BW GOLD LTD
a subsidiary company of Artemis Gold Inc

Blackwater Gold Project

Vegetation Management Plan

March 2022

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ACRONYMS AND ABBREVIATIONS

Aboriginal Groups or Indigenous nations	Ulkatcho First Nation, Lhoosk'uz Dené Nation, Nadleh Whut'en First Nation, Stellat'en First Nation, Saik'uz First Nation, and Nazko First Nation (as defined in the Project's Environmental Assessment Certificate #M19-01)
AQDMP	Air Quality and Fugitive Dust Management Plan
AAR	Annual Reclamation Report
BC	British Columbia
BGC	Biogeoclimatic
BMP	Best management practice
BW Gold	BW Gold LTD.
CEA Agency	Canadian Environmental Assessment Agency
CDC	Conservation Data Centre
CEO	Chief Executive Officer
CEMP	Construction Environmental Management Plan
CFMP	Country Foods Monitoring Plan
COO	Chief Operating Officer
DFO	Department of Fisheries and Oceans
DS	Decision Statement
EAC	Environmental Assessment Certificate
EC	Environment Canada
EM	Environmental Manager
EMLI	Ministry of Energy, Mines and Low Innovation Carbon
EMPR	Ministry of Energy, Mines and Petroleum Resources
EMS	Environmental Management System
EPCM	Engineering, Procurement and Construction Management
FPB	Forest Practices Board
FLNRO	Ministry of Forests, Lands, and Natural Resource Operations
GM	General Manager
IPMP	Invasive Plant Management Plan
Joint MA/EMA Application or Application	Blackwater Gold Project Joint *Mines Act/Environmental Management Act* Permits Application
m	metre(s)

MPB	Mountain pine beetle
MOE	Ministry of Environment
MOF	Ministry of Forests
MWLAP	Ministry of Water, Land and Air Protection
New Gold	New Gold Inc.
Project	Blackwater Gold Project
QA/QC	Quality control/Quality Assurance
RCP	Reclamation and Closure Plan
RMA	Riparian Management Area
RMZ	Riparian Management Zone
RRZ	Riparian Reserve Zone
SEPSCP	Surface Erosion Prevention and Sediment Control Plan
SMP	Soil Management Plan
SOP	Standard operating procedure
VMP	Vegetation Management Plan
VP	Vice President
WMMP	Wildlife Mitigation and Monitoring Plan

1. PROJECT OVERVIEW

The Blackwater Gold Project (the Project) is a gold and silver open pit mine located in central British Columbia (BC), approximately 112 kilometres (km) southwest of Vanderhoof, 160 km southwest of Prince George, and 446 km northeast of Vancouver.

The Project is presently accessed via the Kluskus Forest Service Road (FSR), the Kluskus-Ootsa FSR and an exploration access road, which connects to the Kluskus-Ootsa FSR at km 142. The Kluskus FSR joins Highway 16 approximately 10 km west of Vanderhoof. A new, approximately 13.8 km road (Mine Access Road) will be built to replace the existing exploration access road, which will be decommissioned. The new planned access is at km 124.5. Driving time from Vanderhoof to the mine site is about 2.5 hours.

Major mine components include a tailings storage facility (TSF), ore processing facilities, waste rock, overburden and topsoil stockpiles, borrow areas and quarries, water management infrastructure, water treatment plants, accommodation camps and ancillary facilities. The gold and silver will be recovered into a gold-silver doré product and shipped by air and/or transported by road. Electrical power will be supplied by a new approximately 135 km, 230 kilovolt (kV) overland transmission line that will connect to the BC Hydro grid at the Glenannan substation located near the Endako mine, 65 km west of Vanderhoof.

The Blackwater mine site is located within the traditional territories of Lhoosk'uz Dené Nation (LDN), Ulkatcho First Nation (UFN), Skin Tyee Nation and Tsilhqot'in Nation. The Kluskus and Kluskus-Ootsa FSRs and Project transmission line cross the traditional territories of Nadleh Whut'en First Nation (NWFN), Saik'uz First Nation (SFN), and Stellat'en First Nation (StFN; collectively, the Carrier Sekani First Nations) as well as the traditional territories of the Nazko First Nation (NFN), Nee-Tahi-Buhn Band, Cheslatta Carrier Nation and Yekooche First Nation (BC EAO 2019a, 2019b).

Project construction is anticipated to take two years. Mine development will be phased with an initial milling capacity of 15,000 tonnes per day (t/d) or 5.5 million tonnes per annum (Mtpa) for the first five years of operation. After the first five years, the milling capacity will increase to 33,000 t/d (or 12 Mtpa) for the next five-years, and to 55,000 t/d (20 Mtpa) in Year 11 until the end of the 23-year mine life. The Closure phase is 24 to approximately 45 years, ending when the Open Pit has filled and the TSF is allowed to passively discharge to Davidson Creek, and the Post-closure phase is 46+ years.

New Gold Inc. (New Gold) received Environmental Assessment Certificate (EAC) #M19-01 on June 21, 2019 under the 2002 *Environmental Assessment Act* (BC EAO 2019c) and a Decision Statement (DS) on April 15, 2019 under the *Canadian Environmental Assessment Act, 2012* (CEA Agency 2019). In August 2020, Artemis Gold Inc. (Artemis) acquired the mineral tenures, assets and rights in the Blackwater Project that were previously held by New Gold Inc. On August 7, 2020, the Certificate was transferred to BW Gold LTD. (BW Gold), a wholly-owned subsidiary of Artemis, under the 2018 *Environmental Assessment Act*. The Impact Assessment Agency of Canada notified BW Gold on September 25, 2020 to verify that written notice had been provided within 30 days of the change of proponent as required in Condition 2.16 of the DS, and that a process had been initiated to amend the DS.

2. PURPOSE AND OBJECTIVES

The purpose of the Vegetation Management Plan (VMP) is to minimize impacts on vegetation and ecosystems by limiting disturbance to permitted areas during construction and operations. The VMP is also intended to mitigate impacts to streams, wetlands and fish and wildlife.

The objectives of the VMP are to:

- Minimize impacts on native vegetation, sensitive areas (riparian, old growth forests), and plant species and ecosystems at risk; and
- Ensure the successful revegetation of disturbed areas to reduce soil erosion and the establishment of invasive plants.

The VMP addresses the requirements in Section 9.8 (Vegetation Management Plan) of the Joint Application Information Requirements for *Mines Act* and *Environmental Management Act* Permits (EMPR & ENV 2019).

Prior to commencement of Project construction, standard operating procedures will be developed to provide direction for BW Gold employees and contractors. The SOPs will be developed with input from Aboriginal Groups, EPCM and other contractors. The SOPs will be available upon request.

2.1 Indigenous and Stakeholder Engagement

The VMP has been developed in consultation with Aboriginal Groups. The draft plan was provided to Aboriginal Groups for review and comment, and revised to address the comments. Aboriginal Groups and relevant government agencies will have an opportunity to review and comment on proposed updates to the VMP during construction, operations, closure and post-closure.

2.2 Related Documents

The VMP is linked to the following documents: Reclamation and Closure Plan (RCP: Chapter 4); Aquatic Effects Monitoring Program (AEMP; Appendix 7-A); Surface Erosion Prevention and Sediment Control Plan (SEPSCP; Appendix 9-A); Soil Management Plan (SMP; Appendix 9-B); Invasive Plant Management Plan (IPMP; Appendix 9-L); and Air Quality and Fugitive Dust Management Plan (AQDMP; Appendix 9-O).

3. ROLES AND RESPONSIBILITIES

BW Gold has the obligation of ensuring that all commitments are met and that all relevant obligations are made known to mine personnel and site contractors during all phases of the mine life. A clear understanding of the roles, responsibilities, and level of authority that employees and contractors have when working at the mine site is essential to meet Environmental Management System (EMS) objectives.

Table 3-1 provides an overview of general environmental management responsibilities during all phases of the mine life for key positions that will be involved in environmental management. Other positions not specifically listed in Table 3-1 but who will provide supporting roles include independent environmental monitors, an Engineer of Record (EOR) for each tailings storage facility and dam, an Independent Tailings Review Board (ITRB), TSF qualified person, geochemistry qualified professional, and other qualified persons and qualified professionals.

Table 3-1: Blackwater Roles and Responsibilities

Role	Responsibility
Chief Executive Officer (CEO)	The CEO is responsible for overall Project governance. Reports to the Board.
Chief Operating Officer (COO)	The COO is responsible for engineering and Project development and coordinates with the Mine Manager to ensure overall Project objectives are being managed. Reports to CEO.
Vice President (VP) Environment & Social Responsibility	The VP Environment & Social Responsibility is responsible for championing the Environmental Policy Statement and EMS, establishing environmental performance targets and overseeing permitting. Reports to COO.
General Manager (GM) Development	The GM is responsible for managing project permitting, the Project's administration services and external entities, and delivering systems and programs that ensure Artemis's values are embraced and supported: Putting People First, Outstanding Corporate Citizenship, High Performance Culture, Rigorous Project Management and Financial Discipline. Reports to COO.
Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, EMS implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate their responsibilities to qualified personnel. Reports to GM.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. Reports to GM.
Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management (EPCM) contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of the EMS relevant to their areas. Report to Mine Manager.
Indigenous Relations Manager	Indigenous Relations Manager is responsible for Indigenous engagement throughout the life of mine. Also responsible for day-to-day management and communications with Indigenous groups. Reports to VP, Environment & Social Responsibility.

Role	Responsibility
Community Relations Advisor	Community Relations Advisor is responsible for managing the Community Liaison Committee and Community Feedback Mechanism. Reports to Indigenous Relations Manager.
Environmental Monitors	Environmental Monitors (includes Environmental Specialists and Technicians) are responsible for tracking and reporting on environmental permit obligations through field-based monitoring programs. Report to EM.
Aboriginal Monitors	Aboriginal Monitors are required under EAC condition 17 and will be responsible for monitoring for potential effects from the Project on the Indigenous interests. Indigenous Monitors will be involved in the adaptive management and follow-up monitoring programs. Report to EM.
Employees and Contractors	Employees are responsible for being aware of permit requirements specific to their roles and responsibilities. Report to Departmental Managers.
Qualified Professionals and Qualified Persons	Qualified professionals and qualified persons will be retained to review objectives and conduct various aspects of environmental and social monitoring as specified in EMPs and social MPs.

BW Gold will employ a qualified person as an EM who will ensure that the EMS requirements are established, implemented and maintained, and that environmental performance is reported to management for review and action. The EM is responsible for retaining the services of qualified persons or qualified professionals with specific scientific or engineering expertise to provide direction and management advice in their areas of specialization. The EM will be supported by a staff of Environmental Monitors that will include Environmental Specialists and Technicians and by a consulting team of subject matter experts in the fields of environmental science and engineering.

During the Construction phase, BW Gold will be entering into multiple EPC contracts, likely for the Transmission Line, Process Plant, Tailings and Reclaim System, and 25kV Power Distribution. Each engineer/contractor will have their own CM and there will be a BW Gold responsible PM and/or Superintendent who ultimately reports to the GM Development. Some of the scope, such as the TSF and Water Management Structures will be self-performed by BW Gold, likely using hired equipment. Other smaller scope packages may be in the form of EPCM contracts. The EPCM contractors will report to the CMs who will ultimately be responsible for ensuring that impacts are minimized, and environmental obligations are met during the Construction phase. For non-EPCM contractors, who will perform some of the minor works on site, the same reporting structure, requirements, and responsibilities will be established as outlined above. BW Gold will maintain overall responsibility for management of the construction and operation of the mine site and will therefore be responsible for establishing employment and contract agreements, communicating environmental requirements, and conducting periodic reviews of performance against stated requirements.

The CM is accountable for ensuring that environmental and regulatory commitments/obligations are being met during the construction phase. The EM will be responsible for ensuring that construction activities are proceeding in accordance with the objectives of the EMS and associated MPs. The EM or designate will be responsible for reporting non-compliance to the CM and EPCM contractor, other contractors, and regulatory agencies, where required. The EM or designate will have the authority to stop any construction activity that is deemed to pose a risk to the environment; work will only proceed when the identified risk and concern have been addressed and rectified.

Environmental management during operation of the Project will be integrated under the direction of the EM, who will liaise closely with departmental managers and will report directly to the Mine Manager. The EM will be supported by the VP of Environment and Social Responsibility in order to provide an

effective and integrated approach to environmental management and ensure adherence to corporate environmental standards. The EM will be accountable for implementing the approved MPs and reviewing them periodically for effectiveness. Departmental area managers (e.g., mining, milling, and plant/site services) will be directly responsible for implementation of the EMS and EMPs relevant to their areas. All employees and contractors are responsible for daily implementation of the practices and policies contained in the EMS. During Closure and Post-closure staffing levels will be reduced to align with the level of activity associated with these phases. Prior to initiating closure activities, BW Gold will revisit environmental and health and safety roles and responsibilities to ensure the site is adequately resourced to meet permit monitoring and reporting requirements. The Mine Manager will have overall responsibility for Closure and Post-closure activities at the mine site.

Pursuant to Condition 19 of the EAC, BW Gold has established an Environmental Monitoring Committee to facilitate information sharing and provide advice on the development and operation of the Project, and the implementation of EAC conditions, in a coordinated and collaborative manner. Committee members include representatives of the Environmental Assessment Office (EAO), UFN, LDN, NWFN, StFN, SFN, NFN, Ministry of Energy, Mines and Low Carbon Innovation (EMLI), Ministry of Environment and Climate Change Strategy, and Ministry of Forests, Lands, Natural Resource Operations and Rural Development.

Pursuant to Condition 17 of the EAC, Aboriginal Group Monitor and Monitoring Plan, BW Gold will retain or provide funding to retain a monitor for each Aboriginal Group prior to commencing construction and through all phases of the mine life. The general scope of the monitor’s activities will be related to monitoring for potential effects from the Project on the Aboriginal Group’s Aboriginal interests.

4. COMPLIANCE OBLIGATIONS, GUIDELINES AND BEST MANAGEMENT PRACTICES

4.1 Legislation and Regulations

Federal legislation applicable to vegetation management includes:

- *Canadian Environmental Protection Act, 1999*;
- *Fisheries Act;*
- *Migratory Birds Convention Act,1994;*
- *Impact Assessment Act;*
- *Species at Risk Act*; and
- *United Nations Declaration on the Rights of Indigenous Peoples Act*.

Provincial legislation applicable to vegetation management includes:

- *Declaration on the Rights of Indigenous Peoples Act;*
- *Environmental Assessment Act;*
- *Forest and Range Practices Act;*
- *Integrates Pest Management Act;*
  - *Integrated Pest Management Regulation;*
- *Mines Act;*
  - Health, Safety and Reclamation Code for Mines in BC (Code; EMLI 2021a) – Part 10, section 10.7.7 (Re-vegetation);
- *Riparian Areas Protection Act*;
  - *Riparian Areas Protection Regulation*;
- *Weed Control Act*;
- *Wildlife Act*; and
- *Wildfire Act*.

4.2 Environmental Assessment Certificate and Decision Statement Conditions

There are no specific conditions in the EAC relating to vegetation management.

However, vegetation management is discussed in Condition 13 which requires the development of a Construction Environmental Management Plan (CEMP; Appendix 9-C of the Application). The CEMP includes measures to mitigate potential impacts to vegetation, and to describe how vegetation management will protect the environment, including water, soil, vegetation communities, fish, and wildlife. The VMP references EAC Condition 23 (Wildlife Management and Monitoring Plan [WMMP] in Appendix 9-H), and EAC Condition 41 (Country Foods Monitoring Plan [CFMP]).

Condition 6.11 of the DS requires *"…a follow-up program to verify the accuracy of the environmental assessment as it pertains to adverse environmental effects of the Designated Project on the health of Indigenous Peoples caused by changes in concentrations of contaminants of potential concern in water, soil, vegetation and wildlife, including fish, and determine the effectiveness of mitigation measures."*

Condition 8.20 of the DS requires a Whitebark Management Plan to mitigate Project effects on whitebark pine (*Pinus albicaulis*) and its critical habitat. Whitebark pine is a listed species under the *Species at Risk Act* (2002a) and blue-listed by the BC government (BC CDC 2021). There is a standalone Whitebark Management Plan and measures to mitigate impacts whitebark pine are considered in this plan.

4.3 Existing Permits

BW Gold received *Mines Act* Permit M-246 on June 22, 2021, authorizing early construction works (Early Works) for the Project. Condition 7 (Vegetation Management) in Part C (Protection of Land and Watercourses) of the permit includes the following requirements for vegetation management:

(a) The Permittee must limit disturbance to vegetation to those areas approved by this permit.

(b) The Permittee must manage and control weeds that establish on the site and must ensure that weeds do not migrate from the site to adjacent areas. The Permittee must consider using non-toxic means for weed control. The Permittee must ensure that all seed used on-site is certified weed free.

(c) The Permittee must avoid burning and/or disposal of woody debris suitable for use in reclamation.

The requirements in the VMP (and any conditions in the *Mines Act* permit for full mine construction) will supersede requirements in Permit M-246 relating to vegetation management.

4.4 Guidelines and Best Management Practices

Guidelines and best management practices that have informed the VMP include:

- Federal Policy on Wetland Conservation (EC 1991);
- Riparian Management Area Guidebook (BC MOF 1995);
- Aggregate Operators Best Management Practices Handbook for British Columbia Volume II (BC MEM 2002);
- Standards & Best Practices for Instream Works (BC MWLAP 2004);
- Best Management Practices for Tree Topping, Limbing and Removal in Riparian Areas (BC MOE 2009);
- Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in BC (Cox and Cullington 2009);
- Soil Conservation Planning and Practices in the Quesnel and Vanderhoof Forest Districts (BC FPB 2010);
- BCTS Windthrow Manual: A Compendium of Information and Tools for Understanding, Predicting and Managing Windthrow on the BC Coast (Zielke et al. 2010);
- Fish-stream Crossing Guidebook, Revised Edition (BC MFLNRO, BC MOE, and DFO 2012);
- Policy for Mitigating Impacts on Environmental Values (Environmental Mitigation Policy; BC MOE 2014a);
- Develop with Care. Environmental Guidelines for Urban and Rural Development in British Columbia (BC MOE 2014b);
- Integrated Vegetation Management Plan for BC Hydro Transmission and Distribution Power Line Corridors (BC Hydro 2016);
- Measures to Protect Fish and Fish Habitat (DFO 2019);
- Interim Code of Practice: Temporary Stream Crossings (DFO 2020); and
- BC Conservation Data Centre (CDC).

5. ADAPTIVE MANAGEMENT FRAMEWORK

The VMP is a living document that will evolve over time in response to monitoring results and regulatory changes. The Plan incorporates adaptive management as follows:

- Plan
  - Develop plan for pre-clearing;
  - Prepare SOPs (vegetation clearing, re-vegetation);
- Do
  - Implement VMP;
  - Undertake pre-clearing surveys;
  - Implement training;
- Monitor
  - Implement monitoring;
  - QA/QC monitoring records;
- Adjust
  - Review / update SOPs as required;
  - Review effectiveness of best management practices;
  - Update VMP as required.

6. TRAINING AND AWARENESS

Employees and contractors will receive training in vegetation management on their arrival on site and prior to the start of work as part of the Site Orientation. The purpose of this training is to provide site personnel with a basic level of environmental awareness and an understanding of their obligations regarding compliance with regulatory requirements and best practices. This training will cover measures to mitigate effects on vegetation.

Site managers will be provided with a copy of the VMP and will receive additional training with respect to the requirements that are outlined in the plan. Targeted vegetation management training will be provided by the Environment Department to personnel with responsibility for vegetation management activities. It will include training on incidental observations and protection measures specific to sensitive ecosystems. This training will be delivered by means of classroom instruction, toolbox/tailgate meetings or other means as appropriate.

BW Gold will regularly review and update training and awareness documentation based on changes in training needs and regulatory requirements.

7. BASELINE TERRESTRIAL ECOSYSTEM SUMMARY

There are three biogeoclimatic (BGC) units within the mine site: 1) SBSmc3 (Kluskus Moist Cold Sub-Boreal Spruce variant) at low elevation, 2) ESSFmv1 (Nechako Moist Very Cold Engelmann Spruce-Subalpine Fir variant) at medium to high elevation, and 3) ESSFmvp (Nechako Moist Very Cold Engelmann Spruce-Subalpine Fir Parkland) on the top of Mount Davidson. The ESSFmv1 is the most common BGC variant followed by the SBSmc3 and the ESSFmvp. The mine site lies on the north-facing slope of Mount Davidson.

The majority of the mine site consists of sub-boreal spruce, Engelmann spruce (*Picea engelmannii*), and subalpine fir (*Abies lasiocarpa*), although there are also areas containing lodgepole pine that have been severely affected by mountain pine beetle (MPB) and have been subject to accelerated salvage logging. The ore deposit is located on the north face of Mount Davidson, the tallest peak in the Fawnie Range. At higher elevations, forestry activity is limited and MPB infestation is less predominant. The TSF, borrow areas, and freshwater reservoir are located in lower elevation areas that have been extensively logged and where MPB infestation is severe.

Table 7-1 summarizes the terrestrial ecosystems within the mine site.

Table 7-1: Distribution of Terrestrial Ecosystems within the Mine Site

BGC	Ecosystem	Site Series	Map Code	Mine Site	
				(ha)	(%)
SBSmc3	Hybrid white spruce - Huckleberry	1	SB	386.1	9.00%
	Lodgepole pine - Juniper - Dwarf huckleberry	2	LJ	18.9	0.40%
	Lodgepole pine - Feathermoss - Cladina	3	LF	517.8	12.10%
	Hybrid white spruce - Huckleberry - Soopolallie	4	SS	47.4	1.10%
	Black spruce - Huckleberry - Spirea	5	BH	26.2	0.60%
	Black spruce - Lodgepole pine - Feathermoss	6	BF	6.1	0.10%
	Hybrid white spruce - Twinberry	7	ST	24.1	0.60%
ESSFmv1	Subalpine fir - Rhododendron - Feathermoss	1	FR	1,511.10	35.30%
	Lodgepole pine - Huckleberry - Cladonia	2	LC	308.8	7.20%
	Subalpine fir - Huckleberry - Feathermoss	3	FF	507.4	11.80%
	Subalpine fir - Huckleberry - Gooseberry	4	FG	210	4.90%
ESSFmvp	Subalpine fir - Indian Hellebore	0	FH	5.9	0.10%
	Subalpine fir - Whitebark Pine - Crowberry parkland	0	PC	25.6	0.60%
	Scrub birch - Altai fescue shrub steppe	0	SF	0.6	0.01%
	Sitka valerian - globeflower moist meadow	0	VG	9.9	0.20%
	Whitebark pine - White mountain avens	0	WW	15	0.40%

Source: Blackwater Gold Project 2013 Baseline Report Vegetation (AMEC 2013a).

Listed species within the mine site include Whitebark pine (*Pinus albicaulis*), which is red-listed under the CDC (BC CDC 2020) and as endangered on Schedule 1 of *Species at Risk Act*. Whitebark pine occurs in dry, high elevation sites in the ESSF and as krummhotz in the BAFA on Mount Davidson and two parkland

ecosystems, both within the ESSFmvp; Subalpine fir - Whitebark Pine - Crowberry parkland and Whitebark pine - White mountain avens (Figure 7-1).

Plant species-at-risk in the mine site include sickleleaf tomentypnum moss (*Tomentypnum falcifolium*), small-flowered lousewort (*Pedicularis parviflora* spp. *parviflora*), swollen beaked sedge (*Carex rostrata*) and meesia moss (*Meesia longiseta*). Sickleleaf tomentypnum moss and swollen beaked sedge are yellow-listed (BC CDC 2020).

Traditional use plants identified by LDN, UFN, NWFN, SFN, StFN, NFN, Skin Tyee Nation and Tsilhqot'in Nation and Nee-Tahi-Buhn Band are listed in Table 7-2 (ERM 2016). These species are potentially present within the mine site.

Table 7-2: Traditional Use Plants Identified by Aboriginal Groups

1. Alder (*Alnus* spp.)	33. Balsam (*Abies balsamea*)
2. Birch (*Betula* spp.)	34. black moss (*Tillandsia usneoides*)
3. black twinberry (*Lonicera involucrate*)	35. Bulrush (*Scirpoides holoschoenus*)
4. Cottonwood	36. devil's club (*Oplopanax horridus*)
5. fiddleheads (*Matteuccia struthiopteris*)	37. Fireweed (*Chamaenerion angustifolium*)
6. gooseberry (*Ribes uva-crispa*)	38. high bush cranberry (*Viburnum trilobum*)
7. Hudson's Bay tea	39. Indian rice (*Zizania* spp.)
8. Juniper *(Juniperus* spp.)	40. Labrador tea (*Rhododendron groenlandicum*)
9. mountain alder (*Alnus incana*)	41. mushrooms
10. pine pitch, bark, needles	42. poplar (*Populus* spp.) bark and buds
11. raspberry (*Rubus idaeus*)	43. red willow (*Salix laevigata*)
12. Rosehips (*Rosa canina L*)	44. Saskatoon berry (*Amelanchier alnifolia*)
13. Sitka alder (*Alnus rubra*)	45. spruce (*Picea* spp.) gum/pitch, tips, roots
14. Tamarack (*Larix laricina*)	46. Thistle (*Cirsium* spp.)
15. wild flowers	47. wild rice (*Zizania* spp.)
16. willow (green and red; *Salix* spp.)	48. yellow hemlock
17. aspen (*Populus tremuloides*)	49. bearberry (*Arctostaphylos uva-ursi*)
18. black current (*Ribes nigrum*)	50. black tree lichen
19. blueberry (*Cyanococcus* spp.)	51. chokecherry (*Prunus virginiana*)
20. cow parsnip (*Heracleum maximum*)	52. elderberry (*Sambucus* spp.)
21. fir (*Abies* spp.)	53. fresh grasses
22. grouseberry (*Vaccinium scoparium*)	54. huckleberry (*Vaccinium* spp.)
23. Indian hellebore (*Veratrum viride*)	55. Indian tea (*Camellia sinensis*)
24. Kinnikinnick (*Achillea millefolium*)	56. moss
25. Mountain ash (*Sorbus subg. Sorbus*)	57. Oregon grape (*Mahonia aquifolium*)
26. plankton	58. pussy willow (*Salix discolor*)
27. red alder (*Alnus rubra*)	*59.* Rhubarb (*Rheum rhabarbarum*)
28. Sage (*Salvia officinalis*)	60. silkberry
29. Soapberry (*Sapindus* spp.)	61. strawberries, and runners (*Fragaria* × *ananassa*)
30. thimbleberry (*Rubus parviflorus*)	62. wild celery (*Apium* spp.)
31. wild onion *(Allium* spp.)	63. wild rose (*Rosa* spp.)
32. yarrow (*Achillea millefolium*)	64. woman's medicine plant

Based on the terrestrial ecosystem mapping completed for the environmental assessment (EA) and a review of BC CDC database of listed ecosystem in 2021, there are no ecosystems at risk that will be disturbed by Project activities at the mine site.

Sensitive ecosystems within the mine site include old growth forest (Figure 7-2) and riparian areas (Figure 7-3; AMEC 2013a). Davidson Creek and 661 Creek are the dominant watersheds in the mine site.

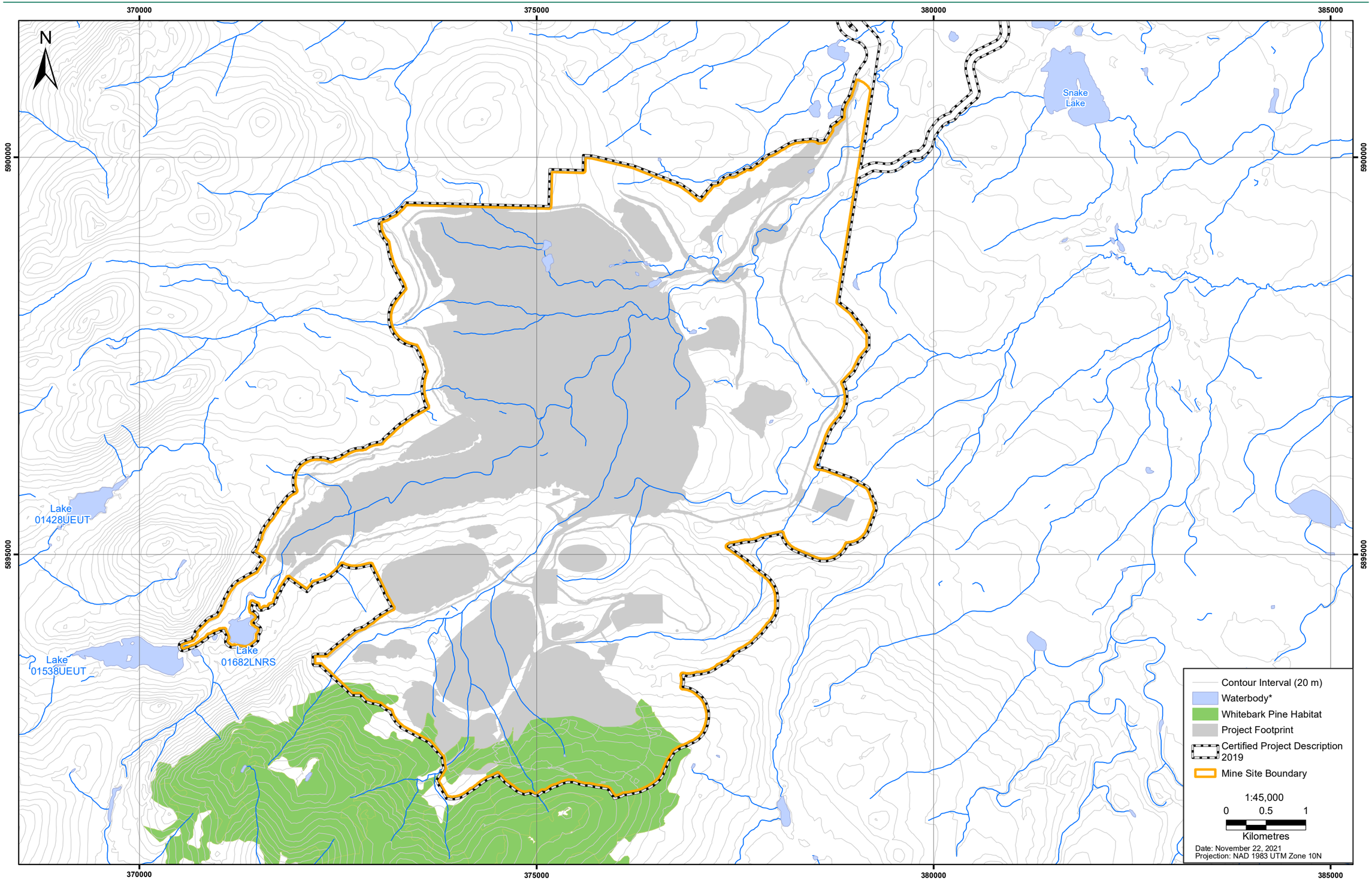


Figure 7-1: Whitebark Pine within the Mine Site

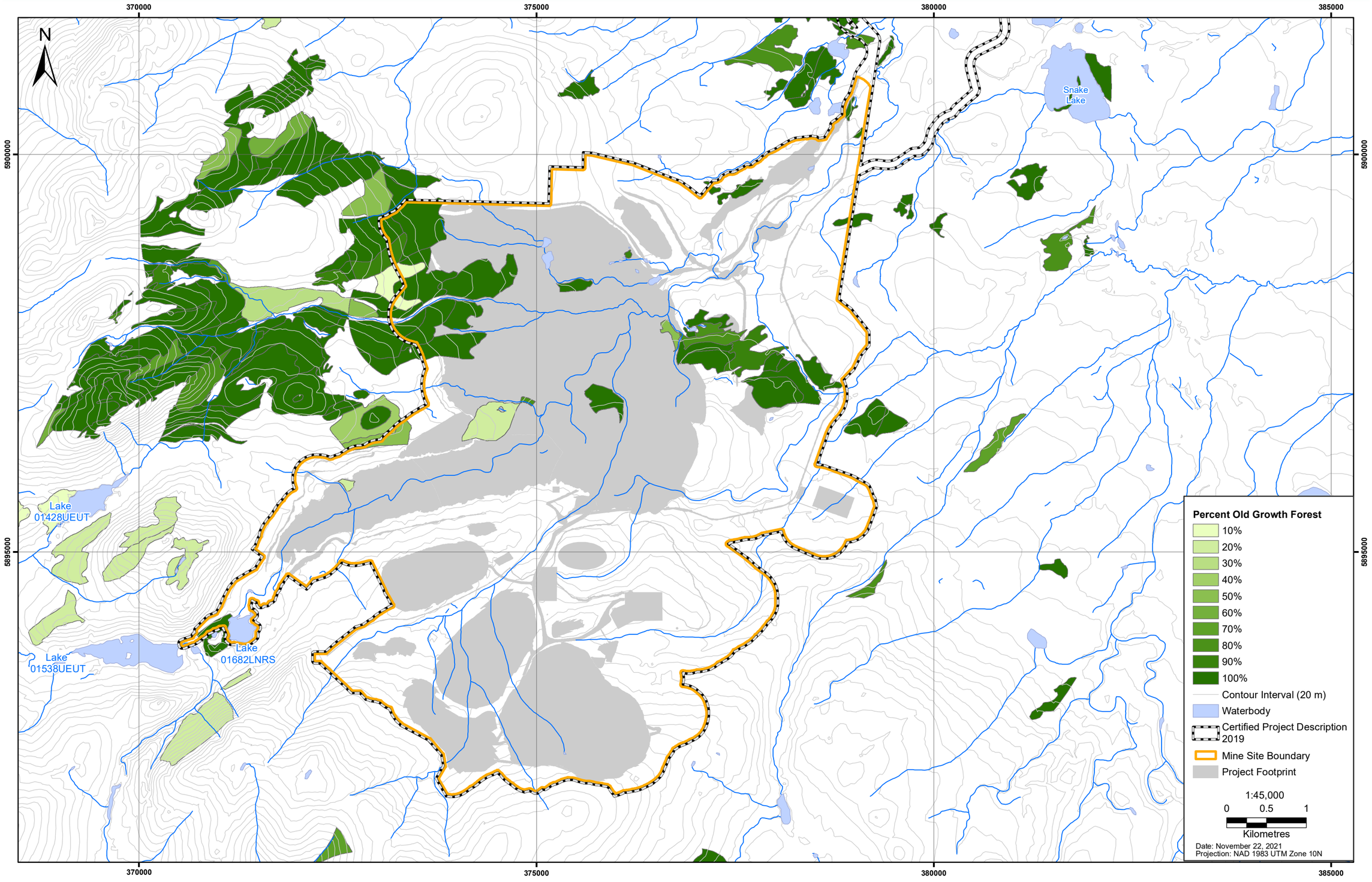


Figure 7-2: Old Growth Areas within the Mine Site

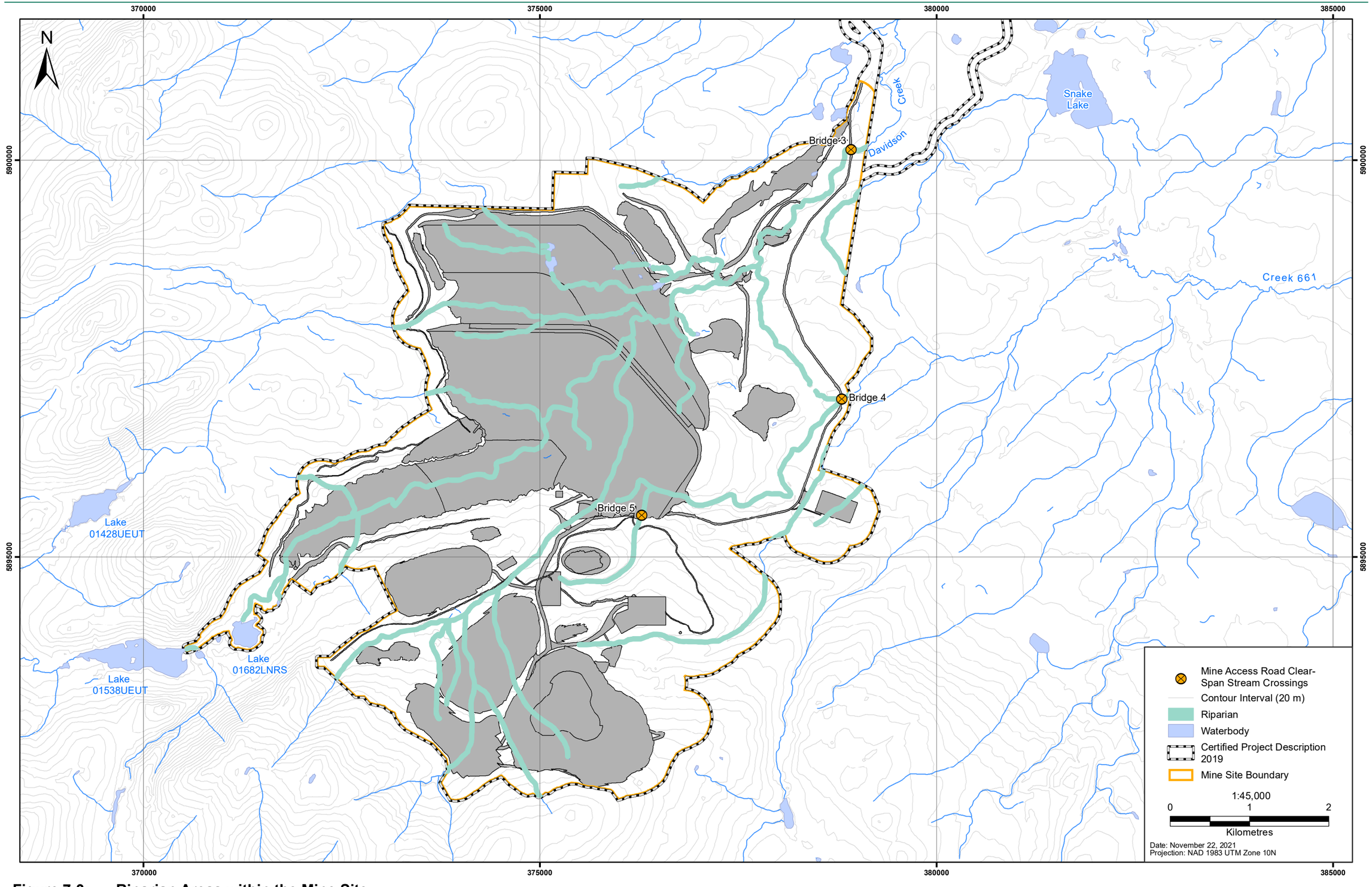


Figure 7-3: Riparian Areas within the Mine Site

8. MITIGATION AND MANAGEMENT MEASURES

8.1 General Mitigation Measures

General mitigation measures that will be implemented to minimize impacts to native vegetation, sensitive ecosystems, listed plant species and ecosystems at risk are described in Table 8.1-1.

Table 8.1-1: General Mitigation Measures

Category	Measure
General	■ Coordinate clearing activities with relevant provisions of other management plans IPMP, RCP, Aquatic Effects Monitoring Plan, SEPSCP, SMP, CEMP, WMMP, AQDMP, and Whitebark Pine Management Plan. ■ Conduct vegetation clearing in accordance with the Fire Danger Class in the *Wildfire Regulation*. ■ Limit vegetation disturbance to areas approved by the Project's *Mine Act* permit boundary. ■ Minimize all clearing dimensions, regardless of clearing size or ecosystem affected. This requires planning when harvesting in order to not create danger trees and windthrow. ■ Consult the BCTS Windthrow Manual: A Compendium of Information and Tools for Understanding, Predicting and Managing Windthrow on the BC Coast (Zielke et al. 2010) for guidance in assessing windthrow risk and for developing prescriptions to reduce the risk of windthrow hazard linked to vegetation clearing activities. Best management practices include: ○ Using caution with block layout in tall slender timber on exposed windward knolls – especially when isolated on large plains or plateaus; ○ Avoiding unnecessary exposed peninsulas; ○ Avoiding narrow leave strips in riparian areas that are less windfirm; ○ Avoiding exposing trees on rock knolls or on the edges of gullies, or escarpments or incised streams; and ○ Use setbacks of at least 10 m from the edge of non-impacted gullies or channels to avoid destabilization, as identified by the Environmental Monitor.
Pre-clearing	■ Coordinate the timing of vegetation clearing and construction activities to occur outside of sensitive time periods (e.g., breeding birds, amphibians). If clearing must occur during sensitive time periods for a particular wildlife species, conduct pre-clearing surveys prior to the planned timing of the clearing occurrence, to confirm a species is not present. If a species is present, establish setback buffers[1]. ■ Coordinate in-water work within reduced risk work window (July 15 to August 31) in Region 7 - Omineca (BC MWLAP 2004b). If in-water work must occur outside of the least risk work window, mitigation measures will be identified to avoid harm to fish and fish habitat in consultation with Aboriginal Groups, subject to *Fisheries Act* authorization. ■ Conduct pre-clearing surveys to identify environmentally sensitive features (e.g., riparian areas) that may interact with clearing and construction activities, taking into account riparian setbacks in Table 8.3-1. Map and flag sensitive features and identify management actions (e.g., restrictions, e.g., no heavy machinery, refueling, etc.). ■ Conduct windthrow hazard assessments along all new openings greater than 1 ha (Reference: BCTS Windthrow Manual: A Compendium of Information and Tools for Understanding, Predicting and Managing Windthrow on the BC Coast (Zielke et al. 2010).

[1] See Table 3.3-1 in the WMMP for wildlife sensitive time periods and guidelines for buffers.

Category	Measure
Clearing	■ Cutting prescriptions for each site will consider Soil Conservation Planning and Practices in the Quesnel and Vanderhoof Forest Districts (FPB 2010; specifically Appendix C Timber Harvesting Practices Extension Note #1). ■ Adhere to SMP to manage salvaged and non-salvaged soil resulting from clearing. ■ Limit soil disturbance in non-cleared areas. ■ In areas with sensitive features, where clearing cannot be avoided and soil disturbance is not required (e.g., road edges or to create safe setbacks from forest to facilities), use low-disturbance methods and removal techniques that are most appropriate, such as pruning, mowing, girdling, topping, and hand-falling, or clearing on frozen ground. ■ In areas where only tree removal is required, retain shrub and herbaceous vegetation to help encourage a self-sustaining, native shrub community. Limit soil disturbance, as determined by the supervising qualified professional, through practices such as winter falling and machine work on snow, using low ground pressure machinery, and avoiding clearing during periods of high soil moisture. ■ Avoid damage to residual tree's roots or stems as this can increase risk of windthrow and disease. ■ Salvage and retain woody debris in accordance with the Coarse Woody Debris Management SOP. ■ Maintain clearing dimensions to areas approved by the Project *Mines Act* permit and Occupant Licence To Cut. ■ Maintain vegetated buffers adjacent to mine facilities and roads, except for areas that would be managed for wildlife and human safety as described in the CEMP.
Post-Clearing	■ Minimize soil degradation and erosion by leaving stumps and understory vegetation intact where possible and adhering to the SMP, SEPSCP and RCP. ■ Salvage soil and traditional use plants in accordance with the RCP during appropriate weather conditions to the extent feasible, transport to stockpiles in a timely manner, and use erosion control measures to minimize erosion. ■ Use hydromulching, tackifier, etc., when and where appropriate. ■ Manage fugitive dust on roads in accordance with the Fugitive Dust Management SOP and the TARP provided in the AQDMP. ■ Restrict vehicles and machinery to development footprint where feasible. ■ Vegetation management on Project roads (Mine Access Road and mine site roads) will be maintained to provide sightlines. Vegetation will be selectively brushed to prefer low growing species to maintain a vegetated cover. ■ A qualified professional will assess new edge areas adjacent to roads, work areas, and the transmission line for windthrow risk and hazard trees, and if risk levels are too high site-specific measures to reduce risk to an acceptable level will be developed. Measures will be consistent with relevant best management practices in Section 7 of the BCTS Windthrow Manual (Zielke et al. 2010), as determined by the qualified professional. ■ Maintain vegetation within the transmission line right of way to a minimum height of 1 m from the ground except at the locations of the tower bases, guy anchor wires and along the transmission line access roads, or where not feasible for safety reasons.
Herbicide Use	■ Use spot applications and avoid broad spraying of herbicides, especially adjacent to listed plant communities or plants and riparian zones (no use within 30 m of water body). See Appendix E of the IPMP for information on herbicide use and application.

Category	Measure
Revegetation	■ Re-vegetate or seed cleared areas (including road edges, berms) during optimal seasons (e.g., planting during spring and fall) as quickly as possible following disturbance to avoid, erosion and sedimentation, and to accelerate the re-establishment of ecological function and wildlife habitat. ■ Use native plants or certified weed-free seed mixes appropriate to the disturbed site in consultation with Aboriginal groups. Application will be in accordance with the RCP. ■ Whitebark pine will be used to reclaim landforms (e.g., west waste rock dump) and will be considered for dry to mesic ESSFmv1 and ESSFmv1p sties. See Section 3 WBPMP. ■ To re-vegetate roadsides, use species that prevent erosion and are not wildlife attractants to prevent the establishment of invasive plants in accordance with the IPMP. Wildlife attracting species include legumes (family Fabaceae), brome (*Bromus* sp.), alfalfa (*Medicago sativa*), annual rye (*Lolium multiflorum*), barley (*Hordeum vulgare*), timothy (*Phleum pretense*), alpine bluegrass (*Poa Alpina*), and American sloughgrass (*Beckmannia syzigachne*) (Matheus & Omtzigt 2013).
Windthrow	■ Conduct windthrow hazard assessments along all new openings greater than 1 ha (Reference: BCTS Windthrow Manual: A Compendium of Information and Tools for Understanding, Predicting and Managing Windthrow on the BC Coast (Zielke et al. 2010), and periodically monitor for windthrow following construction and annually.

8.2 Traditional Plants, Listed Species, and Plant Species and Ecosystems at Risk

Within the mine site, listed species include Whitebark pine (*Pinus albicaulis*) and plant species-at-risk include sickleleaf tomentypnum moss (*Tomentypnum falcifolium*), small-flowered lousewort (*Pedicularis parviflora* spp. *parviflora*), swollen beaked sedge (*Carex rostrata*) and meesia moss (*Meesia longiseta*). There are no listed ecosystems at risk.

Mine component footprints have been designed to avoid old growth forest, riparian areas, and sparsely vegetated areas. Standard operating procedures have been developed for minimizing disturbance and preservation of old growth forests, and plant species at risk (Appendix A).

In the event rare plants, new provincially or federally listed species or ecosystems at risk are identified, or changes to the listed status of known plants, communities, or ecosystems occur, the following mitigation measures will be implemented:

- Rare or listed plant species and plant communities will be marked or flagged, mapped (GPS), recorded (photographed), and provided to the EM;
- Salvage plant species at risk where practical following Guidelines for Translocation of Plant Species at Risk in British Columbia (Maslovat 2009), and re-establish in suitable natural habitats that will be undisturbed by Project activities, except for whitebark pine which will be managed in accordance with the Whitebark Pine Management Plan;
- Avoid use of herbicide sprays within 200 m of rare plants and ecosystems at risk and within 30 m of water in accordance with section 8.2.2.1 of the IPMP;
- Comply with the StFN and NWFN Nation herbicide policy in their Traditional Territories; and
- Reduce the impact of fugitive dust on rare plants and ecosystems at risk through adherence to fugitive dust control measures (Table 8.2-1 in AQDMP).

8.3 Riparian Areas and Wetlands

Riparian areas provide important wildlife habitat, are sensitive to disturbance, and contain vegetation that helps stabilize streambanks and reduce floodwater velocity. Wetlands provide food and habitat for fish and wildlife, water quality improvement, flood storage, and shoreline erosion control.

Within BC, riparian areas and wetlands are protected under several acts and regulations, including the *Forest Planning and Practices Regulation*. Table 8.3-1 presents each riparian class based on stream width, the minimum widths of the riparian management area (RMA) width, riparian reserve zone (RRZ) width and riparian management zone (RMZ) width, on each side of the stream. Areas occurring within the mine site are shown in Figure 7-3. Riparian classes of streams within the mine site include S2, S3, S4, and S6 (AMEC 2013b).

Table 8.3-1: Riparian Classes

Riparian Class	Channel Width (m)	RRZ Width (m)	RMZ Width (m)	Total RMA (m)
Fish bearing				
S1A – large river	≥ 100	0	100	100
S1B	> 20	50	20	70
S2	> 5 ≤ 20	30	20	50
S3	> 1.5 ≤ 5	20	20	40
S4	≤ 1.5	0	30	30
Non-Fish Bearing				
S5	> 3	0	30	30
S6	≤ 3	0	20	20

Source: Division 3, subsection 47(4) of the Forest Planning and Practices Regulation.

It is expected that the legislated reserve and/or management zone setbacks and work practices established under the *Forests and Range Practices Act* will guide development activity within riparian areas, including floodplains, and wetlands. If work is required within these setbacks, (e.g., bridge construction, health and safety reasons, spill response or slope stabilization work), the BW Gold EM will identify specific mitigation measures to protect riparian functions. All work in and around water will follow Approved Work Practices for Managing Riparian Vegetation (BC Hydro 2003) and Measures to Protect Fish and Fish Habitat (DFO 2019).

To reduce effects to wetlands, RRZ and RMZ buffers will be established around wetlands. The RMA will be used to guide clearing activities for the Construction phase and the *Forest Planning and Practices Regulation*. The RMA will provide protection to the vegetation, soil, and hydrological constituents of wetlands, which will maintain their extent and reduce impacts on function. Wetland RMZs will be extended beyond the 10 m RRZ to the distances detailed in Table 8.3-2, or if no RRZ exists, they will extend from the edge of the wetland. The RMA consist of the sum of the RRZ and RMA widths.

Table 8.3-2: Wetland Riparian Management Areas

Wetland Size	RRZ Width (m)	RMZ Width (m)	RMA Width (m)
Small wetlands (< 5 ha)	0	30	30
Large wetlands (> 5 ha)	10	40	50
Wetland complexes	10	40	50

In addition to the general mitigation measures in Table 8.1-1, Table 8.3-3 identifies mitigation measures for riparian areas (FLNRO, MOE & DFO 2012). Standard operating procedures have been developed for minimizing disturbance and preservation of riparian areas, and wetlands (Appendix A).

Table 8.3-3: Mitigation Measures for Riparian and Wetland Areas

Type	Mitigation Measures
Buffers	■ Preserve riparian area function with management area setbacks or buffers adjacent to construction activities (Tables 8.3-1 and 8.3-2). ■ RMA for wetlands (Table 8.3-2) will be established to reduce disturbance to wetlands waterbodies located within the mine site, excluding the footprint of Project components and associated activities required to construct them, in accordance with the Riparian Area Management SOP. ■ Work or activity within the RMA buffer will only occur to the extent necessary for safety reasons, along the transmission line right of way, to control invasive plants, or to install and maintain erosion or sediment run-off control measures. ■ An independent environmental monitor will observe work being completed within the buffer, except when not possible for safety reasons.
Clearing Activities	■ Retain streamside vegetation wherever possible, including trees, shrubs, and ground cover, in accordance with the Riparian Area Management SOP. ■ Remove all slash and debris that lands within the RMA to minimize the amount of disturbance to trees, shrubs or grass species, unless its removal will result in more damage than leaving it in place. ■ Fall trees directionally away from stream banks and aquatic areas to minimize disturbance to riparian areas. ■ Clearing may occur within RRZs of the transmission line right of way and will follow the Integrated Vegetation Management Plan for BC Hydro Transmission and Distribution Power Line Corridors (BC Hydro 2016) in addition to Approved Work Practices for Managing Riparian Vegetation (BC Hydro 2003) and Measures to Protect Fish and Fish Habitat (DFO 2019).
Construction Activities	■ Protect natural drainages and watercourses by constructing appropriate on-site sediment control devices (including but not limited to silt fencing, hay bales, multi barrier approaches where necessary, diversion ditches, sediment traps, sediment ponds) in accordance with the SEPSCP. ■ Remove all slash and debris from felling and place it outside the RMA. ■ Within the RMA, preferentially use heavy equipment with low-pressure tires over tracked equipment.
Equipment and Fueling	■ Machine inspections will occur daily when working in the RMA to determine if they are in good operating condition, clean, free of leaks, excess oil, and grease. ■ No equipment refuelling or servicing (machines or hand tools) within an RMA (see Table 8.3-1) to minimize risk of aquatic contamination in accordance with the Riparian Area Management SOP. ■ Ensure all hydraulic machinery entering an RMA uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable. ■ Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. Onsite staff will be trained in emergency response and spill reporting procedures in accordance with Fuel Management and Spill Control Plan. Any spill of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities will be immediately reported to the Provincial Emergency Program 24-hour phone line at 1-800-663-3456. See Section 9 in FMSCP for further details on the Spill Response Plan.

Type	Mitigation Measures
Herbicides	■ To protect fish and wildlife, riparian areas and wildlife habitat, herbicide use in riparian areas will be avoided and a Pesticide Free Zone established in accordance with Table 8.2-3 of the IPMP. ■ Comply with the Stellat'en First Nation and Nadleh Whut'en First Nation herbicide policies in their Traditional Territories (applicable to the transmission line).
Revegetation	■ Use native plants, seeds, or approved weed-free certified seed mixes, timing and scheduling appropriate for the ecosystems in accordance with the RCP. ■ Appropriate vegetation species and methods will be employed as instructed by a qualified person. Measures may include consideration of planting of suitable tree species, live staking of willows, and planting of riparian shrub vegetation. ■ Seeding may be accomplished by hand or mechanical methods, or by hydraulic application (hydroseeding). The Environmental Monitor will consider the most effective practice for areas identified as being at risk for erosion or sedimentation. ■ Hand seeding may be used in small areas that are difficult to reach with equipment, and hydroseeding may be used on steep slopes that are highly susceptible to erosion. Fertilizers will not be used in hydroseeding in riparian areas.
Sediment and Erosion Control	■ The SEPSCP will be implemented and will identify erosion control measures (e.g., proper ditching, reducing slopes and placement of soil salvage piles, diversion and runoff collection ditches, sediment control ponds, erosion control mats).

IPMP = Invasive Plant Management Plan; RMA = Riparian Management Area; RRZ = Riparian Reserve Zone; SEPSCP = Surface Erosion Prevention and Sediment Control Plan; SOP = Standard Operating Procedure

8.4 Considerations for Reclamation Planning

The proposed reclamation revegetation strategy is based on the projected post-closure ecosystems and the corresponding wildlife habitats (described in detail in Appendices 4-D and 4-E). Each post-closure ecosystem has an associated suite of plant species that are adapted to its climatic and edaphic conditions, and thus, there are specific revegetation strategies linked to each post-closure ecosystem.

Reclamation of the post-closure landscape will re-establish basic ecological processes (e.g., biochemical functions, water cycling) and relatively simple structural diversity and native plant communities that will support end land uses. Ecohydrological modelling results indicate edaphic conditions required to support a given ecosystem in the long-term; however, ecosystems will take a long period to resemble their climax potential. The processes, structure, and plant communities established through early reclamation will create conditions for the development of the targeted native plant communities (i.e., site series) to become self-sustaining over the long-term. The objective for all reclamation treatments is to establish a diverse landscape with habitats that will persist and continue to develop into more complex communities over time based on natural successional pathways to support wildlife species.

Coarse woody debris is an important habitat element and will be retained for use in reclamation. During site clearing and pre-stripping, large volumes of woody debris, some representing large pieces (logs, root wads) will be encountered. These materials can represent valuable biotic material for reclamation and surface micro-habitat creation. Under the direction of a qualified professional, opportunities for salvage will be identified and coarse woody debris will salvaged and stored for future use. Standard operating procedures have been developed for the management of coarse woody debris (Appendix A).

9. MONITORING

Monitoring will be performed by appropriately qualified Environmental Monitors, under the direction of the BW Gold EM.

Vegetation and soil metal concentrations will be monitored as required by the *Mines Act* and Part 10.7.17 of the Health, Safety and Reclamation Code for Mines in British Columbia (EMLI 2021) to identify trends and mitigation. Metal uptake monitoring is addressed in the CFMP, which includes sampling methods and locations for sampling contaminants of potential concern in vegetation and other media (Section 4.4 of the CFMP). Standard operating procedures have been developed for field procedures for the collection of vegetation and soils for the purpose of metals analysis (Appendix A).

Table 9-1 presents the Vegetation Monitoring Plan. Record keeping is described in Section 10.

Quality assurance / quality control (QA/QC) procedures will be followed during surveys and monitoring. Qualified persons will conduct the surveys and will be provided with training on appropriate monitoring techniques to standardize field methods. Field data sheets or a digital survey form will be used to standardize data collection. Observations indicated in either field data sheets or digital survey forms will be reviewed at the end of day by the surveyor. All data will be transferred to a database and will be reviewed prior to analysis and reporting. Depending on the amount of data, a random, statistically representative sample of the data may be queried or the entire database may be queried for QA/QC.

Table 9-1: Vegetation Monitoring Plan

Monitoring Activity	Measurable Parameter (s)	Frequency	Timing	Duration/Phase	Reporting
Office and field review of pre-clearing surveys and boundaries	■ Pre-clearing survey is completed and sensitive features and mitigation specified ■ Boundaries and works zones flagged (RMAs) ■ Clearing is within *Mines Act* permit boundary ■ Clearing work windows are identified and work is during the correct window	Variable	Prior to clearing occurring	Ongoing as required; Construction and Operations phases	Annual Reclamation Report (ARR)
Vegetation clearing	■ Clearing dimension size in relation to planned activity ■ Avoidance of rare plants, ecosystems at risk, riparian areas through implementation of pre-clearing survey, flagging, and mitigation measures	Variable	When clearing is occurring	Ongoing as required; Construction and Operations phases	ARR
	Clearing work windows: ■ for instream works refer to the *Fisheries Act* authorization (to be issued) ■ breeding bird season refer to the WMMP (Table 3.3-1)	Variable	When clearing is occurring	Ongoing as required; Construction and Operations phases	ARR and WMMP Report
Post-clearing revegetation	■ Total area disturbed (m^2) ■ Total area (m^2) revegetated and the specific prescriptions ■ Revegetation plots including vegetation species cover, composition, diversity and, invasive plant species ■ Documentation of evidence of erosion including sheet erosion, rills, gullies ■ Periodic inspections of the re-vegetated areas to assess performance objectives (including photos) compared to prescription targets ■ Evaluation of the success of the revegetation prescriptions in meeting site objectives and, if required, identification of additional mitigation activities	Annual	May to October	Ongoing as required; all phases	ARR

Monitoring Activity	Measurable Parameter (s)	Frequency	Timing	Duration/Phase	Reporting
Post-clearing windthrow monitoring	■ The effectiveness of windthrow reduction measures used ■ The number and species of wind-thrown trees; ■ The approximate area affected ■ Bark beetle presence (e.g., Douglas-fir or spruce bark beetle)	Variable	March to September	Constructions and Operations phases	ARR
Vegetation maintenance	■ Vegetation maintenance within road and transmission line RoWs	Variable	March to September	Construction and Operations phases	ARR
	■ Document management actions in RMAs to confirm consistent with RMA mitigation measures	Variable	When activity in RMA occurs	Construction and Operations phases	ARR
Woody debris management	■ Volume of wood cut (identified in License to Cut) ■ Volume of wood stockpiled or used for progressive reclamation ■ Volume of wood disposed of or sold ■ Assess fire hazard of stored woody debris ■ Bark beetles present that may cause forest health issues (e.g., Douglas-fir or spruce bark beetle)	Annual	April to October (fire hazard assessments); May to August (beetle assessments)	Construction and Operations phases (beetle assessment may be halted 3 years after storage)	ARR

10. REPORTING AND RECORD KEEPING

10.1 Reporting

10.1.1 Incidental Observations

Incidental observations of vegetative conditions in the field will be flagged, photographed and recorded as follows:

- Type of observation (e.g., if suspected invasive species, wildlife trees);
- Project area (UTM coordinates if possible);
- Date of observation; and
- Name of observer.

Incidental observations, including non-compliances, will be recorded using a standard field data sheet and submitted to the EM on a daily basis. The EM will follow up on incidental observation reports within one week and report non-compliances to the appropriate regulatory agency and Aboriginal Groups.

10.1.2 Annual Reclamation Reporting

Vegetation monitoring and management activity will be reported in the ARR as identified in Table 9-1 (EMLI 2021b). The ARR will be submitted to EMLI and provided to Aboriginal Groups on or before March 31 each year. The ARR will provide a summary of monitoring results and describe mitigation measures, including treatments applied and the next year's monitoring program.

10.2 Record Keeping

The EM is responsible for data management, reporting and records related to vegetation management. Monitoring data will be entered into an electronic database and have quality control checks completed upon receipt of results. Data will be entered into a standard format that allows for data reporting and analyses. Data and data comparisons will be stored in a single file format for each type of survey or monitoring activity. Monitoring data will be stored for the life of the mine and will be made available for review upon request.

11. EVALUATION AND ADAPTIVE MANAGEMENT

The trigger action response plan is provided in Table 11-1.

Table 11-1: Trigger Action Response Plan for Terrestrial Ecosystems

Metric	Level 0 Alert		Level 1 Alert		Level 2 Alert	
	Trigger	Action/Response	Trigger	Action/Response	Trigger	Action/Response
Total cleared area (ha)	■ Clearing matches the areas predicted in the EA (<5% increase over predicted areas)	■ Conduct ongoing monitoring for compliance with the VMP	■ Total area clearing exceeds areas predicted in the EA (>5% and less than 15% increase over predicted areas)	■ EM to review clearing plans identify causes for increases over EA predictions (e.g., new permits for approved disturbance where required) and identify solutions ■ Evaluate if changes are required to onsite approval processes, methods, or monitoring program requirements ■ Review and update the VMP ■ If required review the predicted effects in the EA and revise as required	■ Total area clearing exceeds areas predicted in the EA (>15% increase over predicted areas)	■ EM to review clearing plans identify causes for increases over EA predictions (e.g., new permits for approved disturbance where required) and identify solutions ■ Evaluate if changes are required to onsite approval processes, methods, or monitoring program requirements ■ Review and update the VMP ■ If required review the predicted effects in the EA and revise as required ■ Implement changes based on the evaluation as required ■ Implement progressive reclamation and/or offsetting as required
Pre-clearing survey and flagged clearing boundaries	■ Clearing matches approved and flagged clearing boundary	■ Conduct ongoing monitoring for compliance with the VMP	■ Area clearing exceeds approved cleared area or flagged clearing boundary is incorrect	■ EC to review clearing plans and boundary marking with site personnel and identify causes and solutions ■ Evaluate if changes are required to onsite approval processes, pre-clearing methods, methods, or monitoring program requirements ■ Review and update the VMP	■ Area Clearing exceeds approved cleared area or flagged clearing boundary is incorrect and clearing extends beyond *Mines Act* permit boundaries	■ Notify Aboriginal Groups and regulators ■ EM to review clearing plans and boundary marking with site personnel and identify causes ■ Evaluate what changes are required to onsite approval processes, pre-clearing methods, or monitoring program requirements ■ Implement changes based on the evaluation as required ■ Implement progressive reclamation and/or offsetting as required ■ Review and update the VMP
Management Area zones and mitigation followed	■ Appropriate zones (e.g., RRZ and RMZ) flagged ■ Clearing and work activities meet approved riparian work practices ■ Clearing occurs within the approved work windows	■ Conduct ongoing monitoring for compliance with the VMP	■ Management zones incorrectly flagged; ■ Clearing and work activities do not meet approved work practices for each management zone ■ Clearing occurs within the approved work windows	■ EM to review clearing plans and boundary marking with site personnel and identify causes and solutions ■ Evaluate if changes are required to onsite approval processes, pre-clearing methods, methods, or monitoring program requirements	■ Management zones incorrectly flagged; or ■ Clearing and work activities do not meet approved work practices for each management zone ■ Clearing occurs outside the approved work windows	
Migratory birds	■ Clearing occurs within clearing windows or with required approvals	■ Conduct ongoing monitoring for compliance with the VMP	■ N/A	■ N/A	■ Clearing occurs outside clearing windows and without required approvals	■ Notify Indigenous groups and regulators ■ EM to review clearing plans with site personnel and identify causes ■ Evaluate what changes are required to onsite approval processes, pre-clearing methods, or monitoring program requirements ■ Implement changes based on the evaluation as required ■ Review and update the VMP

Metric	Level 0 Alert		Level 1 Alert		Level 2 Alert	
	Trigger	Action/Response	Trigger	Action/Response	Trigger	Action/Response
Revegetation	■ Monitoring indicates revegetation meets prescription goals and targets	■ Conduct ongoing monitoring for compliance with the VMP	■ Monitoring indicates revegetation prescription goals and targets have not been consistently met but no significant environmental issues are occurring (e.g., erosion issues, establishment of invasive plants)	■ EM to review prescriptions to determine appropriate adaptive measures ■ Continue site monitoring to track vegetation trajectory (e.g., improving / declining) ■ Identify and implement seeding / planting / erosion controls to meet prescription goals and targets as required ■ Review and update the VMP	■ Monitoring indicates revegetation prescription goals and targets have not been met and significant environmental issues are occurring (e.g., erosion issues, establishment of invasive plants)	■ EM to review prescriptions to determine appropriate adaptive measures ■ Identify and implement immediate seeding / planting / erosion control to meet prescription goals and targets ■ Continue site monitoring to track vegetation trajectory (e.g., improving / declining) ■ Review and update the VMP
Windthrow	■ Windthrow amounts are not greater than 20% of predicted volumes / amounts	■ Conduct ongoing monitoring for compliance with the VMP	■ Windthrow amounts exceed 20% but are less than 50% of predicted volumes / amounts by	■ Review windthrow assessment procedures ■ Assess windthrow to determine if bark beetles or fire risk require salvage of downed trees ■ Review and update the VMP	■ Windthrow amounts exceed 50% predicted volumes / amounts	■ Review windthrow assessment procedures ■ Assess windthrow to determine if bark beetles or fire risk require salvage of downed trees ■ Implement changes to windthrow mitigation measures to reduce future windthrow damage as required ■ Review and update the VMP
Woody debris: volume, bark beetle, and fire hazard assessments	■ Woody debris is stored for use during reclamation or used for progressive reclamation ■ Bark beetles are not observed in stored woody debris ■ Stored material does not present a fire hazard	■ Conduct ongoing monitoring for compliance with the VMP	■ Woody debris is sold or disposed of ■ Bark beetles are noted in stored woody debris ■ Stored material is assessed as a fire hazard	■ EM to review woody debris amounts required during closure and current stored woody debris to identify volume requirements ■ Evaluate if changes are required to woody debris management procedures if wood debris has been disposed of and stockpile volumes are insufficient for reclamation purposes ■ Adopt measures to control bark beetle infestation and spread ■ Adopt measures to reduce fire hazard ■ Review and update the VMP	■ N/A	■ N/A
Vegetation maintenance	■ Vegetation in maintained areas meets mitigation requirements	■ No response	■ Vegetation in maintained areas does not meets mitigation requirements (e.g., vegetation height along roads edges)	■ EM to review vegetation maintenance plans and with site personnel and identify causes and solutions ■ Review and update the VMP	■ Near misses or accidents occur related to vegetation that has not been maintained (e.g., conflicts with wildlife along roads due to poor visibility)	■ EM and Safety Committee to review vegetation maintenance requirements and procedures with site personnel and identify causes ■ Evaluate what changes are required to vegetation maintenance methods or monitoring program requirements ■ Implement changes based on the evaluation as required ■ Review and update the VMP

12. PLAN REVISION

The VMP is a living document and will be reviewed annually to assess its effectiveness and to ensure that it remains current with legislation and best management practices. The timing of plan updates will be informed by monitoring results and changes to regulations and best management practices. Federal species at risk and the BC CDC will be reviewed annually to check status updates to listed species and ecosystems at risk.

The EM is responsible for updating plan. Proposed revisions will be reviewed and discussed with the Blackwater Environmental Monitoring Committee and Aboriginal Groups, FLNRORD and EMLI prior to adopting and implementing the changes. Revised versions of the IPMP will be filed with EMLI, FLNRORD, and Aboriginal Groups.

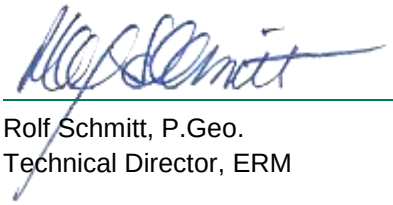
13. QUALIFIED PROFESSIONALS

This management plan has been prepared and reviewed by the following qualified professionals:

Prepared by:

Shannon Seahra, Ph.D.
Consultant, ERM

Reviewed by:



Rolf Schmitt, P.Geo.
Technical Director, ERM

14. REFERENCES

Definitions of the acronyms and abbreviations used in this reference list can be found in the Acronyms and Abbreviations section.

Legislation and Regulations

Canadian Environmental Protection Act, 1999, SC 1999, c 33.

Declaration on the Rights of Indigenous Peoples Act, SBC 2019, c 44.

Environmental Assessment Act, SBC 2018, c 51.

Fisheries Act, RSC 1985, c. F-14.

Forest and Range Practices Act, SBC 2002, c 69.

Forest Planning and Practices Regulation, BC Reg. 14/2004.

Impact Assessment Act, RSC 2019, c 28.

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Migratory Birds Convention Act, 1994, SC 1994, c 22.

Mines Act, RSBC 1996, c 293.

Riparian Areas Protection Act, SBC 1997, c. 21.

Riparian Areas Protection Regulation, BC Reg. 178/2019.

Species at Risk Act, SC 2002, c 29.

Weed Control Act, RSBC 1996, c 487

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Wildfire Act, SBC 2004, c 31.

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APPENDIX A STANDARD OPERATING PROCEDURES

Appendix A1 Old Growth Forest Standard Operating Procedure

Appendix A2 Rare and At-Risk Plant Species Management Standard Operating Procedure

Appendix A3 Riparian Area Management Standard Operating Procedure

Appendix A4 Wetlands Management Standard Operating Procedure

Appendix A5 Coarse Woody Debris Management

Appendix A6 Vegetation Metals Sampling Standard Operating Procedure

Appendix A7 Soil Metals Sampling Standard Operating Procedure

APPENDIX A1 OLD GROWTH FOREST STANDARD OPERATING PROCEDURE

Blackwater Gold Mine

Old Growth Forest Management

STANDARD OPERATING PROCEDURE

March 2022		Version A.1
Scope:	To define a standard operating procedure (SOP) for safe and efficient work practices to manage old growth forest.	
Contacts:	Travis Desormeaux Environmental Manager	tdesormeaux@artemisgoldinc.com 250.278.7788
Document Ownership:	Mine Manager	

1. SCOPE

This standard operating procedure (SOP) for old growth forest management applies to all employees, contractors, and subcontractors/vendors at the Blackwater Gold Mine (Blackwater) during construction, operation and closure. Procedures focus on minimizing disturbance and preservation of old growth forest stands outside the Project footprint.

2. RESPONSIBILITIES

Individuals with key roles and responsibilities with respect to riparian area management are presented in Table 2-1.

Table 2-1: Blackwater Roles and Responsibilities

Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, Environmental Management System (EMS) implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate their responsibilities to qualified personnel. Reports to Artemis Gold's Chief Operating Officer.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. Reports to Mine Manager.
Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management (EPCM) contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Supervisors	Supervisors include the Construction Supervisor and Production Supervisor and are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.

Departmental Managers	Departmental Managers are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Employees and Contractors	Employees and contractors are responsible for being aware of the Vegetation Management Plan, including monitoring requirements, mitigation measures, adaptive management trigger action response, and reporting and record keeping.

3. STANDARD OPERATING PROCEDURES

3.1 Pre-construction

During pre-construction planning (prior to clearing) the EM and CM will review baseline old growth forest mapping relative to the proposed clearing footprint. The CM will identify potential opportunities to limit the cleared footprint within old growth forest, pending operational requirements, and adjust the clearing plan accordingly. Site drainage will also be evaluated during this review, with the intent that temporary and final site drainage not discharge to undisturbed old growth forest to the extent feasible.

Once the disturbance boundary is established, survey will clearly stake and flag the edge of the disturbance boundary such that it is clearly visible to loggers and equipment operators.

3.2 Construction

The spatial boundary and SOPs below will be reviewed with all logging/construction staff at morning tailgate meeting(s) when working near an old growth forest disturbance limit. SOPs for active work around the old growth forest boundary include:

- Prior to the start of logging/clearing the final clearing boundary determined during pre-construction planning will be loaded into GPS systems held by all logging/clearing crews, if applicable.
- Areas outside the disturbance boundary are a strict “no work zone”.
- Activity within the “no work zone” will be limited to foot traffic and felling of trees that pose a windthrow risk and subsequently a health and safety risk. Approval by the EM is required and will be on a case-by-case basis. Felled trees in the “no work zone” are to be left in place.
- Activity within the “no work zone” may be permitted if staff find that the ground conditions are not as mapped during the pre-construction planning and may pose a health and safety threat. Approval by the EM is required and will be on a case-by-case basis.
- Fell trees into the disturbance boundary (i.e., not into the “no work zone”) whenever possible.
- Maintain ‘century trees’ that lie on or near the disturbance boundary, whenever possible.

3.3 Operation and Closure

The “no work zone” and associated disturbance limit will be maintained throughout the Operation and Closure phases. This will be achieved with signage to notify employees of old growth forest and the associated “no work zone”. Signs will be erected in Year +1, spaced a maximum of every 200 m along appropriate boundaries.

4. REVIEW AND APPROVAL

Reviewed by:

Environmental Manager

_____	_____	_____
Print	Signature	Date

Approved by:

Mine Manager

_____	_____	_____
Print	Signature	Date

APPENDIX A2 RARE AND AT-RISK PLANT SPECIES MANAGEMENT STANDARD OPERATING PROCEDURE

Blackwater Gold Mine

Rare and At-Risk Plant Species Management

STANDARD OPERATING PROCEDURE

March 2022 Version A.1

Scope:	To define a standard operating procedure (SOP) for safe and efficient work practices to minimize impacts to native vegetation, sensitive ecosystems, listed plant species and ecosystems.	
Contacts:	Travis Desormeaux Environmental Manager	tdesormeaux@artemisgoldinc.com 250.278.7788
Document Ownership:	Mine Manager	

1. SCOPE

This SOP for rare and at-risk plant species and ecosystem management applies to all employees, contractors, and subcontractors/vendors at the Blackwater Gold Mine (Blackwater) during Construction, Operation and Closure. Procedures focus on minimizing disturbance and preservation of traditional plants, listed plant species, and plant species and ecosystems at-risk within the Project footprint.

Within the mine site, listed plant species and species-at-risk include: whitebark pine (*Pinus albicaulis; Species-at-Risk Act Schedule 1 Endangered; BC CDC blue-listed*), sickleleaf tomentypnum moss (*Tomentypnum falcifolium; BC CDC yellow-listed*), small-flowered lousewort (*Pedicularis parviflora* spp. *Parviflora; BC CDC yellow-listed*), swollen beaked sedge (*Carex rostrata; BC CDC yellow-listed*) and meesia moss (*Meesia longiseta; BC CDC blue-listed*).

There are no listed ecosystems at-risk.

2. RESPONSIBILITIES

Individuals with key roles and responsibilities with respect to rare and species-at-risk management are presented in Table 2-1.

Table 2-1: Blackwater Roles and Responsibilities

Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, Environmental Management System (EMS) implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate their responsibilities to qualified personnel. Reports to Artemis Gold's Chief Operating Officer.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. Reports to Mine Manager.

Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Supervisors	Supervisors include the Construction Supervisor and Production Supervisor and are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Employees and Contractors	Employees and contractors are responsible for being aware of the Vegetation Management Plan, including monitoring requirements, mitigation measures, adaptive management trigger action response, and reporting and record keeping.

3. STANDARD OPERATING PROCEDURES

3.1 Pre-construction

During pre-construction planning (prior to clearing) the EM will review baseline listed and species-at-risk mapping relative to the proposed clearing footprint (Figure 3.1-1). The CM will identify potential opportunities to limit the cleared footprint within areas of listed and plant species-at-risk, pending operational requirements, and adjust the clearing plan accordingly. Site drainage will also be evaluated during this review, with the intent that temporary and final site drainage not discharge to undisturbed listed and species-at-risk habitat sites to the extent feasible.

If a disturbance boundary is required based on the review of the species-at-risk mapping, delineation areas will be established through a survey will clearly stake and flag the edge of the disturbance boundary such that it is clearly visible to loggers and equipment operators.

Provide orientation to workers on whitebark pine identification to minimize the disturbance to whitebark pine.

Develop fire management plans, including consideration of whitebark pine on Mount Davidson in suppression planning.

3.2 Construction

The spatial boundary and SOPs below will be reviewed with all logging/construction staff at morning tailgate meeting(s) when working near listed and plant species-at-risk disturbance limit. SOPs for active work around listed and plant species-at-risk boundary include:

- Review relevant mitigation measures in the Vegetation Management Plan, Whitebark Pine Management Plan, and Wetland Management and Offsetting Plan;

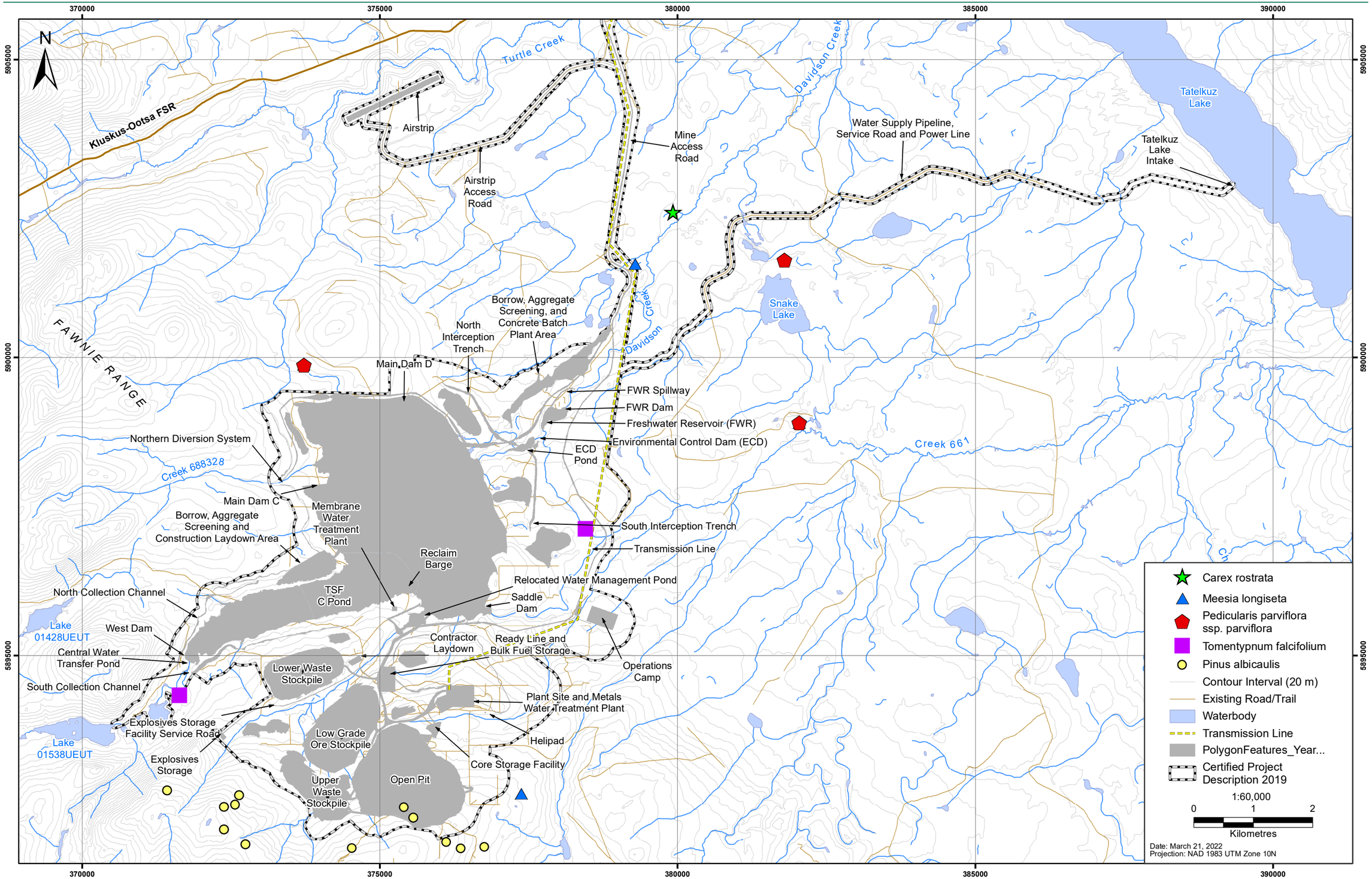

Figure 3.1-1: Documented Plant Species at Risk

- Under the direction of a qualified professional, consider plant salvage opportunities for plant species-at-risk, where practical, following Guidelines for Translocation of Plant Species-at-Risk in British Columbia[1], and re-establish in suitable natural habitats that will be undisturbed by Project activities, except for whitebark pine which will be managed in accordance with the Whitebark Pine Management Plan;
- Avoid use of herbicide sprays within 200 m of rare plants and ecosystems at-risk and within 30 m of water in accordance with the Invasive Plant Management Plan;
- Comply with the Stellat'en First Nation and Nadleh Whut'en First Nation herbicide policy in their Traditional Territories;
- Reduce the impact of fugitive dust on rare plants and ecosystems at-risk through adherence to fugitive dust control measures provided in the Air Quality and Fugitive Dust Management Plan; and
- Avoid the introduction of invasive species through implementation of the Invasive Plant Management Plan.

3.3 Operation and Closure

The "no work zone" and associated disturbance limit will be maintained throughout the Operation and Closure phases. This will be achieved with signage to notify employees of rare and species-at-risk plants and the associated "no work zone". Signs will be erected in Year +1, spaced a maximum of every 200 m along appropriate boundaries.

4. REFERENCES AND DOCUMENTS

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[1] Maslovat, C. 2009. *Guidelines for Translocation of Plant Species at Risk in British Columbia*. Prepared for Ministry of Environment Victoria, B.C.

5. REVIEW AND APPROVAL

Reviewed by:

Environmental Manager

_____	_____	_____
Print	Signature	Date

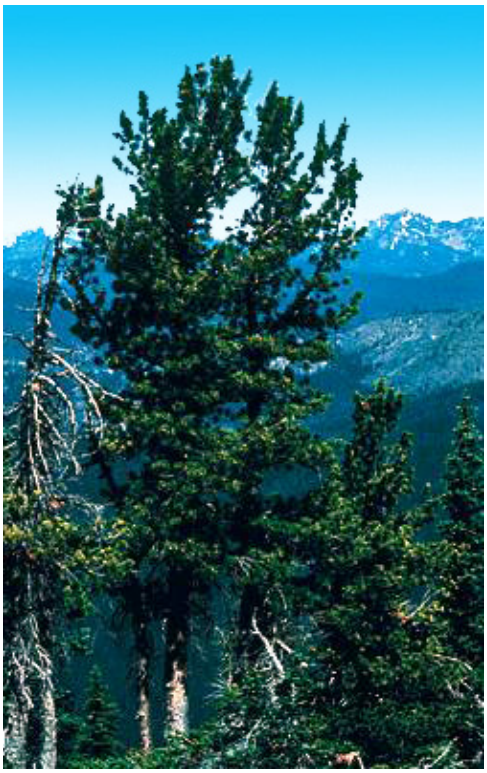
Approved by:

Mine Manager

_____	_____	_____
Print	Signature	Date

APPENDIX A SPECIES-AT-RISK DESCRIPTIONS

Appendix A: Species-at-Risk Descriptions

Common Name	Description	Photos
Whitebark pine[2]	General: Often contorted and dwarfed, 5-10 m tall, or a shrubby sprawling timberline tree, but also straight and up to 20 m; bark thin with light-whitish scales; young twigs hairy. Leaves: Needles in bunches of five, clustered toward ends of branches, (3) 4-7 cm long; yellow green. Cones: Seed cones egg-shaped, deep red to purple, (3.5) 5-8 cm long; scales remain closed and shed the seeds slowly, rarely falling from tree intact; pollen cones red.	 Photo credit: Footnote [3]
Sickleleaf tomentypnum moss[4]	General: A species of hummocks and drier habitats in poor fens, often associated with *Sphagnum angustifolium.* Plants erect to ascending, pinnately branched. Stems covered on one side with tomentum of reddish rhizoids. Leaves long lanceolate, falcate-secund, acuminate to narrowly acute, strongly plicate; costa strong and single, ending just below apex; margins entire.	No image available

[2] E-Flora BC. 2021. Electronic Atlas of the Flora of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver.

[3] BC Tree Book. (https://www.for.gov.bc.ca/hfd/library/documents/treebook/whitebarkpine.htm).

[4] Vitt, D., Luth, M. 2017. A Guide to Mosses and Liverworts of Alberta Peatlands. NAIT Boreal Research Institute.

Common Name	Description	Photos
Small-flowered lousewort[5]	*General:* Annual or biennial herb from a spindly taproot; stems single, ascending to erect, 10-40 cm tall, simple or more commonly branched, smooth except sometimes minutely hairy in the inflorescence. *Leaves:* Basal leaves small or lacking; stem leaves alternate, unstalked, lance-oblong, 1-5 cm long, pinnately cleft to lobed, the segments toothed or entire. *Flowers:* Inflorescences several-flowered, compact, somewhat head-like clusters at the ends of branches, often elongating and with a few lower, remote, axillary flowers, the bracts similar to the leaves but reduced upward; corollas purple or two-toned pinkish and purple, 11-17 mm long, 2-lipped, the upper lip 4-7 mm long, slightly arched, hood-like, beakless, with or more often without a pair of slender teeth near the tip, the lower lip 3-lobed, fringed with minute hairs; calyces 4-6 mm long, 2-lobed, the lobes jaggedly toothed; stamens 4, the filaments long-hairy. *Fruits:* Capsules, egg-shaped, abruptly pointy-tipped, smooth, 8-17 mm long, partly enveloped by dry expanded calyces; seeds several.	 Photo credit: Footnote [6]

[5] E-Flora BC. 2021. Electronic Atlas of the Flora of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver.

[6] Fenneman, J. 2012. Electronic Atlas of the Flora of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver.

Common Name	Description	Photos
Swollen beaked sedge[7]	General: Perennial, tufted herb from short-creeping rhizomes; stems 30-70 cm tall, triangular, smooth, except slightly rough below the inflorescence, slightly longer than the leaves. Leaves: Sheaths tight; ligules as long as wide; blades 4 to 8 per stem, borne on the lower ½ of the stem, 1.2-4.5 mm wide, folded or channelled, with silica papillae on the upper surface, cross-walled; lower leaves reduced, persistent. Flowers: Spikes 3 to 6 (8), the terminal 1 or 2, sometimes 3 or 4, linear, 1.5-5 cm long, long-stalked, with many male flowers, the lower 2 to 4 spikes cylindrical, 3-6.5 cm long, with female flowers, short-stalked, the lowermost ones spreading; bracts subtending the lowest spike leaflike, sheathless, the lowest one longer than the inflorescence. Fruits: Perigynia egg-shaped, 5-9 mm long, 1.7-3 mm wide, yellowish-green to reddish-brown, somewhat inflated, smooth, shiny, strongly nerved, rather abruptly contracted into beaks, the beaks 1.5-2 mm long, bidentate, with straight teeth; female scales lanceolate to egg-shaped, pointed, rarely awned, narrower and shorter than the perigynia, yellowish- to chestnut-brown, with lighter centres and narrow, translucent margins; stigmas 3; achenes 3-angled, 2.5-3 mm long.	 Photo credit: Footnote [8]

[7] E-Flora BC. 2021. Electronic Atlas of the Flora of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver.

[8] Kelly-McArthur, B. 2021. Electronic Atlas of the Flora of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver.

Common Name	Description	Photos
Meesia moss[9]	General: Habitat: Calcareous soil banks, rich fens, boreal, alpine, and arctic habitats, low to high elevations. Plants 0.4–0.8 cm. Stem leaves spreading and somewhat twisted when dry, irregularly spreading and indistinctly 3-ranked when moist, ovate-lanceolate to lanceolate, 2–3.5 mm; base decurrent; margins plane to weakly reflexed basally, entire; apex acute to narrowly obtuse; costa narrow, ending in or just before apex; inner laminal cells smaller, walls thicker than those of marginal cells.	 Photo credit: Footnote[10]

[9] Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico [Online]. 22+ vols. New York and Oxford. http://beta.floranorthamerica.org.

[10] Bjork, C. 2009. Electronic Atlas of the Flora of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver.

APPENDIX A3 RIPARIAN AREA MANAGEMENT STANDARD OPERATING PROCEDURE

Blackwater Gold Mine

Riparian Area Management

STANDARD OPERATING PROCEDURE

March 2022 Version A.1

Scope:	To define a standard operating procedure (SOP) for safe and efficient work practices to manage and protect riparian areas.	
Contacts:	Travis Desormeaux Environmental Manager	tdesormeaux@artemisgoldinc.com 250.278.7788
Document Ownership:	Mine Manager	

1. SCOPE

This SOP applies to all employees, contractors, and subcontractors/vendors at the Blackwater Gold Mine (Blackwater) during construction, operation and closure.

2. EXCLUSIONS

During Early Works, a minimum 30 metre (m) no-disturbance zone must be maintained around all watercourses, waterbodies, and wetlands within or adjacent to the Early Works footprint as committed to in regulatory filings. There are fundamental differences between that commitment and this SOP (i.e. disturbance within riparian area will be necessary during Construction and Operation); as such this SOP does not apply to Early Works activities.

3. RESPONSIBILITIES

Individuals with key roles and responsibilities with respect to riparian area management are presented in Table 3-1.

Table 3-1: Blackwater Roles and Responsibilities

Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, Environmental Management System (EMS) implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate their responsibilities to qualified personnel. Reports to Artemis Gold's Chief Operating Officer.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. The CM is responsible for riparian area management during mine site construction. Reports to Mine Manager.

Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Supervisors	Supervisors include the Construction Supervisor and Production Supervisor and are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Employees and Contractors	Employees and contractors are responsible for being aware of the Vegetation Management Plan, including monitoring requirements, mitigation measures, adaptive management trigger action response, and reporting and record keeping.

4. DEFINITIONS

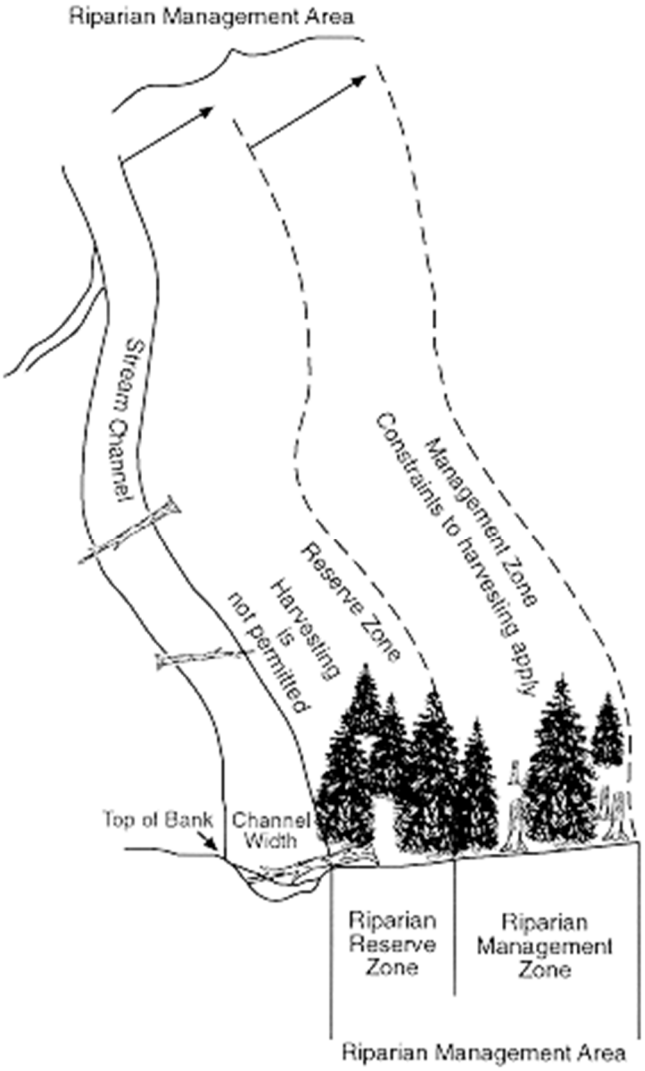
Riparian areas occur next to the banks of streams, lakes, and wetlands and include both the area dominated by continuous high moisture content and the adjacent upland vegetation that exerts an influence on it. The *Riparian Management Area Guidebook*[1] prescribes minimum riparian management area (RMA) widths for fish-bearing and non-fish-bearing streams, wetlands, and fisheries sensitive zones. There are two types of management areas associated with an RMA: Riparian Reserve Zones (RRZ) and Riparian Management Zones (RMZ). These are defined below and illustrated on Figure 4-1.

Riparian Reserve Zones: The RRZ includes the environmental value being protected and a buffer. Generally, no machine activity is permitted in RRZs unless the construction footprint occurs in this zone. This zone is designed to reduce effects on the value being protected during infrastructure construction, maintenance, and use. Avoidance of activity in this zone is the primary goal. When this is not possible, minimizing clearing widths and relocating clearing sites such as borrow pits, log lands, and waste areas is required.

Riparian Management Zone: RMZs allow more flexibility in work practices than Reserve Zones. The goal of this zone is to provide a buffer around the RRZ. Limited heavy equipment activity is permissible in this zone. Soil disturbance should be minimized through the use of low ground pressure machinery unless the construction footprint occurs in this zone. Permitted activities are described below for each RMZ. Where retention of this zone is possible, it will limit changes in microclimatic conditions such as wind, light, and temperature and reduce the potential for effects such as windthrow or invasive species colonization.

[1] BC MOF.1995. *Riparian Management Area Guidebook*. Government of British Columbia: Victoria, BC. Available at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/silvicultural-systems/silviculture-guidebooks/riparian-management-area-guidebook

Figure 4-1: Riparian Management Area[2]



5. STANDARD OPERATING PROCEDURES

While protection of riparian area is important during all Project phases, the greatest opportunity to protect riparian area is during construction (specifically during felling / clearing). This SOP focuses on this phase of Project development.

SOPs specific to the pre-clearing phase of activity and watercourse-specific SOPs are provided in the following sections. See also the Wetland SOP for procedures specific to working near or within wetlands.

[2] BC MOF.1995. *Riparian Management Area Guidebook*. Government of British Columbia: Victoria, BC. Available at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/silvicultural-systems/silviculture-guidebooks/riparian-management-area-guidebook

5.1 Pre-clearing

A minimum of 14 days prior to the start of felling/clearing in any new area, Site Survey will load the Project disturbance footprint, waterbody and watercourse polygons from baseline surveys, and apply RMAs in accordance with the buffers identified in Table 5.1-1. The EM, CM, and Site Survey will review the proposed clearing limits in relation to RMAs and identify opportunity to optimize the clearing limits, with a preference to avoid unnecessary disturbance to an RRZ outside and adjacent to the clearing limit.

Table 5.1-1: RMA Widths by Stream Class[3]

Stream Class	Mean Channel Width (m)	RRZ Buffer (m)	RMZ Buffer (m)	Total RMA Width (m)
Fish-Bearing				
S1A – large river	≥ 100	0	100	100
S1B	> 20	50	20	70
S2	> 5 ≤ 20	30	20	50
S3	> 1.5 ≤ 5	20	20	40
S4	≤ 1.5	0	30	30
Non-Fish-Bearing				
S5	> 3	0	30	30
S6	≤ 3	0	20	20

RRZ = Riparian Reserve Zone; RMZ = Riparian Management Zone; RMA = Riparian Management Area. Construction and Operations.

Once the final clearing limit has been determined, the CM will coordinate with Site Survey to clearly stake the RRZ and RMZ buffers around waterbodies and watercourses that lie outside the Project disturbance footprint. RMAs will also be established for waterbodies and watercourses within the Project disturbance footprint if there is opportunity to avoid or limit riparian loss (for example, streams within the transmission line right-of-way).

All stream classes require an RMZ. Streams classes S1B to S3 require both an RRZ and RMZ. Table 5.1-1 presents the RRZ and RMZ widths for fish-bearing and non-fish-bearing streams of varying sizes.

Table 5.1-2 lists general SOPs for activities within the RMA of any stream (all classes) to protect bank integrity and water quality.

[3] BC MOF.1995. *Riparian Management Area Guidebook*. Government of British Columbia: Victoria, BC. Available at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/silvicultural-systems/silviculture-guidebooks/riparian-management-area-guidebook

Table 5.1-2: General Stream RMA SOPs

Stream Class	Standard Operating Procedures
All	■ The spatial boundary and key SOPs will be reviewed with all logging/construction staff at morning tailgate meeting(s) when working near RMAs. ■ Fall trees away from streams wherever possible. If trees must be felled across streams for safety reasons, they should be lifted (rather than dragged) out. ■ Minimize vegetation clearing within the RMZ. Implement construction practices to preserve soil integrity of stream banks at crossings and minimize bare soil exposure. ■ To protect fish and wildlife, riparian areas and wildlife habitat, herbicide use in riparian areas will be avoided. If required, a minimum width of 10 m from the RMA will be a Pesticide Free Zone in accordance with the product label, provincial regulation, and the Invasive Plant Management Plan (IPMP). ■ Comply with the Stellat'en First Nation and Nadleh Whut'en First Nation herbicide policy in their Traditional Territories. ■ Protect natural drainages and watercourses by constructing appropriate on-site sediment control devices (including collection and diversion ditches, sediment traps, sediment ponds) and use of flocculants. ■ Trees felled within the RRZ should be left as coarse woody debris. ■ Within the RMZ, preference is to use heavy equipment with low pressure tires over tracked machine, unless authorized by the EM. ■ Prevent sediment and deleterious substances from entering the stream by implementing sediment and erosion control measures in accordance with the Surface Erosion Prevention and Sediment Control Plan. ■ Refuelling or servicing of equipment is not allowed within RMA. ■ Machine inspections will occur daily prior to use in RMA to ensure equipment and machinery are in good operating condition, clean , free of leaks, excess oil, and grease. ■ No equipment refuelling or servicing (machines or hand tools) should be undertaken within an RMA to minimize risk of aquatic contamination. ■ Ensure all hydraulic machinery entering a stream uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable. ■ Minimize the clearing width at crossing sites and retain streamside vegetation within the right-of-ways wherever possible. ■ Re-vegetate and stabilize any disturbed soil to prevent post-construction erosion in accordance with the Reclamation and Closure Plan. ■ Design crossing structures to be perpendicular to streams to reduce the area required to be cleared. ■ Do not remove natural debris from streams. ■ Use temporary crossing structures (rather than fording) to transport machinery across streams. If this is not possible, locate fords in areas with shallow, stable banks and limit crossings to once over and back.

RRZ = Riparian Reserve Zone; RMZ = Riparian Management Zone; RMA = Riparian Management Area

Table 5.1-3 lists standard operating procedures for activities in RMAs, by stream class.

Table 5.1-3: Stream RRZ and RMZ SOPs

Stream Class	Standard Operating Procedures	
	Riparian Reserve Zone	**Riparian Management Zone**
S1-S3	■ Refer to general riparian management area SOPs (Table 4.2-1). ■ No activity within the RRZ other than tree harvesting and brush clearing associated with the direct Project footprint. ■ Maintain trees and shrubs below the transmission line that meet line clearance standards. ■ Danger trees removed for safety reasons. ■ Top individual trees within the RRZ that have a high windthrow risk and may endanger personnel or infrastructure.	■ Refer to general riparian management area SOPs (Table 4.2-1). ■ Feather the outer edge of the RMZ by removing trees prone to windthrow. ■ Top individual trees within the RMZ that have a high windthrow risk. ■ Combine edge feathering and topping in high risk areas.
S4	■ Refer to general riparian management area SOPs (Table 4.2-1).	■ Refer to general riparian management area SOPs (Table 4.2-1). ■ Retain windfirm trees with roots embedded in the streambank. ■ Remove dominant conifers and retain 50% of the remaining trees within 10 m of the channel. ■ Fall and yard away from the stream, and remove slash and debris from the stream. ■ Retain smaller trees, understory trees, and herbaceous vegetation within 5 m of the channel. ■ Retain wildlife trees. ■ Where windthrow is a concern, harvest as many windthrow-prone trees and retain smaller conifers for future large woody debris recruitment.
S5	■ Refer to general riparian management area SOPs (Table 4.2-1).	■ Refer to general riparian management area SOPs (Table 4.2-1). ■ Valley-Bottom Streams: ■ Retain 50% of dominant and codominant, windfirm trees throughout the RMZ. ■ Retain small trees, understory trees, and herbaceous vegetation within 10 m of the channel. and ■ Retain wildlife trees. ■ Non-Valley-Bottom Streams: ■ Retain smaller conifers and deciduous trees within 5 m of the channel. ■ Retain leaning trees within 10 m of the channel.

Stream Class	Standard Operating Procedures	
	Riparian Reserve Zone	Riparian Management Zone
S6	■ Refer to general riparian management area SOPs (Table 4.2-1).	■ Refer to general riparian management area SOPs (Table 4.2-1). ■ Fall and yard away from the stream, while retaining a minimum of ten trees per 100 m of streambank. ■ Remove slash and debris from the stream. ■ Retain smaller trees, understory trees, and herbaceous vegetation within 5 m of the channel. ■ Retain wildlife trees.

RRZ = Riparian Reserve Zone; RMZ = Riparian Management Zone; RMA = Riparian Management Area

6. REFERENCES AND DOCUMENTS

BC MOF.1995. *Riparian Management Area Guidebook*. Government of British Columbia: Victoria, BC. Available at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/silvicultural-systems/silviculture-guidebooks/riparian-management-area-guidebook

ERM 2021. *Blackwater Gold Project - Wetland Management and Offsetting Plan*. Prepared for BW Gold Ltd by ERM Consultants Canada Ltd, Vancouver, BC.

ERM 2021. *Blackwater Gold Project - Vegetation Management Plan.* Prepared for BW Gold Ltd by ERM Consultants Canada Ltd, Vancouver, BC.

ERM 2021. *Blackwater Gold Project - Invasive Plant Management Plan*. Prepared for BW Gold Ltd by ERM Consultants Canada Ltd, Vancouver, BC.

Knight Piésold 2021. *Blackwater Gold Project - Surface Erosion Prevention and Sediment Control Plan.* Prepared for BW Gold Ltd by Knight Piésold Ltd, Vancouver, BC.

7. REVIEW AND APPROVAL

Reviewed by:

Environmental Manager

_____	_____	_____
Print	Signature	Date

Approved by:

Mine Manager

_____	_____	_____
Print	Signature	Date

APPENDIX A4 WETLANDS MANAGEMENT STANDARD OPERATING PROCEDURE

Blackwater Gold Mine

Wetlands Management

STANDARD OPERATING PROCEDURE

	March 2022	Version A.1
Scope:	To define a standard operating procedure (SOP) for safe and efficient work practices to manage and protect wetlands.	
Contacts:	Travis Desormeaux Environmental Manager	tdesormeaux@artemisgoldinc.com 250.278.7788
Document Ownership:	Mine Manager	

1. SCOPE

This SOP applies to all employees, contractors, and subcontractors/vendors at the Blackwater Gold Mine (Blackwater) during construction, operation and closure. This SOP applies to all wetlands including listed wetlands.

2. EXCLUSIONS

During Early Works, a minimum 30 metre (m) no-disturbance zone must be maintained around all watercourses, waterbodies, and wetlands within or adjacent to the Early Works footprint (with the exception of bridge crossings) as committed to in regulatory filings. There are fundamental differences between that commitment and this SOP (i.e. disturbance within wetland area will be necessary during Construction and Operation); therefore this SOP does not apply to Early Works activities.

3. RESPONSIBILITIES

Individuals with key roles and responsibilities with respect to wetland management are presented in Table 3-1.

Table 3-1: Blackwater Roles and Responsibilities

Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, Environmental Management System (EMS) implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate their responsibilities to qualified personnel. Reports to Artemis Gold's Chief Operating Officer.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. The CM is responsible for riparian area management during mine site construction. Reports to Mine Manager.

Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Supervisors	Supervisors include the Construction Supervisor and Production Supervisor and are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Employees and Contractors	Employees and contractors are responsible for being aware of the Vegetation Management Plan, including monitoring requirements, mitigation measures, adaptive management trigger action response, and reporting and record keeping.

4. DEFINITIONS

Wetlands are "lands that are saturated with water long enough to promote wetland or aquatic process as indicated by poorly drained soils, hydrophytic vegetation, and various kinds of biological activity adapted to a wet environment"[1]. In Canada there are five classes of wetlands (bog, fen marsh, swamp, and shallow open water) that are organized into wetland associations based on floristic and biogeochemical properties[2].

The *Riparian Management Area Guidebook*[3] prescribes minimum riparian management area (RMA) widths for fish-bearing and non-fish-bearing streams, wetlands, and fisheries sensitive zones. To reduce effects to wetlands, riparian reserve zone (RRZ) and riparian management zone (RMZ) buffers will be established around wetlands as defined in Table 4-1 and described below.

Table 4-1: Wetland Riparian Management Areas

Wetland Type	RRZ Width (m)	RMZ Width (m)	Total RMA Width (m)
Small wetlands (< 5 ha) or blue listed wetlands	0	30	30
Large wetlands (> 5 ha) or red listed wetlands	10	40	50
Wetland complexes	10	40	50

RRZ = Riparian Reserve Zone; RMZ = Riparian Management Zone; RMA = Riparian Management Area

[1] National Wetlands Working Group 1988. *Wetlands of Canada*. Sustainable Development Branch, Environment Canada, Ottawa, ON and Polyscience Publications Inc., Montreal, PQ.

[2] MacKenzie, W.H. and J.R. Moran. 2004. *Wetlands of British Columbia: A Guide to Identification*. B.C. Min. For., Res. Br., Victoria, B.C. Land Management. Handbook. 52.

[3] BC MOF.1995. *Riparian Management Area Guidebook*. Government of British Columbia: Victoria, BC. Available at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/silvicultural-systems/silviculture-guidebooks/riparian-management-area-guidebook.

Riparian Reserve Zones: The RRZ includes the wetland being protected and a buffer. Generally, no machine activity is permitted in a RRZ unless the construction footprint occurs in this zone. This zone is designed to reduce effects on the wetland being protected during infrastructure construction, maintenance, and use. Avoidance of activity in this zone is the primary goal. When this is not possible, minimizing clearing widths and relocating clearing sites such as borrow pits, log lands, and waste areas is required.

Riparian Management Zone: The RMZ allow more flexibility in work practices than reserve zones. The goal of this zone is to provide a buffer around the RRZ. Limited machine activity is permissible in this zone. Soil disturbance should be minimized through the use of low ground pressure machinery unless the construction footprint occurs in this zone. Permitted activities are described below for the RMZ. Where retention of this zone is possible, it will limit changes in microclimatic conditions such as wind, light, and temperature and reduce the potential for effects such as windthrow or invasive species colonization.

5. STANDARD OPERATING PROCEDURES

While protection of wetland area is important during all Project phases, the greatest opportunity to protect wetland areas is during construction (specifically during felling / clearing). This SOP focuses on this phase of Project development.

SOPs specific to the pre-clearing phase of activity, wetland-specific SOPs, and watercourse-specific SOPs are provided in the following sections.

5.1 Pre-clearing

Where possible, locate Project components, including roads and transmission line poles away from wetlands and riparian areas and alongside existing disturbed areas and existing infrastructure footprints. A minimum of 14 days prior to the start of felling/clearing in any new area, Site Survey will load the Project disturbance footprint, waterbody and watercourse polygons from baseline surveys, and apply RMAs in accordance with the buffers identified in Table 4-1. The EM, CM, and Site Survey will review the proposed clearing limits in relation to RMAs and identify opportunity to optimize the clearing limits, with a preference to avoid unnecessary disturbance to an RRZ outside and adjacent to the clearing limit.

Once the final clearing limit has been determined, the CM will coordinate with Site Survey to clearly stake the RRZ and RMZ buffers around wetlands that lie outside the Project disturbance footprint. A 30 m buffer of undisturbed vegetation around wetlands located within the mine site is required, excluding activities required to construct Project components. Work or activity conducted within the 30 m buffer will only be completed to the extent necessary for safety reasons to control invasive plants, or install and maintain erosion and sediment runoff control measures. An environmental monitor will observe work being done within the buffer, except when it is not possible for safety reasons.

5.2 Construction and Operations

The SOPs that apply to all wetlands, including listed wetlands, are presented in Table 5.2-1.

Table 5.2-1: Wetland RMA Standard Operating Procedures

Activity	Standard Operating Procedures[4]
Timing	Work in or around a wetland should be scheduled when the ground is frozen (i.e., a minimum 30 cm of frost penetration is preferred). This timing will avoid affecting most of animals that use wetlands and reduce soil compaction, rutting, and changes to site hydrology. When working in non-frozen conditions: ■ schedule work during favourable weather and low water conditions; ■ stop work during periods of heavy and persistent precipitation if there is a risk of sediment delivery to the wetland; and ■ complete the work as quickly as possible by ensuring all necessary equipment and materials are onsite and ready for installation to minimize the duration of disturbance.
Clearing	Establish protected riparian areas prior to clearing at locations. Within the RMZ and RRZ: ■ avoid construction in wetland RMZ and RRZ; ■ use low ground pressure machinery; ■ limit clearing widths; ■ debris disposal is not permitted in wetland RRZs or RMZs; ■ relocate borrow pits, waste areas, log landings, and other cleared areas that can be feasibly constructed outside riparian management areas; ■ minimize vegetation removal in and adjacent to wetlands; ■ do not grub within 10 m of water bodies where possible; ■ re-contour disturbed areas to restore natural cross drainages; ■ fall trees away from wetlands. Within the RMZ: ■ conduct wind firming treatments to reduce windthrow risk.
Machinery	■ Conduct work with low ground pressure machinery (e.g., tracked equipment, all-terrain vehicles for crew travel) using portable support structures such as swamp mats where required. ■ Machines must be checked for leaks and biodegradable hydraulic fluid must be used for work in wetland RRZs. ■ Refuelling or servicing of equipment is not allowed within a wetland RMA or RMZ.
Erosion and Sedimentation	■ Identify areas for potential erosion and sedimentation of wetlands, and mitigate in accordance with the Surface Erosion Prevention and Sediment Control Plan. ■ Maintain erosion prevention and sedimentation control throughout crossing construction and as required during operations. Ensure that erosion and sedimentation prevention and mitigation measures, if removed or damaged, are reinstalled or repaired as soon as possible.
Drainage	■ Direct surface runoff from roads during grading to designed sediment control structures. ■ Maintain or enhance existing drainage connections when designing and installing culverts for cross drainage, and avoid creating outlets that either drain wetlands or constrict the natural outlet during construction. ■ Maintain drainage pathways and wetland hydrology by installing appropriately sized culverts for stream and wetland crossings. ■ Avoid altering watercourses where this changes discharge into or out of wetlands. ■ Place soil salvage stockpiles in locations where they will have no impact on natural drainages, and avoid draining into wetlands.

[4] Cox, R. and Cullington, J. 2009. *Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia.* Wetland Stewardship Partnership: n.p. Available at https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-planning-strategies/wetlands-in-bc.

Activity	Standard Operating Procedures[4]
	■ Ensure that all water and tailings pipelines that interact with or intersect wetlands are raised enough to prevent hydrologic impacts to western toad dispersal but not raised too high that they will limit ungulate movement in and out of the wetland. ■ Minimize pesticide and fertilizer use around aquatic resources and before precipitation events to limit chemical runoff from entering wetlands.

RRZ = Riparian Reserve Zone; RMZ = Riparian Management Zone; RMA = Riparian Management Area

6. REFERENCES AND DOCUMENTS

ERM 2021. *Blackwater Gold Project - Wetland Management and Offsetting Plan*. Prepared for BW Gold Ltd by ERM Consultants Canada Ltd, Vancouver, BC.

ERM 2021. Blackwater Gold Project - Vegetation Management Plan. Prepared for BW Gold Ltd by ERM Consultants Canada Ltd, Vancouver, BC.

ERM 2021. Blackwater Gold Project - Invasive Plant Management Plan. Prepared for BW Gold Ltd by ERM Consultants Canada Ltd, Vancouver, BC.

Knight Piésold 2021. Blackwater Gold Project - Surface Erosion Prevention and Sediment Control Plan. Prepared for BW Gold Ltd by Knight Piésold Ltd, Vancouver, BC.

7. REVIEW AND APPROVAL

Reviewed by:

Environmental Manager

_____	_____	_____
Print	Signature	Date

Approved by:

Mine Manager

_____	_____	_____
Print	Signature	Date

APPENDIX A5 COARSE WOODY DEBRIS MANAGEMENT

Blackwater Gold Mine

Coarse Woody Debris Management

STANDARD OPERATING PROCEDURE

March 2022 Version A.1

Scope:	To define a standard operating procedure (SOP) for safe and efficient work practices to manage coarse woody debris.	
Contacts:	Travis Desormeaux Environmental Manager	tdesormeaux@artemisgoldinc.com 250.278.7788
Document Ownership:	Mine Manager	

1. SCOPE

This standard operating procedure (SOP) for coarse woody debris (CWD) management applies to all employees, contractors, and subcontractors/vendors at the Blackwater Gold Mine (Blackwater) during construction and operation. Application of coarse woody debris will be detailed in the Reclamation and Closure Plan, and as determined through reclamation trials.

2. RESPONSIBILITIES

Individuals with key roles and responsibilities with respect to riparian area management are presented in Table 2-1.

Table 2-1: Blackwater Roles and Responsibilities

Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, Environmental Management System (EMS) implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate their responsibilities to qualified personnel. Reports to Artemis Gold's Chief Operating Officer.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. The CM is responsible for riparian area management during mine site construction. Reports to Mine Manager.
Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management (EPCM) contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Supervisors	Supervisors include the Construction Supervisor and Production Supervisor and are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.

Employees and Contractors	Employees and contractors are responsible for being aware of the Vegetation Management Plan, including monitoring requirements, mitigation measures, adaptive management trigger action response, and reporting and record keeping.

3. STANDARD OPERATING PROCEDURES

Coarse woody debris is an important habitat element and will be retained for use in reclamation. During site clearing and pre-stripping, large volumes of woody debris, some representing large pieces (logs, root wads) will be encountered. These materials can represent valuable biotic material for reclamation and surface micro-habitat creation. Under the direction of a qualified person, opportunities for salvage will be identified and coarse woody debris will be salvaged and stored for future use. Standard operating procedures for CWD management and disposal, if required, are provided in Table 3-1.

Table 3-1: Coarse Woody Debris Management Standard Operating Procedures

Debris Management	Standard Operating Procedures
Coarse Woody Debris Retention > 12 cm diameter fuels	■ Where non-merchantable logs are available, retain approximately 50 logs or root wads per hectare (equates to approximately 10 m spacing at final application) for reclamation purposes. ■ Partially decayed existing coarse woody debris (Decay Class II or greater) should be disposed of. ■ All fuels > 12 cm in diameter must be sold or disposed of per the *Wildfire Act*. and ■ Priority will be to store CWD within topsoil stockpile footprints depending on diameter and nature of the CWD. Large CWD that is not manageable within the topsoil stockpile will be stored adjacent to stockpile footprints. ■ Establish and maintain a site-wide inventory of CWD volume available for reclamation purposes.
Fine woody debris retention	■ Priority will be to combine all fuels < 12cm in diameter (needles, tops, limbs, roots, etc.) within the topsoil stockpiles.
Fine woody debris slash loading limits < 12 cm diameter fuels	■ Design slash loading limits to reduce surface fire spread rates, fire intensity, and fire severity and to conform to the *Wildfire Act*. ■ Residual slash loading of fuels 7 to 12 cm diameter must not exceed 3 kg/m^2. ■ (30 tonnes/ha). ■ Residual slash loading of fuels < 7 cm must not exceed 1 kg/m_2 (10 tonnes/ha). ■ Retain all stumps to reduce soil erosion and assist in revegetation efforts in areas where grading is not required.
Debris Disposal Methods	■ Burning, chipping, and burying of woody debris are disposal methods that can be used when timber cannot be marketed or is in excess of salvage requirements. Guidance on the implementation of these methods is provided below.
Burning Material	■ Unless exempted by an appropriate authority, all burning is to be conducted in compliance with the BC *Wildfire Act* and the *Environmental Management Act*, and Open Burning Smoke Control Regulations. ■ Unless exempted by an appropriate authority, local ventilation indices must be indicated as ‘good’ prior to ignition of burn piles, using Environment Canada data or better information, and only continue if indices are fair or better. Wildfire Management Branch burning restrictions must be monitored and followed. ■ Burn piles must be constructed to facilitate effective ignition and complete combustion with minimal tending by crews and must have 3 m fuel free zones around them.

Debris Management	Standard Operating Procedures
	■ No debris may be disposed of within any Special Management Zones including management zones such as flagged no-work zones, and 10 m setbacks are required from these areas, wherein no chipping or burning is permitted. One exception to this exists for burning and chipping blue listed ecosystems but only in areas where grading of mineral soil is occurring and all native vegetation will be removed. ■ Burning must occur in the disturbed footprint in areas that will not have native vegetation after construction. ■ Piles must be constructed a minimum of 10 m from existing forest edges and from any reserve zones to reduce scorch and damage to retained trees. ■ Minimize the number of piles to reduce damage to soil resources. ■ Burning is not permitted within any Riparian Management Area(s) shown on the maps or that are located during pre-clearing surveys.
Chipping Material	■ Chips must be distributed evenly on–site, targeting an average of 5 cm depth over the dispersal area and a maximum depth of 15 cm in any given spot. Chips may not be dispersed within reserve zones or in areas where low-lying herbaceous plants comprise the main component of understorey plants. ■ The chipping or mulching of slash will not be permitted within the riparian management zone of any stream. In particular, chipped cedar debris will not be used for erosion control within a riparian zone as it produces a leachate toxic to fish.
Buried Material	Prior to burying, the volume of slash and overburden will first be calculated. Generally, for every cubic metre of debris, a square metre of clearing will be used for disposal. When excessive slash volumes are encountered, other disposal methods such as chipping or burning will be considered. Buried material will: ■ be compacted before being covered with soil; ■ be covered with a minimum of 300 mm of soil; ■ be placed so as not to interfere with roadway or other drainage, snow removal, design; ■ not interfere with sight distance, future developments, or standing timber; and ■ not interfere with any watercourse. Trenching is a type of burying in which slash and debris are placed in a trench rather than being spread over the ground surface. The volume of debris will determine the size of the trench. To minimize the size of the cleared area, a deep, narrow trench shall be used preferentially over a shallow, wide trench. To prevent undermining tree roots, 3 m of cleared width shall be left between any standing timber and the trench.

4. REVIEW AND APPROVAL

Reviewed by:

Environmental Manager

_____	_____	_____
Print	Signature	Date

Approved by:

Mine Manager

_____	_____	_____
Print	Signature	Date

APPENDIX A6 VEGETATION METALS SAMPLING STANDARD OPERATING PROCEDURE

Blackwater Gold Mine

Vegetation Metals Sampling

STANDARD OPERATING PROCEDURE

March 2022		Version A.1
Scope:	To define a standard operating procedure (SOP) for safe and efficient work practices to collect vegetation samples for the analysis of metal concentrations.	
Contacts:	Travis Desormeaux Environmental Manager	tdesormeaux@artemisgoldinc.com 250.278.7788
Document Ownership:	Mine Manager	

1. SCOPE

This standard operating procedure (SOP) applies to all employees, contractors, and subcontractors/vendors at the Blackwater Gold Mine (Blackwater) who collect vegetation samples for the purpose of monitoring trace metal uptake in soils and vegetation. Collection of vegetation samples should be conducted under the guidance of a qualified professional.

2. RESPONSIBILITIES

Individuals with key roles and responsibilities with respect to collection of vegetation samples are presented in Table 2-1.

Table 2-1: Blackwater Roles and Responsibilities

Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, Environmental Management System (EMS) implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate their responsibilities to qualified personnel. Reports to Artemis Gold's Chief Operating Officer.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. The CM is responsible for riparian area management during mine site construction. Reports to Mine Manager.
Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management (EPCM) contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Supervisors	Supervisors include the Construction Supervisor and Production Supervisor and are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.

Employees and Contractors	Employees and contractors are responsible for being aware of the Vegetation Management Plan, including monitoring requirements, mitigation measures, adaptive management trigger action response, and reporting and record keeping.

3. OBJECTIVE

The objective of this SOP will be to establish consistent field sampling procedures for collecting vegetation (plant and/or berries) samples for the analysis of metal concentration. The procedures are specific to vegetation sampling conducted at same sites as soil samples.

4. EQUIPMENT

The following equipment is essential:

- Nitrile gloves
- Camera
- Hand-held GPS
- Field forms, pencils and permanent marker
- Plastic zip-lock bags and labels
- Safety glasses

5. HEALTH AND SAFETY HAZARDS

Field Safety Hazards

- Noxious Weeds
- Working Remotely
- ATV Use
- Wildlife Encounter
- Insect bites (wood ticks)
- Working In and Around Water

6. STANDARD OPERATING PROCEDURES

Sample Timing

- Vegetation should be collected close to the peak summer growth prior to seed set, generally in the middle of July.
- Sampling should be conducted close to the same time each year to reduce potential changes in metal concentrations due to temporal differences, and at the same sites over time to minimize potential changes in metal concentrations due to spatial differences.

Sampling Location

- Locations will be determined based on the approved sampling program (i.e., sampling outside the Certified Project Description Boundary or sampling with the mine site)
- Site selection will be consistent with historical sampling per Appendix B of the Country Foods Monitoring Program.
- Record the following on a standard site description form:
  - Site ID number
  - sample type
  - date and time of collection
  - UTM coordinates
  - plant or berry species collected
  - sample IDs
  - site observations (e.g., unusual conditions, signs of stress)
  - photograph IDs taken of each plant species collected

Sampling Method

- New plant growth (leaves/stems) or ripe berry samples will be collected as composite samples from at least three locations on each targeted plant species (Table B-1 of the Country Foods Monitoring Program).
- Composite samples from a sample site will comprise sampling from three to five plants, distributed throughout an individual sample site to ensure that the minimum sample weight is collected.
- Nitrile gloves will be worn during plant and berry tissue collection.
- The absolute minimum is 3 grams of dry mass of plant tissue, but 5-10 grams are the recommended amount to be confirmed by laboratory completing the metals analysis. If vegetation sampled is wet, allowance for weight loss for dry sample weight must be considered. It is better to collect more, than less sample.
- All foreign debris will be removed prior to the sample being placed into a sampling bag; however, plant and berry samples should not be washed prior to placing in the bag (i.e., analysis should also include any dust on surfaces to be consistent with methods used in baseline studies).
- Bags will be immediately labelled with location, date, sample ID, and the species and sample type collected.
- Vegetation samples will be kept frozen or kept cool below 5ºC (placed directly into a cooler with ice packs and transferred to a fridge/freezer each evening) and packaged in coolers with icepacks for transport to the laboratory for analysis.
- Samples will be tracked using chain of custody forms.

Quality Assurance/Quality Control

- Field Split Duplicates should be collected for 10% of samples: field samples are obtained from *one location*, homogenized, divided into separate bags and treated as separate samples throughout the remaining sample handling and analytical processes. Before splitting, sample has to be homogenized by thorough mixing.
- All persons collecting samples must be capable of identifying plant species that will be collected and will be trained on appropriate sampling techniques to minimize the potential for cross-contamination and ensure that sample sizes are adequate for chemical analyses.
- Field notes and observations will be maintained to document field conditions, unusual conditions, general plant health at a sample site, and any notes related to the samples collected.
- Field data will be reviewed for accuracy after input into a database to minimize the potential for transcription errors.

7. REFERENCES AND DOCUMENTS

BC ENV. 2013. *British Columbia Field Sampling Manual*. British Columbia Ministry of Water, Land and Air Protection: Victoria, BC. https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/bc_field_sampling_manual_part_a.pdf.

BC ENV. 2020b. *British Columbia Field Sampling Manual, Part D: Solids*. British Columbia Ministry of Environment and Climate Change Strategy: Victoria, BC. https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/bc_field_sampling_manual_part_d.pdf.

Enita 2021. *Blackwater Gold Project - Country Foods Monitoring Plan*. Prepared for BW Gold Ltd by Enita Environmental Consultants Ltd., Campbell River, BC.

8. REVIEW AND APPROVAL

Reviewed by:

Environmental Manager

_____	_____	_____
Print	Signature	Date

Approved by:

Mine Manager

_____	_____	_____
Print	Signature	Date

APPENDIX A7 SOIL METALS SAMPLING STANDARD OPERATING PROCEDURE

Blackwater Gold Mine

Soil Metals Sampling

STANDARD OPERATING PROCEDURE

March 2022 Version A.1

Scope:	To define a standard operating procedure (SOP) for safe and efficient work practices to collect soil samples for the analysis of metal concentrations.	
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Document Ownership:	Mine Manager	

1. SCOPE

This standard operating procedure (SOP) applies to all employees, contractors, and subcontractors/vendors at the Blackwater Gold Mine (Blackwater) who collect soil samples for the purpose of monitoring trace metal uptake in soils and vegetation. Collection of soil samples should be conducted under the guidance of a qualified professional.

2. RESPONSIBILITIES

Individuals with key roles and responsibilities with respect to collection of soil samples are presented in Table 2-1.

Table 2-1: Blackwater Roles and Responsibilities

Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, Environmental Management System (EMS) implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate their responsibilities to qualified personnel. Reports to Artemis Gold's Chief Operating Officer.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. The CM is responsible for riparian area management during mine site construction. Reports to Mine Manager.
Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management (EPCM) contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Supervisors	Supervisors include the Construction Supervisor and Production Supervisor and are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.

Employees and Contractors	Employees and contractors are responsible for being aware of the Vegetation Management Plan, including monitoring requirements, mitigation measures, adaptive management trigger action response, and reporting and record keeping.

3. OBJE CTIVE

The objective of this SOP will be to establish consistent field sampling procedures for collecting soil samples for the analysis of metal concentration. The procedures are specific to soil sampling conducted at the same sites as plant or berry samples.

4. EQUIPMENT

It is recommended that equipment be made of inert materials such as stainless steel or polycarbonate. Corroded steel should be avoided. The following equipment is essential:

- Nitrile gloves
- Soil knife
- Hand-trowel / small shovel
- Measuring tape
- Field forms, pencils and permanent marker
- Plastic zip-lock bags and labels

In addition, it is often useful to carry a spatula, and a soil sieve.

5. HEALTH AND SAFETY HAZARDS

Soil can potentially contain chemical or biological agents posing risk to human health. Consequently, the sampler should treat all soil samples as potentially harmful.

Soil is considered hazardous if it contains elevated levels of any of the following contaminants: arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, endrin, lindane, methoxychlor, toxaphene, 2,4-dichlorophenoxyacetic acid, and 2,4,5-trichlorophenoxypropionic acid. If there is a known potential for any of the listed substances to be present in toxic quantities, the sampling program has to be carried out by personnel trained in contaminated sites surveys.

Field Safety Hazards

- Noxious Weeds
- Working Remotely
- ATV Use
- Wildlife Encounter
- Insect bites (wood ticks)
- Working In and Around Water

6. STANDARD OPERATING PROCEDURES

Sample Timing

- Soil metals collection should coincide with the vegetation metals program (generally mid-July).
- Sampling should be conducted close to the same time each year to reduce potential changes in metal concentrations due to temporal differences, and at the same sites over time to minimize potential changes in metal concentrations due to spatial differences.

Sampling Location

- Sampling should be done in locations typical of the soils that the samples are intended to represent; away from roads, fences, bioturbated areas such as burrows, uprooted trees, and other features that may be associated with atypical soil properties.
- In wetlands it is preferable to sample in the areas located away from peripheral ecotones and the wettest central sections.
- Soil sampling location characteristics should be assessed according to the methodology specified in the *Field Manual for Describing Terrestrial Ecosystems*[1] and recorded in the field datasheet. The terrain should be described based on British Columbia's Terrain System Classification[2].
- Record the following on standard site description form:
  - site ID number;
  - sample type;
  - date and time of collection;
  - UTM coordinates;
  - sketch of area;
  - number of samples collected;
  - sample IDs;
  - photograph IDs taken in each of the four cardinal directions (north, east, south, west); and
  - photograph ID of the pit and soil profile (care should be taken to focus camera on either sun-lit or shady surfaces to avoid highly contrasting areas).

Sampling Method

- Sample timing to coincide with the vegetation metals program.
- Samples should be collected from freshly excavated pits using a stainless-steel hand trowel.
- Soil sampling should start from the deepest portion of the pit and continue upwards.
- A blade of the shovel should be pushed into the pit wall at the bottom of the sampled soil section.

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[1] BC MELP and BC MOF 2010. Field Manual for Describing Terrestrial Ecosystems 2nd Edition. BC Ministry of Forests and Range and BC Ministry of Environment https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/conservation-data-centre/field_manual_describing_terrestrial_ecosystems_2nd.pdf.

[2] Howes, D.E. and Kenik, E. 1997. Terrain Classification System for British Columbia. Victoria, BC. https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/terclass_system_1997.pdf.

- The soil should be gently loosened from the respective portion of the pit wall with a knife and dropped onto the shovel blade. Any material that accidentally is included in the sampled material can be easily removed from the blade before the soil is transferred into the sample bag.
- It is important to insure that the depth delimitation of the soil sample is correct and that the probability of collection of all fractions of the soil is constant. Samples should be extracted from the soil pit wall in even portions. The thickness and the number of increments would depend upon the volume of material needed to make up the sample. It may be necessary to smooth the face of the pit before sampling so that the depth of the resulting vertical “channel” is as uniform as possible.
- Plant-integrated and depth-integrated composite sample: collected within the rooting zone (top 30 cm of the soil horizon) of each sampled plant species.
- Sampling within the mine site: soil samples are collected from the upper 0–2 cm and at regular intervals through the soil profile (at minimum every 20 cm).
- All foreign debris (such as twigs, roots, leaves, mosses, etc.) will be removed prior to the sample being placed into a plastic sampling bag.
- If coarse mineral fragments (> 20 mm) are present in the sampled soil, their proportion in the sample should be assessed and recorded. Coarse fragments will be removed prior to the sample being placed into a plastic sampling bag.
- Portions of the collected soil should be pushed off the shovel with a soil knife directly into a sealable plastic bag.
- The minimum mass of each representative sample for chemical analysis should be large enough for all laboratory analyses (mandatory and optional parameters) and possible repetitions or retesting. The absolute minimum mass of mineral soil samples (with no or little gravel) should be 250 grams but collection of 300 to 400 grams is recommended for important samples. For organic soil sampling at least 250 grams (approximately one cup volume when compacted) of peat should be collected. Minimum soil mass should be confirmed with the laboratory prior to field sampling.
- Bags will be immediately labelled with location, sample ID, and the type of sample collected.
- Soil samples will be kept cool below 5 ºC (placed directly into a cooler with ice packs and transferred to a fridge each evening) and packaged in coolers with ice packs to transport to the laboratory for analysis.
- Samples will be tracked using chain of custody forms.

Quality Assurance/Quality Control

- Field Split Duplicates should be collected for 10% of samples: field samples are obtained from *one location*, homogenized, divided into separate containers and treated as separate samples throughout the remaining sample handling and analytical processes. Before splitting, sample has to be homogenized by thorough mixing. Alternatively, two sub-sample containers should be filed simultaneously with alternate spoonful of the original sample.
- Field notes and observations will be maintained to document field conditions, unusual conditions,, and any notes related to the samples collected.
- Field data will be reviewed for accuracy after input into a database to minimize the potential for transcription errors.

7. REFERENCES AND DOCUMENTS

BC ENV. 2013. *British Columbia Field Sampling Manual*. British Columbia Ministry of Water, Land and Air Protection: Victoria, BC. https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/bc_field_sampling_manual_part_a.pdf.

BC ENV. 2020b. *British Columbia Field Sampling Manual, Part D: Solids*. British Columbia Ministry of Environment and Climate Change Strategy: Victoria, BC. https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/bc_field_sampling_manual_part_d.pdf.

Enita 2021. *Blackwater Gold Project - Country Foods Monitoring Plan*. Prepared for BW Gold Ltd by Enita Environmental Consultants Ltd., Campbell River, BC.

8. REVIEW AND APPROVAL

Reviewed by:

Environmental Manager

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Print	Signature	Date

Approved by:

Mine Manager

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Print	Signature	Date