APPENDIX 9-A SURFACE EROSION PREVENTION AND SEDIMENT CONTROL PLAN

Blackwater Gold Project

Surface Erosion Prevention and Sediment Control Plan

November 2021

BW GOLD LTD
a subsidiary company of Artemis Gold Inc

CONTENTS

List of Tables

List of Figures

ACRONYMS AND ABBREVIATIONS

Aboriginal Groups or Indigenous Nations	Lhoosk'uz Dené Nation, Ulkatcho First Nation, Nadleh Whut'en First Nation, Stellat'en First Nation, Saik'uz First Nation and Nazko First Nation (as defined in Environmental Assessment Certificate #M19-01)
Application	Joint *Mines Act/Environmental Management Act* Application
Artemis	Artemis Gold Inc.
BC	British Columbia
Blackwater	Blackwater Gold Project
BMP	best management practices
BW Gold	BW Gold LTD.
CD	collection ditch
CDA	Canadian Dam Association
CM	Construction Manager
DD	diversion ditch
DS	Decision Statement
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office
EM	Environmental Manager
EMLI	Ministry of Energy, Mines and Low Carbon Innovation
EMPR	Ministry of Energy, Mines and Petroleum Resources
EMS	Environmental Management System
ENV	Ministry of Environment and Climate Change Strategy
EPCM	Engineering, Procurement and Construction Management
ESC	erosion and sediment control
km	kilometre
KP	Knight Piésold Ltd.
LDN	Lhoosk'uz Dené Nation
masl	metres above sea level
MOE	Ministry of Environment

MOF	Ministry of Forests
NFN	Nazko First Nation
NTUs	Nephelometric turbidity units
PMP	Probable Maximum Precipitation
The Project	Blackwater Gold Project
RUSLE	Revised Universal Soil Loss Equation
RUSLEFAC	Revised Universal Soil Loss Equation for Applications in Canada
SCP	sediment control pond
SEPSCP	Surface Erosion Prevention and Sediment Control Plan
SFN	Saik’uz First Nation
StFN	Stellat’en First Nation
t/d	tonnes per day
TARP	Trigger Action Response Plan
TSS	total suspended solids
UFN	Ulkatcho First Nation
USLE	Universal Soil Loss Equation
VP	Vice President

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 soil 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 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) for the first five years of operation. After the first five years, the milling capacity will increase to 33,000 t/d for the next five-years, and to 55,000 t/d 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. received Environmental Assessment Certificate #M19-01 (EAC) on June 21, 2019 under the *2002 Environmental Assessment Act* (BC EAO 219c) 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

This Surface Erosion Prevention and Sediment Control Plan (SEPSCP) has been developed to proactively manage water, erosion, and sedimentation throughout all phases of the Project, with a focus on the Construction phase, as this is when the greatest ground disturbance will occur. Land clearing and construction activities for development of mine components will increase the mine site's susceptibility to erosion. Movement of eroded soil off the site associated with actions of water, wind, or ice, has the potential to impact water quality if unmitigated. A detailed, site-specific, stand-alone plan will be submitted to the Chief Permitting Officer prior to the commencement of construction.

The SEPSCP has been prepared in accordance with Section 9.2 of the *Joint Application Information Requirements for Mines Act and Environmental Management Act Permits* (BC EMPR & ENV 2019). The SEPSCP adheres to the following guidance documents:

- Forest Road Engineering Guidebook (BC MOF 2002).
- Revised Universal Soil Loss Equation for Application in Canada. A Handbook for Estimating Soil Loss from Water Erosion in Canada (Wall et al. 2002).
- Dam Safety Guidelines 2007 (2013 Edition; CDA 2013).
- Technical Guidance 3 – *Environmental Management Act* – Developing a Mining Erosion and Sediment Control Plan (BC MOE 2015a).
- Technical Guidance 7 – *Environmental Management Act* – Assessing the Design, Size and Operation of Sedimentation Ponds Used in Mining (BC MOE 2015b).
- Developing Management Plans for Mines in British Columbia – Erosion and Sediment Control Plan (BC EMPR 2020).
- Health, Safety and Reclamation Code for Mines in British Columbia (BC EMLI 2021).

This SEPSCP should be read in conjunction with Project design reports for early works, construction, and operation, and is intended to be used in conjunction with other management and monitoring plans pertinent to the protection of the aquatic receiving environment, including the following:

- Environment Monitoring Program (Section 7);
- Aquatic Effects Monitoring Plan (Section 7.6);
- Construction Environmental Management Plan (Appendix 9-C);
- Metal Leaching / Acid Rock Drainage Management Plan (Appendix 9-D);
- Mine Site Water and Discharge Monitoring and Management Plan (Appendix 9-E); and
- Air Quality and Fugitive Dust Management Plan (Appendix 9-O).

The intent of this document is to outline strategies and design objectives, with appropriate flexibility, to allow the facilities to be field-fit to suit the site conditions encountered (i.e., an adaptive management approach). The SEPSCP describes best management practices (BMPs) that will be implemented – it is not meant to be prescriptive. Specific measures to be implemented for each work area will be presented on detailed design drawings prepared for construction. The overall objective of the SEPSCP is to manage contact water within the Project footprint, so as to prevent runoff from potentially impacting adjacent watercourses.

The term "contact water" is used to describe water that has come into contact with mine facilities and/or any disturbed areas, road runoff, borrow areas, or vegetation cleared areas. Conversely, "non-contact water" is used to describe water that has not come into contact with any project facilities or disturbed areas.

2.1 Activities Schedule

This Project has five phases:

- Early Works (approved under *Mines Act* M-246 Permit on June, 22, 2021 and the *Environmental Management Act* Permit 110602 on June 24, 2021);
- Construction Phase: Y-2 to Y-1;
- Operations Phase: Y+1 to Y+23;
- Closure Phase: Y+24 to Y+45; and
- Post-closure Phase: Y+46.

The mine development sequence and schedule for all mine components for all phases of mine life (construction, operation, closure, and post-closure) are provided in detail in Section 3.3 of the Joint MA/EMA Application.

2.1.1 Construction

Activities during the Construction Phase that have the potential to cause erosion and sedimentation include:

- Vegetation clearing, grubbing, and surface preparation for the Open Pit;
- Foundation construction and initial stockpiling for the Run of Mine stockpile at the Processing Plant;
- Vegetation clearing for the TSF C Main Dam, excavation of cut-off trench, and construction of starter dam;
- Construction of Interim Environmental Control Dam; and
- Vegetation clearing, grubbing, and surface preparation for Waste Rock Storage Facilities and Ore Stockpiles and construction of foundation and perimeter drainage.

In the initial construction area, Davidson Creek will be diverted around the site along the north bank. Two options are proposed: pumping or a diversion channel. For the diversion channel, a diversion berm will be located approximately 500 m upstream of the TSF C Main Dam centreline to facilitate diversion of Davidson Creek into the diversion channel. An initial fill area and downstream sediment control pond will be constructed close to the initial construction area prior to site preparation and initial embankment construction. Construction of the Stage 1 dam will be completed by the end of Y-1 to provide sufficient capacity for a start-up pond and to impound tailings and PAG/NAG3 waste rock generated during the first year of operations. The remaining Davidson Creek catchment upstream of the TSF C West Dam will be redirected to Creek 705 to the southwest, away from TSF C, by a cofferdam built in Y-2, which will permanently change the natural catchment divide in this area. This catchment does not contribute to the water balance for the mine site.

2.1.2 Operations

During operations, erosion and sediment control (ESC) measures will be implemented as needed based on site inspections evaluating climactic fluctuations and seasonal conditions (e.g. spring freshet). These are anticipated to include collection ditches and sediment control ponds associated with the following facilities:

- Waste rock and overburden storage facilities;
- Low Grade Ore stockpile; and
- Topsoil stockpiles.

Ditches along mine site haul roads and the access road will also be maintained annually to control erosion from spring freshet and surface runoff from large precipitation events.

Landforms that will be completed prior to closure and can be progressively reclaimed include:

- Upper Waste Stockpile (Y+19);
- Ex-pit haul roads (Y+19); and
- Explosive storage facilities (Y+19).

The Lower Waste Stockpile will be completed in Y+11; however, this material is earmarked for reclamation purposes and therefore the stockpile will not be progressively reclaimed.

2.1.3 Closure and Post-Closure

Reclamation activities are described in Section 4 of the Application. The Open Pit, Upper and Lower Waste Stockpiles, and TSF will remain following closure. Stockpiles will be re-sloped to apply a growth medium prior to re-vegetation. Some of the waste rock and overburden will be used for reclamation activities across the site, particularly reclamation of the TSF.

Landform grading and placement of reclamation materials using large equipment, primarily bulldozers, are the key activities anticipated to require ESC measures. Diversion and collection ditches to manage surface water runoff, sediment control ponds, stabilizing disturbed land surfaces, and establishing vegetation cover will minimize erosion.

Specific (ESC) to be implemented for each work area for closure and reclamation activities will be presented on detailed design drawings prepared prior to the Closure Phase.

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, Independent Tailings Review Board, and TSF qualified person.

Table 3-1: BW Gold Roles and Responsibilities

Role	Responsibility
Chief Executive Officer	The CEO is responsible for overall Project governance. Reports to the Board.
Chief Operating Officer	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 is responsible for championing the Environmental Policy Statement and EMS, establishing environmental performance targets, and overseeing permitting. Reports to COO.
General Manager–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 day-to-day responsibilities as appropriate to the Construction Manager, EPCM contractors, and the Environmental Manager. The Mine Manager will ensure that adequate support and resources are made available for the successful implementation and maintenance of the SEMSCP by Project personnel and contractors. 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. This includes ensuring the successful implementation and maintenance of the SEMCP. The CM delegates day-to-day responsibilities related to the SEMCP to Project Engineers and QPs who are expert in the area of ESC. The CM provides leadership and support to all Project team members who are involved in the implementation of the SEMCP. The CM will ensure that Engineering, Procurement and Construction Management (EPCM) contractors retain sufficient site personnel who are accredited as Certified Professionals in ESC. The CM works closely with the Environmental Manager and Environmental Monitor and reports to GM.

<table>
<tr><th>Role</th><th>Responsibility</th></tr>
<tr><td>Environmental Manager (EM)</td><td>BW Gold will employ a qualified person as an EM who will ensure that throughout the Construction Phase the EMS requirements are established, implemented, and maintained, and that environmental performance is reported to management for review and action. 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 is responsible for the day-to-day management of the Project's environmental programs, compliance with environmental permits, and updating the EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and EPCM contractor, other contractors, the Company, and regulatory agencies, where required. Supports the CM and reports to Mine Manager.

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 has been addressed and concerns rectified.

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.

The EM will be accountable for implementing the approved MPs and reviewing them periodically for effectiveness.</td></tr>
<tr><td>EPCM contractor and other contractors</td><td>The EPCM contractor and other contractors report to the CM and provide day to day project management and assurance in their areas of responsibility that the SEMPCP is being effectively implemented in accordance with applicable contractual terms and conditions. The Contractors liaise closely with the Construction and Environmental Managers, and Environmental Monitors on a day-to-day basis regarding the implementation and maintenance of the SEMCP. The EPCM contractor will be responsible for ensuring that impacts are minimized, and environmental obligations are met during the Construction Phase.

EPCM and other contractors are responsible for the following:
■ Ensure that ESC measures are installed/constructed based on plans and according to design specifications approved by and under the supervision of a Certified Professional in ESC.
■ Ensure that workers are appropriately trained, supervised, and have the necessary experience and competency to implement the requirements of the SEPSCP.
■ Provide input to BW Gold on construction-related aspects of SEPSCP implementation including labour, equipment and materials requirements, construction procedures, and field constraints.
■ Inform the Construction Manager if the conditions of the environment or construction practices vary materially from that as anticipated under this SEPSCP and make suggestions/recommendations for control measure modifications as needed.
■ Undertake corrective and preventative measures in response to non-conformances with the SEPSCP and ensure that such measures are implemented in a timely manner.
Correct deficiencies and any non-compliances upon direction from Construction Manager or Environmental Manager/Monitor.</td></tr>
</table>

Role	Responsibility
Departmental Managers	Departmental Managers (e.g., mining, milling, and plant/site services) will be directly responsible for implementation of the EMS and MPs and standard operating procedures 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 EM.
Community Relations Advisor	Community Relations Advisor is responsible for managing the Community Liaison Committee and Community Feedback Mechanism. Reports to Mine Manager.
Environmental Monitors	Environmental Monitors (include Environmental Specialists and Technicians, including Certified Professional in Erosion and Sediment Control) 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 Aboriginal interests. Aboriginal Monitors will be involved in the adaptive management and follow-up monitoring programs.
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 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 with the EPCM contractor and other contractors, communicating environmental requirements, and conducting periodic reviews of performance against stated requirements.

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. 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. The Mine Manager will maintain overall responsibility for management of 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, 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

Federal legislation pertinent to water management includes:

- *Canadian Environmental Protection Act, 1999;*
- *Fisheries Act;*
  - *Metal and Diamond Mining Effluent Regulations;*
- *Impact Assessment Act*; and
- *United Nations Declaration on the Rights of Indigenous Peoples Act.*

Provincial legislation pertinent to water management includes:

- *Declaration on the Rights of Indigenous Peoples Act;*
- *Environmental Assessment Act*;
- *Environmental Management Act; and*
- *Mines Act;*
  - Health, Safety and Reclamation Code for Mines in British Columbia (EMLI 2021).
- *Water Sustainability Act*.

4.2 Environmental Assessment Office Certificate Conditions and Federal Decision Statement Conditions

There is no specific condition related to erosion and sediment control. Condition 13 requires ESCs are identified in Construction Environmental Management Plan (Appendix 9-C of the Application) and have been informed by the SEPSCP.

Section 7 of the SEPSCP addresses Conditions 3.1 in federal DS which requires:

The Proponent shall implement measures to control erosion and sedimentation within the Designated Project area to avoid the deposit of deleterious substances in water frequented by fish. The Proponent shall submit these measures to the Agency and to Indigenous groups before implementing them.

4.3 Existing Permits

BW Gold received *Mines Act* Permit M-246 on June 22, 2021 and *Environmental Management Act* Permit 110602 on June 24, 2021, authorizing early construction works for the Project. These works include means clearing, grubbing ditching, and site levelling at the Plant Site location and sediment and erosion controls, including construction of a sediment control pond (SCP).

Permit M-246 includes the following conditions related to ESC:

Part B Geotechnical

2. Surface Water Ponds, Ditches, and Diversions

(b) The Permittee must ensure that surface water ponds, ditches and diversion channels are designed to convey the design flood without overtopping, without side slope failure, and with adequate armour or lining to prevent significant erosion.

3. Soil, Overburden and Rock Stockpiles

The Permittee must ensure that all soil, overburden, and rock stockpiles are constructed in accordance with designs prepared by a Professional Engineer, unless exempt in writing from the Chief Permitting Officer, and are constructed and inspected to ensure stability and erosion control is maintained.

4. Borrow Pits and Quarry Excavations

The Permittee must ensure that borrow and quarry excavations are constructed in accordance with designs prepared by a Professional Engineer and are constructed and inspected to ensure stability and erosion control is maintained.

5. Mine Site Roads

(a) The Permittee must ensure that mine roads are constructed in accordance with designs prepared by a Professional Engineer and are constructed and inspected to ensure stability and erosion control is maintained.

Part C Protection of Land and Watercourses

3. Surface Water Management and Monitoring

(*a) The Permittee must implement the surface water monitoring program in the Early Works Erosion and Sediment Control Plan (Document 1.5). The Permittee must track changes to surface water, seepage, and groundwater quality and quantity on the minesite. The Permittee must ensure that the program is capable of providing early warning about the onset of ARD or an increase in contaminant loading.*

(c) The Permittee must ensure that an effective QA/QC program for the surface water, groundwater and seepage monitoring programs is included and implemented as part of the Early Works Erosion and Sediment Control Plan. The Permittee must ensure that this includes detection limits, performance criteria that define acceptable levels of precision and accuracy and reporting of any missed sampling events.

5. Erosion Control and Sediment Control

(a) The Permittee must implement the Early Works Erosion and Sediment Control Plan (Document 1.5).

(b) The Permittee must ensure that the Early Works Erosion and Sediment Control Plan is reviewed annually with updates reported in the Annual Reclamation Report. The Permittee must provide all substantive changes to the Chief Permitting Officer prior to implementation.

6. Soil Salvage and Stockpiling

(e) The Permittee must protect stockpiles from erosion, degradation, and contamination through revegetation and/or other practices.

Part D Reclamation and Closure Program

4. Erosion Control

The Permittee must achieve reduction of erosion through landform configuration, development of maintenance-free vegetation covers, and the development of stable, self sustaining drainage control features and watercourses.

6. Growth Medium

(b) With the exception of areas where closure plans require compaction prior to placement of growth medium in order to reduce infiltration and contact water, the Permittee must ensure that areas to be reclaimed are decompacted to the minimum depth required to adequately address the severity of compaction prior to placement of soil and or vegetation, in a manner intended to achieve end land use objectives and erosion control.

7 Surface Water Management Ponds and Channels

The Permittee must reclaim all surface water management ponds and water diversions to satisfy stability and erosion control requirements and the approved end land use once no longer required.

Permit 110602 includes the following conditions related to ESC:

3.3 Erosion and Sediment Control Plan (ESCP)

To minimize and control the runoff of sediments in stormwater and to manage the treatment of stormwater, the permittee must implement, maintain and comply with all aspects of the ESCP during the Early Works. The ESCP must be prepared by a QP. The Plan must be submitted to the director 90 days prior to construction at the site. Any modifications made to the ESCP must be submitted to the director within 30 days of the modification.

The director may require the permittee to update the ESCP based on environmental data, public complaints, and/or any other information obtained by Environmental Protection in connection with the mine operation and receiving environment.

3.5 Visual Monitoring

The permittee must conduct visual monitoring of the Sediment Control Pond daily while discharging to the Rapid Infiltration Basins. The permittee must conduct visual monitoring of the Rapid Infiltration Basins daily when there is effluent in the basins. Visual monitoring must include monitoring for adequate infiltration in the Rapid Infiltration Basins and monitoring for seepage, overland flow, and erosion in the area outside the Sediment Control Pond and Rapid Infiltration Basins. Daily inspections must be recorded and maintained on site for three years and must be made available to Ministry staff upon request.

5. ENVIRONMENTAL SETTING AND SITE CONDITIONS

5.1 Watersheds

The Blackwater deposit lies within the upper reaches of the Davidson Creek and Creek 661 catchment areas. The terrain within these catchments is predominantly gently inclined, except along the incised portions of Davidson Creek. Davidson Creek flows northeast from the Project site towards lower Chedakuz Creek, the confluence of the two creeks is approximately 800 m downstream of Tatelkuz Lake. Creek 661 flows northeast from the Project site into upper Chedakuz Creek upstream of Tatelkuz Lake.

Chedakuz Creek drains Tatelkuz Lake and flows north-west, passing under a bridge at the Kluskus FSR approximately 2 km downstream from the lake. An unnamed catchment drains Snake Lake, which is located between the Davidson Creek and Creek 661 catchments. The Snake Lake catchment area drains directly into Tatelkuz Lake, while Creek 661 flows northeast from the Project site into Chedakuz Creek upstream of Tatelkuz Lake.

Turtle Creek, located to the north of Davidson Creek, drains another catchment running parallel to Davidson Creek towards Chedakuz Creek. Turtle Creek flows close to Davidson Creek near the mouth, before flowing north under the Kluskus FSR to its confluence with Chedakuz Creek downstream of the Kluskus FSR. Chedakuz Creek flows north-west from this point for approximately 25 km to the Nechako Reservoir.

Along the south-west side of the Project site, Fawnie Creek, Matthews Creek and Creek 705 all flow south-west from the deposit area. Creek 705 is a tributary of Fawnie Creek, which flows towards Laidman Lake and joins with Matthews Creek. Fawnie Creek continues to Johnny Lake, into Entiako Provincial Park, and ultimately forming a portion of the flow of the Entiako River into the Nechako Reservoir.

5.2 Terrain and Natural Hazards

The Project is situated on the Nechako Plateau of British Columbia, part of the Interior Plateau east of the Coast Mountain Range. The area is characterized by gently undulating, northwest-trending hills cut by small to medium-sized drainages. The elevation of the Blackwater property ranges from just over 1,000 metres above sea level (masl) in low-lying areas northeast of the proposed mine site to 1,800 masl on the southwest side of the property at the summit of Mount Davidson, which is the highest peak in the Fawnie Range. The Blackwater deposit is located on the northern flanks of the mountain.

The natural terrain has resulted in relatively few past landslides in the Project area; however, naturally occurring recent debris slides, rock falls, and potentially two relic (pre-aerial photography) rock avalanches have been identified outside of the mine site boundary in gullied terrain southwest of the explosives storage area. All of the identified relic or recent slides have limited areal extent, and no infrastructure is planned to be built at these locations.

Terrain mapping did not reveal any widespread areas of sheet or gully erosion within the mine site.

5.3 Climate and Hydrology

5.3.1 Mean Annual Precipitation

Two climate stations are installed in the Blackwater Project study area: Blackwater Low and Blackwater High. Blackwater Low was installed in July 2011 at an elevation of 1,050 masl and Blackwater High was installed in July 2012 at an elevation of 1,470 masl. Precipitation data from Vanderhoof were used to develop an estimate of long-term precipitation conditions for Blackwater Low and Blackwater High.
The mean annual precipitation estimates are 564 mm for Blackwater High and 489 mm for Blackwater Low.

5.3.2 Monthly Precipitation Distribution

The monthly distribution of precipitation was estimated for the purpose of water management planning. Mean monthly precipitation values range from a low of 30 mm in March to 68 mm in June for Blackwater High, and 24 mm in March to 59 mm in June for Blackwater Low. Approximately 41% of the annual precipitation at the project site falls as snow (at the Blackwater High station). Rain may occur in any month of the year, but largely falls in the period of April to October. The monthly precipitation statistics for Blackwater High are summarized in Table 5-1.

Table 5-1: Mean Monthly Precipitation Statistics

Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total Precipitation (mm)	51	35	30	33	44	68	64	52	51	65	65	56
Rain (mm)	3	3	7	24	43	68	63	52	50	47	14	2
Ratio of Rainfall (%)	6	8	24	72	98	100	100	100	97	76	24	5
Snowfall (mm)	48	32	23	9	1	0	0	0	2	15	42	46
Ratio of Snowfall (%)	94	92	76	28	2	0	0	0	3	24	76	95

Source: KP (2021).

Note:
Blackwater High station.

5.3.3 Intensity-Duration-Frequency Data

Estimates of extreme precipitation are required for a number of design aspects; the 24-hour extreme precipitation and probable maximum precipitation (PMP) for different return period events are summarized in Table 5-2.

Table 5-2: Design Storm Events

Return Period (years)	24-Hour Extreme Rainfall (mm)
2	44
10	73
100	110
200	121
1,000	146
PMP	425

Note:
Regional values recommended to be used as design values for the project.

For the purpose of this plan, a significant rainfall event will be considered as greater than or equal to the 1 in 2 year return period rainfall.

5.3.4 Mean Annual Runoff

The annual stream hydrographs in the Blackwater Gold Project area are typically characterized by a very pronounced period of high flows during the spring freshet, followed by an extended period of steady low flows, with limited autumn storms. All creeks are affected by ice formation during the winter and the smaller systems typically freeze over for extended periods during cold snaps. Estimates of mean monthly and annual unit runoffs are summarized in Table 5-3.

Table 5-3: Mean Monthly and Annual Unit Runoff

Station	Area (km^2)	Mean Monthly Unit Discharge ($L/s/km^2$)												MAUD ($L/s/km^2$)	MAUR (mm)	MAD (L/s)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
H1	9	0.8	0.8	1.1	5.6	24.9	8.6	3.7	1.0	1.4	2.1	2.0	1.0	4.4	139	39
H2	44	2.1	2.0	2.3	7.7	30.1	16.7	8.9	3.6	3.4	4.1	3.0	2.3	7.2	227	316
H2B	46	2.2	2.1	2.6	8.6	32.4	18.7	10.3	4.2	3.9	4.9	3.4	2.5	8.0	252	368
H4B	61	2.7	2.6	3.1	6.7	24.1	14.9	8.6	3.3	3.9	4.8	3.7	3.1	6.8	215	418
H5	593	1.7	1.6	1.9	5.6	15.3	9.7	6.0	3.3	2.2	2.4	2.3	1.9	4.5	142	2663
H6	55	2.3	2.2	2.7	3.8	11.6	9.1	3.7	3.3	2.7	3.5	3.8	2.6	4.3	135	233
H7	42	0.8	0.7	0.9	6.5	27.3	13.4	6.4	1.1	2.2	3.1	1.2	1.0	5.4	170	227
H10	7	3.2	3.1	3.6	12.0	46.3	27.0	14.2	5.4	5.1	6.2	4.6	3.5	11.2	353	79
H11	15	0.7	0.6	0.8	4.6	15.8	11.9	4.2	2.7	2.5	2.9	1.5	0.9	4.1	129	60
L1-Outlet	392	1.5	1.4	1.7	5.4	15.3	9.6	5.6	3.1	2.0	2.1	2.1	1.7	4.3	136	1687

Source: Table 3.4 from KP (2021).

Note:

MAUD - Mean Annual Unit Discharge MAUR - Mean Annual Unit Runoff; MAD -Mean Annual Discharge.

5.3.5 Wet Month Runoff

Wet monthly flow values were estimated for the project area on the basis of the variability of the long-term flow series developed for the H5 hydrology monitoring station. The monthly return period values were estimated in the 2020 Hydrometeorology Report (KP 2021). The return period ratios (estimated by fitting statistical distribution to the monthly flow values) are shown in Table 5-4.

Table 5-4: H5 Wet Monthly Return Period Streamflow Relationships

Month	Return Period Mean Monthly Discharge (L/s)				
	Mean	Wet			
		5 Year	10 Year	20 Year	50 Year
January	1,012	1,218	1,317	1,393	1,469
February	955	1,168	1,219	1,248	1,269
March	1,145	1,322	1,563	1,845	2,300
April	3,293	4,456	6,012	7,819	10,722
May	9,044	11,627	14,523	17,682	22,411
June	5,762	7,220	9,232	11,591	15,423
July	3,531	4,290	5,567	7,156	9,916
August	1,976	2,430	3,052	3,781	4,963
September	1,298	1,590	1,986	2,448	3,194
October	1,443	1,680	2,102	2,636	3,580
November	1,374	1,522	1,916	2,458	3,513
December	1,117	1,287	1,483	1,701	2,032
Mean Annual	**2,663**	**3,318**	**4,164**	**5,147**	**6,733**

Source: Table 3.5 from KP (2021).

6. RISK DETERMINATION

6.1 Surface Preparation Activities

Construction activities that have the potential to cause erosion and sedimentation are briefly described below.

- Clearing and Grubbing: Clearing operations include slashing, cutting, stockpiling, and removal (or burning) of trees and brush. Grubbing operations include the removal of the tree stumps and root masses left behind during clearing operations. Grubbing operations may cause localized soil exposure in areas where roots and stumps are removed.
- Stripping: Stripping is the removal of the organic mat from the construction site to expose the underlying mineral soil.
- Stockpiles: Stockpiles may include material removed from excavations, stripping, clearing, and borrow pits. The creation of stockpiles may disturb the vegetated soil surface and create exposed slopes.
- Road Construction: access roads are constructed to accommodate construction equipment on the Project site. Construction of roads may involve cut slopes, fill slopes, ditches, or culvert installation.
- Culvert Installation: Culverts are installed to connect drainage courses and surface drainage flow. Installation of culverts may cause flow concentrations, create cut slopes, disturb the soil surface on slope faces, and create scour zones at the culvert inlet or outlet.
- Ditch Construction: Where channels or ditches are constructed to direct and transport water along or transverse to the road alignment, the original drainage pattern may be altered, concentrating flows, and increasing flow velocity and erosion potential. Ditch construction creates exposed slopes that can be subject to erosion.
- Borrow Excavations: Borrow excavations can either be landscape borrows or dugout borrows.

Ice or snow blocked culverts at freshet can cause overtopping or washout of roads, and lead to erosion and sedimentation.

Potential effects from the construction activities in the absence of planned mitigation measures include:

- Increased surface erosion from disturbed and rehabilitated areas;
- Increased sediment load entering the natural water system or the terrestrial environment;
- Loss or degradation of soil materials for use in reclamation; and
- Siltation or erosion of watercourses and water bodies.

Heavy rainfall events and freshet runoff can create erosion and sedimentation in areas that did not have previously known erosion. Heavily trafficked areas and land disturbance caused by heavy mobile equipment can be a continuous source of soil displacement and compaction. With compaction, infiltration is reduced, and surface water has a greater potential for erosion. Proper planning prior to the commencement of heavy equipment and construction work can limit the disturbed footprint and mitigate erosion potential. During unusually heavy rain events oversaturated soils can exacerbate the problem.

6.2 Soil Loss Estimation

The potential for soil erosion to occur is determined by surface cover, topography, climate, land use practices and soil texture (the proportion of sand, silt, and clay), soil structure, and soil permeability (Wall et al. 2002).

The Universal Soil Loss Equation (USLE) is a mathematical model developed in the 1960s by the U.S. Department of Agriculture Soil Conservation Service to predict soil erodibility (Wall et al. 2002). The USLE and its derivatives (Revised Universal Soil Loss Equation (RUSLE)), are based on erosion plot and rainfall simulator experiments, primarily for crops in the Eastern United States (Wall e. al. 2002). The Revised Universal Soil Loss Equation for Application in Canada (RUSLEFAC) was developed to specifically reflect Canadian conditions (Wall et al. 2002). The USLE or RUSLE equation to estimate the potential, long-term, average annual soil loss per hectare is:

$A = R \times K \times L \times S \times C \times P$ (Wischmeier and Smith 1978, presented in Wall et al. 2002)

Where:

A = potential, long-term, average annual soil loss per hectare [tonnes/ha/year]
R = rainfall factor [MJ•mm/ha/hr]
K = soil erodibility factor [tonnes•hr/MJ/mm]
L = slope length factor [dimensionless]
S = slope steepness factor [dimensionless]
C = cropping-management factor [dimensionless]
P = support practice factor [dimensionless]

These factors will be obtained from baseline reports for each discipline (e.g., hydrometeorology reports; soils and terrain reports; and site investigations). Where required, additional field truthing will be completed: hand dug test pits will be excavated to a maximum depth of 1.0 metres, and the soils will be characterized and potentially analyzed for particle size, organic matter, structure, and permeability.

The potential soil loss calculated for each worksite/area will be compared to guidelines for assessing potential soil erosion classes summarized in Table 6-1 (Wall et al. 2002). The suggested soil loss tolerance in Canada is 6 tonnes/ha/year (Wall et al. 2002).

Table 6-1: RUSLEFAC – Soil Loss Classes

Soil Erosion Class	Potential Soil Loss [tonnes/ha/year]
1 - Very Low	<6
2 - Low	6 – 11
3 - Moderate	11 – 22
4 - High	22 – 33
5 - Severe	>33

Source: Table 1.1 from Wall et al. (2002).

The erosion potential will be calculated for disturbance areas and included in the design criteria for Issued for Construction (IFC) drawings. RUSLEFAC will be used to guide the selection of appropriate erosion control strategies - areas identified as having greater potential soil loss/erosion will require more intensive ESC measures and monitoring.

7. EROSION AND SEDIMENT CONTROL MEASURES

7.1 Erosion Management and Sediment Control Strategies

The key strategy to control erosion and sedimentation is to protect the soil surface from rain and runoff (water management) and to capture eroded soil on site. These will be addressed through:

- Documentation of baseline conditions and erosion risk potential.
- Minimizing the extent and duration of exposure through planning and scheduling of ESC measure selection, installation, inspection, repair/modification, and decommissioning for every part of the construction schedule.
- Prioritizing drainage control, then erosion control, then sediment control - protecting areas to be disturbed from runoff by intercepting runoff and diverting it away from disturbed areas and keeping runoff velocities low.
- Retaining sediment on site by planning the location where sediment deposition will occur and constructing containment systems before other land-disturbance occurs.
- ESC performance monitoring and routine inspection of ESC measures, documentation of inspections, and prompt response to problems (maintenance and replacement of ESC measures as needed).
- Progressive reclamation, as practicable.
- Permanent site stabilization and decommissioning of ESC measures.

Erosion control practices protect the soil surface against erosion mechanisms, while sediment control practices retain soil particles after they have been dislodged, thereby minimizing their movement off site. Erosion control should be viewed as the primary means in preventing the degradation of downstream aquatic and terrestrial resources, while sediment control should be viewed as a contingency plan, and installed after all opportunities for erosion control have been implemented. A greater emphasis will be placed on erosion control measures, especially in areas of elevated erosion potential; however, measures to address both erosion control and sediment control are required. Erosion control measures prevent exposed soils from being entrained by water or wind, while sediment controls address prevention of sediment mobilizing into natural waterbodies impacting fish and aquatic life and the removal of sediment suspended in water once erosion has occurred. Erosion and sediment control measures applied in series create a resilient system capable of protecting the natural environment from sediment impacts.

This SEPSCP describes design elements and provides guidance for control of all water originating from, or brought into, the mine site area during construction. Water will be controlled in a manner that minimizes erosion in areas disturbed by construction activities and prevents the release of contact water, which could adversely affect the water quality of receiving waters or terrestrial environments.

Water management will focus on diverting non-contact water away from working areas, retention of the understory vegetation (brush and root networks) as much as possible during winter logging, and interception of contact water using BMPs. Disturbed areas will be seeded using quick establishing, weed-free seed mixes (native and approved non-native) for initial soil stabilization followed by planting of native vegetation in accordance with Reclamation and Closure practices to facilitate progressive closure and reclamation of the project where final slopes are created and available.

Erosion management and sediment control at the project will be a process of establishing diversion and collection ditches to manage surface water runoff, constructing SCPs, stabilizing disturbed land surfaces to minimize erosion, establishing temporary vegetation cover, and reclaiming the final slopes in accordance with the Reclamation and Closure Plan (Chapter 4 of the Application).

The type of erosion or sediment control measure will be selected based on site-specific conditions such as:

- Site erosion potential classification;
- Area of up-gradient soil exposure;
- Terrain conditions and space constraints;
- Construction method;
- Anticipated concentrated rainfall amounts due to ditching or drainage pattern changes; and
- Level of risk to the receiving environment.

Environmental monitoring procedures and associated actions are described in Section 9. Performance monitoring and routine inspection of ESC measures are described in Section 11.

7.2 Procedural Controls

A work schedule that coordinates the timing of land-disturbing activities and the installation of ESC measures is a cost-effective way to help reduce erosion risk. Runoff-control measures and diversions should be installed up-gradient of areas to be disturbed prior to grading. Principal sediment basins and traps should be installed before any major site grading takes place, and additional sediment traps and sediment fences should be erected as grading takes place to keep sediment contained on-site at appropriate locations. In steeper terrains, where construction of sediment basins may not be feasible, a combination of silt retention structures and filter bags may be employed, or diversion ditches may redirect flows to an area of flatter terrain where a sediment basin may be implemented.

7.3 Best Management Practices

The ESC BMPs are described in the following sections, with typical design criteria. Specific measures to be implemented for each work area will be identified in the field prior to the construction activity. If monitoring indicates that additional BMPs are required, they will be implemented based on the guidance of the EM and Design Engineer. Prior to construction, design reports will be prepared for the Project facilities and will include Detailed Design drawings, which will supersede the typical design information presented herein. Typical sections and BMP details are provided in the drawings in Appendix A.

7.3.1 Sediment Control Ponds and Sediment Basins

7.3.1.1 Sediment Control Ponds

SCPs will be designed following the BC MOE (2015b) guidance document on size and operation of sediment ponds. SCPs will be designed to accommodate a live storage equal to an established storm event with freeboard; these will depend on the size of the runoff area and the life of the structure. The minimum design flow for removal of suspended solids in sediment ponds should correspond to the 10-year, 24-hour runoff flow (BC MOE 2015b) The ponds may also be designed with spillways to convey larger storm events to maintain a minimum 0.5 m freeboard on the embankment during the structural design run-off event (minimum 1 in 200 years; BC MOE 2015b). The SCPs will be designed following the BC MOE (2015b) recommendation that sediment ponds capture at least a 10 micron soil particle for the 10-year, 24-hour runoff event. Particle size analyses (the fraction of minus 2 and minus 10 micron particles) in representative soil samples will be determined, along with settling analysis required for effective sediment pond design, if required. Predicted discharge frequency and duration will be included for each pond (e.g., intermittent, continuous, or only when impounded water quality meets discharge criteria set out in Table 9-1; see Section 9).

SCP outlets will include energy dissipation mechanisms to reduce the potential for erosion in the downslope environment: these mechanisms may include a dissipation pool/energy basin. During the Construction phase it is anticipated that SCPs will be implemented at the following locations during the construction and operations phases:

- Aggregate screening area / borrow areas;
- TSF C Main Dam;
- Camp site; and
- Open pit disturbance area.

During Operations Y+1 through Y+6 the construction SCPs will remain at the aggregate screening area and the camp. During Y+7 through Y+16 a new Aggregate Screening Area will be established and a SCP implemented: the camp and new Aggregate Screening Area SCPs will remain until closure. Typical pond plan and outlet structure details are shown on Drawing C3803.

The intent of this document is to outline strategies and design objectives, with appropriate flexibility, to allow the facilities to be field-fit to suit the site conditions encountered: the requirement for and location of the final SCPs will be based on the detailed facility designs.

The discharge points for each of the SCPs and monitoring requirements are outlined in the Mine Site Water and Discharge Management and Monitoring Plan (Section 9.6). The following parameters will be monitored at the frequency noted:

- Flow - Continuous, when discharging;
- Turbidity - Continuous, when discharging;
- *In situ* parameters (pH, conductivity, turbidity, oxidation-reduction potential, temperature, measured using an appropriate, calibrated field meter) measured weekly, when discharging;
- Chemistry (pH, hardness, specific conductance, total suspended solids, total dissolved solids, turbidity, nutrients, major anions, total and dissolved metals) measured weekly, when discharging; and
- Acute toxicity (Rainbow trout acute lethality test and *Daphnia magna* acute lethality test) measured monthly, when discharging, or adjusted as appropriate, per the *Metal and Diamond Mining Effluent Regulations*.

7.3.1.2 Sediment Basins

A sediment basin is a temporary structure that is used to detain runoff from small drainage areas to settle out sediment. The basin is typically maintained until the site is permanently protected against erosion by vegetation and/or structures. Sediment basins are generally located in areas where access can be maintained for sediment removal and proper disposal. Sediment basins are typically constructed at the end of collection ditches to detain sediment-laden runoff long enough to allow the majority of the sediment to settle out to comply with water quality objectives. A sediment basin can be created by excavating a basin, utilizing an existing depression, or constructing a dam on a slight slope downward from the work area. Sediment-laden runoff from the disturbed site is conveyed to the basin via ditches, slope drains, or diversion structures. The efficacy of sediment basins is largely dictated by the extent to which they are properly sized and constructed as designed; whether the banks are stabilized immediately following construction; and the extent to which they are regularly cleaned out / maintained.

Sediment basins may be prescribed during construction on an as-required basis, based on conditions encountered. The implementation of these will be at the direction of the supervising engineer or the

Environmental Monitor. The sediment removed from the pond will be used as fill material for the grading of the plant site or disposed of within this area as stockpiles.

The size of the temporary sediment basins is dependent on the size of the drainage areas. The exact locations and final geometry of each basin, as well as overland discharge points, will be field-fit to minimize disturbance. The supervising engineer will approve the sizing and location of the basins prior to construction. Three sizes of sediment basin (designated SB1, SB2, and SB3) are used for different size drainage areas, as summarized in Table 7-1. The width and length dimensions correspond to the top of the wet storage area, at the base of the outlet structure.

Table 7-1: Recommended Configuration of Sediment Basins

Specification	SB1	SB2	SB3
Drainage Area (hectares)	<0.5	0.5 - 1	1 - 2
Length: Width[1] (m)	5:1	5:1	5:1
Depth of Wet Storage Excavation (m)	1	1	1
Embankment Height of Rock Outlet (m)	0.5	1	1
Minimum Spillway Weir Length (m)	1	2	3

Note:
[1] *From BC ENV (2015b)*

Sediment basins will be inspected as outlined in Section 11, by personnel as outlined in Section 8, and cleaned out when the sediment has accumulated to one-half of the designed wet storage volume. The sediment removed from the basins will be used as grading material or placed in soil stockpiles (if suitable). The outlet will be checked regularly for sediment build-up that could prevent drainage and limit the overall carrying capacity of the basin. If the outlet is clogged by sediment, it will be cleaned or replaced. If sediment basins are needed, maintenance and inspection activities will be implemented, as outlined in Section 11. Turbidity in the ponds will be monitored weekly. A typical configuration for a sediment basin is shown on Drawing C3803.

7.3.1.3 Flocculants

Flocculants are commercial products used to increase the rate of sedimentation in a SCP by increasing aggregation of fine sediments. Flocculants can be used to enhance removal of suspended sediment, particularly in situations where the sediment-laden water cannot be detained long enough to allow particles to settle (i.e., when turbidity levels are high and adequate detention times cannot be provided). Flocculants used will be:

- Non-acutely toxic to fish, aquatic organisms, wildlife, and plants;
- Biodegradable;
- Legal for use in Canada; and
- Accompanied with a Safety Data Sheet containing toxicity information confirming that the product is not toxic to aquatic life.

Written approval from an ENV Environmental Protection Mining Team Statutory Decision Maker is required prior to the use of settling aids. The approval request must describe the 96 Hour LC50 concentration, as well as details of the settling aid addition rate (and control method), mixing conditions, and conditioning time/facilities (BC MOE 2015b). Flocculants will be used to prevent damage to sensitive water resources such as streams or whenever turbidity control is required and will only be used after all appropriate physical BMPs have been implemented. The use of flocculants is soil-type dependent and requires a screening process to determine the best chemical for each specific location. If flocculants will be used, the written manufacturer's instructions describing correct use of the product (e.g., dosage and settling time recommendations), site preparation, application, inspection, maintenance, and storage, will be followed.

The site Environmental Manager or Environmental Monitor will monitor water quality and flocculant dosage for discharge compliance with applicable water quality guidelines where water is being discharged to a watercourse.

7.3.2 Culverts

Culverts will be constructed along access and haul road alignments to manage water and drainage channels along the road. Culverts that pass surface runoff beneath the roads will be combined with Check Dams and Collection Ditches. Spacing of culverts along road alignments is dependent on both the grade and skew of the road, and the erosion hazard level.

7.3.3 Diversion Ditches and Structures

Diversion ditches (DD) will be constructed upgradient of disturbed areas to intercept clean surface water runoff and convey it around areas to be disturbed to avoid excessive sheet flow. All diversion ditches will discharge through a stabilized outlet designed to handle the expected runoff velocities and volumes from the ditch without scouring. Each diversion ditch type will provide a minimum freeboard of 0.5 m between the top of flow and the ditch crest.

Two types of diversion ditches may be required: Type 1 (DD1) ditch in soil and Type 2 (DD2) ditch in rock. Whether ditch cross section type DD1 or DD2 is built will depend on site conditions during construction. Dimensions for the two types of diversion ditches are presented in Table 7-2.

Table 7-2: Diversion Ditch Dimensions

Dimension	DD1	DD2
Bottom width (mm)	500	500
Side slopes	2H:1V	0.5H:1V
Minimum Depth (mm)	500	500
Riprap thickness (mm)	300	-

Note:
V-shaped diversion ditches may also be constructed; design criteria will be provided in design reports and drawings.

Type 1 Diversion Ditches (DD1) will require filter fabric to be placed along the base and sides of the ditch prior to placement of riprap. Fabric is placed continuously to maintain intimate contact with the base soil. Fabric is installed so that upstream strips overlap downstream strips by a minimum of 500 mm. Riprap will be placed so as to form a dense, uniform, well-graded mass with few voids. As an alternative to riprap, the diversion ditches may be lined with a bituminous geomembrane HDPE liner, check dams, or other equivalent along with a monitoring, surveillance, and contingency program.

Diversion ditches will be inspected and maintained regularly and before and after major precipitation events to remove any blockages to flow (accumulated sediment, debris, etc.) that may reduce the design capacity. Typical diversion ditch designs are shown on Drawing C3803.

7.3.4 Collection Ditches

A runoff collection ditch (CD) intercepts contact water runoff from disturbed areas and diverts it to a stabilized area where it can be effectively managed. Collection ditches are used within construction areas to collect runoff and convey it to appropriate sediment control measures. Where fine grained soils are exposed, appropriate erosion protection materials will be installed based on the estimated magnitude of flow and flow velocity. General locations and conditions may include:

- Below disturbed slopes to divert sediment-laden water to control facilities;
- At or near the perimeter of the construction area to prevent sediment-laden runoff from leaving the site; and
- Below disturbed areas before stabilization to prevent erosion if stabilization measures cannot be implemented immediately.

Collection ditches may be either temporary or permanent structures. Two types of collection ditches may be required: Type 1 (CD1) ditch in soil and Type 2 (CD2) ditch in rock. Whether ditch cross section type CD1 or CD2 is built will depend on site conditions. Dimension for the two types of collection ditches are presented in Table 7-3. Each collection ditch type will provide a minimum freeboard of 0.5 m between the top of flow and the ditch crest.

Table 7-3: Collection Ditch Dimensions

Dimensions	CD1	CD2
Bottom width (mm)	500	500
Side slopes	2H:1V	0.5H:1V
Minimum Depth (mm)	500	500
Riprap thickness (mm)	300	-

Note:
V-shaped collection ditches may also be constructed; design criteria will be provided in design reports and drawings.

Type 1 Collection Ditches (CD1) will require filter fabric to be placed along the base and sides of the ditch prior to placement of riprap. Fabric is placed continuously to maintain intimate contact with the base soil. Fabric will be installed so that upstream strips overlap downstream strips by a minimum of 500 mm. Riprap will be placed so as to form a dense, uniform, well-graded mass with few voids, and some hand placement may be necessary to obtain good size distribution. As an alternative to riprap, the collection ditches may be lined with a bituminous geomembrane or HDPE liner, or check dams will be used along with a monitoring, surveillance, and contingency program.

Collection ditches will be inspected and maintained regularly and before and after major precipitation events to remove any blockages to flow (accumulated sediment, debris, etc.) that may reduce the design capacity. Typical collection ditch designs are shown on Drawing C3803.

7.3.5 Rock Check Dams

Rock check dams are small dams constructed across swales, drainage ditches, and waterways to avoid erosion by reducing flow velocity. Rock check dams accomplish this by interrupting the flow of water to form small ponds, thereby flattening the surface of the water, and reducing the velocity of flow (Government of Alberta 2011). The obstructions induce infiltration and reduce erosion potential. Check dams are also used to distribute flows across a swale to avoid preferential paths and guide flows towards vegetation.

Rock Check Dams along the centreline of Collection or Diversion Ditches should form an asymmetrical triangle with the bottom of the ditch. Dam slopes of 3H:1V downstream and 2H:1V upstream will be used. The rock check dams will be spaced such that top of the middle of each downstream check dam is at the same elevation as the base of the previous dam - dam spacing and rock size will be determined by the supervising engineer based on hydraulic conditions and gradient (Toronto and Region Conservation Authority 2019). Rock Check Dams should be installed on all ditches exceeding 6.0% grade. Rock Check Dam construction will start from the downstream end of the ditch and be constructed upstream from that point. A minimum 100 mm deep trench must be excavated for the entire footprint of the Rock Check Dam, and spoiled material must be removed from the site.

Rock Check Dams require regular maintenance and should be inspected regularly, and before and after every significant storm event, as outlined in Section 11. It is important that rubble, litter, and leaves are removed from the upstream side of the dam. This is typically done when the sediment has reached a height of one-half of the original height of the dam.

7.3.6 Straw Bale Check Dams

Straw bale check dams are small, temporary dams constructed of straw bales as drop structures placed across channels to reduce a steep grade to intervals of flatter grades. Straw bale check dams are used for (Government of Alberta 2011):

- Small open channels that have a drainage area of ≤2 ha;
- Channels with grade of <5%; and
- Flow velocities of <0.3 m/s.

Straw bale check dams should only be a maximum of one straw bale in height, or 0.5 m maximum. Straw bales should be machine-made; weed free cereal crop straw such as wheat, oats, rye, or barley; tightly compacted and bound with two rows of wire or synthetic string; and show no signs of weathering and be no more than year old (Government of Alberta 2011).

Structures will be inspected at weekly intervals during spring freshet and after significant rainfall events. Damaged, decayed, or dislodged straw bales will be replaced immediately and erosion repairs will be made to prevent failure of the structure. Typical configurations for a straw bale check dam are shown on Drawing C3801.

7.3.7 Energy Dissipators

Energy dissipaters are pools used to dissipate the energy of fast flowing water and control erosion at the outlet of a ditch or a conduit passing water to minimize erosion of natural stream channels downstream. The energy dissipator will be set at zero grade and aligned straight with the direction of flow at the outlet and constructed flush with the surrounding grade.

These structures are used in conjunction with diversion of non-contact water around construction areas and with diversion ditches and are typically located upstream of a receiving water body (e.g., stream, pond, lake, etc.).

7.3.8 Slope Drains

Slope drains consist of flexible tubing or conduit and are required to convey concentrated runoff from the top to the bottom of a cut or fill slope into the appropriate BMP when ditches are deemed impractical (i.e., at steep ditch gradients, or unfavourable side slopes for ditch construction). Additionally, slope drains may be used in conjunction with rock check dams at the inlet to reduce velocities and to drain collection ditches into stabilized outlets. The entrance section to the drains will be well-entrenched and stable so that surface water can enter freely, and the drain will extend downslope beyond the toe of the slope to a stable area. The minimum slope drain diameter will be sized according to the contributing drainage area summarized in Table 7-4.

Table 7-4: Recommended Slope Drain Sizing

Drainage Area (Hectare)	Pipe Diameter (mm)
0.2	300
0.6	450
1.0	530
1.4	600
2.0	900

Source: Government of Alberta (2011).

Slope drains will be inspected and maintained as required, and any blocked or damaged parts will be cleaned, repaired, or removed and replaced. In particular, sediment will be removed from the upslope inflow area before and after storm events to prevent downslope sediment transport, which may cause plugging of the drainpipe and overtopping of the structure.

7.3.9 Surface Roughening

Cut and fill slopes will be roughened with tracked machinery where appropriate to reduce runoff velocity and erosion, increase infiltration, and aid in the establishment of vegetative cover with seeding. The roughening will be carried out by a tracked machine moving up and down the slope surfaces to create grooves perpendicular to the slope, creating undulations on the soil surface, as shown on Drawing C3801. This procedure is simple, inexpensive, and provides immediate short-term erosion control for bare soil where vegetative cover is not yet established. A rough soil surface provides more favorable moisture conditions which will aid in seed germination compared to hard, compacted, smooth surfaces.

7.3.10 Filter Bags

Filter bags are generally constructed from a sturdy non-woven geotextile capable of capturing particles larger than 150 microns. Filter bags will be installed at the discharge end of pumped diversion pipelines, via fabric flange fittings, to remove fine grained materials before discharging to the environment, as needed. Filter bags are generally temporary sediment control measures. Filter bags are installed on flat, stable, non-erodible foundations, or in well vegetated areas. The pumping rate is specified by the manufacturer. Discharge from filter bags is routed to avoid erosion.

A smaller variety of filter bags, referred to as filter socks, can be installed on the discharge ends of gravity flow pipes, such as slope drains, to filter silt particles before discharging to the environment. Filter bags will be inspected daily for defects, rips, tears, sediment accumulation, and erosion of the surrounding area. When sediment fills one-half of the volume of the filter bag, the filter bag will be removed from service and replaced. Spare bags will be kept nearby to minimize time required to recommence pumping activities. Once the used bag is fully drained, the bag and its contents can be disposed of as solid waste. A typical filter bag plan and cross section is provided on Drawing C3802.

7.3.11 Waterbars

Waterbars, shown on Drawing C3802, are ridges or ridges and channels constructed diagonally across a sloping road or right-of-way to limit the accumulation of erosive volumes of water at pre-designed intervals. Waterbars reduce sheet flow and surface erosion of areas of exposed soil and/or roads by diverting runoff towards a stable vegetated area or diversion ditch. Spacing of waterbars will be field-fit based on slope grade, general erodibility of the surface, and anticipated flows. Waterbars will not direct runoff into a ditch that channels water toward a watercourse unless the ditch is adequately designed with check dams and armouring where appropriate.

The height (measured from the channel bottom to the top of the ridge) will be a minimum of 0.45 m, the base width of the ridge will be 1.8 m minimum, and the side slopes will be 3:1 or flatter where vehicles cross. The crossing angle will be selected to provide a positive grade less than 2%.

The approximate spacing of waterbars is summarized in Table 7-5 and will be field-fit to locate the outlet in stable natural areas, where possible. Waterbars will be inspected as outlined in Section 11, and sediment will be removed from the flow and outlet areas as needed.

Table 7-5: Recommended Waterbar Spacing

Grade (%)	Waterbar Interval (m)
< 5	35
5 – 10	30
10 – 20	20
20 – 35	15
>35	7.5

Source: North Carolina Department of Environment and Natural Resources (2013).

If, during the periodic inspections, impacts to vegetated areas are observed (e.g., scour as a result of erosive volumes of water), adaptive management measures will be implemented, which may include installation of additional water bars.

7.3.12 Silt Retention Structures

Silt fences are temporary sediment control devices used to protect water quality in nearby watercourses from sediment present in stormwater runoff, by forcing low volumes of overland flow to pool, allowing sediment to settle out of suspension. Silt fences are typically installed downslope of erosion-susceptible terrain to prevent sediment-laden sheet flow from entering receiving waters. Intercepted drainage pools along the uphill side of the fence to promote sediment settling. Drainage in contact with the fence is filtered through geotextile. The small pores of the silt fence will filter coarse particles (fine sand to coarse silt) and restrict water exfiltration rates. Barrier locations are field-fit based on-site features and conditions (e.g., soil types, climate, terrain features, sensitive areas, etc.), design plans, existing and anticipated drainage courses, and other available ESCs. Typical barrier sites are catch points beyond the toe of fill, or on side slopes above waterways or drainage channels.

Silt fencing will be trenched according to Drawing C3801 for proper anchoring. The design criteria for silt fences includes:

- The size of the drainage area shall be no greater than 0.1 hectare per 30 m length of fence;
- Maximum flow path length above silt fence should be no greater than 30 m; and
- Maximum slope gradient above the silt fence should be no greater than 2H:1V.

Silt fences will be inspected in conformance with Section 11 for damages, tears, clogging, or erosion of the surrounding areas. Damaged sections will be repaired or replaced to maintain their functionality.

An alternative to a silt fence is a sediment retention berm, which is a small (approximately 600 mm high) berm that is constructed using random fill material (rock, wood chips, soil, topsoil). Sediment retention berms do not require removal of the underlying vegetation; however, voids along the base of the berm must be minimized.

7.3.13 Floating Silt Curtains

Floating silt curtains will be used in SCPs as needed to increase flow length, and in construction areas in low flow or standing water to allow disturbed sediment to be contained at the source. Silt curtains are vinyl barriers of varying lengths and heights, held in suspension by heavy duty float line and anchored using a ballast weight chain. Silt curtains are typically placed around a site or shoreline as close as possible to the disturbance area to allow sediment to be contained at the source.

The main purpose of the silt curtain is to allow displaced sediment enough time to settle back down to the bottom of the SCP or natural waterbody: the specific length of time required for the curtain to remain in position will vary depending on the type of sediment and/or silt to be contained, and the construction activities.

7.3.14 Temporary Seeding

Exposed slopes and other temporarily disturbed areas will be seeded for initial soil stabilization using quick establishing weed-free seed mixes (native and approved non-native). The proposed seed mix will be comprised of the following species:

- Slender wheatgrass (*Elymus trachycaulus*);
- Rocky mountain fescue (*Festuca saximontana*);
- Tufted hairgrass (*Deschampsia caespitosa*); and
- Northern sweetvetch (*Hedysarum boreale*).

The purpose of temporary seeding is to stabilize the soil and reduce damage from wind and/or water until permanent stabilization is accomplished. Seeding is applicable to areas that are exposed and subject to erosion for more than 30 days, and is usually accompanied by surface preparation, fertilizer, and mulch; however, the timing of seeding is weather and season dependent and consequently this method is not applicable at all times. Temporary seeding may be accomplished by hand or mechanical methods, or by hydraulic application (hydroseeding), which incorporates seed, water, fertilizer, and mulch into a homogeneous mixture (slurry) that is sprayed onto the soil. Selection of seeding methods will be site-specific: hand seeding will be used in small areas that are difficult to reach with equipment and hydroseeding will be used on steep slopes (>2:1) that are highly susceptible to erosion. Fertilizers and hydroseeding containing fertilizers will not be used near watercourses (within 30 m of the top of bank).

7.3.15 Mulching

Mulching is the application of a uniform protective layer of straw, wood fiber, wood chips, or other acceptable material on or incorporated into the soil surface of a seeded area to allow for the immediate protection of the seed bed. The purpose of mulching is to protect the soil surface from the forces of raindrop impact and overland flow, foster the growth of vegetation, increase infiltration, reduce evaporation, insulate the soil, and suppress weed growth. Mulching also helps to hold fertilizer, seed, and topsoil in place in the presence of wind, rain, and runoff, and reduces the need for watering. Mulching may be utilized in areas that have been seeded either for temporary or permanent cover.

There are two basic types of mulches: organic mulches and chemical mulches. Organic mulches likely to be used include straw, hay, wood fiber, wood chips, and bark chips. All organic mulches will be certified weed-free. This type of mulch is usually spread by hand or by machine (mulch blower) after seed, water, and fertilizer have been applied. Chemical mulches, also known as soil binders or tackifiers, are composed of a variety of synthetic materials. Chemical mulches are usually mixed with organic mulches as a tacking agent to aid in the stabilization process, and are not typically used as the sole control, except in cases where temporary dust and erosion control is required. The choice of materials for mulching will be based on soil conditions, season, type of vegetation, and the size of the area.

7.3.16 Rolled Erosion Control Product

Rolled erosion control products such as blankets, nets, and matting, are manufactured or fabricated into rolls designed to reduce soil erosion and assist in the growth, establishment, and protection of vegetation. Nets are made of high tensile material woven into an open net which overlays mulch materials. Blankets are made of interlocking fibers, typically held together by a biodegradable or photodegradable netting; blankets generally have lower tensile strength than nets but cover the ground more completely. Rolled erosion control products will be used when mulch cannot be adequately tacked and where immediate ground cover is required to prevent erosion damage and will be used to aid permanent vegetated stabilization of slopes 2:1 or greater.

An alternative to the high tensile material woven blanket is a hemp fibre erosion control blanket comprised of fibres that are 100% biodegradable and created without the use of polypropylene netting. The hemp fibre blankets can be used for slope protection (for slopes up to 1H:1V) and on culvert inlets and outlets.

The rolled erosion control products will be monitored and repaired as necessary until ground cover is established. Products will be inspected weekly at a minimum and before and after each significant rainfall event.

7.3.17 Polyethylene Cover

Polyethylene sheets can be used to temporarily (less than two years) cover newly exposed soil in situations when time does not permit other more permanent solutions to be applied. Soil that has high erosion potential will be covered immediately if a precipitation event is forecast. Strips of polyethylene should overlap each other in a configuration that prevents water from running underneath adjacent sheets. Runoff should be directed into an appropriate non-erodible or armoured drainage channel.

8. PLAN IMPLEMENTATION

8.1 Training and Awareness

All staff and subcontractors responsible for the management, implementation, monitoring, and reporting of ESC measures will be experienced and will receive training specific to their roles in this plan prior to the commencement of their work.

8.2 Construction Sequencing

Construction activities will be performed in sequence to minimize the area of exposed soils. The Contractor will establish all sediment control measures during the initial stages of construction to minimize sediment loading to natural watercourses. An example of the planned order of construction activities for a cut and fill slope is as follows:

1. Install ESC measures as directed by the Environmental Monitor or the Project Engineer.
2. Clear and strip work areas as required and link directly all ESC measures associated with each construction stage and area.
3. Provide temporary erosion control measures for cut slopes.
4. Construct components to design lines and grades shown on final IFC Drawings.
5. Provide temporary erosion control measures for fill slopes.
6. Complete final stabilization and seeding of disturbed surfaces and slopes.
7. Reclaim temporary ESC measures.

Detailed activities and the order in which they will be implemented for each activity or disturbance area will be provided on the IFC drawings. ESC measures will primarily be field-fit based on conditions encountered in the field, under the direction of the Environmental Monitor. Examples of how ESC measures may be implemented at various construction areas for the Project are shown on Figures 8-1 through 8-7.

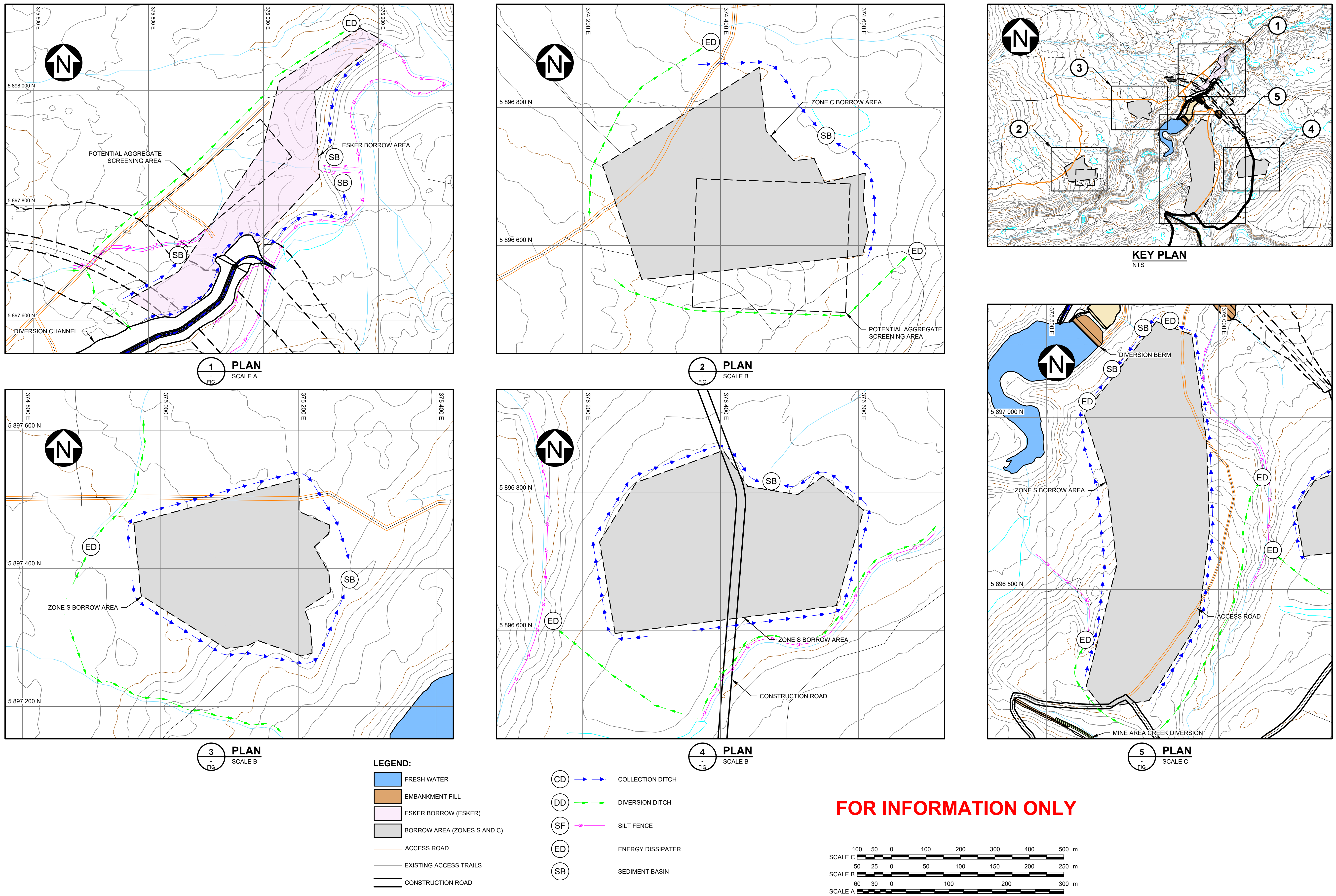


Figure 8-1: Site Borrow Areas General Arrangement – Erosion and Sediment Control Plan

Source: Knight Piésold Consulting (2021).

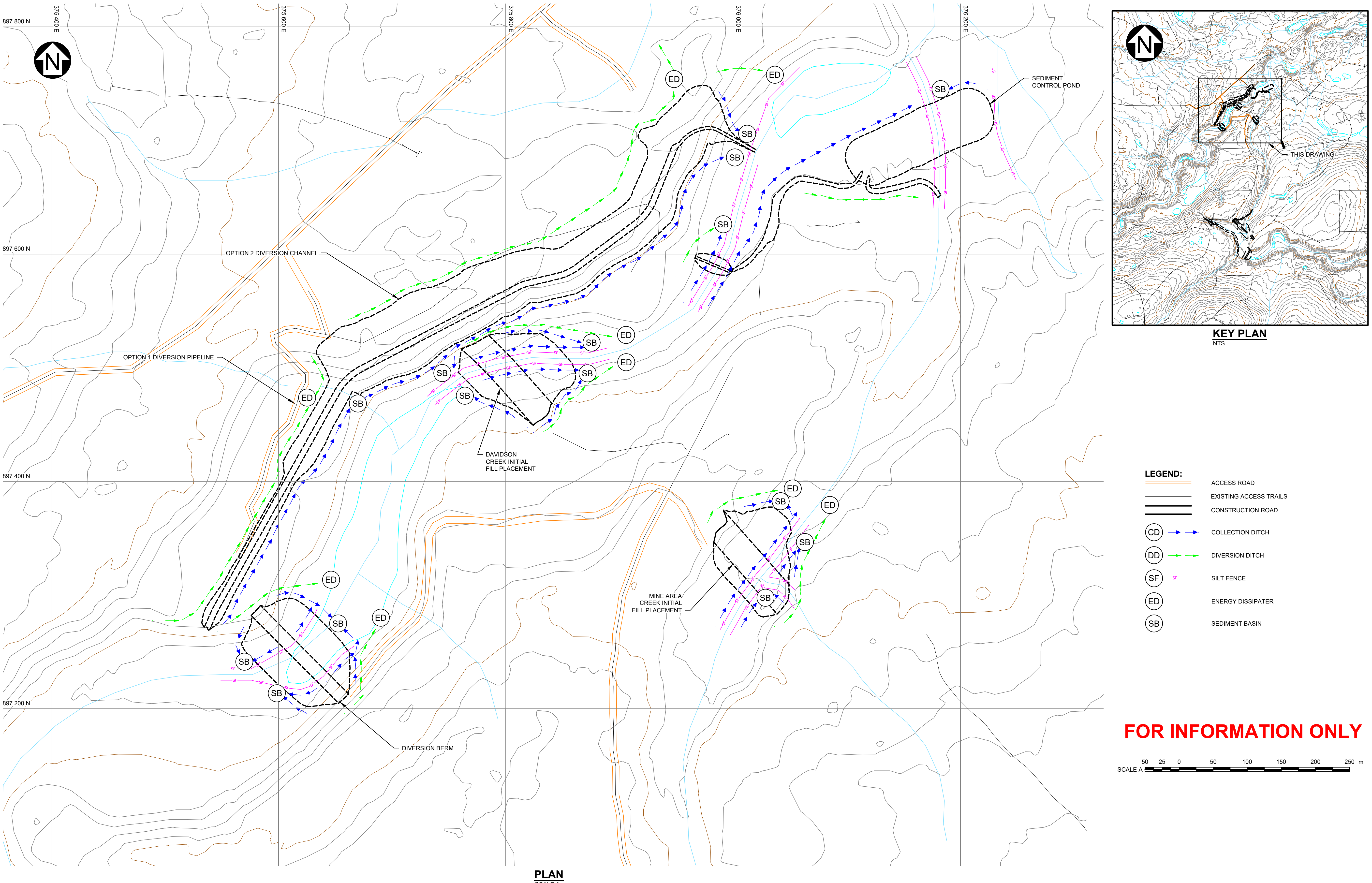


Figure 8-2: Main Dam C Site Establishment – Erosion and Sediment Control Plan

Source: Knight Piésold Consulting (2021).

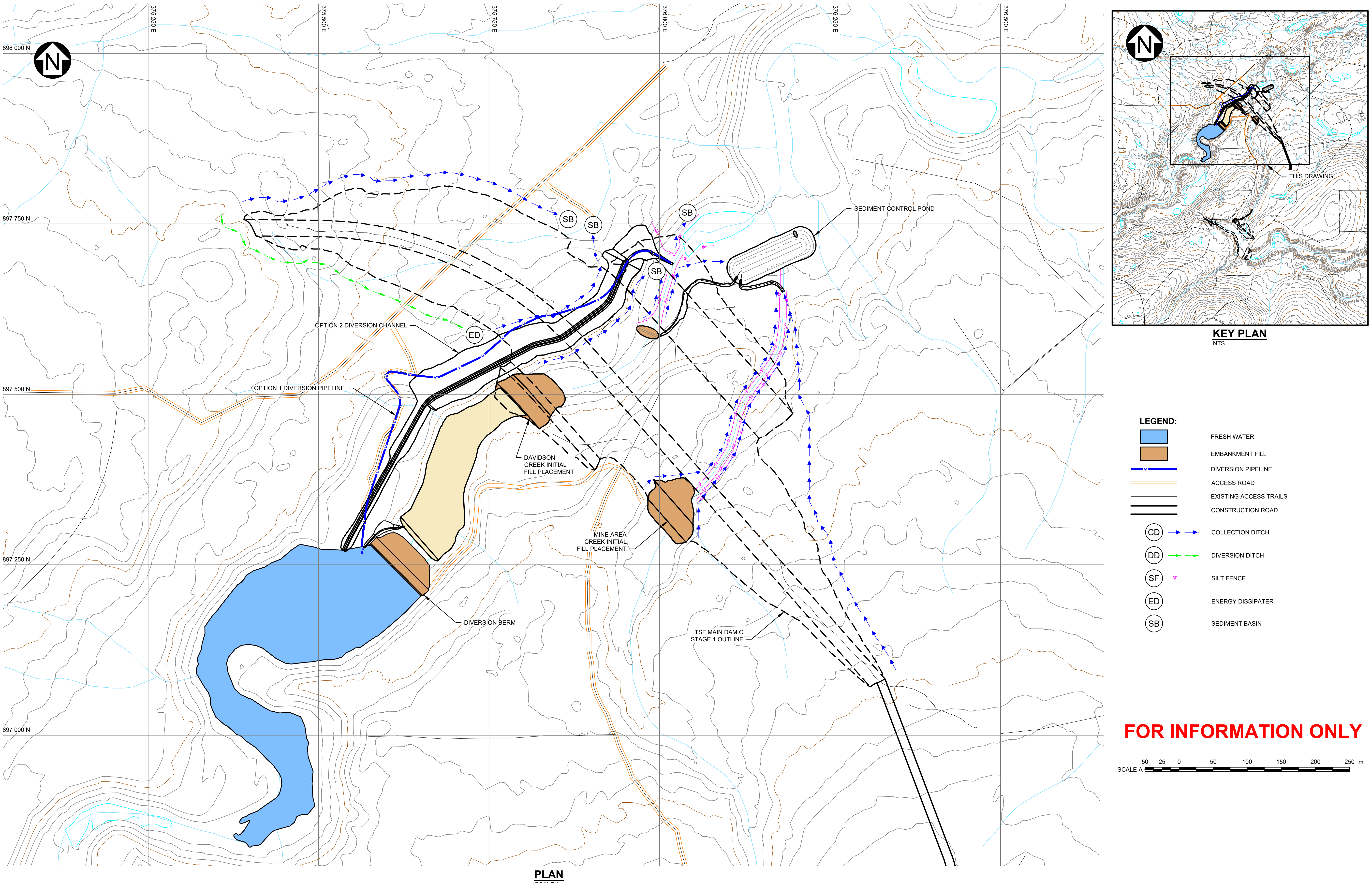
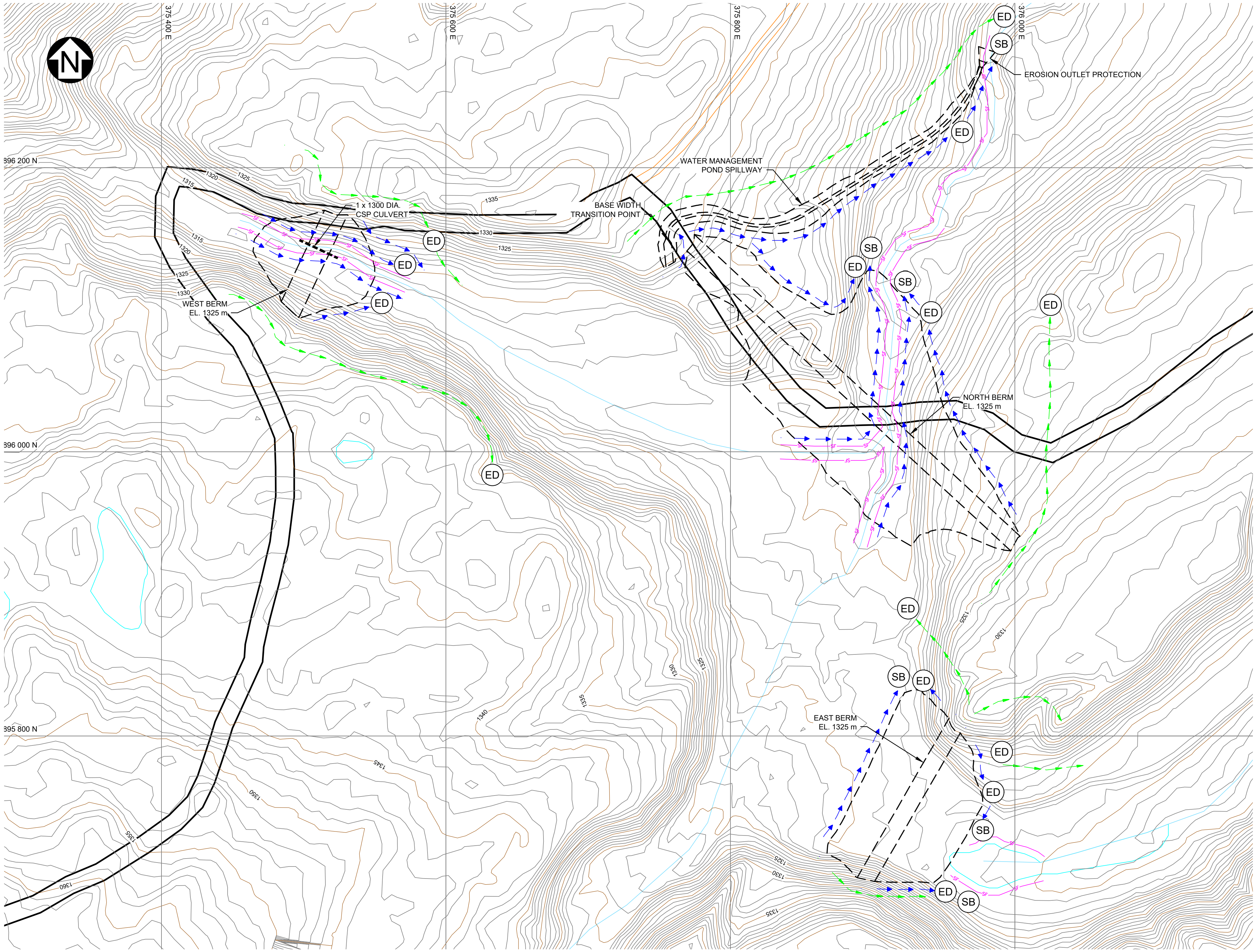
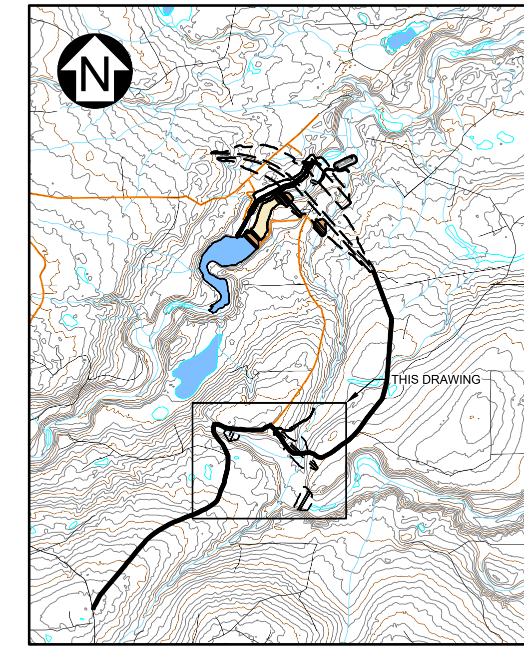


Figure 8-3: Main Dam C Stage 1 Construction – Erosion and Sediment Control Plan

Source: Knight Piésold Consulting (2021).



PLAN
SCALE A



KEY PLAN
NTS

LEGEND:

- FRESH WATER
- EMBANKMENT FILL
- ACCESS ROAD
- EXISTING ACCESS TRAILS
- CONSTRUCTION ROAD
- CD COLLECTION DITCH
- DD DIVERSION DITCH
- SF SILT FENCE
- ED ENERGY DISSIPATER
- SB SEDIMENT BASIN

NOTES:

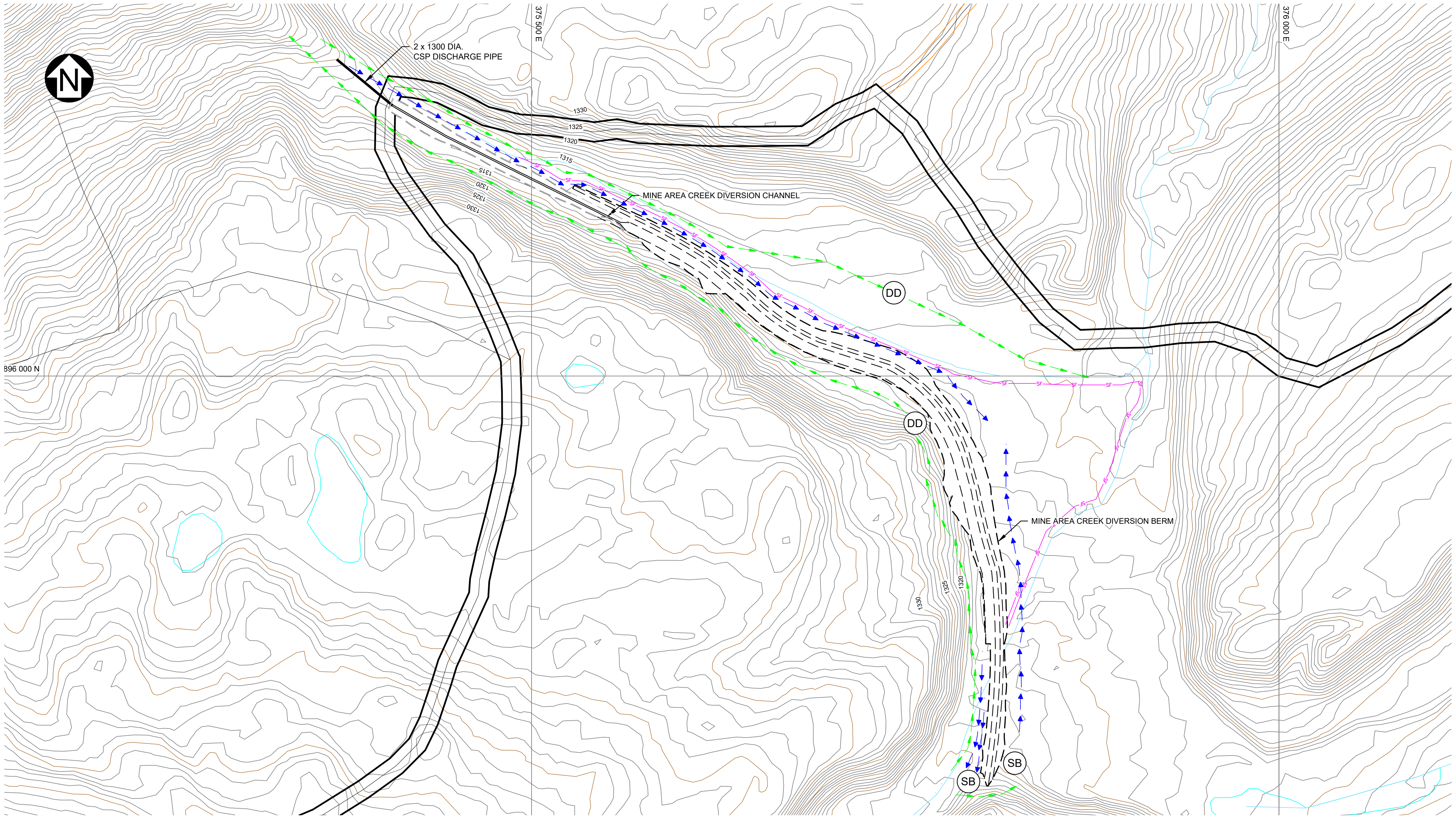
1. EXCAVATE ORGANICS AND UNSUITABLE MATERIALS TO ENGINEER APPROVED SUBGRADE.

FOR INFORMATION ONLY

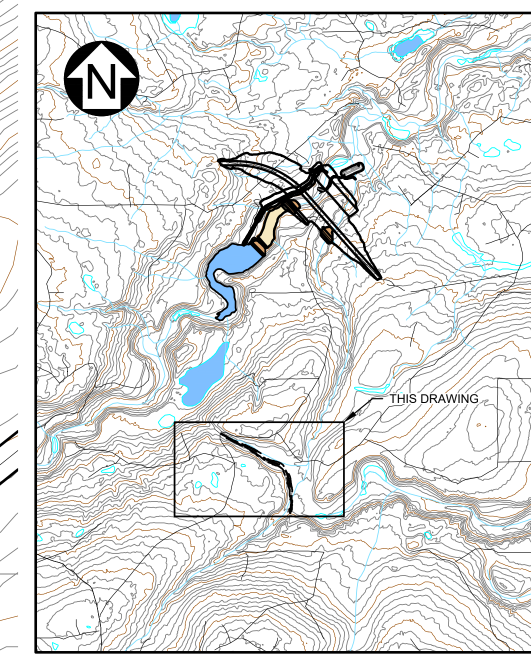
SCALE A 30 15 0 50 100 150 m

Figure 8-4: Tailings Storage Facility Water Management Pond – Erosion and Sediment Control Plan

Source: Knight Piésold Consulting (2021).



PLAN
SCALE A



KEY PLAN
NTS

LEGEND:

ACCESS ROAD
EXISTING ACCESS TRAILS
CONSTRUCTION ROAD
CD COLLECTION DITCH
DD DIVERSION DITCH
SF SILT FENCE
SB SEDIMENT BASIN

FOR INFORMATION ONLY

SCALE A 30 15 0 50 100 150 m

Figure 8-5: Tailings Storage Facility Mine Area Creek Diversion – Erosion and Sediment Control Plan

Source: Knight Piésold Consulting (2021).

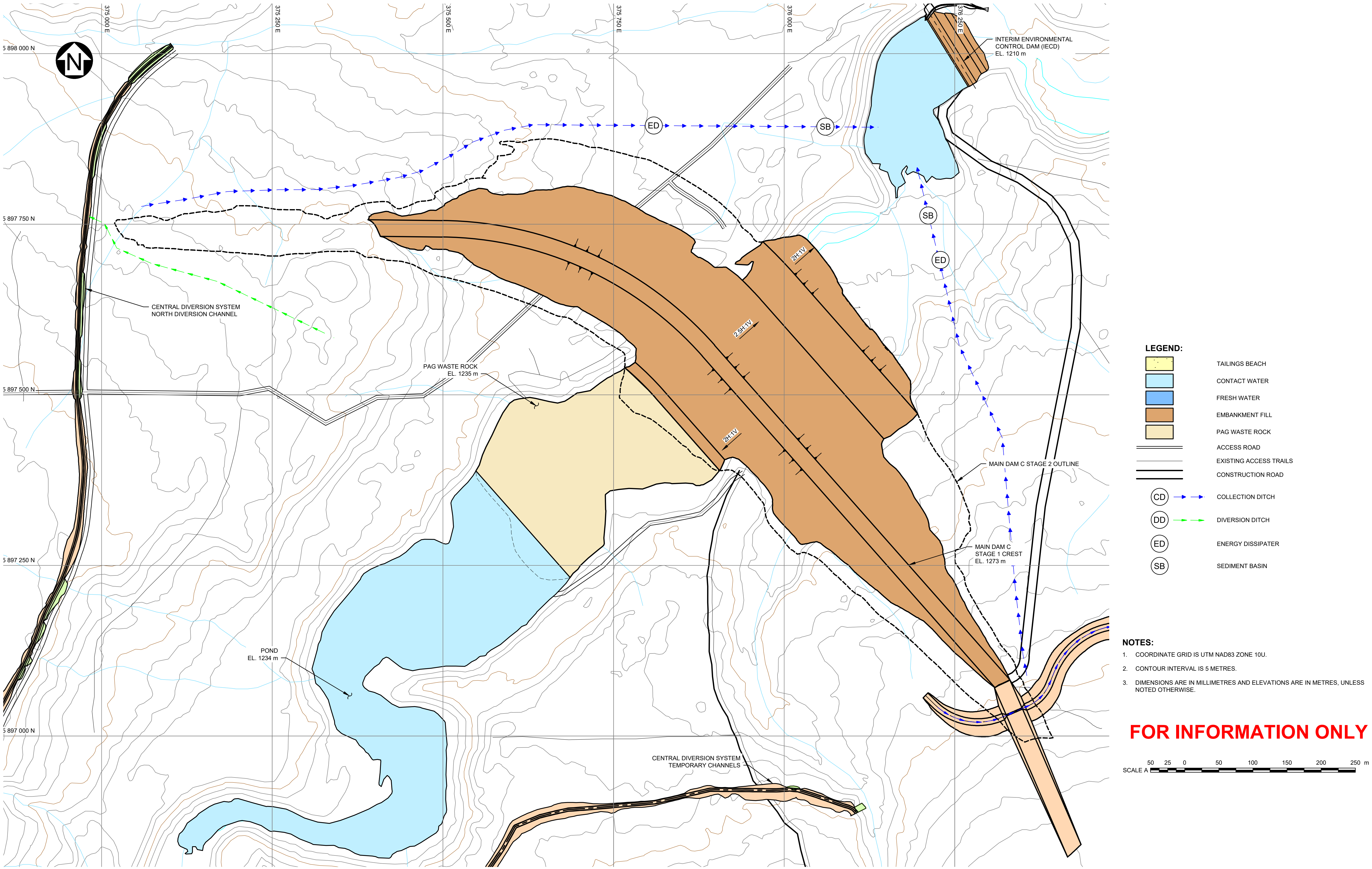


Figure 8-6: Main Dam C Stage 2 Construction (Year +1) – Erosion and Sediment Control Plan

Source: Knight Piésold Consulting (2021).

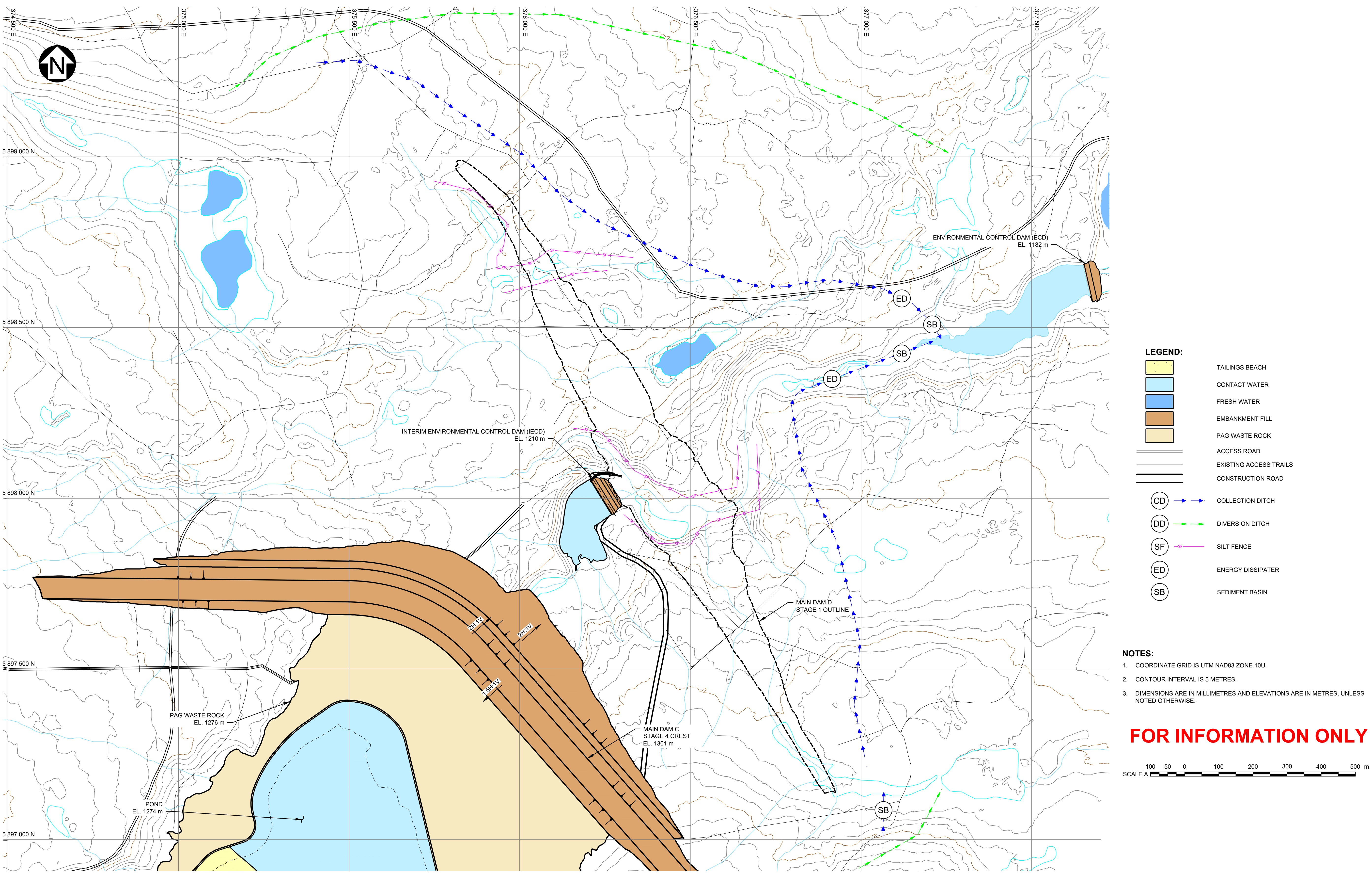


Figure 8-7: Main Dam D Stage 1 Construction (Year +5) – Erosion and Sediment Control Plan

Source: Knight Piésold Consulting (2021).

9. MONITORING

9.1 Scheduled Monitoring

A performance-based approach will be used to assess the effectiveness of the SEPSCP during regularly scheduled monitoring. Monitoring will occur weekly during spring freshet and monthly outside of freshet and in open water periods, as well as after each significant melt event or runoff-producing rainfall event. Effectiveness will be determined by the extent to which certain performance metrics are being achieved. A Trigger Action Response Plan (TARP) will be implemented for managing significant rainfall events and for works in and around water to plan appropriate actions used in response to observed changes in environmental conditions that are approaching or exceeding management objectives (BC ENV 2019).

A receiving water target applies downstream of a construction site, in the water body to which the site drains. The key elements of a TARP (BC ENV 2019) are:

- Trigger: Identification of a clear threshold (location, water quality characteristic, level, frequency, duration);
- Action: Description of clear and time bound actions to be taken in response to a trigger being approached or exceeded; and
- Response: Clear process for determining and confirming if a trigger has been exceeded, a process for reporting the trigger exceedance; and a response that must be implemented.

TSS is the parameter typically measured to assess effectiveness of ESC measures; determination of TSS requires collection of a water quality sample and analysis at an accredited laboratory. Water turbidity is often measured and used as a proxy for TSS, since *in situ* turbidity can be measured onsite with a handheld turbidity meter (in nephelometric turbidity units (NTUs). The federal water quality guidelines for turbidity are extrapolated from the suspended sediment guidelines of a 25 mg/L and 5 mg/L change from background for short-term and long-term exposures, respectively, according to the suspended sediment and the general turbidity correlation of 3 to 1 (CCME 2002).

Because duration of exposure to elevated TSS and turbidity is a key factor in assessing aquatic impacts, as shown in Table 9-1, targets for construction runoff and downstream receivers will be an induced change in turbidity levels, in order to implement any needed corrective measures in a timely manner.

During all required inspections detailed above, if turbidity levels are observed to appear to be exceeding the induced change from 8 NTUs for a duration exceeding 24 hours, a water sample will be collected (an “action”) and submitted for laboratory analysis of TSS. A background water sample will be collected in the receiving watercourse upstream of construction runoff and downstream of the construction area during the same sampling event, in order to determine the change from background. During construction activities near water, “background” for the purpose of TSS and turbidity monitoring, will be based on water samples collected in a receiving stream upstream of the construction area.

The monitoring frequency will depend on site conditions: an increase in contaminant concentrations in construction runoff in the receiving environment may trigger changes in the monitoring program (e.g., increased monitoring frequency, additional monitoring stations in the receiving waterbody both upstream (background) and downstream of the construction area) to identify sources and the requirement for additional BMPs.

Table 9-1: Regular Monitoring Triggers – Maximum Allowable Increase of TSS and Turbidity

Parameter	Background		
	Clear Waters (TSS <25 mg/L Turbidity <8-NTU)	Turbid Waters (TSS 25-100 mg/L Turbidity 8-50 NTU)	Turbid Waters (TSS >100 mg/L Turbidity >50 NTU)
Total Suspended Solids (TSS)	▪ Change from background of 25 mg/L at any one time for a duration of 24 hours ▪ Change from background of 5 mg/L at any one time for a duration of 30 days	▪ Change of background of 10 mg/L at any time	▪ Change from background of 10%
Turbidity	▪ Change from background of 8 NTU at any one time for a duration of 24 hours ▪ Change from background of 2 NTU at any one time for a duration of 30 days	▪ Change of background of 5 NTU at any time	▪ Change from background of 10%

In the event that a measurement is over the target listed in Table 9-1, a preliminary investigation ("response") will take place to confirm whether the exceedance is valid (e.g., not simply a result of passing debris or beaver damming activity) and whether the construction site itself is the source of elevated turbidity measurements. BW Gold will engage suitably qualified individuals to supervise the construction activities, where deemed necessary, who will determine the validity of a result and whether it results from construction or other external factors. BW Gold anticipates that this will be a requirement of the ENV discharge permit. Should a measurement exceed a trigger, a Qualified EM will visually inspect the construction area to evaluate if the result is reasonably being caused by construction activities. If it is, then the actions in the TARP will be triggered without delay. If, however, the EM visually determines that the construction activities are not reasonably the cause of an exceedance, then the EM will implement other validation techniques to ascertain the source of the exceedance. This would include further field-truthing upstream of the construction area to understand if a natural slide event, for instance, has caused the exceedance. Also, calibration of the *in situ* monitoring instrument(s) would be undertaken. The clarification above outlines how the EMs for BW Gold will use their experience to immediately undertake these validation techniques to ascertain the necessity to stop work and protect the receiving environment should there be trigger exceedances caused by the construction activities.

If the elevated turbidity level is valid and is a result of construction activities, the Environmental Monitor will inform the Project Engineer or Environmental Manager, who shall cease all work that may have a direct or indirect impact on water quality, and immediately initiate additional mitigation actions. Upon confirmation of the exceedance, a preliminary notification will be sent out to relevant parties (e.g., Construction Manager) at the earliest safe opportunity to do so. The notification will include:

- Date and time of inspection;
- Site location information;
- Timing, location, magnitude, and duration of turbidity exceedance;
- Any information about suspected source of sediment;
- Description of the repairs, maintenance and/or modifications of ESC measures planned in order to address the elevated sediment releases causing turbidity exceedances; and
- Estimated timing for the completion of repairs, maintenance and/or modifications.

In the event that turbidity exceedances continue despite initial efforts to rectify ESC deficiencies, update reports will be sent to the relevant parties at an agreed upon frequency until turbidity falls back below the applicable target.

Depending on the site of the exceedance, the nature of the construction work, and the magnitude and duration of the exceedance, stop work orders may be issued if on-going exceedances are not rectified in a timely manner.

9.2 Incident Monitoring

A TARP will also be implemented if signs of erosion are noted on site during the construction or operations phases outside of regular monitoring events. Three levels of qualitative triggers have been defined: examples of each trigger level and roles and responsibilities for the implementation of subsequent actions are summarized in Table 9-2.

Incident reporting requirements are detailed in the Spill Contingency Plan.

Table 9-2: Incident Monitoring Triggers and Actions

Roles	Trigger – Minor	Trigger – Moderate	Trigger – Major
First person On the Scene (First Responders) will assess conditions to determine the initial Trigger to be applied.	*Examples of Minor Triggers* ▪ *Freshet Preparation* ▪ *Old and non-active erosion events* ▪ *Small Rills, non-active* ▪ *Equipment required is as per normal activities for maintenance and minor repairs* ▪ *Small, easily manageable erosion events* ▪ *Standing water in non-designated areas*	*Examples of Moderate Triggers:* ▪ *Active ditch erosion* ▪ *Existing Freshet Conditions* ▪ *24-hr storm events >44 mm rain precipitation (2-Year return period)* ▪ *Conditions that are active and have the potential to cause operational changes due to access restrictions or have potential for threats to infrastructure* ▪ *Standing water in non-designated areas that have potential for mobility or interfere with operations*	*Examples of Major Triggers:* ▪ *Slopes with active gullies and erosion channels where large volumes of sediment including rock is entrained* ▪ *Immediate threats to infrastructure* ▪ *Major sedimentation threats to water bodies* ▪ *24-hr storm events >73 mm rain precipitation (10-Year return period)* ▪ *Prolonged heavy rainfall events > 3 days* ▪ *Standing water in non-designated areas that have potential for mobility or interfere with operations in high risk/critical areas*
First Responder - First person on the scene who discovered the event. **Project Engineer** - Personnel designated to perform inspections	1. Note areas where erosion event has occurred, notify Supervisor. 2. If possible redirect flows or correct event immediately. 3. Inspectors to note culverts that may be plugged and that may need attention to be ready for spring freshet flows. 4. Investigate source of erosion event as necessary to prevent repeats or to reduce/remove potential for larger event.	1. All Minor Response duties. 2. Provide immediate actions/assistance as necessary to minimize negative effects of erosion event if safe to do so. 3. Notify EPCM contractor of event including location, potential for damage, proximity to water body, and safety aspects.	1. All Moderate Response duties. 2. Prevent entry by non-essential personnel and maintain a safe distance. 3. If safe to do so, minimize negative effects. 4. Release the scene to Mine Rescue upon their arrival as necessary.
EPC Contractor	1. Provide assistance to First Responder/Inspector as necessary.	1. All Minor Response duties. 2. Determine level of effort required to mitigate the hazard and repair the damage. 3. Organize mitigations/repairs. 4. Notify Environmental Manager, if associated with water bodies or in receiving environment. 5. Notify Mine Manager if event associated inside the pit or with catch benches or with tailings storage facility. 7. Notify department superintendent/superintendent as necessary.	1. All Moderate Response duties. 2. Depending on gravity of situation, initiate Mine Emergency Response Procedures. 3. Ensure safety of the First Responder and safety of the crew by preventing non-essential personnel from entering area. 4. Notify Engineering and Environmental Departments. 5. Notify Project Engineer.
Environmental Monitor	1. Schedule inspections and designate inspectors in fall periods for freshet readiness in spring. 2. Share notes of inspections with EPC Contractor and Construction Manager as necessary. 3. Review SEPSCP and revise as necessary. 4. Ensure revisions are communicated to all affected departments.	1. Respond to notifications for further inspection. 2. If sedimentation into waterbody, perform up and downstream samples for water quality to determine compliance. Note: Full suite samples may be necessary. 3. Direct environmental/erosion controls that may have to take place to mitigate impacts, reduce environmental hazard. 4. Record event and mitigations for reporting purposes.	1. All Moderate Response duties. 2. Notify Environmental Manager 3. Prepare for and assist in receiving environment investigations and impact assessments.
Construction Manager	1. Schedule inspections and designate inspectors in fall periods for freshet readiness in spring. 2. Share notes of inspections with Environment Monitor as necessary.	1. Provide resources/guidance to event responders as necessary. 2. Determine if outside agencies are required to provide assistance. 3. Determine courses of action to prevent/mitigate damage to resources.	1. All Moderate Response duties. 2. Notify Environmental Manager 3. Notify Safety Lead 4. Notify Mine Manager
Environmental Manager	1. Duties as normal.	1. Report event to external agencies, Indigenous groups as necessary.	1. All Moderate Response duties. 2. Provide recommendations to senior management on risks, mitigations and impacts.
Mine Manager	1. Duties as normal.	1. Duties as normal.	1. Notify Corporate Executive as necessary. 2. Ensure all necessary funding and resources are provided in an efficient manner.

10. REPORTING AND RECORD KEEPING

10.1 Reporting

Reporting will be done in accordance with the Construction Environmental Management Plan (Appendix 9-C of the Application). The EM or Environmental Monitor(s) will prepare weekly (during the open water season e.g., April – October, monthly during the winter season) and monthly monitoring reports that will include the following information:

- Summaries of environmental monitoring (e.g., date and time of each sample, weather conditions) ;
- Sampling results (e.g., receiving water results compared to Maximum Allowable Increase levels for any works in and around water, instrument calibration records, etc.); and
- Documentation of all non-compliance instances, including the level of exceedance, the duration of exceedance, the mitigation measures taken, verification of the reporting of the exceedance and any related communications with regulators regarding the exceedance event, and future measures to be taken to avoid or control further exceedances.

Following completion of the construction activities, the EM or Environmental Monitor(s) will prepare a completion report that includes the following information specific to this SEPSCP:

- Maintenance activities;
- Inspection results;
- Assessment of the effectiveness of the BMPs based on the sampling results; and
- A brief description of ongoing activities at the site related to maintenance and monitoring of site areas.

10.2 Record Keeping

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.

11. EVALUATION AND ADAPTIVE MANAGEMENT

11.1 Onsite Inspection and Plan Review

Inspection and maintenance are vital to the performance of erosion and sedimentation control measures; therefore, the success of the SEPSCP is dependent on monitoring of implemented BMPs. The Construction Personnel/Sub-Contractors and Environmental Monitor will inspect all erosion control measures weekly during spring freshet and monthly outside of freshet and in open water period, as well as after each significant runoff-producing rainfall event. Silt fences, sediment traps/basins, ditches, culverts, and sediment control ponds will be visually inspected for the following:

- Excess sediment build-up;
- Structural/physical integrity; and
- Anticipated wear and tear.

Sediment removal and proper disposal will be performed as required.

Once the ESC measures have been installed, their effectiveness will be monitored by the Environmental Monitor, and maintenance will be carried out, as necessary. All ESC measures will be inspected by the Construction Personnel/Sub-Contractors and/or Environmental Monitor before and after following heavy rainstorms or snowmelt events such as spring freshet during the Construction Phase. Immediate action will be taken by the Construction Personnel/Sub-Contractors when the need for maintenance or repair of ESC measures is identified for the ongoing performance of the measures. Monitoring will include but not be limited to the following:

- New erosion control prescriptions will be developed, as needed based on encountered or anticipated erosion of disturbed soils, slopes, and ditches. Initial erosion will be inspected visually by searching for light surface material (litter or soil) movement, while sedimentation resulting from erosion will be determined by searching for deposition of soil particles at the bottom of slopes and depressions. Rilling, gullying, pedestalling, and unusual compaction are also indicators of erosion and will be recorded if and when observed.
- Sediment accumulation in ditches, check dams, and sumps will be identified, and maintenance actions will be recommended where needed.
- The physical integrity and stability of sediment pond components, including berms, outlet pipes, spillways, and downstream discharge channels.
- Sediment levels in sediment control ponds will be measured monthly or prior to a predicted storm event to ensure that the minimum pond depth below the outlet pipe invert is present; sediment captured in traps will be removed in a timely manner.
- Revegetated areas will be monitored for evidence of wind and water erosion; remedial seeding and erosion-control measures will be applied when required.

The Environmental Manager and Project Engineer will modify the SEPSCP when necessary, to reflect changing site conditions or new information which has been identified during construction.

11.2 Continuous Improvement

The design of ESC measures should be viewed as a flexible process that responds to new information obtained throughout the Construction Phase. Contingency strategies for the Project will be active and adaptive, with ongoing inspection, maintenance, and re-evaluation for all BMP control measures and surrounding site conditions. If monitoring identifies that BMPs are not functioning adequately, the following steps will be taken:

- Confirm control measure/feature installed correctly.
- Assess appropriate size or length/depth of control method with site circumstances.
- Determine if alternate BMP/control method or contingency measures are required.
- Assess if increased maintenance/inspections required.

An inventory of ESC materials will be kept on site to address problems that may arise. The inventory list will be updated regularly to reflect a more accurate estimate of the quantities that should be stocked on site. The materials will provide a spectrum of measures to address a broad range of site conditions and severity.

12. PLAN REVISION

This Plan is a 'living document' and components of the plan may be reviewed over the life of the Project. This Plan will be reviewed annually as part of reporting. Any revisions will be implemented following review by stakeholders and an opportunity for response by BW Gold.

BW Gold will conduct an annual (or as necessary) evaluation of the efficacy of mitigation and monitoring activities. This Plan may be updated as frequently as every year, or not at all, if the mitigation and monitoring measures are found to be robust.

Notification and consultation related to modifications will be communicated to the EMLI and Aboriginal Groups (Lhoosk'uz Dené Nation, Ulkatcho First Nation, Nadleh Whut'en First Nation, Stellat'en First Nation, Saik'uz First Nation, and Nazko First Nation). Updated versions of the plan will be filed with EMLI and provided to Aboriginal Groups.

13. QUALIFIED PROFESSIONALS

This management plan has been prepared and reviewed by, or under the direct supervision of, the following qualified professionals:

Prepared by:

Stephanie Eagen, R.P.Bio.
Senior Environmental Scientist
Knight Piésold Ltd.

Reviewed by:

Greg Smyth, B.Sc.
Project Manager | Associate – Environment
Knight Piésold Ltd.

14. REFERENCES

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

Legislation

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.

Environmental Management Act, SBC 2003, c 53.

Fisheries Act, RSC 1985, c F-14.

Impact Assessment Act, RSC 2019, c 28.

Metal and Diamond Mining Effluent Regulations, SOR/2002-222.

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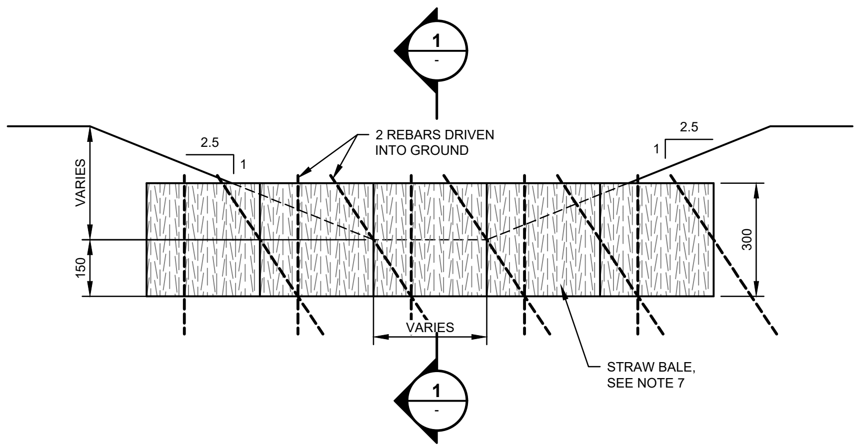
APPENDIX A EROSION AND SEDIMENT CONTROL BMPS

Drawing C3801 ESC – Typical Sections and Details – Sheet 1

Drawing C3802 ESC – Typical Sections and Details – Sheet 2

Drawing C3803 ESC – Typical Sections and Details – Sheet 3



STRAW BALE ON CHANNEL
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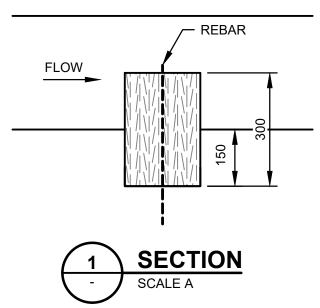

1 SECTION
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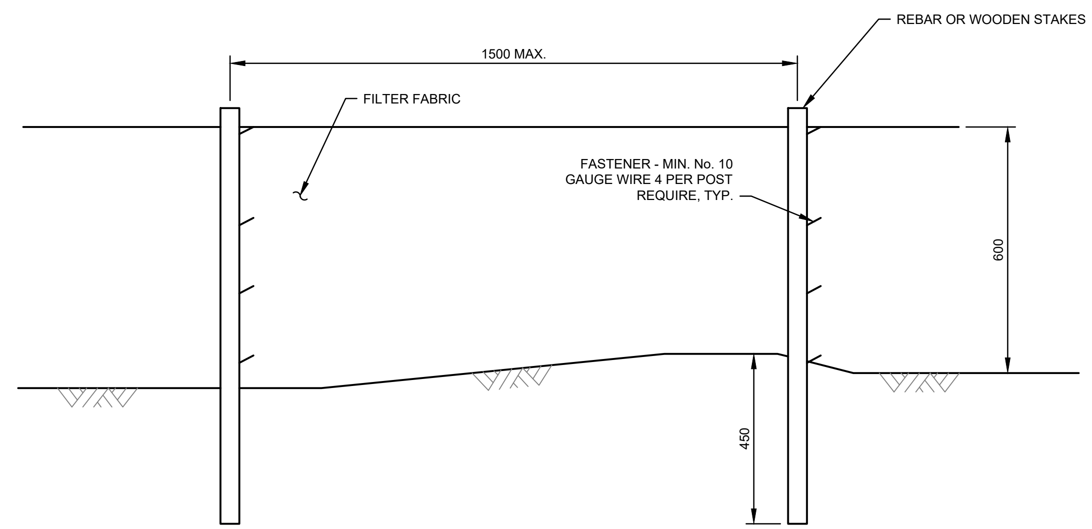

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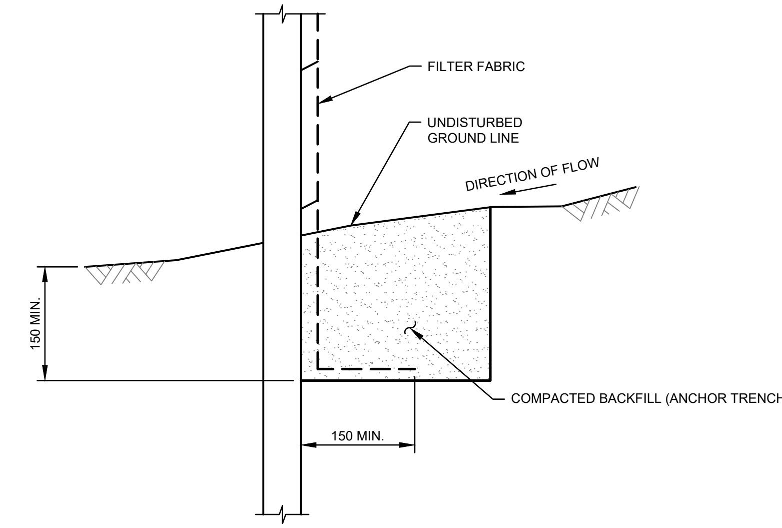

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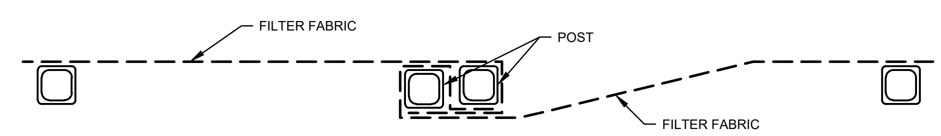

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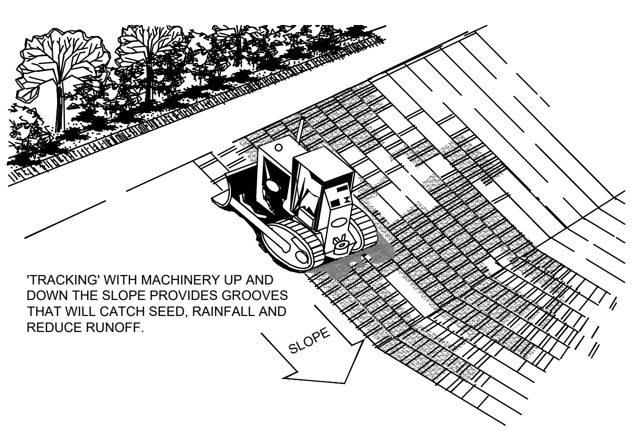

SLOPE ROUGHENING
NTS

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. BEST MANAGEMENT PRACTICES (BMP) FOR SEDIMENT AND EROSION CONTROL WILL BE APPLIED DURING CONSTRUCTION AND OPERATION OF COLLECTION CHANNELS AND SEDIMENT CONTROL POND.
3. FOUNDATION PREPARATION SHALL CONSIST OF REMOVAL OF VEGETATION, MUD, DEBRIS, AND SOFT AND DELETERIOUS MATERIAL.
4. ALL SEDIMENT AND EROSION CONTROL MEASURES MUST BE CONSTRUCTED, STABILIZED AND FUNCTIONAL BEFORE SITE DISTURBANCE BEGINS.
5. SITE GRADING SURFACE WATER RUNOFF TO BE DIRECTED TO THE COLLECTION CHANNELS AT ALL TIMES DURING SITE DISTURBANCE ACTIVITIES UNTIL FINAL STABILIZATION IS ACHIEVED.
6. THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL MEASURES PERIODICALLY AND AFTER EACH RUNOFF-PRODUCING RAINFALL EVENT. ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES SHALL BE MADE IMMEDIATELY.
7. STRAW BALE SHALL BE IMPLEMENTED ON COLLECTION CHANNELS WHEN REQUIRED BY THE CONTRACTOR. TYPE OF CHANNELS MAY INCLUDE NON-CONTACT RUNOFF, CONTACT RUNOFF, ACCESS ROAD, PERMANENT AND TEMPORARY CHANNELS.

DETAILED DESIGN
NOT FOR CONSTRUCTION

SCALE B: 100 50 0 100 200 300 400 500 mm
SCALE A: 200 100 0 200 400 600 800 1000 mm

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2021-02-04

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BLACKWATER GOLD PROJECT

EROSION AND SEDIMENT CONTROL TYPICAL SECTIONS AND DETAILS SHEET 1

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VA101-457/33	C3801	0

REFERENCE DRAWINGS

DRG. NO.	DESCRIPTION
-	-

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
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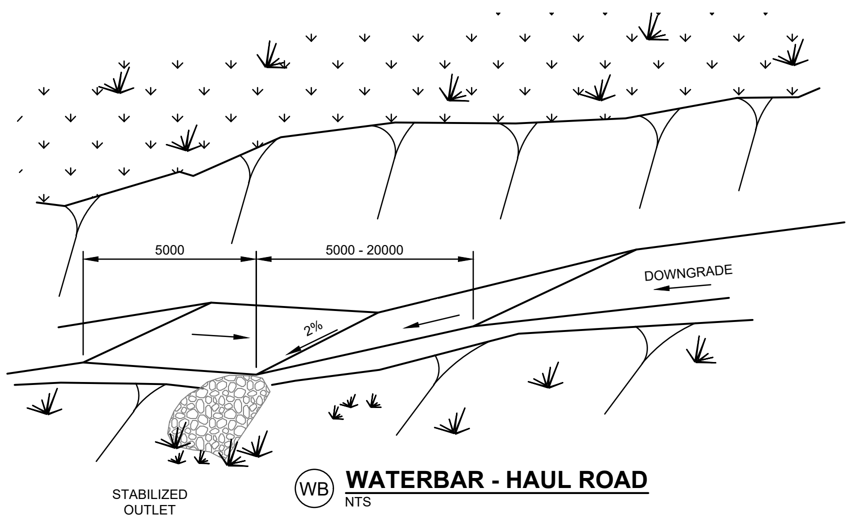
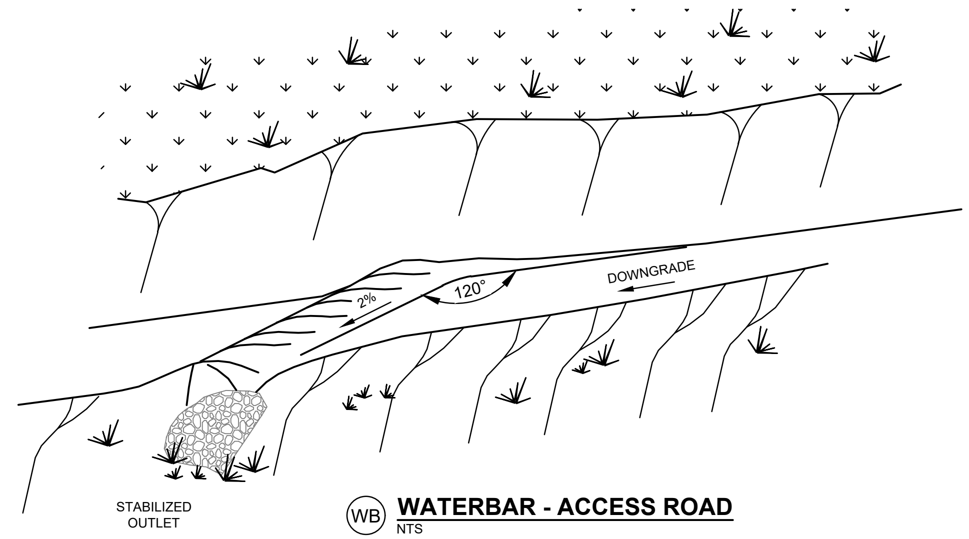
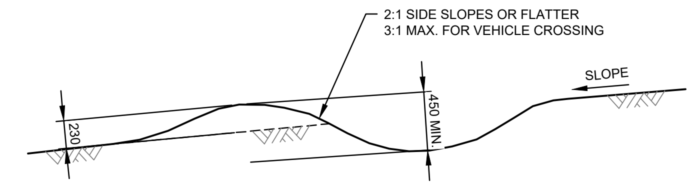


WB **WATERBAR - HAUL ROAD**
NTS



WB **WATERBAR - ACCESS ROAD**
NTS



WB **WATERBAR - TYPICAL SECTION**
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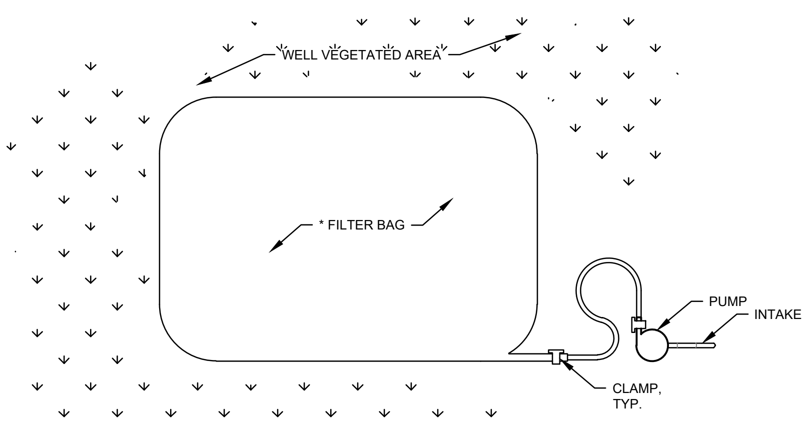
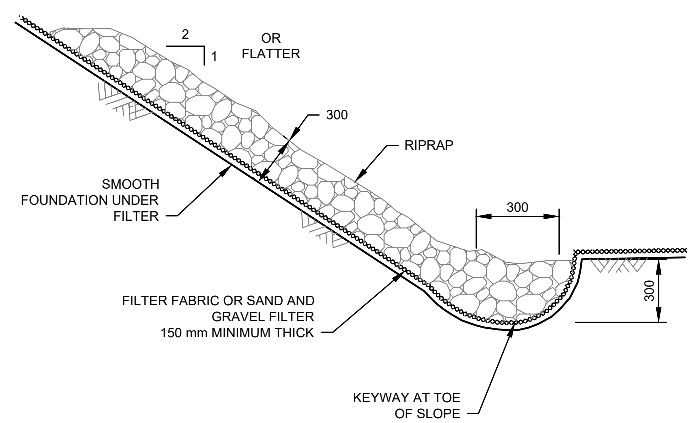
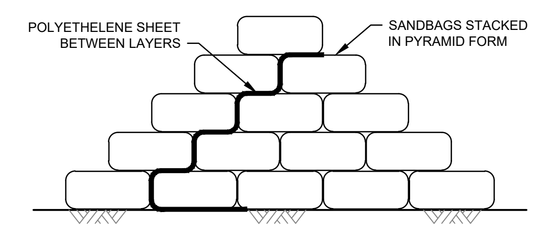


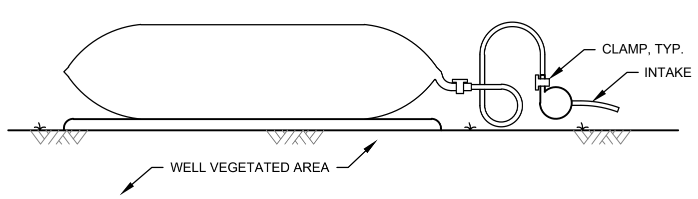
FB **FILTER BAG PLAN**
NTS



AS **ARMOURED SLOPE - TYPICAL**
NTS



DS **TEMPORARY STREAM DIVERSION STRUCTURE**
NTS



FB **FILTER BAG CROSS SECTION**
NTS

DETAILED DESIGN
NOT FOR CONSTRUCTION

NOTES:

1. ALL SEDIMENT AND EROSION CONTROL MEASURES MUST BE CONSTRUCTED, STABILIZED AND FUNCTIONAL BEFORE SITE DISTURBANCE BEGINS.
2. SURFACE WATER RUNOFF TO BE DIRECTED TO THE EROSION CONTROL BMPS AT ALL TIMES DURING SITE DISTURBANCE ACTIVITIES UNTIL FINAL STABILIZATION IS ACHIEVED.
3. THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL BMPS PERIODICALLY AND AFTER EACH RUNOFF-PRODUCING RAINFALL EVENT. ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES SHALL BE MADE IMMEDIATELY.
4. AN AREA IS CONSIDERED TO HAVE ACHIEVED FINAL STABILIZATION WHEN IT HAS A MINIMUM UNIFORM 70% VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER TO RESIST ACCELERATED SURFACE EROSION.
5. DIVERSION STRUCTURE TO CONSIST OF SANDBAGS OR U-SHAPED METAL PLATE.

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2021-02-04

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BLACKWATER GOLD PROJECT

EROSION AND SEDIMENT CONTROL
TYPICAL SECTIONS AND DETAILS
SHEET 2

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VA101-457/33	C3802	0

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REFERENCE DRAWINGS

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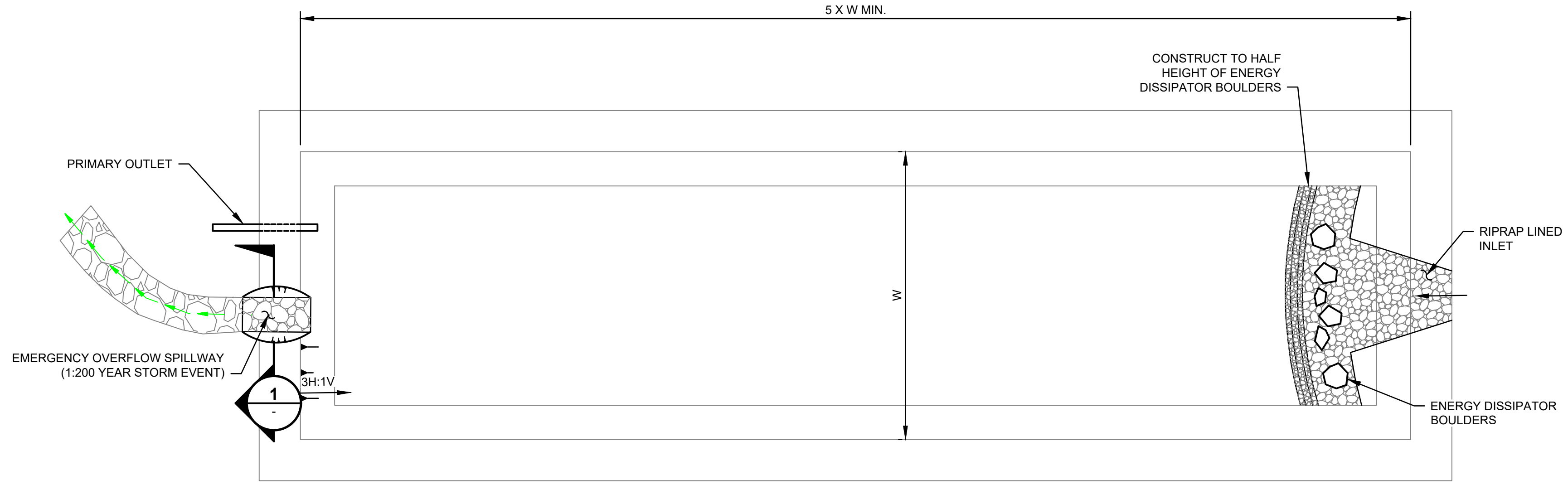
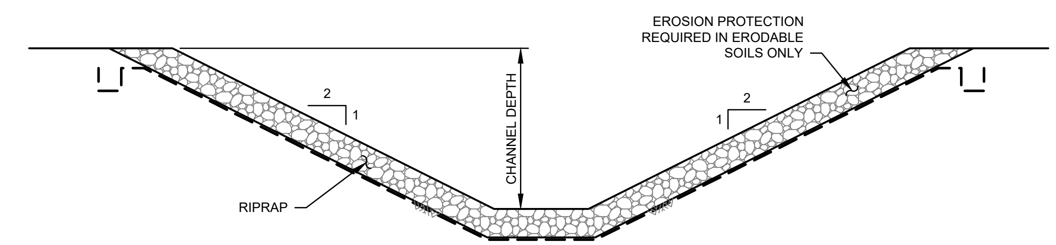
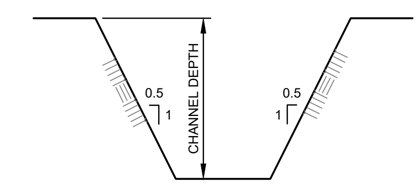
XREF FILE(S): IMAGE FILE(S): Kensington BMP schematics1 Page 4 riprap armour for slope



SP **SEDIMENT POND PLAN VIEW**
SCALE A



DD1 CD1 **DIVERSION / COLLECTION DITCH IN SOIL**
NTS



DD2 CD2 **DIVERSION / COLLECTION DITCH IN ROCK**
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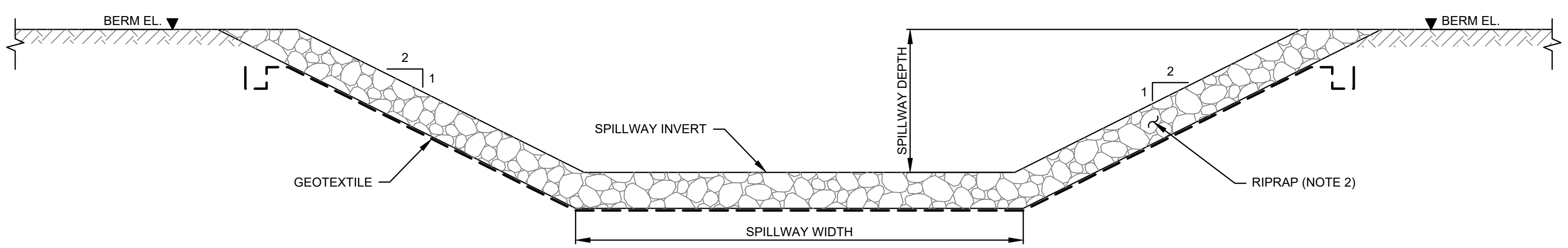

1 - **SECTION**
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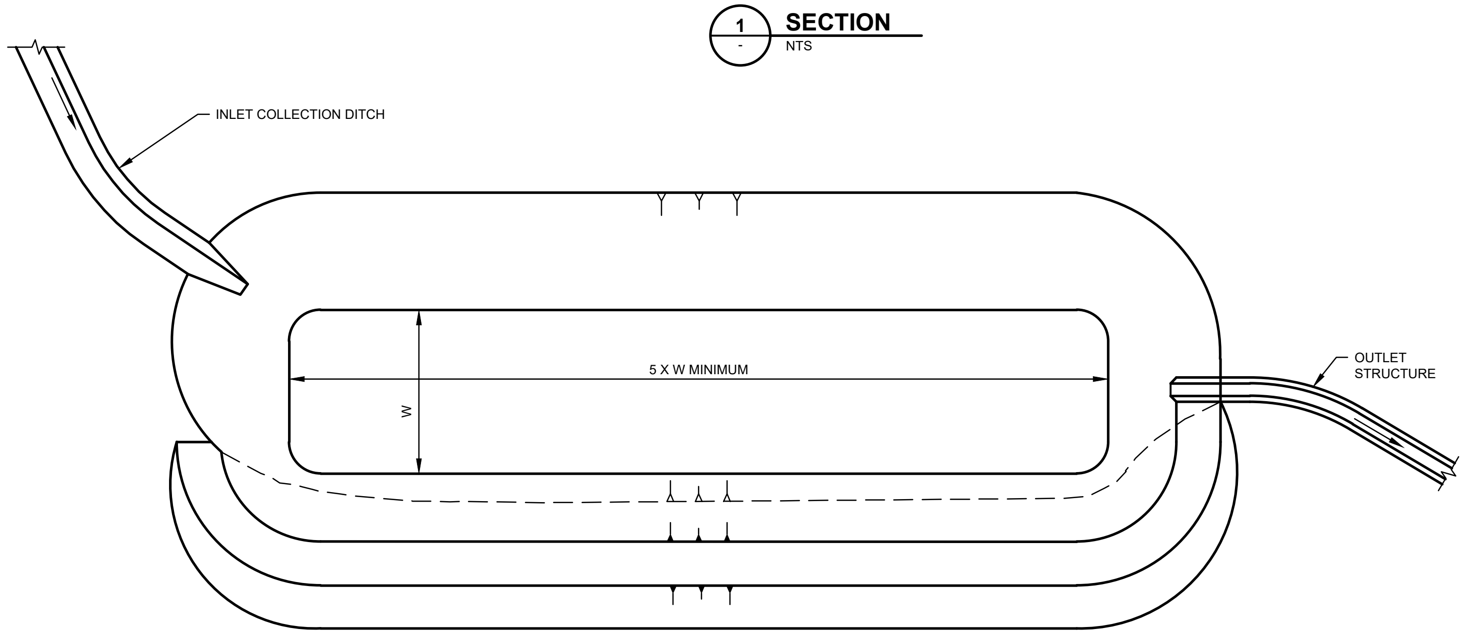

SB **SEDIMENT BASIN PLAN**
NTS

NOTES:

1. SEDIMENT POND LINING REQUIREMENTS SUBJECT TO ENGINEERS REVIEW OF FOUNDATION MATERIAL.
2. RIPRAP TO BE SPECIFIED FOR EACH INDIVIDUAL SEDIMENT POND DURING DETAILED DESIGN PHASE.
3. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS OTHERWISE NOTED.

DETAILED DESIGN NOT FOR CONSTRUCTION

SCALE A 10000 5000 0 10000 20000 30000 40000 50000mm

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA C.A. PENATE ROJAS #45299
2021-02-04

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EROSION AND SEDIMENT CONTROL TYPICAL SECTIONS AND DETAILS SHEET 3

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