Project effects mitigation. A variety of mitigation measures will be implemented during the closure phase to ensure effective environmental management of all Project components. Mitigation consolidates proven guidelines (BMPs, SOPs, etc.) with Project design elements and with mitigation strategies identified in the effects assessment sections of the Application.

EMPs are provided for operational components (e.g., transportation and access, emergency and spill preparedness and response), for social procedures (e.g., occupational health and safety, recruitment, training and employment), and for VCs (e.g., wildlife, wetlands). EMPs may be interlinked due to shared management concern (e.g., erosion and sediment control has its own EMP but is also described in other EMPs). Linkage, if applicable, is outlined in individual EMPs.

EMP mitigation measures will be incorporated as applicable into work planning and execution activities. Required environmental contents of closure work plans include:

- A list of the environmental permits, approvals, licences, and authorizations required to execute and support the work;
- A general summary of the terms and conditions attached to the above;
- References to applicable sections of supporting plans; and
- Specific elaboration, if required by permit conditions, on general mitigation principles referenced in the EMP.

These sections will continue to be developed and used for the following purposes:

- Identify safety, health, and environment concerns and develop appropriate protection measures for such concerns;
- List all required permits, approval, and authorization terms and conditions;
- Provide concise and clear written instructions for procedures that protect the environment; and
- Provide a reference for personnel when planning and/or conducting specific activities.

Project EMPs:

- Construction & Operations Environmental Management Plan;
  - SECP;
  - ARMP;
  - Wetlands Management Plan (WMP) (**Section 12.2.1.18.4.3**);
  - LSVMRP;
  - ISMP;
  - Wildlife Management Plan (WLMP) (**Section 12.2.1.18.4.6**);
  - Archaeology and Heritage Resources Management Plan (AHRMP) (**Section 12.2.1.18.4.7**);
  - Visual Resources Management Plan (VRMP) (**Section 12.2.1.18.4.8**);
  - Air Quality and Emissions Management Plan (AQEMP) (**Section 12.2.1.18.4.9**);
  - WQLDMP;
  - Industrial and Domestic Waste Management Plan (IDWMP) (**Section 12.2.1.18.4.11**);
  - Hazardous Materials Management Plan (HMMP) (**Section 12.2.1.18.4.12**);

- Emergency and Spill Preparedness and Response Plan (ESPRP) (**Section 12.2.1.18.4.13**);
- Transportation and Access Management Plan (TAMP) (**Section 12.2.1.18.4.14**);
- Occupational Health and Safety Management Plan (OHSMP) (**Section 12.2.1.18.4.15**);
- Recruitment, Training and Employment Plan (RTEMP) (**Section 12.2.1.18.4.16**);
- Mine Waste Management Plan (MWMP) (**Section 12.2.1.18.4.17**);
- Wildfire Management Plan (**Section 12.2.1.18.4.20**);
- MWAMP; and
- CYMP.

The above EMP's will be reviewed and modified during the latter years of mine operations with elements applicable to the closure phase. Additional EMPs will be developed as required. EMPs for closure will be reviewed with Agencies, First Nations and community stakeholders prior to finalizing.