



ERIE CREEK DIKE REPAIR ENVIRONMENTAL MANAGEMENT PLAN

Prepared for:

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1 PROJECT INFORMATION

1.1 Introduction and Purpose

Masse Environmental Consultants Ltd. (Masse) has prepared this Environmental Management Plan (EMP) for proposed erosion protection works along a 115 m section of the dike along Erie Creek near the Village of Salmo, BC. This EMP identifies the environmental values associated with the project and environmental management measures to prevent adverse impacts to the surrounding environment. The proposed project activities will comply with appropriate federal and provincial legislations and Best Management Practices (BMPs).

This EMP is recognized as a working document and will be updated as required with any changes/updates to the proposed construction activities. All parties, including the Village of Salmo, WSA, Masse, and contractors will be notified of any changes to the existing plan.

1.2 Project Overview

The project site is located on Erie Creek ~2.4 km upstream from the junction with the Salmo River, within Area G of the Regional District of Central Kootenay just outside the Village of Salmo limits (LOT 1 PLAN NEP1122 District Lot 1237 Kootenay Land District Except Plan 4145 7463; Figure 1). This dike was constructed in ~ 1996 in order to protect a low lying neighborhood along 8th and 9th Street at the west end of the town, west of Highway 6 and south of Highway 3. A dike inspection was conducted in 2020 by Greg Henderson, P.Eng., of WSA Engineering (2012) Ltd., and identified this section of dike to have undersized riprap protection with localized loss of rock, and some areas may have earth-only bank protection (Henderson, 2020).

The section of dike included in these works extends for ~115 m (Figure 1; from UTM 11U478564.5448860 to 11U478447.5448908) and is situated immediately downstream of an outside bend in the stream, which results in direct flows into the bank, making it more prone to erosion (Photo 1 and 2). Erie Creek water levels begin to rise in late March/early April, with full freshet occurring typically early May to early June based on a review of the hydrometric data for the Salmo River Water Survey of Canada gauging station located at Salmo (Environment Canada 08NE074). Ideally, works will be completed in 2021 during low water levels. The average dike height is 3-4 m with a 2:1 slope. The average width of the dike crest is 4 m.



Figure 1. Project location map.



Photo 1. Upstream view of section of Erie Creek dike scheduled for repairs. Note cottonwood trees in background mark upstream end of section.



Photo 2. Downstream view of section of Erie Creek dike scheduled for repairs.

1.3 Regulatory Framework

The Project must comply with applicable legislation and any permits, licenses, or approvals (Table 1). Applicable provincial and federal legislations and regulations, as well as standards, guidelines and best management practices are listed in Table 2.

Table 1. Contract requirements relevant to environmental protection.

Approval or Standard	Agency	Comment
Section 11 Approval (Tracking # 100344375)	Ministry of Forests, Lands, Natural Resource Operations and Rural Development	Application was submitted as a Notification but was determined as an Approval by the Province. EMP was requested during the review process.
Request for Review	Department of Fisheries and Oceans	

Table 2. Approval and Standards.

Applicable Legislation	BMP Guidelines
Federal Legislation <ul style="list-style-type: none"> - Canadian Environmental Protection Act (1999) - Fisheries Act (RSC 1985) - Migratory Birds Convention Act (SC 1994) and Regulation - Species at Risk Act (SC 2002) - Transportation of Dangerous Goods Act (2008) 	<ul style="list-style-type: none"> - A Field Guide to Fuel Handling, Transportation & Storage (MWLAP 2002). - BC Approved Water Quality Guidelines (MoE, 2018). - Canadian Environmental Quality Guidelines (CMME, 2012). - Land Development Guidelines for the Protection of Aquatic Habitat (DFO, 1993). - Measures to Protect Fish and Fish Habitat (DFO, 2019) - Kootenay- Boundary Water Sustainability Regulation Notification Terms and Conditions (FLNRORD 2018) - Standards and Best Practices for Instream Works (BC MWLAP, 2004)
Provincial Legislation <ul style="list-style-type: none"> - Environmental Management Act (SBC 2003) - Hazardous Waste Regulation (BC Reg. 63/88) - Spill Reporting Regulation (BC Reg. 187/2017) - Heritage Conservation Act (RSBC 1996) - Water Sustainability Act (SBC 2014) and Regulation - Weed Control Act (RSBC 1996) and Regulation - Wildlife Act and Amendment (RSBC 1996) 	

2 SITE DESCRIPTION

2.1 Aquatic Resources

Erie Creek is a large 5th order tributary stream to the Salmo River with a total length of ~32 km and originates from the Bonnington Range of the Selkirk Mountains. The stream flows mainly in a southerly direction and takes a sharp turn to the east as it merges with the outflow of Erie Lake ~6.3 km upstream from the junction with the Salmo River (Figure 1). The stream has an average channel width of 36 m, gradients of ~3% and riffle-pool stream morphology with substrate consisting predominantly of cobbles and boulders (Photo 3). The main habitat at the project location consists of a long riffle. One pool was observed next to the dike with an approximate length of 20 m and 1- 2 m deep. The pool appears to have been further enhanced with the placement of a manmade cobble dam at the crest likely to enhance a swimming area (Photo 4). This pool may also provide good fish rearing and overwintering habitat. There is no spawning habitat present as no gravel size substrate was observed due to high water velocities in that section.

Fish species reported in Erie Creek include Rainbow Trout (*Oncorhynchus mykiss*), Eastern Brook Trout (*Salvelinus fontinalis*), Longnose Dace (*Rhinichthys cataractae*), and Slimy Sculpin (*Cottus cognatus*). Historical data indicates the presence of Westslope Cutthroat Trout (*O. clarki lewisi*) in the Erie Creek watershed, although there was only one observation point located in Erie Lake dating back to 1954. Bull Trout (*Salvelinus confluentus*) are known to reside in the Salmo River but there are no records of their presence in Erie Creek (Habitat Wizard).



Photo 3. Cross view of Erie Creek with long riffle and coarse substrate consisting of cobbles and boulders.



Photo 4. Upstream view of Erie Creek with pool habitat enhanced by manmade cobble dam.

2.2 Terrestrial Resources

The project area is located along an existing dike. The face of the dike has steep banks armoured with a mixture of cobble and boulder size angular rock material (Photo 5), with sparse vegetation consisting of a few shrubs and some herbaceous species including sitka willow (*Salix sitchensis*), red-osier dogwood (*Cornus sericea*; Photo 6), alder (*Alnus sp*; Photo 7), black cottonwood seedlings (*Populus trichocarpa*), grand fir seedlings (*Abies grandis*), and western red cedar (*Thuja plicata*).

The riparian habitat on the inside of the dike consists of a mixed forest dominated by mature black cottonwood trees with white pine (*Pinus monticola*), grand fir, Douglas fir (*Pseudotsuga menziesii*), trembling aspen (*Populus tremuloides*), hybrid white spruce (*Picea glauca x engemanni*), western red cedar, western hemlock (*Tsuga heterophylla*), and Ponderosa pine (*Pinus ponderosa*; Photo 8). Invasive weed species present on dike include knapweed (*Centaurea stoebe*) and mullein (*Verbascum Thapsus*). The riparian habitat on the inside of the dike provides potential habitat to many wildlife species and is located within designated ungulate winter range habitat (u-4-001).



Photo 5. Mixture of cobble and boulder size angular rocks on face of dike.



Photo 6. Red osier dogwood and grand fir seedling in background.



Photo 7. Alder and willow near toe of dike.



Photo 8. Black cottonwood and mix forest on the inside of dike.

2.3 Species at Risk

The following table identifies Species at Risk confirmed within a 3 km radius of the project site (CDC 2021) and have potential to occur on or near the site.

Table 1. Species at Risk.

Species (common name)	Latin name	Provincial Status	COSEWIC and SARA, Schedule*
Steer's Head	<i>Dicentra uniflora</i>	Yellow	-
Western Bumble Bee	<i>Bombus occidentalis</i>	Blue	T
Western Painted Turtle	<i>Chrysemys picta</i>	Blue	SC, S1
Western Screech-Owl	<i>Megascops kennicottii macfarlanei</i>	Blue	T, S1

*T: Threatened; SC: Special Concern; S1: Schedule 1

Both the Western Bumble Bee (*Bombus occidentalis*) and the Western Screech-Owl (*Megascops kennicottii macfarlanei*) may be encountered in or near the project area. Western bumble bee occurrences are reported at Erie Creek Provincial Park. The Western Screech-Owl is found in riparian forests dominated by black cottonwood (*Populus trichocarpa*), water birch (*Betula occidentalis*) or trembling aspen (*Populus tremuloides*), usually within an arrangement of ponderosa pine (*Pinus ponderosa*) or Douglas-fir (*Pseudotsuga menziesii*). Western Screech Owl have been reported on the other side of Erie Creek from the project in a wetland complex at the headwater of Hayward Creek.

The likelihood of encountering Steer's Head (*Dicentra uniflora*) is low as this plant typically establishes in moist – dry meadows and scree slopes in montane and subalpine zones. The likelihood of encountering a Western Painted Turtle (*Chrysemys picta*) also remains low as they prefer calm water with little to no flow. They are currently found in Erie Lake ~ 4 km upstream of the project site.

2.4 Public Use

This area is currently used by local residents for recreational activities. The area will need to be temporarily closed during the works and signage will be installed.

2.5 Heritage Resources

First Nations will be notified as part of the Section 11 Approval for Instream Work under the Water Sustainability Act. Since the works are being completed on an existing dike and no excavation work is proposed, the chance of finding archaeological artifacts is low. The Archaeological Chance Find Procedures (Appendix 1) will provide guidance to the Village of Salmo, WSA and contractor(s) in the case of a chance archaeological find to ensure that archaeological sites are documented and protected as required.

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3 CONSTRUCTION ACTIVITIES AND POTENTIAL ENVIRONMENTAL IMPACTS

3.1 Construction Activities

The scope of work associated with the erosion protection along the Erie Creek dike includes the following:

- Mobilization of personnel, equipment, and materials. This will include an excavator and dump trucks.
- Onsite traffic management. The site is accessible via the dike (Photo 9). Trucks will be able to loop around without having to back track. The rock material will be stockpiled in a small turnaround area on private property in order to maintain access (Photo 10). The rock will then be forwarded from this location.
- No clearing and grubbing of riparian vegetation will be necessary.
- The erosion protection revetment includes 3 layers of materials as per engineering drawings (Appendix 5):
 - Non-woven geotextile placed on original dike surface. Loose rocks that may interfere with laying the geotextile will first be removed.

- A layer of 10 kg class angular riprap to a minimum thickness of 200 mm.
- A layer of 500 kg class angular riprap to a minimum thickness of 1000 mm. Smaller angular rock to be firmly embedded in surface fold to form a closely massed regular surface revetment. Voids between boulders will be filled with suitably sized, well graded, angular rocks.
- The upstream end will be keyed into the dike with 500 kg class angular riprap placed to a minimum thickness of 2000 mm. Smaller angular rock to be placed as per the remainder of the revetment.
- Site cleanup and restoration.
- Demobilization.

The project is expected to take ~ 6 to 8 days and may commence as early as the beginning of August depending on obtaining Section 11 Approval from the Province and a DFO Request for Review. If permits and approvals are not obtained in time for an early August start, works could be completed during the fall as water levels should remain relatively low. Ideally the project would be completed in 2021 prior to the 2022 freshet as failure of this dike has been rated as potentially having high consequences.



Photo 9. Access along crest of dike.



Photo 10. Access and laydown area via private property.

3.2 Potential Environmental Impacts

Environmental impacts of the project are expected to be reduced if best management practices and mitigation measures are followed. The primary environmental concern of this project is the risk of introduction of harmful or deleterious substances (sediment, hydrocarbons) into Erie Creek during construction. Other potential environmental concerns include instream habitat loss from the placement of riprap within the stream channel below the high water mark and potential removal of some vegetation on the face of the dike. Impacts to wildlife are expected to be minimal as the dike is an existing structure and vegetation clearing is expected to be minimal. Removal of established vegetation and the disturbance of ground cover can also lead to the introduction and /or proliferation of invasive plant species on the site.

The potential environmental effects of this project and suitable mitigation measures to minimize impacts are summarized in Table 3 **Error! Reference source not found..**

Table 3. Potential Environmental Impacts.

Resource	Potential Effect	Mitigation/BMP
Water quality	Increase in sedimentation due to erosion	<ul style="list-style-type: none"> • Minimize amount of disturbed soils. • Revegetate disturbed areas as soon as possible. • Implement and maintain erosion and sediment control measures where appropriate and necessary.
	Introduction of deleterious substances due to spills (fuels/oils)	<ul style="list-style-type: none"> • Use well-maintained, leak free equipment. • Locate laydown/fueling/maintenance area > 30 m from Erie Creek. • Contain and collect waste materials. • Develop a contingency plan to address potential spills (Spill Response Plan). • Excavator working above water should be equipped with biodegradable hydraulic fluids.
Wildlife	Impacts to fish by incidental stranding or introduction of a deleterious substance to a watercourse.	<ul style="list-style-type: none"> • Conduct work within the least risk period for fish if possible (July 16- Aug 31). Alternatively, conduct the works at low water flows to minimize the amount of in water work. • Isolate instream work area if possible. • Conduct fish salvage as necessary. • Monitor water quality. • Maintain erosion and sediment control. • Maintain equipment and use of biodegradable hydraulic fluid in excavators.
	Disturbance of nesting birds	<ul style="list-style-type: none"> • Works are not expected to be conducted during the breeding bird season which extends from April 1 to August 15.
	Attract wildlife to project site	<ul style="list-style-type: none"> • Maintain site clear of litter and garbage.
Vegetation	Increase spread of noxious/invasive weeds	<ul style="list-style-type: none"> • No vegetation on the inside of the dike is to be cleared. • Sparse shrubs on the face of the dike to be retained as much as possible. • Rehabilitate site as soon as possible after project completion. • Use machinery/materials that are free of noxious weeds.
Landscaping/ visual aesthetics		<ul style="list-style-type: none"> • Maintain sites clear of litter or garbage.
Air quality	Increase local air pollution	<ul style="list-style-type: none"> • Implement idle reduction practices.

Best management practices and mitigation measures to address these concerns are provided below.

4 CONSTRUCTION MITIGATION

4.1 Environmental Orientation

An environmental awareness orientation will be conducted with all personnel at the project start-up. The purpose of the orientation is to ensure familiarity with the environmental procedures outlined in this document and to ensure that obligations regarding the exercise of due diligence for protection of environmental values are understood. The orientations can be led by the Project Manager or EM and a record of orientation will be signed by those present. By signing the environmental awareness orientation document, the contractor indicates they have been advised of and understand the environmental requirements of the contract, and that they will communicate the project environmental requirements to all personnel. A copy of the orientation is provided in Appendix 2.

4.2 Environmental Timing Windows

The project works were initially scheduled for early August within the instream work window which extends from July 16 to August 31 due to the presence of spring spawners such as Rainbow Trout and fall spawners such as Eastern Brook Trout. However, a DFO Request for Review will be submitted during the month of May, which may delay the project pushing it beyond the preferred instream work window. Works are to be conducted at low water levels and minimal in water works would be required other than placing a few large rocks at the toe of slope. Since there are no spawning gravels present at the toe of the dike, the spawning success of Eastern brook trout, which is an introduced species, would not be affected. Environmental monitoring of the works is recommended if works are completed outside of the instream work window.

Timing of this project will likely be outside of the bird nesting season (April 1 - Aug 15). If works are to be conducted within this time period, all personnel should be made aware of the requirements to protect active bird nests, and to report signs of active nesting that occurs in or near the work site. A nesting bird survey would be required for any clearing of vegetation during this time period.

4.3 Clearing and Grubbing

Minimal vegetation clearing will be required for this project. The work site will be accessed via the existing dike and private driveway, which are already devoid of vegetation. All vegetation on the inside of the dike will not be disturbed by the project works. Some vegetation clearing may be required on the face of the dike, however, the sparse shrubs should be retained as much as possible. No excavation or grubbing will be conducted as the new riprap revetment will be placed directly on top of the existing dike surface. The following mitigation measures will be implemented:

- Clearing will be kept to the minimum possible area required.
- All materials will be stockpiled in the designated stockpile areas and minimise disturbance to the existing vegetation.
- Riprap material to be stored in such a way that will not impact the existing vegetation on the inside of the dike.

4.4 Instream Works

Any works occurring below the high water mark of Erie Creek are considered “instream works”. Instream works include the placement of the geotextile and the two layers of angular riprap (as per engineering drawings, Appendix 5). Worksite isolation is not proposed for this project as the works will be conducted at low water levels with minimal in water works necessary. Riprap material will be carefully placed at the toe of the dike in such a way that will cause minimal disturbance. The following mitigation measures are recommended:

- Works will be completed in the dry as much as possible.
- If the first layer of rocks needs to be placed in water, scare tactics, such as tapping the excavator bucket on the surface of the water, will be used prior to placing the rock in order to scare any fish present in the vicinity.
- All rocks used for riprap need to be clean and free of debris and fine particles.
- The first layer of rocks should be large enough to create protrusions and provide cover for fish.

4.5 Erosion and Sediment Management Plan

All ground or surface water potentially contaminated as a result of project activities shall be managed in a manner that will prevent the release of deleterious substances into the environment. The following mitigation measures to reduce erosion and introduction of sediment into the watercourse include:

- Minimize removal of riparian vegetation.
- Locate stockpiles away from Erie Creek in a stable location.
- All stockpiled materials will be tarped and/or otherwise secured to prevent erosion and the escape of material by wind and/or water when necessary.
- Cover exposed slopes with polyethylene sheets or tarps as required.
- Place only clean rock, essentially free of dust and fines instream.
- Modify or stop work activities during periods of inclement weather.

4.6 Water Quality Monitoring

The BC Water Quality Guidelines (BCWQG) provides the acceptable threshold concentrations of suspended sediment in watercourses for aquatic life. Allowable induced turbidity or total suspended sediments (TSS) relate to ambient (background) levels occurring naturally in the watercourse. The allowable levels are described in Table 6.

Table 4. BC Water Quality Guidelines for Turbidity

Water Use	Maximum Induced Turbidity (NTU)
Freshwater Aquatic Life	Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters.
	Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters.

Water Use	Maximum Induced Turbidity (NTU)
	Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters.
	Change from background of 10 % when background is >50 NTU at any time during high flows or in turbid waters.

Table adapted from MoE 2018

Turbidity levels will be measured and recorded by the EM in the field using a handheld portable turbidity meter, if required. Measurements will be taken from an upstream site to measure background turbidity levels and downstream of the construction site. Measurements will be taken at the following times:

- daily during instream excavation activities;
- during/after rain events;
- at any time increased sedimentation levels are observed; and
- at any time of high turbidity risk.

If levels of turbidity exceed freshwater aquatic guidelines due to construction activities, the contractor will be notified. Additional monitoring and/or mitigation will be required.

4.7 Management of Equipment and Fuel/Lubricant Materials

Construction activities require the use of machinery and equipment that use fuels, oils, lubricants, and hydraulic fluids. These materials are hazardous to the surrounding terrestrial and aquatic environments and must be managed properly. To reduce the risk of fluid leaks and spills the following measures will be implemented:

- Excavators will be equipped with biodegradable hydraulic fluid.
- Machinery will arrive on site in a clean condition free of fluid leaks, excess oil or grease, mud, sediment, and invasive or noxious weeds or seeds.
- All equipment will be regularly inspected for leaks at the start and end of each working day.
- All fuel operating equipment (ie. pumps, generators, excavators) will be equipped with secondary containment trays when stationary.
- Equipment will be stored in the staging area overnight (>30 m from any watercourse).
- An emergency spill response kit and spill reporting procedures (Section 4.14) will be available on site. The spill response kit will be inspected regularly and replenished as necessary.
- Smoking will not be permitted within the staging area.
- If emergency repairs are required, spill pads will be used to capture any drips.
- No large quantities of fuel will be stored on site.
- Small containers of fuel and oil to be stored in appropriate secondary containment.
- Any refuse contaminated with fuel, oil, grease, lubricants, or hydraulic fluid generated during repairs or servicing of equipment will be collected in polyethylene lined, covered, containers. This waste will be disposed of at a registered or licensed facility.
- Maintenance logbooks will be kept for each machine on-site and updated daily.

4.8 Waste Management and Onsite Facilities

All refuse, garbage, sewage effluent, petroleum product, and any item or fluid contaminated with a hazardous material (including contaminated water) is considered as “construction waste”. No construction waste shall be dumped or discharge to the ground or into any waterbody. All construction waste will be collected and taken offsite for disposal at an approved disposal facility, in compliance with the applicable legislation and regulations. The Contractor is responsible for keeping the site clean and upon completion of the project works, the site will be cleaned and restored (Section 4.12)

A portable toilet facility will be installed onsite. It will be pumped out on a regular basis by an equipped and qualified contractor who will dispose of the waste in an appropriate manner.

4.9 Hazardous Waste

Hazardous wastes potentially associated with the work include hydrocarbons, oily rags or spent absorbents containing more than 3% by weight hydrocarbons. The Contractor is responsible for the removal, handling and disposal of any hazardous wastes associated with the Work.

- Hazardous waste will be contained in appropriate leak-proof labeled containers and stored in an area with secondary containment.
- MSDS/SDS for identified hazardous substances will be made available on site.

4.10 Air Quality

In order to reduce greenhouse gas emissions, idle reduction practices will be implemented onsite (Table 7).

Table 5. Idle Reduction Strategy

Strategy	Action
1. Construction vehicle and equipment idling time restrictions	<ul style="list-style-type: none">• Motor vehicles and light diesel trucks- 1 minute• Heavy duty diesel vehicles- 5 minutes• Diesel vehicles involved in construction Site passenger transport- 10 min• Construction equipment- exemptions when actually employed at the Site for work.
2. Staging Areas	<ul style="list-style-type: none">• Establishing a staging zone for trucks waiting to load or unload materials that is located away from sensitive receptors.
3. Operation Efficiencies	<ul style="list-style-type: none">• Book systems to ensure drivers are not required to wait and unload.• In instances where there is queuing, providing parking for trucks to wait and unload.
5. Worker Training	<ul style="list-style-type: none">• Communication of the idle reduction strategy during the environmental site orientation, toolbox and health and safety meetings.

4.11 Wildlife Management

In order to ensure impacts to wildlife are minimized the following procedures should be followed:

- Minimize disturbance to riparian vegetation.
- Do not feed, hunt, harm, harass or capture any wildlife. Do not disturb, destroy or relocate any bird, nest or egg.
- Maintain a litter free worksite. Contain, secure and pack out all garbage and construction waste.

4.12 Invasive Species Management

The project area has established invasive plants species. The project has the potential to spread invasive weeds to surrounding areas by creating additional disturbance and/or transporting weed seeds. Once established, invasive plants have the capacity to invade adjacent, undisturbed natural communities, displace wildlife, and disrupt natural ecosystem functions. To prevent the spread of invasive plants into, the following measures should be implemented:

- Clearing of existing vegetation will be minimized.
- Exposed soils will be seeded as soon as possible following the project works.

4.13 Site Restoration

Site rehabilitation activities required during and at the conclusion of the project include:

- All disturbed areas with exposed soils shall be re-seeded using an appropriate erosion and sediment control seed mix.
- Removal of temporary site facilities.
- Site cleanup.
- Replacement planting for any vegetation removed on site as per the MoE (1996) Tree Replacement Criteria to determine the amount of trees and shrubs to be replanted (Table 6). Planting will be completed in the Fall 2021 if necessary.

Table 6. Tree replacement criteria.

Tree Diameter	Replacement Trees
0 mm -151mm (6") dbh	2 replacement trees(min height 1.5 m) or 4 shrubs (for up to 50% of trees being replaced in this range)
152 mm- 304 mm (12") dbh	3 replacement trees (min. height 1.5 m)
305 mm – 456 mm (18") dbh	4 replacement trees (min height 2.0 m)
457 mm – 609 mm (24") dbh	6 replacement trees (min height 2.0 m)
610 mm- 914 mm (36") dbh	8 replacement trees (min height >2.0 m)

4.14 Spill Prevention and Emergency Response Plan

A detailed Spill Prevention and Emergency Response Plan (SPERP) will be available on site throughout the duration of the project. The Contractor's SPERP is provided in Appendix 3. The most likely source of a spill is from equipment used onsite, either during fueling, from unanticipated leaks, or the failure of a hydraulic hose.

In order to minimize the likelihood and impact of a spill the contractor will ensure that:

- A site-specific industrial spill kit is kept onsite at all times in a location that is clearly visible and easy to access. The industrial spill kit will be capable of handling the largest potential onsite spill and equipped with absorbent booms. Suggested industrial spill kit contents are detailed in Appendix 3.
- Each piece of heavy equipment will be equipped with a spill response kit.
- All personnel shall be familiar with the use of spill kits and their contents and are responsible for maintaining the contents of the spill kits according to the spill kit contents list contained within each kit.
- Personnel knowledgeable in the SPERP and adequately trained to respond to hazardous material spills and emergencies to be available and onsite during all project activities. These personnel will review the SPERP regularly to ensure that it is up-to-date and that all required materials are available onsite.
- The SPERP will be placed within each spill kit.
- If a spill occurs it will be abated and contained immediately, and then cleaned up. The contaminated material will be removed from the work site and disposed of in compliance with the applicable legislation and regulation of all authorities with jurisdiction over the project area.
- All spills will be reported to the Village of Salmo representative, WSA and the EM. Emergency Management BC (1-800-663-3456) will be contacted for spills of a reportable quantity (See Appendix 3 for reporting requirements and Appendix 4 for Environmental Incident Report Form).

4.15 Environmental Incident Reporting Plan

An environmental incident is a situation that has caused, or has the potential for causing, one or more of the following:

- Adverse impact on the quality of air, land or water, wildlife, aquatic species, or species at risk.
- Violation of permit requirements or environmental regulations.
- Adverse publicity with respect to the environment.
- Legal or regulatory action with respect to violation of statutes or environmental damage.
- Alteration of, or damage to, heritage or archaeological resources.

4.16 Environmental Monitoring Plan

An Environmental Monitor (EM) will conduct site visits to ensure that the preventative and mitigative strategies outlined in this plan are implemented and effective. The frequency of these visits will be

dependent on construction activities, the effectiveness of the environmental measures, and the weather conditions. The EM should be onsite for all in water works and at the beginning of the project to ensure that construction personnel are familiar with the environmental requirements outlined in this CEMP. The EM will be notified prior to the commencement of construction activities in sensitive areas to review mitigation procedures with the contractor and determine if it is necessary to be present during the work. Sensitive construction activities include:

- Vegetation clearing if conducted during the breeding bird season (March 31 – August 15).
- Instream works.
- Any discharge of potentially contaminated water.

5 CLOSURE

We trust the information provided in this report meets your current requirements. If you have any questions or require any further information do not hesitate to contact the undersigned.

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6 REFERENCES

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WSA Engineering (2012) Ltd. 2021. Village of Salmo 2021 Erie Dike Maintenance Engineering Drawings. Prepared for the Village of Salmo.

Appendix 1
Archaeological Chance Find Procedures

Chance Find Procedures for Archaeological Material

This document provides information on how a developer and/or their contractor(s) can manage for potential archaeological material discoveries while undertaking construction and/or maintenance activities. This document can provide assistance to in-field contractors in the identification of archaeological remains and the procedures to follow if a discovery is made. The discovery of human remains initiates a different course of action and is outlined separately.

Under the provincial *Heritage Conservation Act (HCA)*, archaeological sites that pre-date 1846 are automatically protected whether on public or private land. Protected sites may not be damaged, altered or moved in any way without a Section 12 or 14 Permit as issued through the *HCA*. It is illegal to collect or remove any heritage object from an archaeological site unless authorized to do so under permit.

1. Activities occurring outside of known Archaeological Sites:

When archaeological material is encountered outside of known archaeological site areas work in the vicinity must stop immediately no matter what type of material or feature has been identified. Alteration to an archaeological site can only occur under a Section 12 (Site Alteration Permit) or Section 14 (Heritage Inspection Permit) *Heritage Conservation Act* permit. Such permit applications should be prepared by a professional archaeologist.

If archaeological material is discovered during the course of construction activities:

- 1.1 **Stop Work:** Halt all work in the area of the discovery and safely secure the area. Contact the project manager or site foreman.
- 1.2 **Contact an Archaeologist:** An archaeologist should be contacted as soon as possible. For a list of qualified archaeologists in the area, the proponent is directed to the BC Association of Professional Consulting Archaeologists website: www.bcaca.ca. The proponent may also wish to contact the Ktunaxa Nation Council's Cultural Resources Stewardship Technician for direction (1-250-420-2739; nikapell@ktunaxa.org).

- 1.3 **Archaeologist provides guidance:** The archaeologist will direct the proponent on the next courses of action, which will include notifying the Archaeology Branch and First Nations with interest in the area.

2. Activities Occurring within Known Archaeological Site Boundaries:

Land altering activity within a previously recorded archaeological site must be conducted under a Section 12 HCA Site Alteration Permit (SAP), in some cases with an onsite archaeological monitor. It is common for additional archaeological material and features to be encountered during activities occurring within previously recorded archaeological sites. Minor finds (lithic flakes, diffuse charcoal or fire altered rock) may not require work to stop, however significant finds require a level of assessment by a professional archaeologist, and it is up to the onsite project manager to determine the level of significance based on criteria presented below.

2.1 Significant Cultural Finds that Require a Professional Archaeologist (described in detail in Section 4)

- Intact archaeological features, which can include but are not limited to hearths, cultural depressions (e.g. cache pits, house depressions) and rock alignments or forms (e.g. tipi rings, cairns, blinds)
- Significant archaeological materials, which include but are not limited to, the presence of formed lithic tools (e.g. projectile point, microblade core, scraper), a dense concentration of lithic waste flakes, or artistic items
- Human Remains (described in detail in Section 3)

2.2 Archaeological Site Management Options

- 2.2.1 **Site Avoidance:** If the boundaries of a site have been delineated, redesign the proposed development to avoid impacting the site. Avoidance is normally the fastest and most cost effective option for managing archaeological sites. Site avoidance could also be achieved through minimizing ground disturbance by looking for alternative constructive methods.
- 2.2.2 **Mitigation:** If it is not feasible to avoid the site through project redesign, it is necessary to conduct systematic data collection and analysis within the site prior to its loss. This could include surface collection and/or excavation. This work can be time-consuming and therefore expensive to conduct.
- 2.2.3 **Protection:** It may be possible to protect all or portions of the site which will be impacted through installation of barriers during the development period and possibly for a longer period of time. Methods for barrier construction could include fencing around site boundaries or applying geotextile to the ground surface and capping it with fill. The exact method used would be site-specific.

3. Chance Find Procedures for Identified Human Remains

Procedures in the event of the discovery of human remains during construction are covered in depth by an Archaeology Branch Policy Statement, found on their website at www.for.gov.bc.ca/archaeology, and are summarized below.

- 3.1 Stop all construction activities immediately in the area of found or suspected human remains and contact the RCMP and/or Office of the Coroner.
- 3.2 The coroner must determine whether the remains are of contemporary forensic concern or archaeological/aboriginal.
- 3.3 If the remains are found to be of aboriginal ancestry then the next step involves the relevant First Nations collaboratively determining the appropriate treatment of those remains.

The key to respectfully dealing with ancient aboriginal remains is to involve the appropriate First Nations as early as possible in the process. However this must be done in a manner that does not interfere with the coroner's office ability to conduct their business in the manner that they see fit.

4. Site Identification Guide

The following are characteristics typical to site types found within the Ktunaxa Traditional Territory.

4.1 Artifact Scatters

Lithic (stone) scatters from the production and maintenance of stone tools are the most common type of archaeological site found in the region. Other materials that may be represented in artifact scatters are Fire Altered Rock (FAR), bone, antler and tooth.

Lithics: What to look for

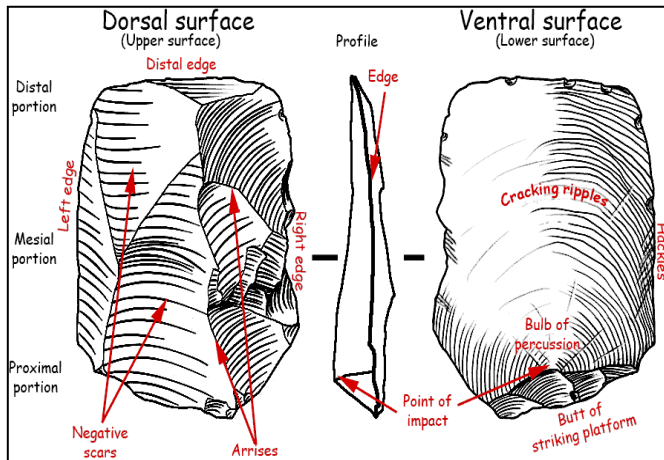


Image 1: Basic flake morphology



Image 2: Examples of lithic flakes

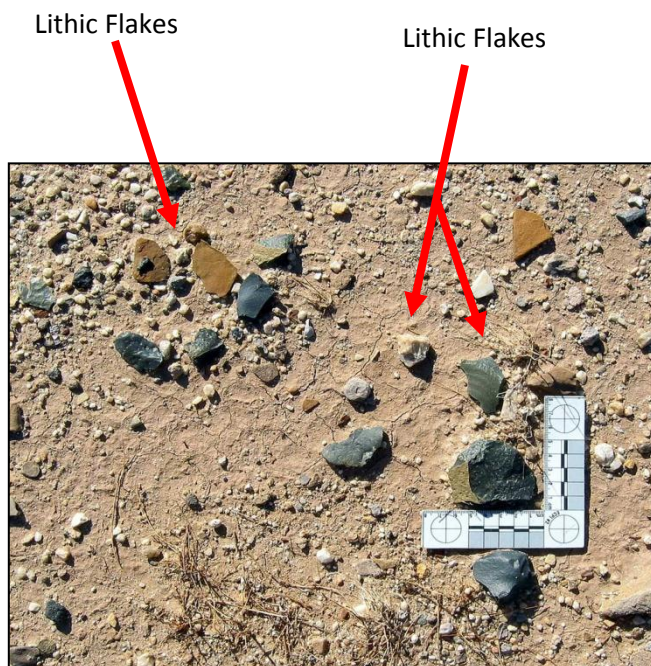


Image 3: Example of lithic scatter found on ground surface



Image 4: Example of formed lithic artifacts

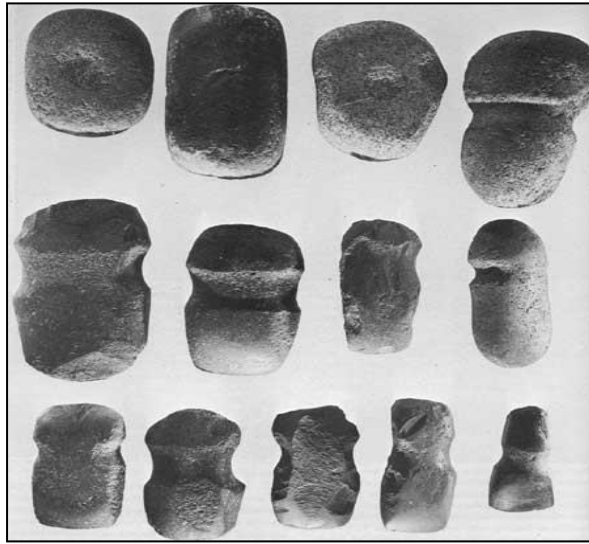


Image 5: Ground stone artifacts

Bone, Tooth and Antler Artifacts: What to Look For

- Obvious shaping
- Incising
- Unnatural holes



Image 6: Bone and Antler artifacts

4.2 Fire Broken Rock and Hearths

Fire-broken rock (FBR) results from the use of fire during cooking, heating and processing activities. FBR is often associated with other features including hearths and cultural depressions, but can also be thinly scattered in concentrations away from the features with which they were first associated.

When looking for FBR, note concentrations of roughly fractured rock from rapid heating and cooling, rock showing signs of burning or oxidation and/or reddening or blackening of surrounding matrix.



Image 7: Example of FBR; note the zig/zag pattern of breakage common to FBR

A hearth feature is evidence of a fire pit or other fireplace feature of any period. Hearths were used for cooking, heating, and processing of some stone, wood, faunal, and floral resources and may be either lined with a wide range of materials like stone or left unlined. Occasionally site formation processes (e.g., farming or excavation) deform or disperse hearth features, making them difficult to identify without careful study.

Hearths: What to look for

- FBR
- reddening or blackening of the associated soil/sediment
- charcoal
- layering of FAR and charcoal, and
- depressions in the earth associated with FAR, reddened or blackened matrix and charcoal.



Image 8: Example of a hearth uncovered along the wall of an excavation unit

4.3 Cultural Depressions

Any depression seen on the ground surface that appears to have been excavated by man can be a cultural depression and have archaeological significance. These “pits” were dug for a variety of reasons such as for food storage or as a base for a dwelling. They can range in size from 1m across to 7-10m across, and are usually found associated with other artifacts such as FAR and lithic scatters.

To identify a cultural depression, look for:

- Subtle to deep scours on the ground surface that are circular to rectilinear in shape
- A raised rim along the edge of a depression
- Depressions associated with artifacts and FAR
- Depressions associated with fire reddening and blackening of the matrix



Image 9: Example of a large cultural depression in a natural setting

4.6 Rock Alignments

There are several types of rock alignments that occur within the culture area, which include tipi rings, medicine wheels, cairns and blinds. When attempting to identify rock alignments, look for a group of rocks that look purposefully placed as in a circle, pile or line; isolated groups of rock that do not seem to belong to that landscape; and/or rocks which form a pattern.



Image 10: Example of a Cairn or piling of rocks



Image 11: Example of a tipi ring in a natural setting

Appendix 2
Environmental Orientation

Environmental Orientation Record

The Environmental Orientation Record (EOR) shall be completed for all work involving an environmental component. The YRB Construction Work Coordinator (e.g. Project Manager, Designer, Planner, etc.), is responsible for ensuring that the environmental requirements of the work are reviewed with the workers before work is started, and that a record of the discussion is documented on the EOR. By signing the EOR, the Contractor indicates they have been advised of and understand the environmental requirements of the contract, and that they will communicate the project environmental requirements to all personnel including (but not limited to) subcontractors and replacement crew leaders. The EOR shall be filed with the contract documents.

	Date:		File No. Title
1	Project Information		
	Project Title		
	Project Description		
	Project Location		
2	Contractor Information (if applicable)		
	Company Name		
	Company Address		
	Site Contact/Representative Name		
	Phone #	Cell #	E-mail
3	Key Environmental Issues and Requirements Review and record the environmental issues and requirements of the work as specified in the Environmental Management Plan (CEMP), Environmental Field Guides or other environmental requirements (e.g. Contract clauses, SOR). Use the checklist below to guide discussion.		
	Is there an CEMP, Field Guide, or other environmental requirement for the work?		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> NA
	Site-Specific Environmental Sensitivities	Site-Specific Environmental Protection Requirements	Discussed NA
	Soil Erosion / Compaction		<input type="checkbox"/> Yes <input type="checkbox"/> NA
	Vegetation Disturbance or Removal		<input type="checkbox"/> Yes <input type="checkbox"/> NA
	Generation and Disposal of Hazardous Substances		<input type="checkbox"/> Yes <input type="checkbox"/> NA
	Generation and Disposal of Waste		<input type="checkbox"/> Yes <input type="checkbox"/> NA
	Contaminated Soil Management		<input type="checkbox"/> Yes <input type="checkbox"/> NA
	Spill of Hazardous Substances		<input type="checkbox"/> Yes <input type="checkbox"/> NA

	Fuel and Flammable Storage		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Dust Generation / Other Air Emissions		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Water Quality – Erosion and Siltation		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Fish and Aquatic - Habitat Alteration, Disturbance or Loss		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Wildlife and Bird – Habitat Alteration, Disturbance or Loss		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Disturbance to Heritage Resources / Archaeological Sites		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Visual Impacts / Noise Concerns		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Property Considerations		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Disruption of Recreation Use		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Public Safety Concerns		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
4	Permits and Approvals Information: Ensure the necessary environmental permits and approvals relating to the work have been obtained prior to starting work.			
	Are environmental notifications, permits, licenses or approvals required? If so, list applicable regulatory requirements.		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> NA
	Have the permits, licenses and approvals obtained and / or checked? If so, identify permit reference numbers.		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> NA
5	Emergency Response Plan / Oil and Chemical Spill Response Plan			
	Has the Emergency Response Plan been discussed?		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Are there spill kits available on location? If so where are they located?		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
6	Environmental Incident Reporting			
	Environmental Incident Reporting Procedures discussed?		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
7	Environmental Competency			
	Demonstrated applicable environment training for appropriate crew members/supervisors?		<input type="checkbox"/> Yes	<input type="checkbox"/> NA
	Environmental monitoring required for this project?		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> NA
	Crew leaders will review this EOR with replacement crew leaders, and replacement crew-leaders will sign this document.		<input type="checkbox"/> Yes	<input type="checkbox"/> NA

Additional Comments:

The undersigned have been briefed on and understand the environmental requirements of the work as detailed above.

Name	Date

**Return completed, signed form to the Project
Superintendent**

Appendix 3
Spill Prevention and Emergency Response Plan

Spill Emergency Response Plan

If a spill of fuel, oils, lubricants or other harmful substances occurs, the following procedures will be implemented.

Spill Response Steps

1. Ensure Safety
2. Stop the Flow (When Possible)
3. Secure the Area
4. Contain the Spill
5. Notify/Report
6. Clean-Up

(circumstances may dictate another sequence of events)

1. ENSURE SAFETY

- Ensure personal/public, electrical and environmental safety
- Wear appropriate Personal Protective Equipment (PPE)
- Never rush in, always determine the product spilled before taking action
- Warn people in immediate vicinity
- Ensure no ignition sources if spill is of a flammable material

2. STOP THE FLOW (WHEN POSSIBLE)

- Act quickly to reduce the risk of environmental impacts
- Close valves, shut off pumps or plug holes/leaks, set containers upright
- Stop the flow of the spill at its source

3. SECURE THE AREA

- Limit access to spill area
- Prevent unauthorized entry onto site

4. CONTAIN THE SPILL

- Block off and protect drains and culverts
- Prevent spilled material from entering drainage structures (ditches, culverts, drains)
- Use spill sorbent material to contain spill
- If necessary, use a dike or any other method to prevent any discharge off site
- Make every effort to minimize contamination
- Contain as close to the source as possible

5. NOTIFY / REPORT

- Notify appropriate Environmental Monitor and Site Supervisor or alternate of incident (provide spill details)
- Follow Incident Reporting Protocol
- When quantities are greater than specified in the *Spill Reporting Regulations* (Table 1 Emergency Management BC (EMBC) must be notified: 1-800-663-3456
- Provide necessary spill details to other external agencies (see spill reporting requirements)

Table 1. Contact List

Prime Contractor:	NAME	[Ph #] [Email]
Environmental Monitor:	Fiona Lau	250-551-6005(cell) 250-352-1147 (office) fiona@masse-env.com
MOTI Representative	NAME	[ph#] [email]
EMBC		1-800-663-3456

Table 2. List of externally reportable quantities for commonly used substances

Product	Quantity
Class 2.1 – flammable gas (<i>e.g.</i> propane)	10 kg
Class 2.2 – non-flammable gas (<i>e.g.</i> SF ₆ , CO ₂)	10 kg
Class 3 – flammable liquids	100 L
Class 8 – corrosive liquid acids and caustics (<i>e.g.</i> battery acid)	5 kg or 5 L
Class 9 – environmentally hazardous (<i>e.g.</i> PCB's, ethylene glycol)	1 kg or 1 L
Oil and Waste Oil	100 L
Other substances (<i>e.g.</i> new antifreeze, powerwash water)	200 kg or 200L
Pesticides and Herbicides	1 kg or 1 L

6. CLEAN-UP

- All equipment and/or material used in clean-up (e.g. used sorbents, oil containment materials etc.) must be disposed of in accordance with BC Ministry of Environment (MOE) requirements.
 - Accidental spills may produce special wastes (e.g., material with > 3% oil) and contaminated soil. All waste disposal must comply with the BC Hazardous Waste Regulations (BC Reg. 63/88) and the BC Environmental Management Act ([SBC 2003] Chapter 53).
 - Waste sorbent material may not be disposed of in a landfill without prior approval from MOE and the landfill operator.
- Contaminated soil must be treated and dealt with as required on a site-specific basis and must comply with the requirements of the BC Contaminated Sites Regulations (B.C. Reg. 375/96).

Recommended Spill Kit Contents

Item	Recommended
190L (50 gal) polyethylene drum	1
Oil absorbent pads	50
Universal absorbent pads	10
18' x 18' oil absorbent pillows	5
3" x 4' oil absorbent socks	5
5" x 10' linkable boom	5
36" x 36" drain cover	1
1 lb plugging compound	1
Nitrile gloves and safety gloves	4
Tyvek coveralls	2
Disposal bags	10
Instruction booklet	1

Appendix 4
Environmental Incident Reporting (EIR) Form

Environmental Incident Report

Date of Report	
Date/Time of Incident	
Date/Time Reported to Site Supervisor	
Date/Time Reported to EM/FLNRO	
Personnel at Spill Site	
Spilled contents/amount	
Spill cause and effect	
Status of Spill	
Spill contained	
Extent of contamination	
Containment method	
Further action required	
Hazards to persons, property or environment	
Comments	

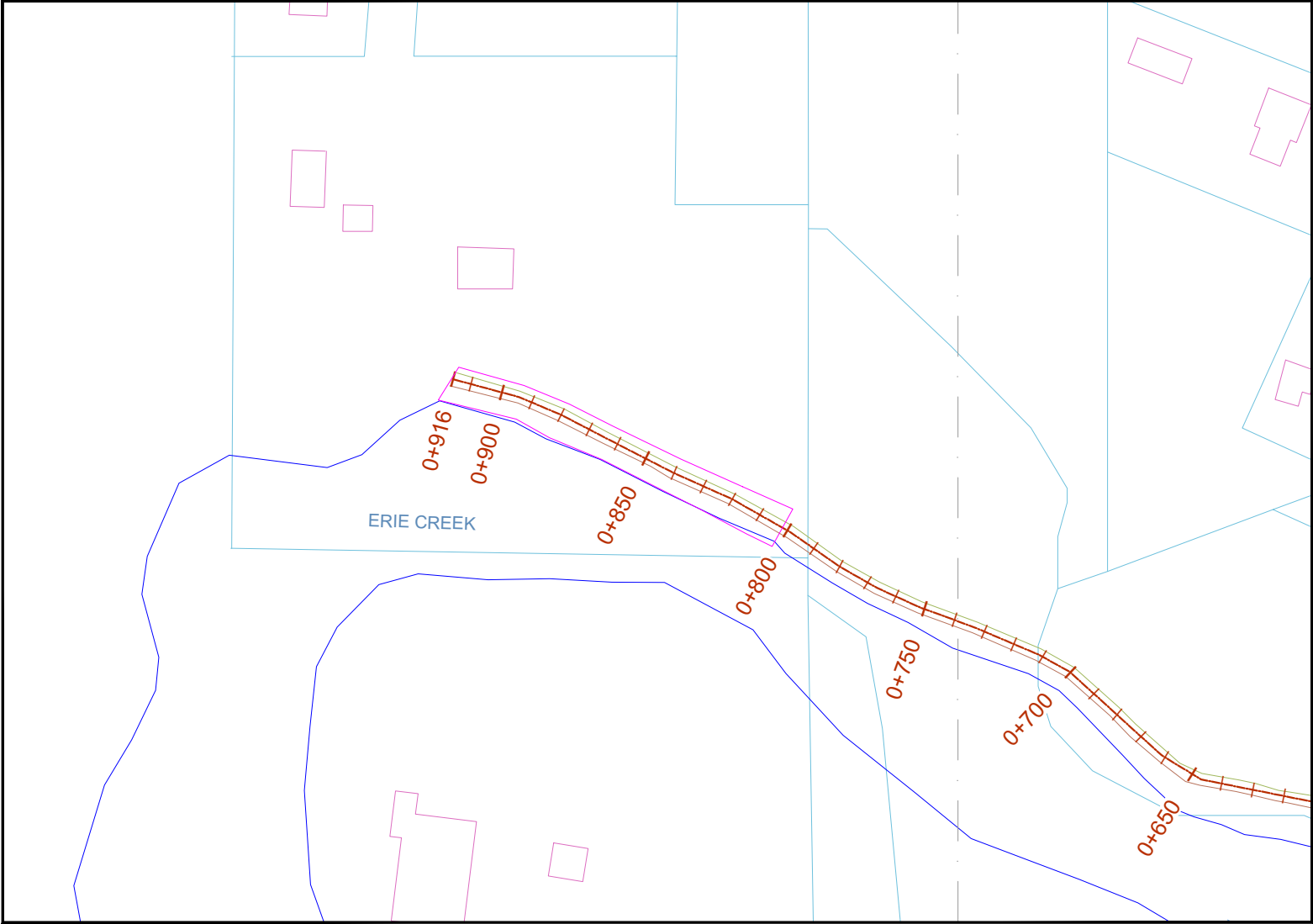
Form filled out by:

Position: _____

Contact: _____

Appendix 5
Engineering Drawings

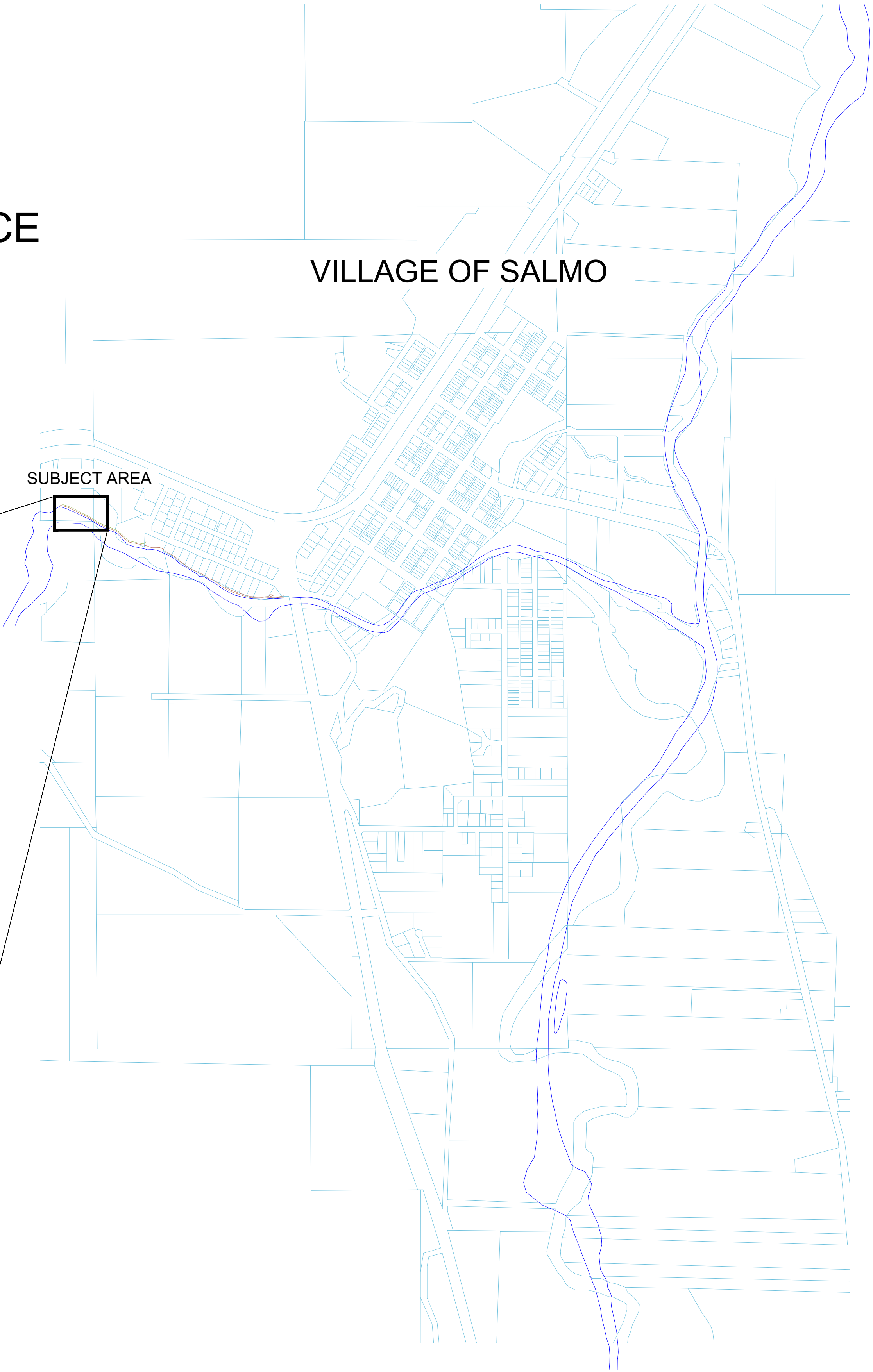
VILLAGE OF SALMO
2021 ERIE CREEK DIKE MAINTENANCE
ERIE CREEK, SALMO, BC



LOCATION - LARGE SCALE

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SUBJECT AREA



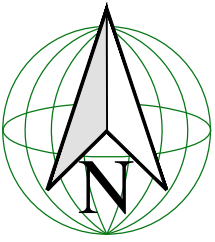
LOCATION - SMALL SCALE

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PERMIT

DRAWING INDEX

C1 - LOCATION PLAN AND DRAWING INDEX
C2 - DIKE MAINTENANCE PLAN
C3 - DIKE RE-ARMOURING SECTIONS



B	25/03/2021	GH	ISSUED FOR PERMIT	DS
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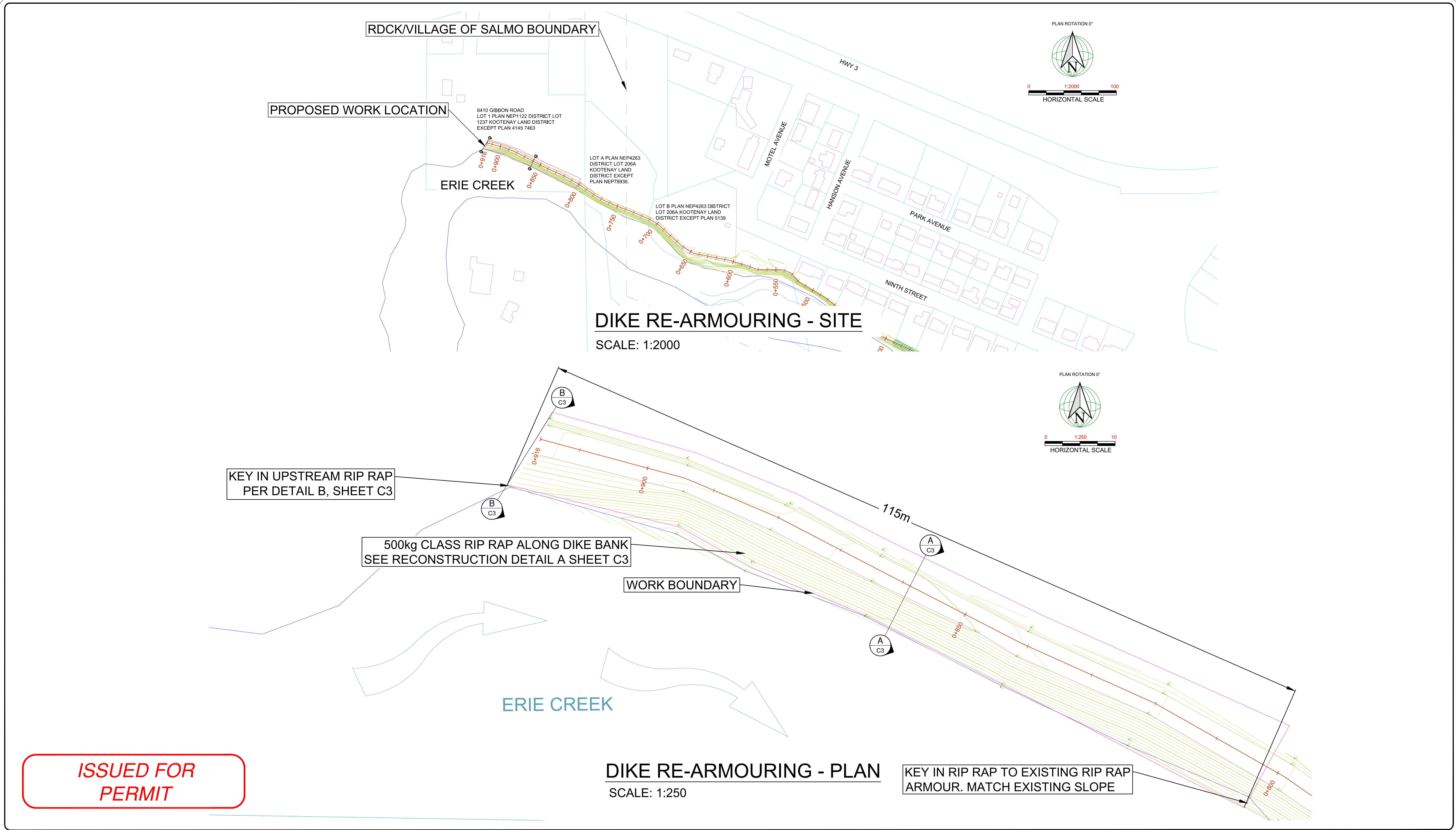
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Civil and Structural Engineering
2248 Columbia Ave. Castlegar, B.C. V1N 2X1 Ph:1-888-617-6927

VILLAGE OF SALMO
2021 ERIE CREEK DIKE
MAINTENANCE
LOCATION PLAN
AND DRAWING INDEX

DESIGN BY	DATE
GH	09/03/2021
DRAWN BY	DATE
GH	09/03/2021
CHECKED BY	DATE
DS	09/03/2021
APPROVED BY	DATE
DS	09/03/2021

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	PROJECT FILE No.	C21255-010	
	SHEET	# IN SET	3
	ISSUE	B	REV.



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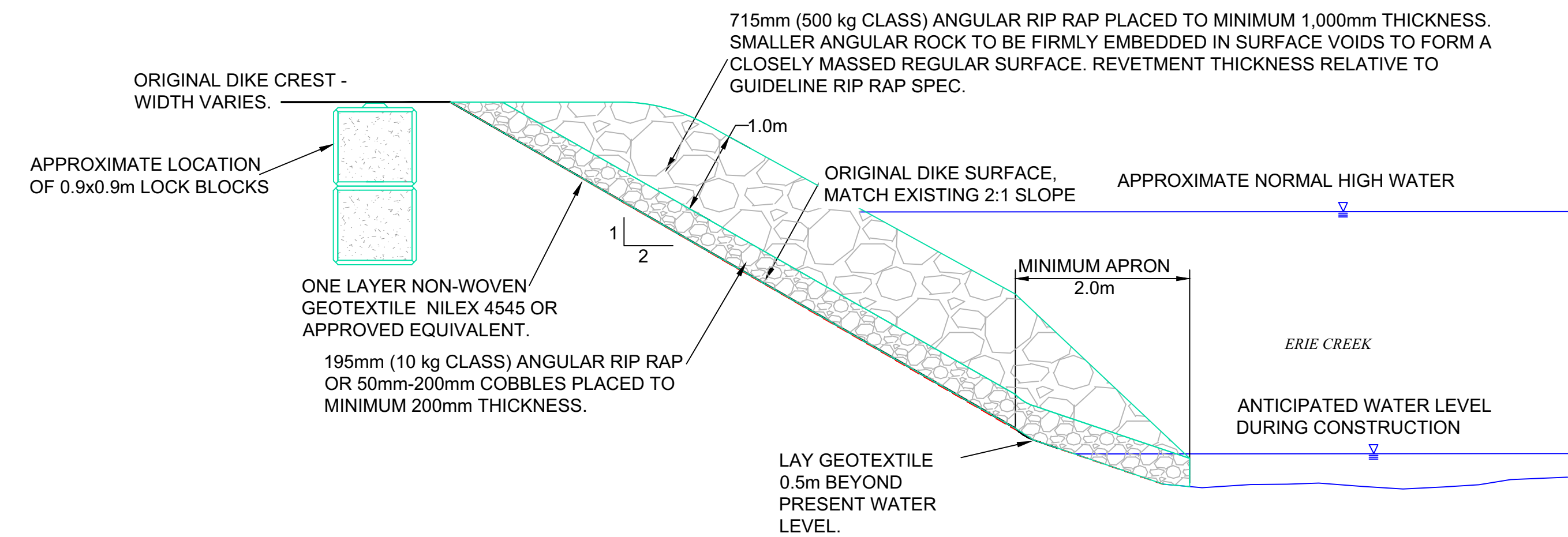
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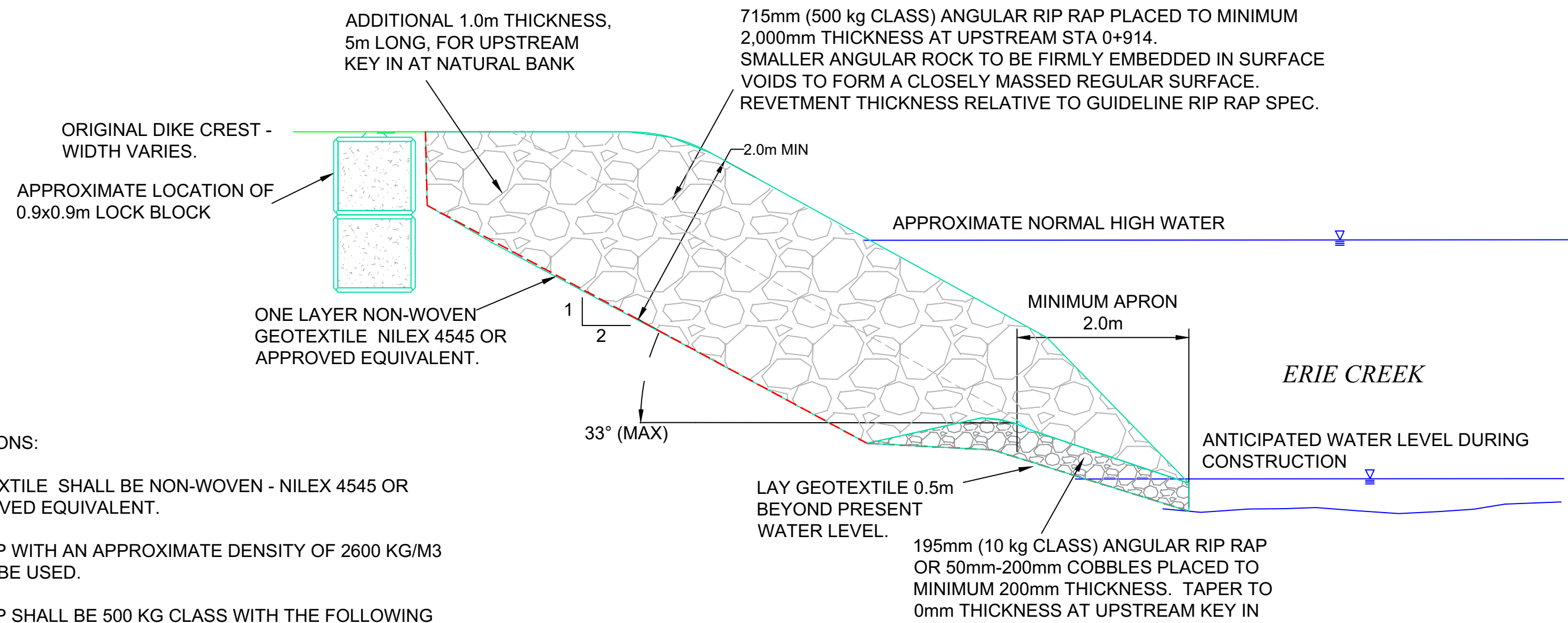
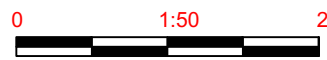
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VILLAGE OF SALMO
2021 ERIE CREEK DIKE MAINTENANCE
DIKE MAINTENANCE PLAN

HOR. SCALE	AS NOTED	VERT. SCALE	AS NOTED
PROJECT FILE No.	C21255-010	# IN SET	3
SHEET	C2	REV.	B



DETAIL A-A - DIKE TYPICAL SECTION
SCALE: 1:50



DETAIL B-B - UPSTREAM KEY IN SECTION
SCALE: 1:50

SPECIFICATIONS:

- 1) GEOTEXTILE SHALL BE NON-WOVEN - NILEX 4545 OR APPROVED EQUIVALENT.
- 2) RIP RAP WITH AN APPROXIMATE DENSITY OF 2600 KG/M3 SHALL BE USED.
- 3) RIP RAP SHALL BE 500 KG CLASS WITH THE FOLLOWING APPROXIMATE DIMENSIONS:
15% 330 mm,
50% 715 mm,
85% 1030 mm.

MoTI TABLE 205-B APPROXIMATE AVERAGE DIMENSION OF AN ANGULAR BLOCK FOR EACH SPECIFIED ROCK CLASS MASS (DENSITY =2,640kg /m³)

CLASS (kg)	APPROX. AVERAGE DIMENSION (mm)		
	15%	50%	85%
10	80	195	280
25	120	260	380
50	155	330	475
100	195	415	600
250	260	565	815
500	330	715	1030
1000	415	900	1295
2000	525	1130	1630
4000	660	1425	2055

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VILLAGE OF SALMO
2021 ERIE CREEK DIKE MAINTENANCE
DIKE RE-ARMOURING SECTIONS

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