Request for Proposal

RFP# LRSR2020

Lillooet River Sediment Removal 2020

Issued: Dec 12, 2019
Closing Time: 4:00pm, January 15th, 2020
Closing Location: Pemberton Valley Dyking District Office
1381 Aster St, Pemberton BC, V0N 1B0
Contact Person: Steve Flynn
Office 604 894-5360, Cell 604 698-6634
Email: steve@pvdd.ca

DESCRIPTION OF REQUIRED SERVICES

1. PROJECT OVERVIEW

The Pemberton Valley Dyking District (PVDD) invites Requests for Proposals for removal of approximately 60,000 m3 of sediment from the Voyageur, Beem, Belkin, Big Sky and Airport bars in the Lillooet River for flood protection purposes – Maps are found in Appendix E – Removal Location Maps. The work window to complete this work is between February 1st and April 15th, 2020 and will be completed in accordance with provincial and federal approvals, removal designs produced by Northwest Hydraulics – examples contained in Appendix F, the Environmental Management Plan produced by Cascade Environmental – Appendix G, and under the direction and control of the PVDD Operations and Maintenance Manager.

The PVDD has made it a high priority to develop a long term sustainable plan for sediment removals that includes capitalizing the value of the sediment material in order to offset the cost to tax payers of this and future Lillooet River sediment removals. Pricing structure and methodology to develop markets to off-set removal costs will be at the sole discretion of the proponent and it is expected that value added uses for the sediment will be included in this proposal to off-set removal cost. It is also expected that the PVDD Hitachi 225 excavator will be used on the project and that it will be the proponent's responsibility to provide an operator and fuel for the PVDD excavator only no other operating cost will apply.

At this time the required permits and funding applications are pending approvals. If permits and/or funding for this work are not received from senior government agencies, this project will be postponed until required permits and/or funding are received. It will be at the sole discretion of the PVDD to enter into an agreement and extend the agreement term or retender the RFP if required permits and funding are not received with sufficient time to complete the project in 2020.

2. SPECIFIC PROJECT REQUIREMENTS

2.1. SCOPE OF WORK

The findings from the extensive flood plain mapping project completed in December 2018 have proven that the sediment aggradation in the Lillooet River as a direct result of the 2010 Mount Meager slide has negatively affected the ability of the Lillooet River to convey flow within the confines of the existing dike system. The PVDD Lillooet River sediment management plan has been updated based on the flood plain mapping report findings and it is now required to remove 60,000 m^3 of sediment annually in the lower diked reach of the Lillooet River in order to maintain existing flood protection levels. The estimated quantity of work for 2020 is removal of up to a total of 60,000 cubic metres of sediment from five river bar locations in the Lillooet River.

2.2. CONSTRUCTION REQUIREMENTS

2.2.1 – Equipment

All equipment and trucks used for this project **must** be free of leaks and be pressure washed prior to starting the work. All excavators and earth moving equipment used for this project **must** use Environ hydraulic oil (or an approved equivalent) and **must** have a spill kit on board with staff trained on the use of these spill kits. Any equipment found not meeting these requirements will be immediately removed from the jobsite by the contractor as directed by the PVDD and replaced with equipment that does meet the requirements, at the contractor's expense. A list of equipment including model, year of manufacture and quantity must be submitted as provided in Schedule D.

2.2.2 – Survey Requirements

Survey layout on the bars as per the engineered plans will be completed by the PVDD. The successful contractor will be responsible for ensuring the excavation is completed as per the engineered plans, this **will require** survey oversight by the contractor at all times during excavation. Excavators equipped with 3D control systems for precise removals and real time excavation data transfer to the PVDD will be considered a valuable addition to the proposal but is not considered mandatory. Proponents offering this technology must provide summary of system details and capabilities in this proposal.

2.2.3 – Access

Where access crosses private lands and/or is on a dike the contractor **must** ensure that the surfaces are left in as good or better condition than before the project is started at the contractors cost.

2.2.4 – Deposit Location Plan

The sediment will be removed and deposited to a location that is approved by the PVDD. A deposit location plan including location and types of equipment that will be used to handle the sediment in a manner that will ensure efficient truck turn times and eliminate delays at the deposit location **must** be provided by the proponent and **must** be approved by the PVDD. The Deposit Location Plan can be included in the RFP submission as provided in Schedule C in a format provided at the sole discretion of the proponent.

2.2.5 – Traffic Control Planning

The selected contractor will be responsible for all traffic control and any other measures that MOTI may require to protect the roads and safely transport the sediment from the Lillooet River to its deposit location. The contractor will be responsible to contact the area Manager of MOTI to discuss and work out the transportation plan in advance of the project start date and shall deliver this plan to the PVDD once completed and prior to commencement of the project.

2.2.6 – Sediment Quantities

The quantity of work for this contract is an estimated maximum, the PVDD does not guarantee the target quantities will be achieved. Adverse weather, other environmental factors, or conditions of the permits may result in changes to the total quantity of sediment removed.

Table of Estimated Quantities

Gravel Removal Locations	**Est. Quantity (M^3)**
Voyageur Bar	20,000
Beem Bar	10,000
Belkin Bar	10,000
Big Sky Bar	10,000
Airport Bar	10,000
Total	**60,000**

2.2.7 – Timing and Locations

In order to manage water level and MOTI road restriction concerns that could affect the efficiency of the project, location and timing of the work **must** be approved the PVDD maintenance manager before any work proceeds. The timing of the removal will be based on the discharge rate of the Lillooet River being at or close to 25m3/sec, and will be at the sole discretion of the PVDD. This discharge rate historically occurs during the months of January through April. The PVDD will take all measures to try and avoid removals at a time when road restrictions are in force but does not guarantee that this will be possible.

2.2.8 – Supervision and Permits

All work will be done under the supervision of the PVDD and environmental monitor (contracted separately by the PVDD), and all work **must** be done in accordance with permits from the Federal Department of Fisheries and Oceans Canada (DFO), Provincial Forests, Lands and Natural Resource Operations & Rural Development (FLNRORD), the Environmental Management Plan by Cascade Environmental and the excavation designs as provided by Northwest Hydraulics. As all work will be conducted in isolation from the river the conditions of the permits are not expected to adversely affect the proponent's ability to conduct this project in an efficient manner. The PVDD expects to have permits for this work from DFO and FLNRO for the period of February 1st, 2020 to April 15th, 2020 and will make them available when received.

2.2.9 – Designs

An example of a typical design from a previous sediment removal project is contained in Appendix F. These design example are very similar to what proponents can expect to find in the final designs and it is expected that these examples will provide adequate design information to the proponents for proposal submission proposes.

2.2.10 – Performance Bond

The successful proponent will be required to provide to the PVDD a performance bond equivalent to 75% of the contract price.

2.2.11 – Past In-stream Work Experience

It is preferred but not mandatory that the successful contractor have past in-stream work experience. Please list the Contractors relevant experience as provided in Schedule B.

Proposed sub-contractors must also be identified as provided in Schedule B.

2.3 – Items for Pricing

It is the sole responsibility of the Proponent to analyze the sediment and make a determination of high value uses for this material. It is understood by the PVDD that it will be difficult for proponents to calculate what high value uses for the material will be until all material is removed and proponent has analyzed the material to know exactly what high value markets the material can be used for to provide the highest possible removal cost off-sets. It is required that proponent provide a detailed explanation of the cost off-set plan as provided in Schedule A – Item 2.

Items for pricing are listed in Schedule A and include:

Item 1 – Quantities and Price for sediment removal provided by $/M^3 to remove Sediment from Lillooet River and haul to the Proponent's choice of location as approved by the PVDD.

This item is to include all equipment, equipment mobilization and demobilization, labor and material required to excavate and haul sediment from the Lillooet River to the deposit location. The contractor can choose the number and size of the pieces of equipment to be used for excavation and hauling but must ensure and prove to the PVDD that this equipment will be balanced to maximize efficiencies so the project can be completed in the timeliest, most efficient and cost effective manner possible. The PVDD Excavator is a 2009, Hitachi 225, TSN 4000 hrs with a rock and cleanup bucket (quick change) and thumb and must be used and taken into account in this pricing.
Access ramps / roads from the dykes to the work sites may require upgrading and the portion of access from the high water mark on the river bank to the bar will need to be removed at the end of the project. Snow may need to be removed from the excavation area prior to starting the removal. This work is to be included in this price. Determining the sediment deposit location is the responsibility of the contractor and must be approved by the PVDD.

Item 2 – Removal Cost Off-set Plan

This Item will be provided by describing in detail the proponent's plan to:

1. Analyze the material
2. Determine high value markets based on the material analysis
3. How the material will be brought to market and sold
4. How the sales from the material will be used to off-set removal costs

2.4. Project Schedule

The work for this project must be done with authorization from Fisheries and Oceans Canada and the Provincial FLNRO. The PVDD has not yet received authorization from DFO, but it is anticipated that the permitted schedule for the work will be from February 1st, 2019 to April 15th, 2019. The exact timing of the project start date will be based on the discharge rate of the Lillooet River and long range weather forecast. The optimum discharge rate for removal is 25m^3/second and this rate historically occurs between the months of January and April. The start date for the project will be at the sole discretion of the PVDD.

2.5 Contract Extension

If it is deemed by the PVDD to be in the public's best interest for public safety and financial reasons the PVDD may at its sole discretion agree to extend the contract for a period of 2 additional years. This contract extension would include removal of 60,000 m^3 of sediment in 2021and 60,000 m^3 of sediment in 2022 pending required funding and permits be granted for these addition years.

3. Evaluation Criteria

The PVDD reserves the right to select the RFP best suited for this project and may evaluate RFPs on the criteria listed below.

The PVDD has disclaimed any intention to assume contractual or other obligations to RFPs during the RFP process partly to ensure that it retains maximum flexibility in regard to whether it proceeds, whether it proceeds with one of the RFPs, or

how it will evaluate RFPs. While the PVDD intends to evaluate RFPs as fairly as possible, RFP submitters should be aware the PVDD may evaluate RFPs on any basis whatsoever, whether specifically identified in this document or not. RFP submitters should be aware that various matters may be considered by the PVDD when evaluating RFPs, including, for example:

- Whether, or to what extent, a proposal has complied with the RFP requirements set out in this document
- The PVDD's assessment of the ability of the Proponent to successfully perform the work
- The Proponent's past experience with working in and around a stream
- Total costs for the work program based on the estimated quantities
- The nature of any previous dealings the PVDD has had with a Proponent

The PVDD intends to choose the preferred Proponent by January 20th, 2020. The PVDD will then provide to the successful proponent a contract based on the proponents RFP submission for execution once all terms and condition of the contract have been agreed to by both parties.

If a RFP is determined to be unclear or deficient in some aspects, but these deficiencies are capable of being clarified or rectified, the PVDD may prepare a list of questions for the Proponent, to clarify or remedy the deficiencies. If, in the opinion of the PVDD, these clarifications and rectifications do not overcome the deficiencies, the PVDD, at its sole and absolute discretion, may decide to reject the RFP.
The PVDD may contact any or all of the Proponents to seek further clarification and information before awarding the contract.

4. EXAMINATION OF RFP DOCUMENT

The Proponent shall inform itself as to all aspects of the Work. The Proponent agrees that it is the sole responsibility and risk of the Proponent to satisfy itself as to the practicability of executing the Work in accordance with the Agreement, and it shall be held responsible to have satisfied itself of every particular before submitting its RFP. Without limiting the above, the Proponent shall, before submitting its RFP, satisfy itself as to the nature of the Work, equipment necessary for the completion of the Work, and in general, shall obtain all relevant information as to risks, contingencies and other circumstances which may influence its proposal. In submitting its proposal, the Proponent agrees that it has satisfied itself as to the sufficiency of the RFP for the Work and the prices as stated in Schedule A. These prices shall cover all its obligations under the Agreement, and all matters necessary to the proper completion of the related Work, and shall include, without limiting the foregoing, the supply of all labour, equipment, materials, supervision, services, together with the Proponent's overhead and profit, except where otherwise expressly provided for by the PVDD. The PVDD is not liable for any expense, damage or loss incurred as a result of any misunderstanding or error by the Proponent regarding the Work and conditions affecting it.

5. TENDER REQUIREMENTS

5.1 INSTRUCTIONS TO PROPONENTS

Proponents must include a completed:

1. Schedule A – Quantities and Prices items 1 and 2
2. Schedule B – Work Experience and Proposed Sub-contractors
3. Schedule C – Deposit Location Plan
4. Schedule D – Equipment List

These schedules are to be submitted in a sealed envelope marked "RFP – Lillooet River Sediment Removal 2020 by 4:00pm on January 15th, 2020.

Tenders are to be addressed to the Pemberton Valley Dyking District at:

RFP – Lillooet River Sediment Removal 2019
Attn: Steve Flynn
Pemberton Valley Dyking District
PO Box 235, 1381 Aster Street
Pemberton, BC. V0N 2L0

No faxed RFPs or amendments received after 4:00 pm on January 15, 2020 will be accepted.

The PVDD is committed to a fair and open process for all parties interested in this RFP. Please direct all queries and questions related to this RFP to Steve Flynn, Operations and Maintenance Manager at steve@pvdd.ca or Office 604 894-6632 or Cell 604 698-6634.

5.2 Signed RFPs

The RFP must be signed by the person(s) authorized on behalf of the Proponent or company and binds the Proponent to the statements made in the RFP.

5.3 Irrevocability of Proposals

At the appointed closing time, all Proposals become irrevocable for 30 days. By submission of a proposal, the Proponent agrees that should its proposal be selected, the Proponent will enter into a contract with the PVDD.

5.4. Bid Bond

Not Required

5.5 Performance Bond

A performance will be required from the successful proponent for 75% of the contract value.

6. Summary of Related Project Experience

Proponents must include a summary of the proposed equipment operators' past in-stream work experience in Appendix B.

7. General Conditions

Additional Terms and Conditions

7.1 Safety

The successful Proponent will take responsibility as the prime contractor for the project as defined in Section 118 of the WCB act.

The contractor will submit a safety plan to the PVDD.

An initial safety meeting including all personnel working on the project must be held prior to the start of the project to discuss all know hazards and the hazard mitigation and safety plans.

A person responsible for the overall safety of the project must be identified by the contractor as the “Safety Officer”. The safety officer must be in a position to:

- Foresee potential safety issues and mitigate these issues immediately.
- Monitor the work areas to ensure all safety measures required by Work Safe BC, WCB and the Contractors Safety Plan are adhered to.

7.2 Insurance

The successful contractor must provide proof of the following insurance naming the SLRD, PVDD and the Province of BC as additionally insured:

1) COMMERCIAL GENERAL LIABILITY:
The insurance shall be in an amount of no less than TEN million dollars ($5,000,000) combined single limit for bodily/personal injury including death and/or property damage to or destruction of property (including loss of use) caused by an accident or an occurrence and shall include a) contingent employers liability, b) products and completed operations coverage, c) non-owned automobile liability, d) sudden and accidental pollution and e) a contractual liability endorsement specifically granting coverage for all liability assumed by the Licensee under this Agreement. This insurance policy must name the Pemberton Valley Dyking District as additionally insured and shall contain a cross liability clause.

2) AUTOMOBILE LIABILITY:
During the term of this agreement, the Contractor agrees to purchase and maintain, at its sole cost and expense, Automobile Liability insurance on all licensed vehicles for this project owned by, hired, leased to or on behalf of the Contractor, its sub-contractors, servants or agents in an amount of no less than FIVE million dollars ($5,000,000) per occurrence.

3) WORKERS COMPENSATION:
During the term of this agreement, the contractor agrees to purchase and maintain, at its sole cost and expense, Workers Compensation insurance in amounts no less than the statutory limits and employer’s liability/contingent employer’s liability in the amount of no less than TEN million ($10,000,000).

7.3 Changes to the Tender Wording and Content

The Proponent is entitled to amend its Proposal at any time before the deadline for submission of RFPs. After the closing date and time, the Proponent will not change the wording or content of the Proposal and no words will be added to the Proposal, including changing the intent or content of the presentation of the Proposal

7.4 Proponent Expenses

Proponents are solely responsible for their own expenses in preparing and submitting the Tender.

7.5 Acceptance of Proposals

The PVDD is not bound to accept the lowest priced or any of the submitted Proposals.

7.6 Subcontracting

Proposed subcontractors must be listed in Schedule B. A joint Proposal submission must indicate which Proponent has overall responsibility for the project.

7.7 Agreement with Terms
The Proponent, through the submission of a Proposal, agrees to all terms and conditions of this Proposal.

7.8 Addenda
Proponents are required to check the PVDD's website for any updated information and addenda issued before the closing date at www.PVDD.ca under News and Request for Proposals. Any changes to the RFP Documentation will be issued by means of written Addenda and posted on the PVDD's website and will form part of the RFP. No amendment of any kind to the RFP is effective unless it is posted in a formal written Addendum on the PVDD website. Upon submitting a Proposal, Proponents will be deemed to have received notice of all Addenda that are posted on the PVDD's website and deemed to have considered the information for inclusion in the RFP submitted.

7.9 Confidentiality of Information
Information pertaining to the PVDD obtained by the Proponent as a result of participation in this project is confidential and must not be disclosed without written permission from the PVDD.

7.10 Confidentiality of Tenders
The PVDD is subject to the British Columbia Freedom of Information and Protection of Privacy Act. That Act creates a right of access to records in the custody or under the control of the PVDD, subject to the specific exceptions in that right set out in the Act. The PVDD will receive all Proposals submitted in response to this RFP in confidence. Because of the right of access to information created by that Act, the PVDD does not guarantee that information contained in any proposals will remain confidential if a request for access in respect of any Proposal is made under the Act. Proponents are required to keep their Proposals confidential and must not disclose their Proposals, or information contained in them, to anyone else without the prior written consent of the PVDD.

7.11. Payment
The Proponent's invoices for this contract will be payable, net 30 days, upon submission of monthly progress claims. The invoices must be submitted in a manner acceptable to the PVDD.

7.12. Responsibility
The Proponent shall not transfer responsibility to meet the obligations of this contract to a third party without the consent, in writing, of the PVDD project manager.

7.13. No Collusion
Proponents shall not directly or indirectly communicate with any other Proponent regarding the preparation or presentation of their proposals, or in connection with the RFP engage in any collusion, fraud or unfair competition.

7.14. Laws of the Jurisdiction
Any contract resulting from this RFP will be governed by and will be interpreted in accordance with the laws of the Province of British Columbia.

SCHEDULES & APPENDICES

A	**Schedule A – Quantities and Prices**
B	**Schedule B – Past Experience & Subcontractors**
C	**Schedule C – Deposit Location Plan**
D	**Schedule D – Equipment List**
E	**Appendix E – Location Maps**
F	**Appendix F – Engineered Plans Examples**
G	**Appendix G – Environments Management Plan**

SCHEDULE A – Quantities and Prices:

Company Name: **Officer of Company:**

Company Address: **Phone Number:**

Date: **Signature:**

Item 1 – Removal Costs

Item	Unit	Estimated Quantity M^3	Unit Price/M^3	Extended Unit Price
1. Remover Sediment From Lillooet River and Transfer to Deposit Location	**Cubic Meters (M^3)**	**60,000**		

Notes:
1. Estimate quantity of sediment is only an estimated maximum, and the PVDD does not make any guarantee that the contractor will be able to remove this amount of sediment from the River.
2. Quantity of sediment removed to be calculated by conducting pre and post construction surveys, the pre-construction surveys were completed in late November 2019. Truck counts are required and are to be verified by the PVDD Operations Manager at the end of each day. Contract payment will be based on volume as determined by pre and post construction surveys.

ITEM 2 - REMOVAL COST OFF-SET PLAN

This Item will be provided by describing in detail the proponent's plan to:

1. Analyze the sediment material
2. Determine high value markets based on the material analysis
3. How and when the material will be brought to market and sold
4. How, when and what dollar amount of the sales from the material will be used to off-set removal costs

This item can be presented in a format that the proponent considers the best option to provide the information in a clear and concise manner.

Schedule B – Work Experience

Company Name:

Company Experience Working In and Around a Stream:

Operators Experience Working In and Around a Stream:

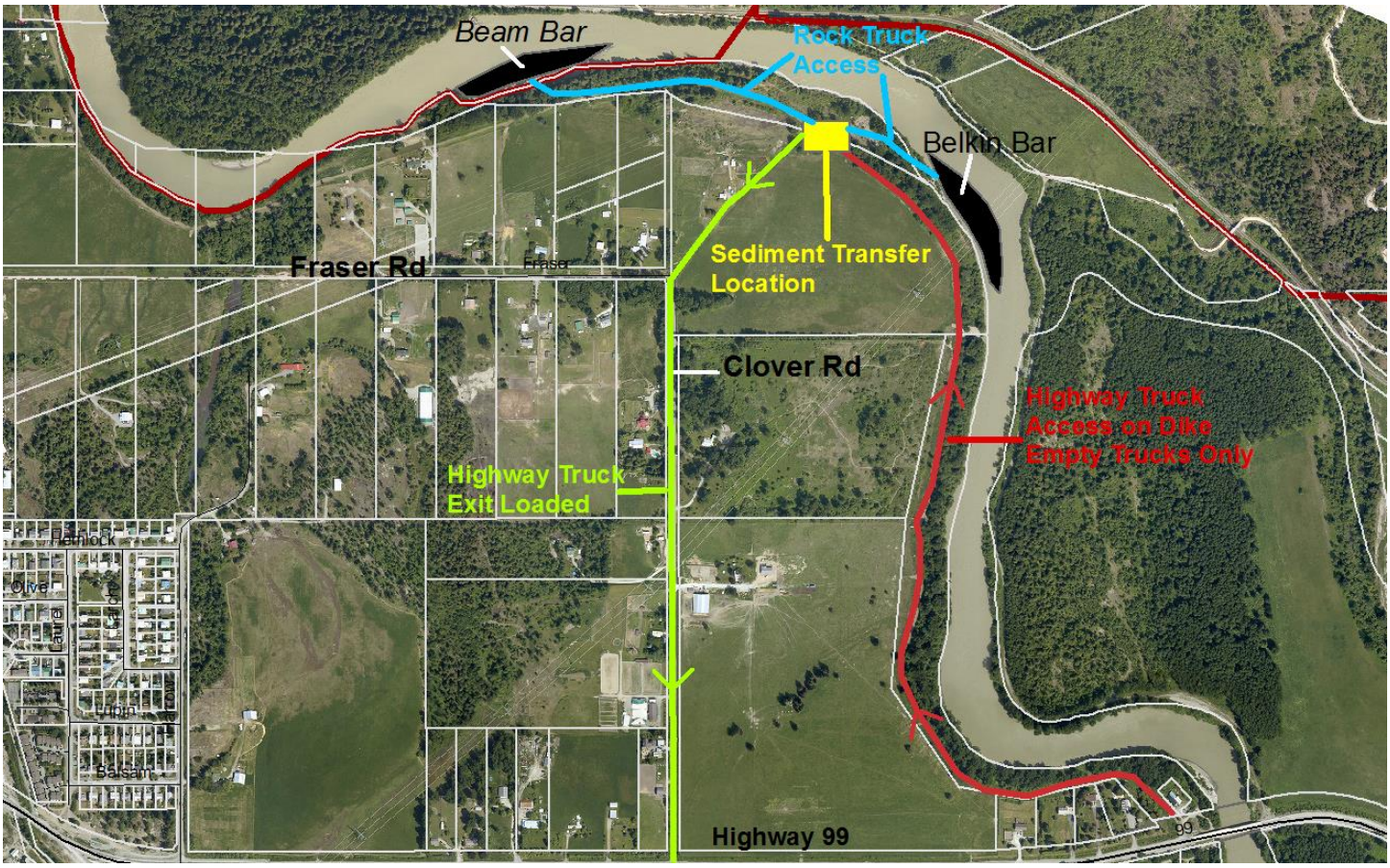
List of Proposed Sub-contractors:

Schedule C – Deposit Location Plan – Must include location map and equipment to be used to manage sediment at this location.

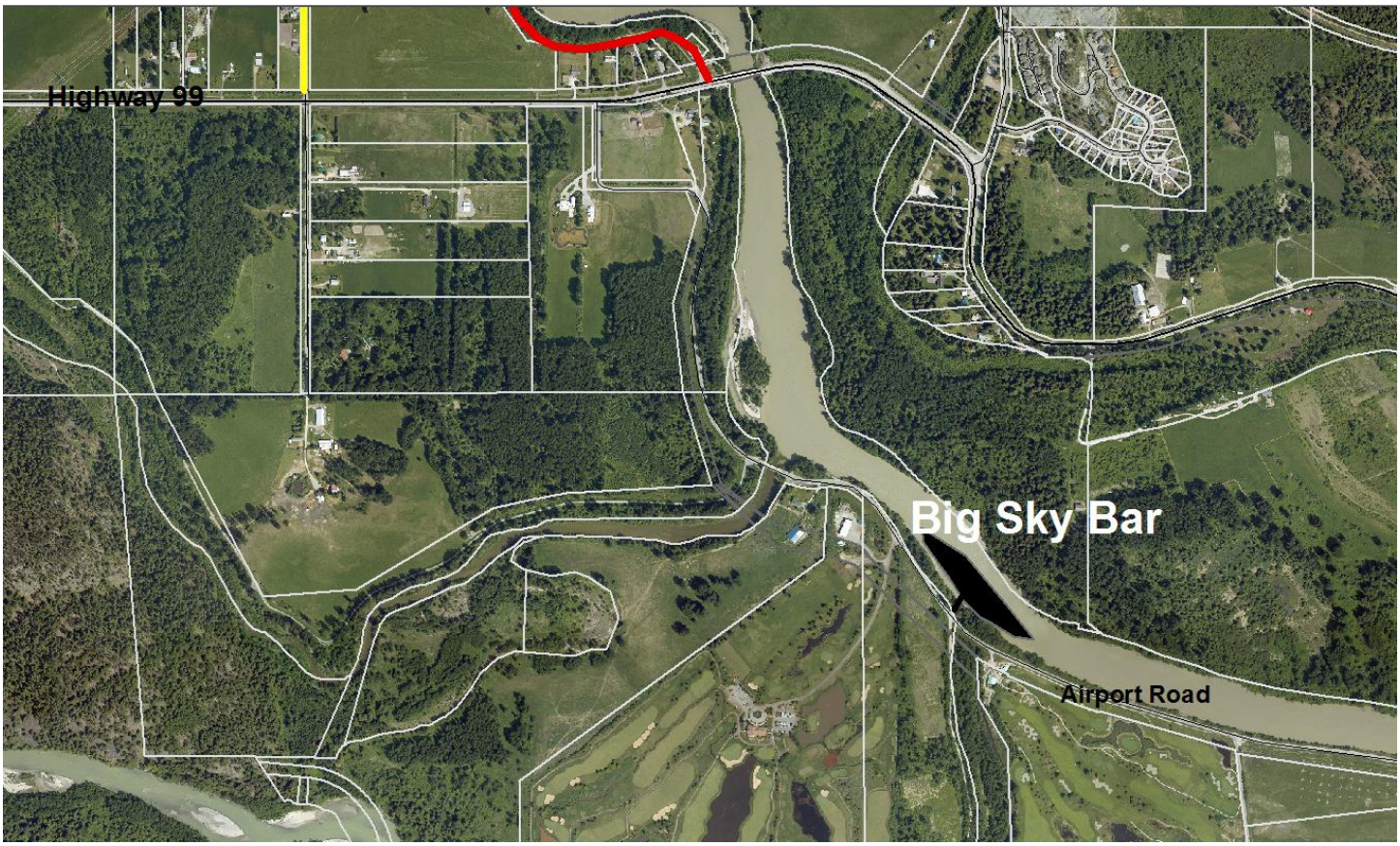
Schedule D – Equipment List – Must include model, date of manufacture and any specialty attachments if applicable of all equipment to be used.

Appendix – E

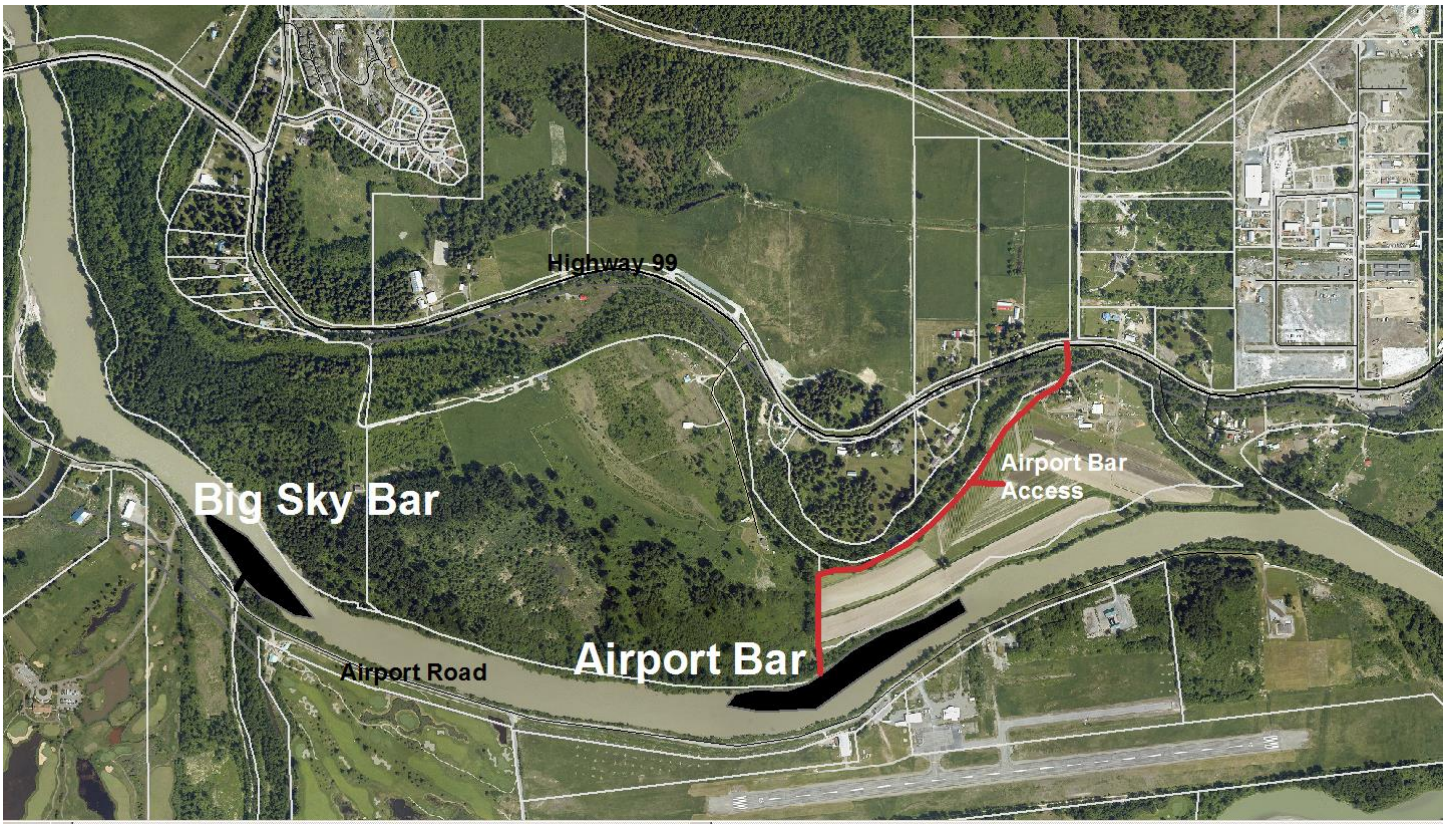
Removal Location Maps



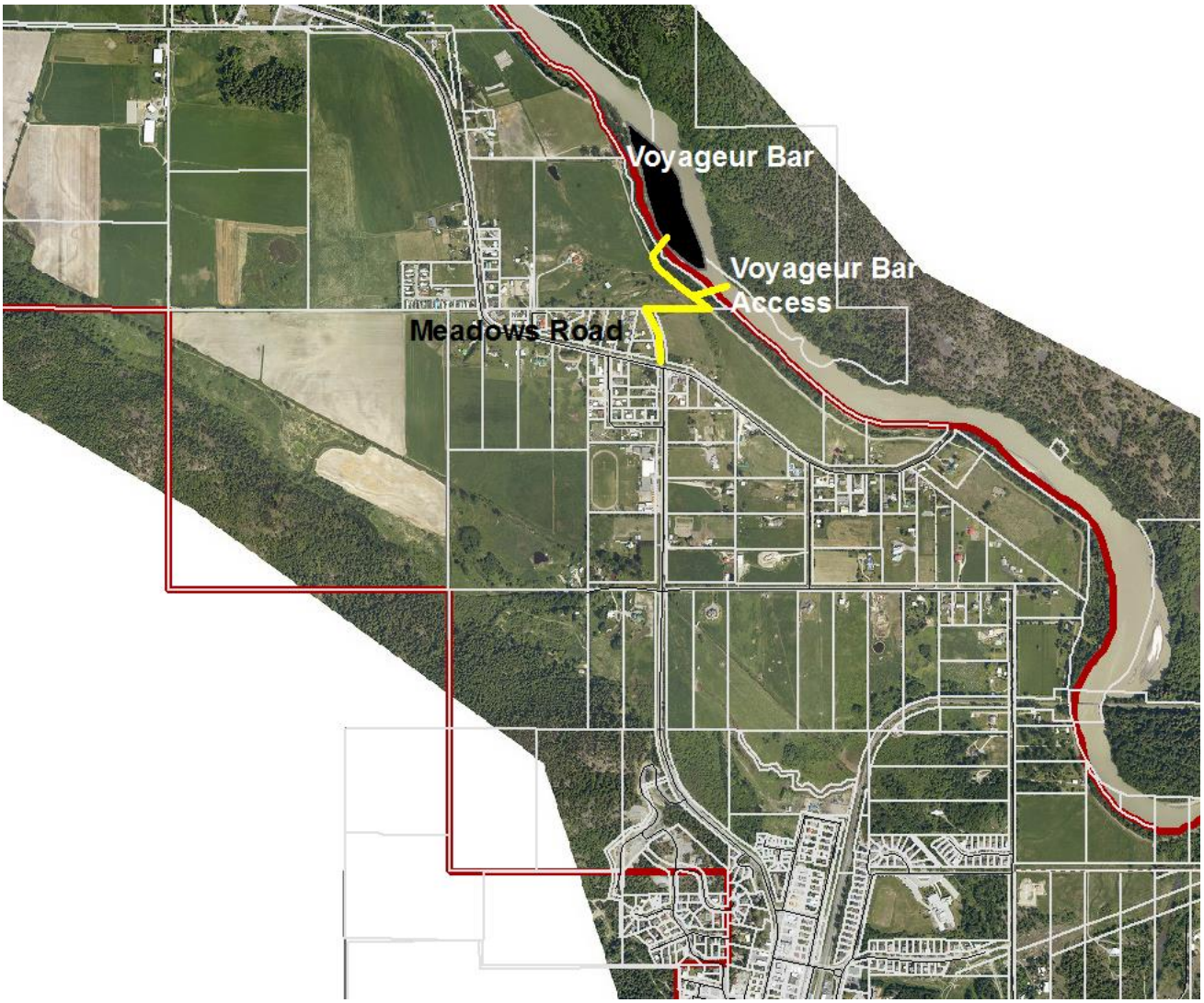
Beem and Belkin Bars Location Map



Big Sky Bar Location Map

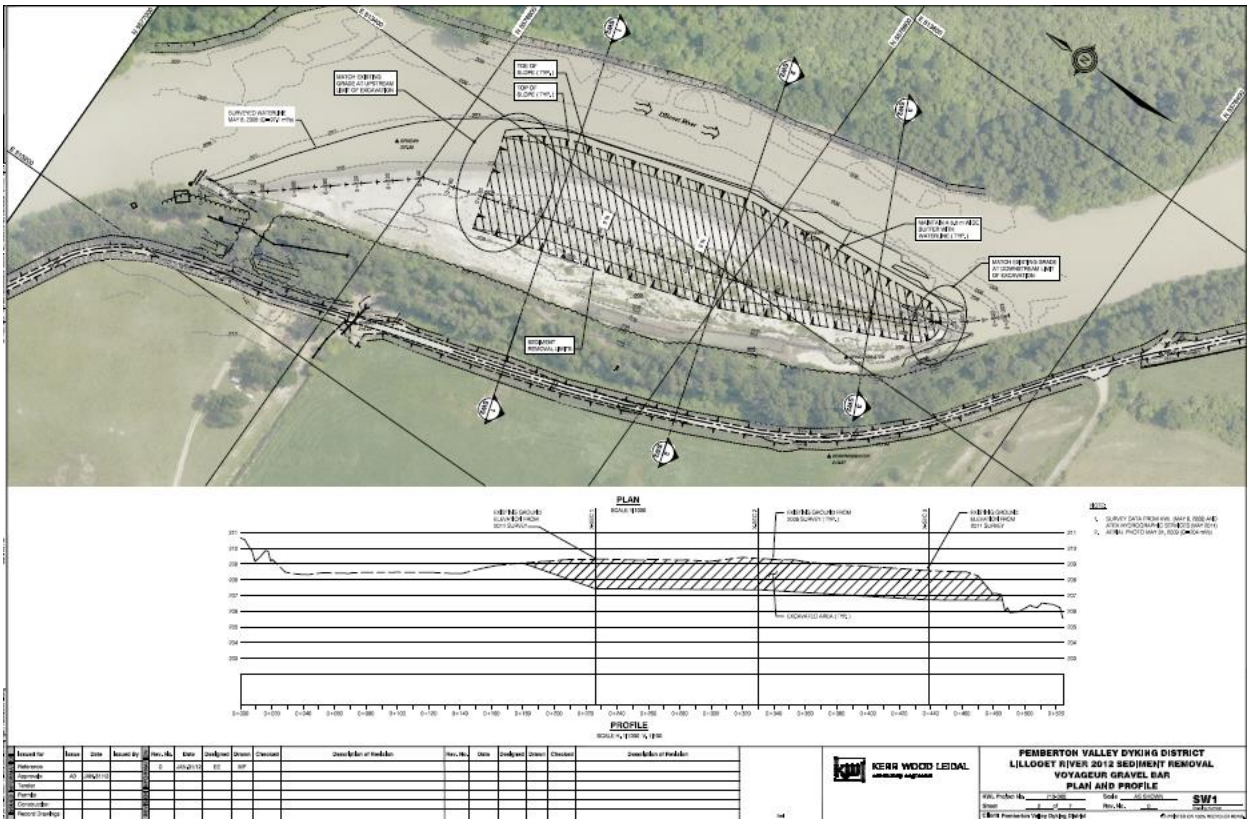


Airport Bar Location Map

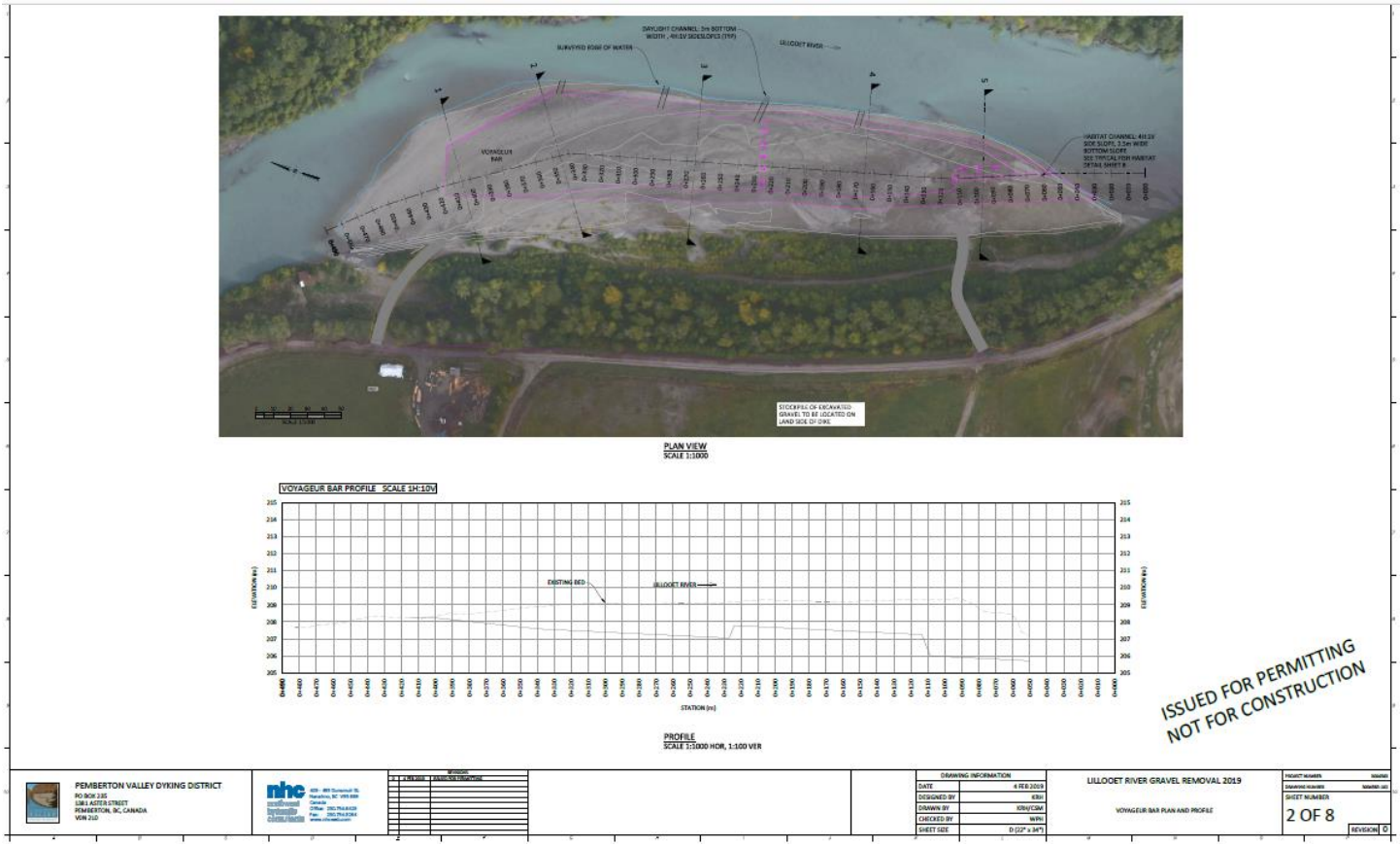


Voyageur Bar Location Map

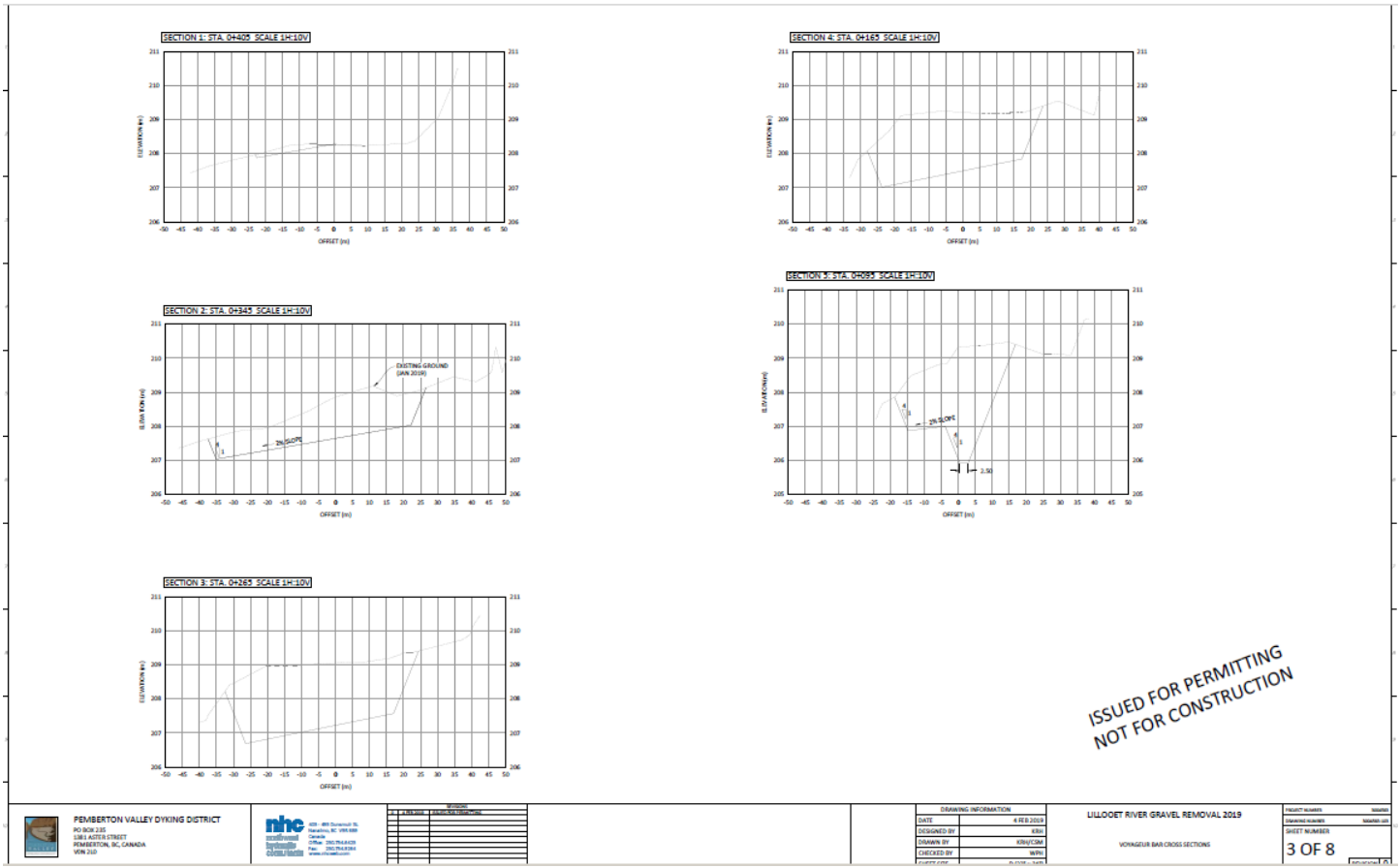
Appendix F – Engineer Design Examples



Example


PLAN VIEW
SCALE 1:1000
VOYAGEUR BAR PROFILE SCALE 1H:10V
EXISTING BED
LILLOOET RIVER
STATION (m)
PROFILE
SCALE 1:1000 HOR, 1:100 VER
ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION
PEMBERTON VALLEY DYKING DISTRICT
PO BOX 235
1381 ASTER STREET
PEMBERTON, BC, CANADA
V0N 2L0
DRAWING INFORMATION
DATE 4 FEB 2019
DESIGNED BY KBH
DRAWN BY KBH/CSM
CHECKED BY WRH
SHEET SIZE D (22" x 34")
LILLOOET RIVER GRAVEL REMOVAL 2019
VOYAGEUR BAR PLAN AND PROFILE
SHEET NUMBER
2 OF 8
REVISION 0

Example


SECTION 1: STA. 0+405 SCALE 1H:10V
SECTION 4: STA. 0+165 SCALE 1H:10V
SECTION 2: STA. 0+345 SCALE 1H:10V
EXISTING GROUND (JAN 2019)
2% SLOPE
SECTION 5: STA. 0+095 SCALE 1H:10V
2% SLOPE
SECTION 3: STA. 0+265 SCALE 1H:10V
ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION
PEMBERTON VALLEY DYKING DISTRICT
PO BOX 235
1381 ASTER STREET
PEMBERTON, BC, CANADA
V0N 2L0
DRAWING INFORMATION
DATE
4 FEB 2019
DESIGNED BY
KBH
DRAWN BY
KBH/CSM
CHECKED BY
WRH
LILLOOET RIVER GRAVEL REMOVAL 2019
VOYAGEUR BAR CROSS SECTIONS
SHEET NUMBER
3 OF 8

Example

Appendix G – Environmental Management Plan

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

Environmental Management Plan

Lillooet River Maintenance Program

Version 2

Prepared by:
Cascade Environmental Resource Group Ltd.
Unit 3 – 1005 Alpha Lake Road
Whistler, BC
V0N 1B1

Prepared for:
Pemberton Valley Dyking District
1381 Aster Street
Pemberton, BC
V0N 2L0

File No.: 052-11-06-01
Date: October 31, 2019

Executive Summary

This Environmental Management Plan was created to be Standard Operating Procedures (SOP) that can be used during all subsequent Lillooet River gravel management operations. Standard and consistent terminology presented herein should be used by all future consulting firms that are involved in gravel management in Lillooet River. This plan was prepared considering many different gravel extraction scenarios that may occur during bar management. The scenarios are comprehensive to include varying intensities of gravel removal that can be used at different locations along the river. Each scenario is paired with optimal fish salvage protocols and existing access points, while also considering special situations such as high creek flows. While acting as a pre-works planning tool, this environmental management plan can also be used as a quick reference during gravel extraction operations when conditions suddenly change. These tools are presented in the form of environmental checklists, quick reference guides, and emergency procedure guidelines specifically prepared for use during Lillooet River gravel management operations.

This Environmental Management Plan is intended to provide SOP for Voyageur, Beem, Belking, Big Sky and Airport Bar. The next scheduled removal for these bars will be in 2020.

Emergency Contact List

NAME	COMPANY	POSITION	CONTACT
Cascade Contact Numbers – Office			**604-938-1949**
Dave Williamson	Cascade Environmental	Project Manager	604-932-0797
Mike Nelson	Cascade Environmental	Project Manager	604-815-9973
TBA	Cascade Environmental	Environmental Monitor	
TBA	Cascade Environmental	Environmental Monitor	
Pemberton Valley Dyking District Contact Numbers – Office			**604-698-6634**
Steve Flynn	Pemberton Valley Dyking District	Operations and Maintenance Manager	604-698-6634
Spill Contact Personnel			
Provincial Emergency Program	24 Hour Spill Reporting		1-800-663-3456
Pemberton RCMP			640-894-6634
CANUTEC	Spill Response Advice	Chemical Accident Emergency Advisory Service (Transport Canada)	613-996-6666 or *666 on cell
Quantum Murray Environmental Group	Spill Disposal Waste Transportation	24 hour response line	1-877-378-7745
Ministry of Environment	Surrey Regional Office		604-582-5200
Fire Agency Personnel		**EMERGENCY**	**911**
Coastal Fire Center			250-951-4222
Duty Officer			1-800-663-5555
Emergency Medical Services		**EMERGENCY**	**911**
Emergency – Pemberton			**911**
Fire – Pemberton			911 604-894-6111
Ambulance - Pemberton			911 604-894-6022
BC Poison Control Centre	BC Drug & Poison Info Center		1-800-567-8911 604-682-5050
Pemberton Health Centre	Vancouver Coastal Health		604-894-6633
Environmental/ Conservation			
Environment Canada			604-666-0370
Bear Conservation Officer	Ministry of Environment		604-905-2327
BC Conservation Officer Service	Ministry of Environment		1-877-952-7277 or*7277 on cello
Conservation and Protection Field Supervisor	Fisheries and Oceans (DFO)		1-604-892-3230
Observe, Record, Report	Fisheries and Oceans (DFO)		1-800-465-4336

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1.0 Introduction

This Environmental Management Plan (EMP) is prepared in support of the Section 11 Approval application for the Lillooet River Channel Management Program. The application is in support of the approval process that has been developed for sediment maintenance for flood protection on the Lillooet River.

In 2017, Northwest Hydraulic Consultants Ltd. (NHC) conducted a study of the Lillooet River to update the Lillooet River Floodplain Mapping. The Lillooet River Floodplain Mapping Final Report was released on November 22, 2018. The report shows that the current Lillooet River flows corresponding to the 50, 100 and 200 year flood events have increased by 39%. Prior to the release of the findings of the Lillooet River Floodplain Mapping Final Report, it was thought that the existing dikes offered protection from a 1 in 200 year event + 0.6m freeboard; the report findings now indicate that the dikes offer protection from less than a 1 in 50 year flood event. In addition, the updated sediment management plan (NHC, 2019) showed that the current sediment transport rate is 210,000 to 260,000 m^3/year while previous studies estimated the sediment transport rate to be approximately 30,000 to 40,000m^3 per year (KWL, 2002). The report highlights the need to intensify the current sediment management program. Based on the updated sediment transport rate of 210,000 to 260,000 m^3/year (NHC, 2019a), the PVDD proposes to remove 60,000 m^3 from Voyageur Bar, Beem Bar, Belkin Bar, Big Sky Bar and Airport Bar to maintain flood protection on the Lillooet River. In light of the updated sediment transport rate and the updated floodplain mapping, yearly gravel removal will likely be necessary to maintain flood protection for residential and agricultural properties as well as critical infrastructure.

The EMP, prepared by Cascade Environmental Resource Group Ltd. (Cascade), provides measures to prevent and mitigate adverse environmental impacts associated with gravel extraction operations. Adherence to the protocols described in the EMP should ensure that all environmental issues including, but not limited to, the health of streams and watercourses, air and water quality, wildlife and wildlife habitats, and riparian vegetation are protected and maintained. This document is intended for use by the Pemberton Valley Dyking District (PVDD) to assist in the design, management, and operation of the Lillooet River gravel extraction program.

While this plan will aid the PVDD in gravel extraction planning, site specific plans should be discussed with the Environmental Monitor (EM) during the planning stages and immediately prior to works commencing. Every attempt was made for this Standard Operating Procedures (SOP) document to be a guide for gravel extraction at all gravel bars within the Lillooet River system, although site specific conditions may require field fitting of each scenario/ fish salvage protocol to suit existing conditions.

This document functions to provide standardized and consistent terminology to be used by all firms and organizations involved in gravel management planning.

1.1 Goals and Objectives

Lillooet River supports bull trout (*Salvelinus confluentus*), rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarkia*), coho salmon (*Oncorhynchus kisutch*), pink salmon (*Oncorhynchus gorbuscha*), sockeye salmon (*Oncorhynchus nerka*), Dolly Varden (*Salvelinus malma*), Chinook salmon (*Oncorhynchus tshawytscha*), mountain whitefish (*Prosopium williamsoni*), lamprey (general) (*Petromyzontiformes*), redside shiner (*Richardsonius balteatus*), and sculpins (*Cottus* sp.). All fish and fish habitat are protected under the federal *Fisheries Act*.

The goal of the EMP is to provide environmental protection guidance to the PVDD to aid in gravel extraction planning by identifying scenarios and associated salvage protocols for likely conditions of the Lillooet River system. This goal is met by the following four objectives:

1. Provide the PVDD Operations and Maintenance Manager and contractors with prescription based scenarios to facilitate annual project planning, through describing procedures and protocols to minimize potential environmental impacts associated with gravel extraction operations.
2. Protect valued ecological components within the floodplain area of the Lillooet River in the Squamish-Lillooet Regional District (SLRD),
3. Assist the PVDD in meeting compliance conditions of environmental certificates and approvals from regulatory agencies.
4. Avoid impacting fish or fish habitat by carrying out all work, to the greatest degree possible, in dry conditions above the wetted perimeter of the Lillooet River.

Gravel extraction on the Lillooet River last occurred in 2019, when 40,000 m^3 of material was proposed for extraction from Voyageur, Beem, Belkin and Big Sky Bar (*Water Sustainability Act* Subsection 11(1) and 11(2) Approval #2004004). However, due to budget and funding issues, only 14,200 m^3 was removed from Voyageur Bar. Prior to 2019, the PVDD removed 38 072 m^3 of gravel at Beem Bar, Belkin Bar and Voyageur Bar in 2017.

The 2019 sediment removal proposed habitat compensation of approximately 1,300 m^2. A target of approximately 2,000 m^2 is proposed for 2020. The 2020 program proposes to create two back flow habitat channel of approximately 1,000 m^2 on Voyageur and Beem Bar. Large Woody Debris in the form of 10 m logs with attached root wads will be placed along the back-channel to provide habitat cover. Each log will be anchored with enough ballast to avoid being swept downstream.

The PVDD is proposing to remove 60,000 m^3 of gravel from the Lillooet River in 2020 at Voyageur, Beem Bar, Belkin, Big Sky and Airport Bar, following similar engineering design and environmental criteria as all previous removals.

Prior to any gravel removal, the bars will be inspected by the EM for evidence of redds. While none of the previous studies identified occurrence of redds in the gravel bars on the Lillooet River, as a precautionary measure, a 5 m buffer is established around the perimeter of the bars. The rationale for establishing the buffer is that eggs can survive on a dry bar if the eggs in the redd are inundated with oxygenated water below the surface of the dry bar. If this condition does occur at any time on the subject bars, it will in all likelihood be close to the margin of the bar, where the water levels will be close to the surface of the dry bar.

1.2 Environmental Permitting

The EMP is designed to meet all applicable Municipal, Provincial and Federal legislation, regulations, orders, standards and guidelines. The EMP assumes that all necessary permits, permissions, allowances and licenses issued by governing bodies are obtained and their provisions complied with. Permission to conduct the works associated with the Lillooet River gravel extraction project must be received from the BC Ministry of Environment (MOE) *Water Act* and *Dike Maintenance Act*, the federal Fisheries and Oceans Canada (DFO) *Fisheries Act,* and the *Canadian Environmental Assessment Act (CEAA)*. Approval under the Transport Canada's *Navigation Protection Act* is not required, however the Project must comply with the act. A Wildlife Permit under the BC *Wildlife Act* is required if beaver dams must be removed.

1.3 Environmental Monitor (EM) Responsibilities

Prior to the gravel extraction, the lead Environmental Monitor (EM) will liaise with the project manager, contractors and regulatory agencies to review bar specific gravel extraction plans, including procedures such as access /egress, and refuelling locations.

The EM must be consulted and knowledgeable on all activities proposed to occur within 30 m of the stream to ensure that all works requiring monitoring are monitored. Works within 5 m of the stream channel or instream works are considered sensitive works and will require monitoring on a full time basis. Works occurring further than 5 m from the wetted channel still require prior consultation with the EM, but may not require full time monitoring. It is at the discretion of the EM to decide if works farther than 5 m from the wetted channel constitute sensitive works and require full time monitoring.

When multiple bars are being excavated concurrently, the lead EM will organize environmental monitors to be stationed at each bar to ensure documentation of works and to provide direction to the operators when needed. The lead EM will be in regular contact with each environmental monitor, and will visit each active site every day to ensure that works are conducted according to this plan or the annual project plan. Additionally, the lead EM will ensure that completed sites are deactivated according to this plan.

In general, the monitoring program will include:

- delineation of the sediment removal area with wooden stakes marked with surveyor paint to provide reference for the monitor and to ensure that the contractor is working within the delineated area;
- on-site monitoring of gravel bar extraction, including gravel loading and transport in and about Lillooet River, including access and egress activities;
- monitoring of water quality throughout the work sites to demonstrate compliance with regulatory requirements,
- fish salvage (as described in section 2.0) to capture, record, and re-locate fish from gravel extraction areas to appropriate habitat;
- ensuring that hazardous materials (i.e., fuel and / or lubricants) used by excavators and gravel transport vehicles are properly used, stored, transported, and disposed of in compliance with applicable legislation and regulations;
- ensuring that deleterious materials associated with the gravel extraction program are not released into the waters of Lillooet River;
- ensuring that environmental features, such as riparian buffers and / or high value habitat areas are adequately protected and are not disturbed by gravel extraction activities, and
- ensuring that all personnel working on the Project have received environmental training to ensure personnel understand the potential environmental impacts associated with gravel extraction and are able to respond to environmental emergencies (e.g., fire or spill) that may result from the gravel extraction works.

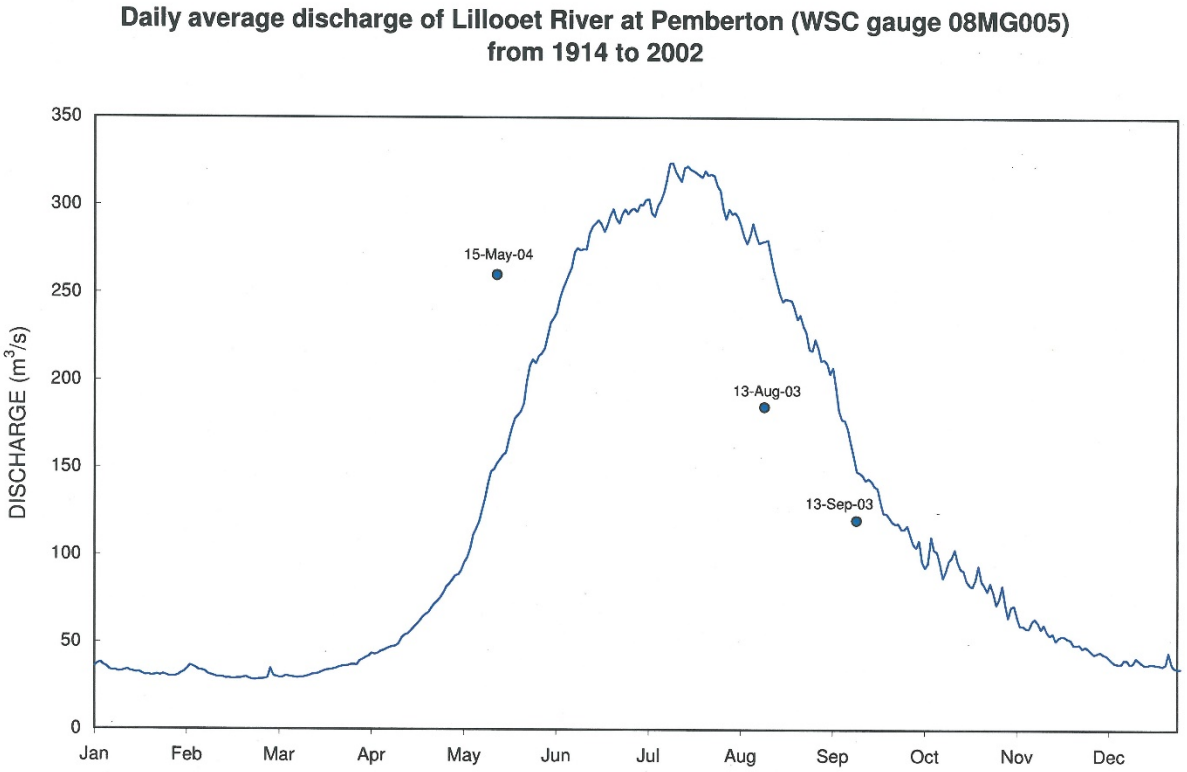
The EM suggests that contractors and supervisors keep a copy of this EMP at each extraction site at all times.

2.0 Fish Salvage Protocols

The planned sediment removal works will be completed during a period of low flow (between February 1st to April 30th), hence the bars will be accessed via the existing Lillooet River dyke and existing access roads/ramps, with no planned instream work. All side channels between the five bars (Voyageur, Beem,

Belkin, Big Sky and Airport Bar) and the Lillooet River bank will be dry during the low flow period and fish salvage should not be required. Review of historic hydrological flow data indicates that the lowest annual flow volumes typically occur during the late winter months (Figure 1: Lillooet River Hydrograph).

Figure 1: Lillooet River Hydrograph



Source: KWL, 2007

Fish salvage is discussed herein, in case a warm weather event occurs that results in unseasonable water levels and side channel back flooding. If any side channels become wetted through back flooding during the gravel extraction period, fish salvage protocols, as outlined below, will be employed if there is deemed to be a risk of high turbidity arising from gravel extraction activities. High turbidity can adversely affect fish by clogging and abrasion of gills from increased stream turbidity, impairment of visual feeders, and stranding, unless they are re-located away from active extraction areas.

Efficient and low risk methods of fish salvage are employed, which is particularly important for bull trout, a provincially blue listed species of special concern. Fish salvage can be conducted in a few ways depending on site conditions and level of flows. Three fish salvage protocols are described below and include approved salvage methods of electrofishing and minnow trapping. All fish that are caught during salvage efforts will be relocated away from gravel extraction activities.

The goal of the fish salvage is to remove 100% of the fish in the work zone that will be at risk of harm during gravel extraction. When appropriate, minnow traps can be used to capture and relocate fish from the work site. Minnow trapping, the preferred method, rarely captures all fish and electrofishing is generally conducted following minnow trapping; or, depending on site conditions, it may be the only

method of salvage utilized. A minimum of two passes of the worksite will be made with the electrofisher. Ideally, the number of fish captured will decrease with each pass, resulting in a final pass with no observation or capture of fish. In some cases where the fish salvage is dependent on concurrent instream works, for example when access for electrofishing personnel is dependent on a machine altering the site for safety, then the best effort for fish salvage is the goal.

Protocol 1 - Fence and fish

This method of fish salvage involves erecting fish exclusion fencing in any wetted area. Wetted areas may be a small channel between the shore and the dry bar, a portion of the perimeter of the bar where flows are shallow, or the entire channel. To be effective, fencing must be erected prior to salvage efforts, must prevent fish from swimming under or between sections of fence. and the fence mesh size must be appropriately sized. Depending on the size of the area to be salvaged, one or two electrofishing teams will begin at either the downstream or upstream end of the bar and work towards the opposite end. All fish observed will be captured using a mesh net and placed in a bucket filled with creek water. Should other non-fish aquatic species such as tailed frogs be observed, capture and relocation will be attempted. Fishing will continue until no fish are observed during a pass or until the rate of return is less than 10 percent.

Conditions that decrease the effectiveness of this method are flows that are too strong and deep, floating debris, excessive turbidity, low conductivity, and low temperatures. If conditions do not permit this salvage protocol, Protocol 2 should be considered prior to considering Protocol 3. Should the EM determine that flows are acceptable for this protocol, an excavator should be prepared to begin cutting off flows immediately following salvage efforts.

In lower flow conditions, the EM may determine that in order to effectively see fish, suspended sediments must be allowed to settle once the bar is isolated. This may mean that the site is left overnight and salvage efforts resume early the following morning.

Depending on the time available, and flow conditions, minnow trapping can be utilised prior to electrofishing efforts. The benefit of minnow trapping is that it is gentler on fish, has a low fisher/effort ratio and the traps are not restricted by turbid water. Minnow traps should be checked a minimum of every 24 hours.

Effectiveness: High

Protocol 2 – Partial fence and fish

Partial fence and fish is when fish exclusion fencing is erected only at the top or top and sides of a bar. The difference of this protocol from Protocol 1 is that the salvage area is not isolated from creek flows and fish can swim into and out of the site. Fencing does not surround the entire wetted area and is considered incomplete, or a partial fence. The purpose of erecting the fence at the top and sides of a bar is to prevent fish from being flushed into the site from upstream of the bar, but does not prevent fish from swimming into the site where there are no fences. This protocol should be used at sites where flows are too deep or fast flowing to erect and maintain effective isolation fencing. The site will be salvaged by means of electrofishing beginning at the upstream fence and working downstream to encourage fish to swim out of the area to be impacted. Construction of an isolation berm by mounding gravel from the gravel bar around the worksite should occur immediately following the salvage effort to minimize the time when fish can re-populate the salvaged area.

Effectiveness: Low / medium. While bar to bar conditions vary, it is the experience of Cascade that when a large amount of gravel is required to build an isolation berm, the amount of gravel that is actually removed from the stream channel is greatly decreased. In other words, instead of removing the gravel from the bar out of the channel, the gravel is kept in the channel to construct the isolation berm. Berms

around excavation sites must be left after excavation is complete to allow sediments to settle prior to breaching of the berms. For this reason, it may not be economical to pursue sites where protocol 2 is used.

Protocol 3 – Fishing without fencing

Fishing without fencing can be used when a small bar or portion of a bar is submerged in shallow water. Construction of an isolation berm must occur immediately following salvage efforts, so access to the bar must be in place prior to salvage completion. Salvage will occur by electroshing from the upstream area of impact moving downstream to encourage fish to swim out of the area. If site conditions permit, an additional salvage effort should occur after the isolation berm is in place. A deeper site may have isolated pools where fish could be trapped warranting additional salvage effort.

Effectiveness: low / medium

Protocol 4 – Salvage for full channel diversion

If flows permit electrofishing personnel to safely enter the mainstem of the Lillooet River prior to construction of diversion structure, then fish salvage should be initiated at that time. The preferred method of salvage is Protocol 1 – fence and fish, although environmental conditions such as flow velocities and channel depth may prevent its use. If it is impractical to erect fencing, Protocol 3 – fishing without fencing should be initiated in the area of impact of the diversion structure.

If access to the mainstem is not feasible prior to initiation of berm construction, then electrofishing should commence as soon as the berm has decreased flows to a level that is safe to access. This may be when the diversion structure is half built. Two or more electrofishing teams should salvage the entire area that will be dewatered during the diversion. Water will be turbid, and visibility difficult. Therefore electrofishers should use large dip nets and place them in the direction of flow, downstream of the electrofishing current, to catch fish as they become stunned and drift into the net. The turbid water makes electrofishing in these conditions difficult, although salvage is much more effective using this method, rather than waiting for flows to decrease and attempting to salvage stranded fish from gravel bars.

Effectiveness: low / medium

3.0 Gravel Extraction Management Scenarios

Gravel bars and sediment accumulations in the Lillooet River system vary from each other and from year to year depending on flow conditions and the amount of sediment that is transported in the system. Therefore, preparing a bar specific plan is not as useful as a management plan outlining standard operating procedures for the various methods of gravel extraction. Five scenarios are presented that vary from low environmental impact such as dry gravel bar scalp, to higher environmental impact such as full channel wet extraction. The intended scenarios should be determined for each bar during the planning stages of each gravel extraction year. Immediately prior to gravel extraction works, these scenarios should be re-assessed to ensure that environmental conditions still fall within recommended conditions for that scenario. It is possible that the intended scenario may need to be altered prior to works to meet the current conditions. Gravel extraction under any scenario should be completed as soon as possible once initiated. If possible, Cascade recommends a longer work day, with adequate gravel transport trucks available to bars where gravel extraction is occurring. This should eliminate excavator idling and minimize the period of impact in the creek.

These scenarios are not intended to be specific design proposals; intent is to provide guidance to decision makers on the benefits and impacts for a variety of scenarios.

While the Environmental Monitor should monitor all aspects relating to protecting the aquatic and terrestrial environment of Lillooet River, the Project Manager should monitor excavation depth and berm/ bank angles. Maintenance of recommended depth and bank angles are essential in maintaining the stability of the Lillooet River channel. Excavation stability monitoring frequency will depend on the size of the excavation, but should at minimum be checked at the beginning of excavation and at one point mid-excavation.

For the purposes of the Lillooet River gravel bar management, a hybridized approach will be used that combines Scenario 1 and Scenario 2 as described below. As per the recommendations of previous environmental assessments, a 5 m buffer of undisturbed bar edge will be left intact (Cascade, 2010). As the excavation progresses toward the middle of the bar, the excavation will extend up to 2 m in depth, as dictated by site conditions. This approach will be the only Scenario used for bar management on the Lillooet River by the PVDD. This approach will be repeated in 2019 and every 3 years as determined by bar surveys.

Scenario 1 – Bar Scalp

Bar scalping presents the lowest environmental impact as only gravel above the level of the creek is removed from the top of the gravel bar. When conducting this method of gravel removal, the outer 0.5 m of the bar should not be disturbed. Additionally, maintaining a relatively steep bar head helps to encourage bar re-formation and should ensure that downstream river flow remains non-linear. Gravel should be removed by an excavator scraping gravel towards the center of the bar.

While the bar scalp does not involve works within the wetted channel, the dry bar may be separated from the stream bank by a wetted area. In this case, the fence and fish salvage method should be used prior to excavator access to the bar. Flow into the wetted area must be cut off by constructing a berm on the inside of the fish fencing using gravel from the gravel bar. The EM will determine if a downstream fish exclusion fence is required. If a downstream fence is installed, gravel can be infilled to create access to the bar up to the downstream fence. Otherwise, access to the bar should occur on a dry section of bar that was created by building the upstream berm.

Proposed sediment removal works will involve scalping approximately 15 000 m^3 from three of the four gravel bars during periods of low water between January 1st, and April 15th. The bars will be accessed by the existing Lillooet River dyke access road and existing access roads/ramps with little to no disturbance to existing riparian vegetation.

The benefit of this method of gravel extraction is that all work occurs in the dry and water quality should not be impacted. The disadvantage of this method is that it may not allow for gravel extraction at quantities required to meet flood protection maintenance requirements of the PVDD.

When to implement

Implement scenario 1 when there is substantial gravel accumulation on dry bars above the water level, or when working in a period of high risk to fish. Significant gravel accumulation on dry bars could occur after a flood event.

Suggested salvage method

Fish salvage will only be required when a wetted area must be crossed in order to access the dry bar. In this case, protocol 1 – fence and fish, should be implemented. If the site access is dry then fish salvage is not required.

Scenario 2 – Full Bar Excavation

A gravel bar located on either side of the thalweg will be accessed from the stream bank closest to the bar. Occasionally a small flow of water between the bank and the bar must be crossed to access the bar. Upon gaining access to the bar, the excavator begins by constructing a berm around the perimeter of the bar using gravel from the bar. The berm must be contained on the existing bar and gravel must not fall into the channel. The berm should be built to be large enough to ensure that a rise in creek level does not breach the berm and flood the work site. This is especially important when excavating large bars that take multiple days to complete. Should water levels rise overnight and flood the site, a mid-bar berm will have to be left (i.e., not excavated) to re-isolate the work site. This will mean that less gravel will be available for extraction. Recommended berm height is 0.5 m and 1 m in width, although site conditions may warrant a larger berm. Additionally, maintaining a relatively steep bar head should encourage bar re-formation and ensure that downstream river flow remains non-linear.

Gravel bars are generally excavated to a depth of 1 – 2 m from the level of the creek. When conducted in accordance with this plan, this method of gravel extraction can be relatively low impact to the aquatic environment. A few days after the bar extraction is complete and turbid water within bar berms has settled, the isolation berm should be breached at an upstream and downstream location to prevent isolating fish should the river flood. Breaching by hand-held shovel may be the only means of breaching if the bar is now inaccessible by an excavator.

The benefit of this method is that the amount of gravel extracted is maximized while minimizing impacts to the aquatic environment. The disadvantage of this method is that there is potential for the aquatic environment to be impacted through increased water turbidity, the potential for fish kill and the potential for deleterious materials to enter the creek.

When to implement

This method of gravel extraction can be utilized when works are conducted during the instream works window or during periods of low flow levels, and when a significant amount of gravel below the water level must be removed from the Lillooet River system, although this is not expected to occur.

Suggested salvage method

Protocol 1 - fence and fish

Scenario 3 – Wet Channel Crossing for Bar Access

Wet channel crossings are generally avoided due to their environmental impact to the aquatic environment. A onetime crossing of an excavator to the bar and back may be considered by Fisheries and Oceans' (DFO) during the planning stages prior to each year's project. However, wet crossings by machinery are not DFO's preference and likely will not be approved under normal circumstances. Additionally, decision makers must consider the logistical difficulties for gravel transport trucks to access the bar while minimizing environmental impact.

A possible exception to this is if an excavator makes a wet crossing in order to install a temporary bridge, such as a rail car, or to facilitate the installation of a culvert crossing. Such a crossing would enable gravel transport vehicles to access the site without entering the wetted channel. A bridge crossing may be suitable to cross the main thalweg depending on the flow conditions, although a culvert crossing is not recommended for use on the main thalweg and should be restricted to side channels or areas of partial flow.

During annual project planning a list of bars that fall into this category should be drafted and the size and type of the temporary crossing should be sized by an engineer to ensure adequate flow conveyance and structure stability. If conditions dictate to installation of a temporary bridge, bridge abutments may need

to be constructed to ensure the temporary bridge is secure during use. Access to rock or concrete loc blocks must not increase the required number of wet stream crossings.

Prior to crossing the channel, the excavator must be cleaned of excess oil, dirt or other hazardous materials. The crossing should be conducted in a shallow location where risk of excavator tipping is reduced or eliminated. The non-toxic and biodegradable hydraulic fluid, *Environ™*, or its equivalent should be used in all machinery working in or near water. Additional permitting may be required under the *Navigable Waters Protection Act* if a temporary bridge is to be installed in the channel.

When to implement

Scenario 3 should be implemented when there is no same-side of the creek access to a large gravel bar, and when there is a safe (i.e., shallow) access route for the excavator to utilise.

Suggested salvage method

Protocol 3 – fishing without fencing as long as flow conditions permit safe access to the channel for electrofishers.

Scenario 4 – Full channel excavation with creek diversion

The full channel excavation scenario involves dewatering a section of the creek by diverting flows to an alternative channel to bypass the extraction site. Flows are diverted by constructing a diversion berm at the upstream boundary of the extraction site by beginning at one side of the channel and working towards the opposite bank. Full channel diversion is generally avoided as impact to the aquatic environment is certain. Depending on the amount of gravel accumulated in an area where diversion can be conducted, full channel diversion may be considered to meet flood protection requirements. A well constructed diversion structure will minimize seepage and water in the work site. Materials that can be used in berm construction include dam sacks (i.e., cubic meter sand bags), and large, angular rip rap backfilled with river gravels. A combination of both rip rap and sand bag can be used with a polyethylene liner used as a sealer either on the front side, middle or backside of the structure. Methods to minimize turbidity during diversion construction are:

1. Building the diversion berm during low flow conditions,
2. Completing works as quickly as possible once initiated, and ensuring diversion materials are available on site prior to construction commencement,
3. Clearing rip rap of dirt and other deleterious substances, and securely fastening dam sacks so they do not open in the stream,
4. Using river gravels from Lillooet River as backfill if needed.
5. Constructing the diversion to minimize or prevent seepage into the worksite,
6. Once the diversion structure is complete, the downstream excavation boundary will be delineated and depending on site conditions, a berm constructed to prevent turbid water flowing from the worksite into the main channel.

Effort must be taken to minimize water turbidity during berm construction. Downstream water quality will be monitored, recorded and submitted to regulatory agencies.

The fish salvage should occur concurrent to the construction of the diversion berm when flow conditions permit access to the channel, because the channel will become dry when berm construction is complete. It is very difficult to salvage fish without flows as fish get lodged between rocks as they seek diminishing wetted areas. Therefore, electrofishing salvage efforts must be initiated as soon as conditions permit, and continue until all fish are salvaged, or until electrofishing is no longer feasible and salvage efforts must resort to salvaging fish on bars by hand.

When flows in the main channel are eliminated, personnel should walk the dewatered bars looking for stranded fish. Once flows are diverted into the temporary channel, it is essential that they are maintained in the temporary channel until flows are re-diverted back into the main channel as fish will immediately populate the temporary channel and could be at risk of stranding if flows decrease. The same salvage procedure should be followed when flows are diverted back into the main channel.

The advantages of this method of gravel extraction are that a large area of gravel can be excavated, and once the initial diversion is complete, the site is generally fairly secure with minimal impacts to water quality or risk to fish. The disadvantage of this method is that it causes short term but significant impacts to water turbidity. Additionally, the time allowed to salvage fish is finite and restricted to the period in which flows are adequately reduced to allow safe passage into the main channel and the time when construction of the berm is complete and the channel dries up. Lastly, the temporary diversion of creek flows into an alternative channel may result in decreased flood protection during the work period.

When to implement

When significant volumes of gravel can be excavated from the main Lillooet River channel and an alternative channel is available to accept creek flows scenario 4 can be implemented.

Suggested salvage method

Protocol 4 – Salvage for full channel diversion

Scenario 5 - Full channel without creek diversion

The environmental impacts associated with this type of gravel removal are significant and this scenario is not recommended under normal circumstances. If all of the other four scenarios have been assessed and cannot be utilised in the current circumstances, and gravel extraction cannot be postponed to the following summer season, then the PVDD and their Environmental Monitor, should begin the emergency works approval process. Both DFO and MOE have emergency work approval processes and if the works are deemed an emergency by the agencies then emergency approval will be granted. Such approvals still require inventory of the work conducted including excavation locations, and volume extracted, and may involve an obligation for post-works compensation.

If emergency approval is granted, conditions of approval must be followed including mitigation to minimize impacts to the environment. The excavator must be free of excess oil, grease and dirt and must be fuelled using *Environ™* fuel or equivalent. If possible, the excavator should work from a dry location, and if this is not possible, the excavator must work from a wetted location where it is not at risk of tipping into the stream. Extraction using this method can occur by a clean excavator ideally working from an elevated bar and extracting gravel from the main channel, or the machine can be perched in the stream. Gravel can be placed at a location where it will not be re-introduced into the channel.

When to implement

This scenario may be used during emergency situations when gravel or debris management must be expedited and dry bar maintenance is not feasible.

Suggested salvage method

Protocol 3 – Fish without fencing.

3.1 Timing

Gravel extraction works will be conducted during low flow conditions between January 1st and April 30th annually, there are no planned instream works. Works are expected to take place during a three week period within this low flow window.

Gravel will be removed from extraction areas using an excavator that is in good working order, with no excess oil or grease and no leaks. All extracted gravel will be placed directly into dump trucks from the excavation site and hauled off site to an area outside the high water mark. The gravel extraction method to be employed, bar scalping, presents the lower environmental impact of river gravel extraction methods as only gravel above the level of the river is removed from the top of the gravel bar. Additionally, maintaining a relatively steep bar head helps to encourage bar re-formation and should ensure that downstream river flow remains non-linear. The outer 5 m of the bar will not be disturbed, and the excavator will scrape gravel towards the centre of the bar.

3.2 Evaluation of Gravel Extraction Scenarios

While the purpose of this plan is to identify potential environmental impacts associated with each scenario, and offer mitigation methods to manage/ minimize impacts, Cascade also realizes that the PVDD has flood hazard protection goals to achieve.

The lowest impact method of gravel extraction (i.e., Scenario 1) will result in the lowest yield of gravel at potentially higher cost per unit of gravel excavated. As this plan outlines standard operating procedures and does not consider actual amounts of gravel in the channel, a yield/ cost assessment is outside of the scope of this plan. Decision makers must take into account likely environmental impacts and flood protection goals/ requirements when selecting the scenario that is most appropriate for each bar.

4.0 Bar Access Points

Bar access points are presented in tabular format in Table 1 and are illustrated in Maps 2-5. The bars, beginning with the most upstream bar are, Voyageur, Beem, Belkin, Big Sky and Airport. Gravel bars are named and associated with the appropriate access points in Table 1. While the location of gravel bars is not static in a system such as the Lillooet River, the general location does not change greatly from year to year. For this reason, assigning names to each bar will create consistency for planners during future gravel extraction planning. It is possible that bar locations may change and require renaming following a significant flood event, although the frequency of such events is low.

The gravel bars are easily accessible from adjacent properties at the proposed access points. Owners of adjacent properties have supplied written approval of works for previous gravel extraction projects in these locations, and consultation and approval from adjacent landowners will be part of each approval process. The bars will be accessed by the existing Lillooet River dyke and existing access roads/ramps with little to no disturbance to existing riparian vegetation.

In some cases, a ramp onto a bar is maintained from year to year, although ramps at other sites must be assembled and disassembled prior to and after gravel extraction to ensure that flood protection is maintained. All access points provide access to bars on the same side of the creek and are thus appropriate options for gravel extraction.

The purpose of this section is to inventory all access points and to identify the corresponding bar. As previously mentioned, the location of gravel bars does not change significantly from year to year, although the orientation of the thalweg to the bar can change. For example, an access point on the river-left could be used when the thalweg flows on the river-right side of the bar, but cannot be used if the thalweg flows on the river-left side of the bar. Annual flow fluctuations and previous gravel extractions are

causes of thalweg flow changes. Therefore, access points must be reviewed every year prior to gravel extraction to ensure that bars listed in Table 1 can, in fact, be accessed from the identified access points.

Voyageur Bar

The Voyageur Bar is located 6 km upstream from the Highway 99 Bridge, and is located along Lillooet River's right bank, at the following geographic coordinates: latitude 50.3424; longitude -122.8121. A description of the access points is provided in Table 1, and is illustrated on Map 2.

Beem Bar

The Beem Bar is located 2.7 km upstream of the Highway 99 Bridge along the Lillooet River's right bank, and is accessed via the Miller/Lillooet dyke crest. Beem Bar is located at the following coordinates: latitude 50.3268; longitude -122.7881.

A description of the access points is provided in Table 1, and is illustrated on Map 3.

Belkin Bar

Belkin Bar is located 1 km downstream from Beem Bar, and is accessed the same way. Belkin Bar is located at the following coordinates: latitude 50.3271; longitude -122.7759.

A description of the access points is provided in Table 1, and is illustrated on Map 4.

Big Sky Bar

Big Sky Bar is located 2.8 km downstream from Belkin Bar, and is accessed via Airport Road at the following coordinates: longitude 50.3075; latitude -122.7627.

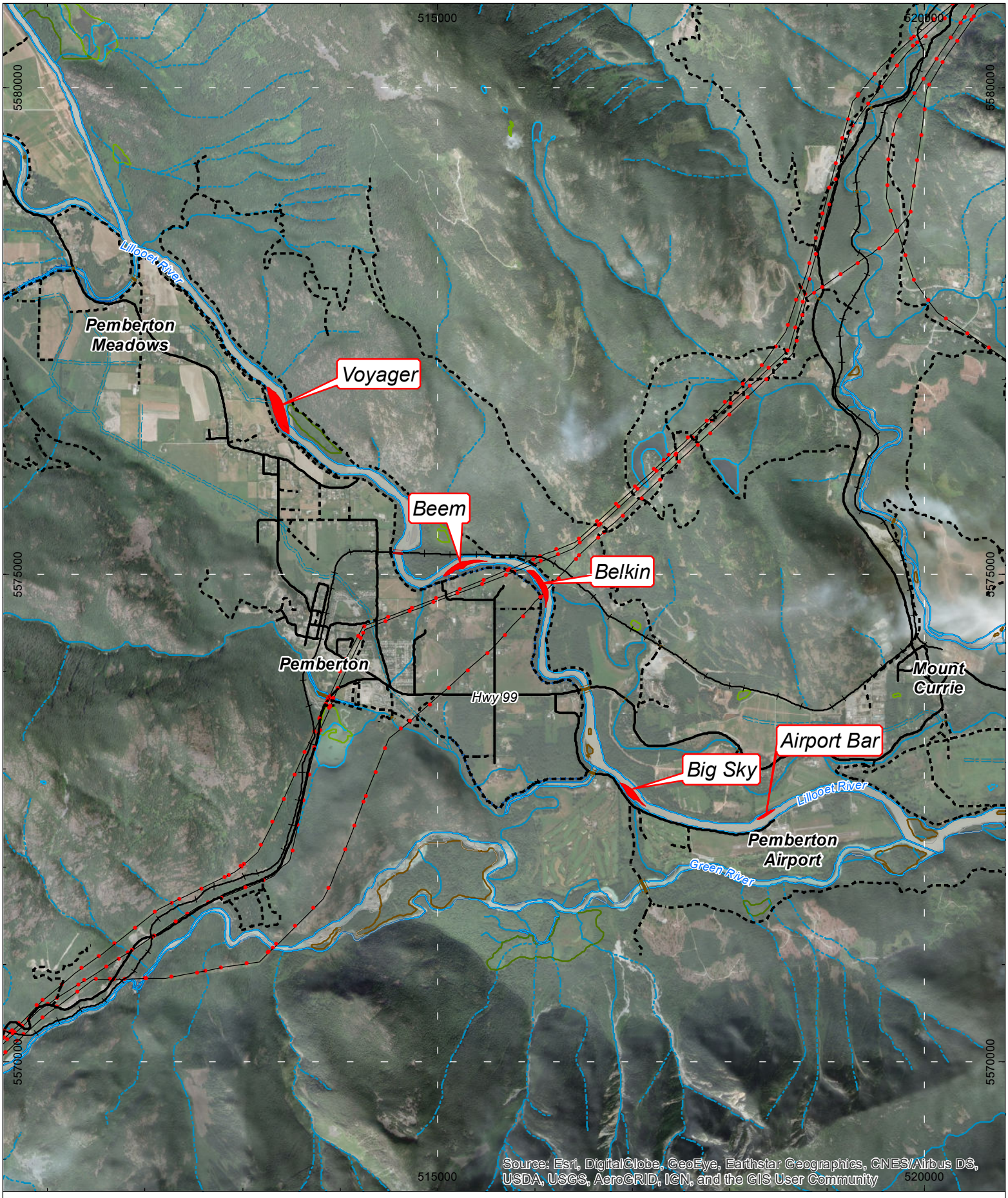
Airport Bar

Airport Bar is located 1.3 km downstream from Big Sky Bar, and is accessed via the North Arm Farm at the following coordinates: longitude 50.3044; latitude -122.742.

A description of the access points is provided in Table 1, and is illustrated on Map 5.

Table 1: Lillooet River gravel bar access points.

Access Point Name	Corresponding Map	Access Points	Bar Name Access	Description
Voyageur Bar Access	Map 2	River right	Voyageur Bar	Access from river right from MOTI right of way opposite Meadows Road. Access to bar is off of existing dyke road.
Beem Bar Access	Map 3	River right	Beem Bar	Access from river right via a new access off of existing dyke road.
Belkin Bar Access	Map 4	River right	Belkin Bar	Access from river right via existing dyke road.
Big Sky Bar Access	Map 5	River right	Big Sky Bar	Access from river right via Airport Road.
Airport Bar Access	Map6	River Left	Airport Bar	Access from river left via the North Arm Farm



GIS Cartographer: Nicola Church
Date: November 01, 2019
CERG File#: 052-11-06
Projection: UTM 10N NAD83
Orthophoto/Base Data: BC Gov

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

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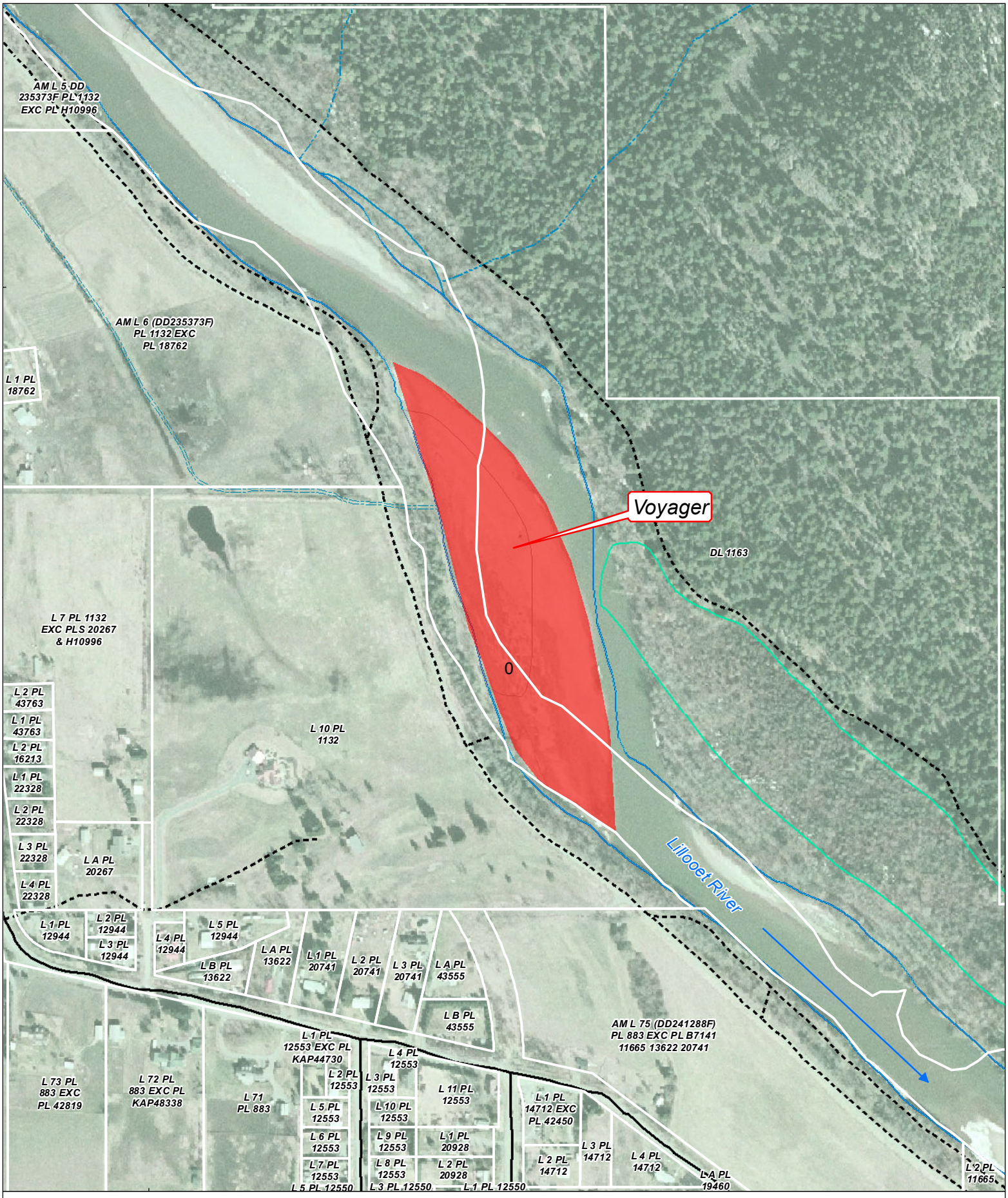
Location Map

2019 Lillooet River Gravel Removal Project
Pemberton Valley Dyking Distrcit
Pemberton, British Columbia



GIS Cartographer: Todd Hellinga
Date: August 28, 2016
CERG File#: 052-11-03
Projection: UTM 10N NAD83
Orthophoto/Base Data: BC Gov

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

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Site Map: Voyager Bar

2016 Lillooet River Gravel Removal Project
Pemberton Valley Dyking Distrcit
Pemberton, British Columbia

515000

DL 5546
013414879

Beem

Lilloet River

UCL

DL 7665
PL CG160
013075951

DL 5547
013414887

5575000

L 13 PL 883
EXC PL CG160
004225295

L 14 PL 883
EXC PL CG160
012180785

PT L 13 PL
883 ON PL CG160
012180769

PT L 14 PL
883 ON PL CG160
012180777

L 16 PL 883
011770287

L 15 PL 883
004818661

L 17 PL 883
EXC PL B3325
006350666

L 18 PL 883
012180793

L 19 PL 883
003600742

PT L 17 PL 883
ON PL B3325
006350780

L 13 PL 883
EXC PL CG160
004225295

L 14 PL 883
EXC PL CG160
012180785

PT DL 204
ON PL B1923
013072692

Fraser Rd

PT L 6 PL 883
ON PL B3514
003144453

PT L 7 PL 883
ON PL B3514
003144461

L 7 PL 883
EXC PL B3514
012180700

L 6 PL 883
EXC PL B3514
012180696

L 5 PL 883
EXC PL B3514
005687276

L 4 PL 883
011584327

L 3 PL 883
012127442

L 2 PL 883
012127434

L 1 PL 883
012127418

L 1 PL 5957
010234241

Egress

Access

N 330FT OF L
7 PL 11063
009594230

Clover Rd

L 7 PL 11063
EXC N 330FT
009529381

DYKE RESERVE
ON DL 204
PL 5957

L 4 PL 5957
010234306

L 2 PL 5957 EXC
PLS 20993 & 35687
010234268

L 1 PL
11063
009529314

L 2 PL
11063
009529322

L 3 PL
11063
009529331

L 4 PL
11063
009529349

L 5 PL
11063
009529357

L 6 PL
11063
009529373

515000

L 5 PL 5957
010234314

L 6 PL 5957
010234357

Hwy 99

L 1 PL 12831
009371401

GIS Cartographer: Todd Hellinga
Date: January 7, 2016
CERG File#: 052-11-03
Projection: UTM 10N NAD83
Orthophoto/Base Data: SLRD/BC Gov

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

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Site Map: Beem Bar

2016 Lillooet River Gravel Removal Project
Pemberton Valley Dyking Distrcit
Pemberton, British Columbia

Lilloet River

DL 7665
PL CG160
013075951

DL 7665
PL CG160
013075951

UCL

L 13 PL 883
EXC PL CG160
004225295

PT L 13 PL 883
ON PL CG160
012180769

DL 5547
013414887

Belkin

L 13 PL 883
EXC PL CG160
004225295

PT DL 204
ON PL B1923
013072692

L 1 PL 883
012127418

L 1 PL 5957
010234241

Egress

Access

Clover Rd

N 330 FT OF
L 7 PL 11063
009594230

DL 213 EXC
PL 35687
013256378

L 7 PL 11063
EXC N 330FT
009529381

L 2 PL 5957 EXC
PLS 20993 & 35687
010234268

DYKE RESERVE
ON DL 204
PL 5957

L 6 PL
11063
009529373

L 5 PL
11063
009529357

BK A DL
204 8746

L A PL
20993
007660227

L C PL 20993
EXC PL 35687
006516301

L D PL
20993
007660260

L B PL 20993
EXC PL 35687
007660251

DL 213 EXC
PL 35687
013256378

Hwy 99

L 6 PL 5957
010234357

L 1 PL
12831
009371401

L 8 PL 5957 EXC
PL 32712 35687
008780781

L 1 PL
32712
002778874

DYKE
RESERVE ON
DL 204 PL 5957

557500

557500

GIS Cartographer: Todd Hellinga
Date: January 7, 2016
CERG File#: 052-11-03
Projection: UTM 10N NAD83
Orthophoto/Base Data: SLRD/BC Gov

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

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Site Map: Belkin Bar

2016 Lillooet River Gravel Removal Project
Pemberton Valley Dyking Distrcit
Pemberton, British Columbia

FR NW1/4 DL 211 EXC PL A21 B3576 B4215 KAP59366 KAP59592 004464532

FR NW1/4 DL 211 EXC PL A21 B3576 B4215 KAP59366 KAP59592 004464532

DL 213 EXC PL 35687 013256378

DYKE RESERVE ON DL 204 PL 5957

BK A DL 204 87746

LA PL 20993 007660227

LB PL 20993 EXC PL 35687 007660251

Hwy 99

LA PL 7488 EXC PL 18266 33212 36380 001582798

L 1 PL KAP60426 023939109

L 2 PL KAP60426 EXC PL KAS1994 023939117

L 1 PL 36380 003329194

L 2 PL 36380 003329216

L 35 PL KAS1994 024034851

L 1 PL KAS1994 024034509

L 28 PL KAS1994 024034789

L 4 PL KAS1994 024034533

L 8 PL KAS1994 024034576

L 9 PL KAS1994 024034584

L 1 PL 32712 002778874

L 1 PL 20878 007719370

L 2 PL 20878 007719388

LA PL 7488 EXC PL 18266 33212 36380 001582798

FR SW1/4 DL 211 EXC PL 7488 010309349

L 8 PL 5957 EXC PL 32712 35687 008780781

DYKE RESERVE ON DL 204 PL 5957

LA PL 22733 006739644

LB PL 22733 006739652

LA PL 22732 001552864

LB PL 22732 006739776

LC PL 22732 006739792

DL 213 EXC PL 35687 013256378

L 9 PL 5957 010234373

DYKE RESERVE ON PL 5957

Lillooet River

IR 2 MOUNT CURRIE

Big Sky

Airport Rd

L 1 PL KAP59654 023962518

L 1 PL KAP49079 018111092

BK A DL 206 011514442

DL 8750 023948108

GIS Cartographer: Todd Hellinga
Date: January 7, 2016
CERG File#: 052-11-03
Projection: UTM 10N NAD83
Orthophoto/Base Data: SLRD/BC Gov

CASCADE ENVIRONMENTAL RESOURCE GROUP LTD

N W E S

0 100 200 300

Meters

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Site Map: Big Sky Bar

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Pemberton, British Columbia

GIS Cartographer: Nicola Church
Date: November 01, 2019
CERG File#: 052-11-06
Projection: UTM 10N NAD83
Orthophoto/Base Data: BC Gov

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

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Meters

Site Map

2019 Lillooet River Gravel Removal Project
Pemberton Valley Dyking Distrcit
Pemberton, British Columbia

5.0 Environmental Monitoring and Mitigation

5.1 Instream Works Best Management Practices

The following steps should be followed to minimize and mitigate any damage to fish and fish habitat during gravel extraction operations. All mitigative strategies outlined in this document should be strictly adhered to by all contractors. To ensure that the proposed Works proceed in accordance with *Standards and Best Practices for Instream Works* (MWLAP, 2004) and *A Users' Guide to Working In and Around Water* (MWLAP, 2005), the following conditions should be adhered to:

- Work will be completed as soon as possible once initiated.
- Gravel extraction activities will preferably occur in isolation of flowing water and will be carried out in such a manner as to prevent the release of deleterious substances into any local surface drainage. Deleterious substances include, but are not limited to, silt, sediment, sediment-laden water, raw concrete, concrete leachate, concrete wash water, hydrocarbons, oil and grease, and chemical products associated with construction activities.
- Gravel extraction activities should not be initiated during heavy precipitation or high water flows. Should water levels rise during gravel extraction, actions will be taken to mitigate potential impacts by increasing berm size, and ensuring that works are completed as soon as possible.
- Machinery is to be removed from the Lillooet River channel when the operator is not in attendance for more than 0.5 hours (i.e., after working hours or during work stoppages) and will be stored a minimum of 30 m from the wetted margin where practical.
- All equipment and machinery involved in the works will be in good operating condition, free of leaks. Machinery will be power washed prior to works to eliminate excessive oil or grease and sediment.
- Servicing and refuelling of equipment will be conducted in designated areas outside of the stream channel, isolated from any surface water drainage and more than 30 m removed from the watercourse.
- Machinery shall not operate from the wetted channel, except in emergency situations.
- All trucks and excavation equipment will minimize disturbance to the riparian vegetation by working from previously disturbed areas or areas designated by the Environmental Monitor.
- Vegetation cutting / removal will be restricted to designated access / egress locations to minimize loss of riparian vegetation and to retain important wildlife trees. If vegetation management is required, it is preferred that vegetation be cut, while maintaining portions of the plant and root structures.
- Large woody debris will be retained where possible and, if moved, shall be repositioned in the channel following gravel removal activities.
- The environmental monitor will monitor all environmentally sensitive works, as defined in section 1.3, on a full time basis. The monitor will ensure that best management practices are followed throughout sensitive works, and that appropriate water quality parameters are monitored. Regular turbidity sampling should be conducted during all instream works.
- In accordance with the BC Ministry of Environment Ambient Water Quality Guidelines for Turbidity, Suspended and Benthic Sediments (http://www.env.gov.bc.ca/wat/wq/BCguidelines/turbidity/turbidity.html#tab1), the EM will ensure that the turbidity of Lillooet River will not (BC Ministry of Environment, 2001):

- Change from background of 8 NTU at any one time for a duration of 24 hours 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 days in all waters during clear flows or in clear waters
- 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

Should turbidity levels exceed the above guidelines, works will be halted or suspended until turbidity levels comply.

- Works will occur in isolation of flowing water. Isolated turbid water will not be released back into the creek until suspended solids have settled and the turbidity is at background levels or at a maximum of 25 NTU.
- Works conducted in and about Lillooet River shall only be conducted under the direction and approval of the Environmental Monitor. The Environmental Monitor will have written authority to alter or suspend works that are deemed to be detrimental to aquatic or terrestrial life.
- All sensitive works will be documented in monitoring memos as part of the Environmental Reporting process.

5.2 Mitigation Products

The following products are to be employed by the contractors:

- *Environ™* non-toxic and biodegradable hydraulic fluid, or equivalent, will be used by all contractors during works in or around Lillooet River.
- *Clean rip rap* will be used when building access ramp or creek diversion structures.

6.0 Water Quality Protection

All works shall be conducted in a manner to minimize impacts to the water quality of Lillooet River. In order to do so, gravel extraction shall occur in isolation of flowing water, while ensuring that water flowing past a work site does not become contaminated as a result of the work activities. Work site isolation can be achieved by the construction of berms and diversions. These structures must effectively isolate the work site from flowing creek water. Bar perimeter berms and channel diversion structures will be left in place following gravel extraction activities except when the water was diverted to obtain a bank-to-bank extraction. Deconstruction of berms or diversion structures will be conducted under the supervision and guidance of the EM to ensure that water quality and fisheries values are maintained.

As riparian vegetation functions to stabilize stream banks and slow run off, protection of riparian vegetation is essential. Appropriate measures will be taken to protect or minimize damage to riparian vegetation.

6.1 Sediment and Erosion Control Strategies

Silt and sediment are considered deleterious substances to aquatic life. Efforts to reduce silt and sediment entering Lillooet River should include:

- Access / egress to Lillooet River will only occur at existing access points identified in Table 1 and on Maps 2 through 5. Should a different or new access point be proposed, the Environmental Monitor, the PVDD project manager, and DFO should all be in agreement to its development and use.
- Ramps, berms and diversions should use material from the Lillooet River bed, and clean rip rap. Any other materials used in the Lillooet River channel, must be certified as clean (i.e., not contaminated).
- Excavated material is to be removed to a stable area above the high-water mark and as far as possible from any watercourse to prevent entry into a watercourse or stormwater system. Should excavated material be stored temporarily within an area that has potential to enter into a watercourse or stormwater system, materials will be covered to prevent runoff in the likelihood of inclement weather.
- Gravel extraction/ diversion construction is to proceed in a manner that will minimize silting and sediment discharge to Lillooet River, including:
    - Select the lowest impact scenarios for gravel extraction (i.e., avoid full channel excavations and excavation of inundated bars when possible),
    - Ensure berms around gravel bars are adequately sized to withstand normal water levels fluctuations to ensure work sites remain isolated from the main channel,
    - Encourage operators to conduct a two step gravel excavation method. By this method, gravel is excavated from the isolated wetted pool and temporarily stockpiled on a dry section of the bar to allow water to drain from the material prior to loading transport vehicles. This method minimizes the sediment laden water dripping from vehicles as

they leave the bar, while maximizing the amount of gravel that can be transported in each load.

- Diversion berm materials can include dam sacks (i.e., cubic meter sand bags), and large, angular rip rap backfilled with river gravels. Polyethylene liners assist in 'waterproofing' the berm and can be used in combination of both materials.
- Diversion berm construction material must be available on site prior to initiation of berm construction,
- Diversion berm construction should be completed as soon as possible once initiated, and
- Diversion berm should be built during low flow conditions.

7.0 Air Quality, Dust, and Noise Control Strategies

The following mitigation measures will be implemented by the contractor to minimize the release of air pollutants from the movement of heavy-duty vehicles and equipment:

- All equipment shall be fitted with standard emission control devices appropriate to the equipment and in compliance with Federal, Provincial, and Municipal regulations and standards.
- Diesel equipment shall be equipped with devices to reduce emissions such as diesel oxygen catalysts (DOCs), flow through mesh filters or diesel particulate traps.
- The Village of Pemberton Noise Regulation Bylaw No. 699, 2012, states, "No person shall, on a Monday to Saturday inclusive before 7:00 a.m. or after 8:00 p.m., or on a Sunday before 10:00 a.m. or after 4:00 p.m. engage in or permit construction in such a manner as to create a noise" (Village of Pemberton, 2012).

7.1 Emissions from Worker Commuter Trips

To decrease emissions of air contaminants resulting from worker commuter trips, contractors will be encouraged to source local workers and facilitate carpool and public transit options for transportation of workers to and from the site.

8.0 Hazardous Materials Handling and Storage

General best practices for hazardous substance storage and handling include:

- The refuelling of equipment will be conducted in the designated areas, away from creeks and surface water drainages. Refuelling will take place at designated staging areas.
- Equipment is to be in good operating condition, leak free, and free of excess oil and grease. Any machinery working in proximity of water and found to be leaking fuel, oil, grease or any other deleterious material will be removed from the site at the direction of the EM.
- The spill response plan to deal with spillage or leakage of fuel shall include an on-site spill response kit with an appropriate supply of oil absorbent material designated for use in and around streams, including absorbent booms.
- Any spill of petroleum products greater than 1000 ml (1.0 litre) shall be reported immediately to the EM. Clean up of such spills is the responsibility of the contractor and will commence immediately. Reporting of petroleum spills to authorities shall be as set out in the appropriate legislation and regulations. Such reporting is the responsibility of the Contractor. The Contractor is also responsible for reporting all spills larger than 100 litres of flammable liquids to the Provincial Emergency Program (PEP) of the Ministry of the Solicitor General.

- Waste fuel, oil, solvents, and other petroleum products shall be disposed off site at a location that is approved by regulatory authorities.
- All vehicles involved in the gravel extraction, including but not limited to excavators, bull dozers, trucks, and pick-up trucks, shall be equipped with a spill response kit with a supply of oil absorbent material.

9.0 Spill Response Plan

During operations, the Construction Supervisor and associated contractors will:

- Ensure all equipment operating on the work site is equipped with absorbent spill pads.
- Ensure all employees are familiar with spill response protocol and ensure a copy of this Spill Response Plan is accessible to all persons on-site.
- Ensure proper spill containment material is in place (e.g., absorbent pads, booms).
- Ensure all employees are familiar with spill kit locations, function, and use.

9.1 Emergency Action Plan - Spills to Land

1. **Identify** the nature of emergency:
   a. Any injuries?
   b. Is it safe?
   c. Do we need special safety or protective gear?

2. **Locate** source, area of risk, and potential for escalation.
   a. Tank volume?
   b. **Notify** fire department and PEP if spill is gas or flammable liquid.
   c. **Suppress** fires
   d. Use foam not water.

3. **Protect** personnel, property, and the environment.
   a. Evacuate if necessary.
   b. Shut down operations if necessary.

4. **Contain** spill at source or downstream and **stop** release.
   a. Construct berms and/or ditches.
   b. Use absorbent products.

5. **Recover** product.
   a. Use absorbent products.

6. **Clean up** site.
   a. Remove contaminated soil and place in a water tight container for removal by a certified hazardous material disposal company.
   b. Cover the affected area with a waterproof plastic membrane.
   c. Use photos, notes, and samples to document clean-up.
   d. Get approval for contaminated soil disposal.

7. **Report**.
   a. Report all spills to Emergency Coordinator and Environmental Monitor
   b. Report spills greater than 100 L to PEP (1-800-663-3456).

9.2 Emergency Action Plan - Spills to Water

1. **Identify** the nature of emergency:
   a. Any injuries?
   b. Is it safe?
   c. Do we need special safety or protective gear?

2. **Locate** source, area of risk, and potential for escalation.
   a. Tank volume?
   b. **Notify** fire department and PEP if spill is gas or flammable liquid.
   c. **Suppress** fires
   d. Use foam not water.

3. **Protect** personnel, property, and the environment.
   a. Evacuate if necessary.
   b. Shut down operations if necessary.

4. **Identify** extent of spill
   a. Where is spill going?
   b. Can we use tailrace, eddies, pools, or culverts to divert spill?

5. **Remove** vehicle from in stream

6. **Contain** spill, and **Stop** release.
   a. Use absorbent booms, construct berms as needed to contain spill

7. **Clean up site**
   a. Use absorbent materials
   b. Remove contaminated absorbent materials and place in a water tight container for removal by a certified hazardous material disposal company.
   c. Take photos, notes and samples to document the clean-up.

8. **Report**
   a. Report all spills to Emergency Coordinator and Environmental Monitor.
   b. The Environmental Monitor will ensure that all spills of deleterious substances to water or fish habitat are reported to DFO, and that all spills greater than 100 L are reported to PEP (1-800-663-3456).

9.3 Disposal of Contaminated Materials

Contractors are responsible for collecting and appropriate disposal of spilled material, diapers, containment booms, absorbent pads, and all other spill containment products. Prior to removing contaminated or treated soil from spill sites for disposal or other use, written approval must be obtained from the BC MOE Regional Office. This may be coordinated by a certified hazardous materials disposal company.

10.0 Bear Management

When confronted with a situation where bears are blocking access to a work site, or are feeding, sleeping or walking in or adjacent to work areas, the Construction Supervisor and their contractors are encouraged to behave in the following manner:

- Avoid creating bear situations by ensuring all food wastes, scraps, and food containers are stored and disposed of in bear proof waste disposal containers.
- If a bear is spotted in the vicinity of the work site, notify supervisor, and people working in the immediate area.
- Keep back 30 meters, and attempt to scare bear away by yelling or making noise.
- Bear proof any potential attractants that may encourage the bear to approach or continue approaching.
- Notify the EM and call the conservation officer in Pemberton at (604) 905-BEAR (2327).

11.0 Wildland Fire Prevention

The Lillooet River gravel extraction is conducted during the months of February to April, during a period of low water flows. These months are typically cold in Pemberton, and therefore there is not typically a high fire risk rating. However, fire prevention is essential to protecting the natural environment of Pemberton and the Lillooet River. The following guidelines should be followed while working on the project:

- Smoking shall be limited to designated smoking areas only.
- Smokers must ensure that cigarettes and matches are fully extinguished and discarded in an appropriate receptacle and that **no cigarette butts are discarded on site.**
- Ensure that garbage and oily rags are properly disposed of in appropriate receptacle and that refuse does not accumulate on site.
- Ensure spills of oil and other combustible material are promptly cleaned using absorbent materials and properly disposed of in appropriate receptacles.
- The EM will monitor the Canadian Fire Weather Index and communicate hazard rating to Project Supervisor.

12.0 References

BC Ministry of Environment, 2001. “Water Quality: Ambient Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments”. Accessed on January 7, 2015 from http://www.env.gov.bc.ca/wat/wq/BCguidelines/turbidity/turbidity.html#tab1.

Cascade, 2010. “Lillooet River Gravel Management, Environmental Risk Assessment”.

KWL. 2002. Engineering Study for Lillooet River Corridor. Final Report.

NHC. 2018. Lillooet River Floodplain Mapping Final Report. Prepared by Northwest Hydraulic Consultants Ltd. for the Pemberton Valley Dyking District Office. Dated 232 November 2018

NHC. 2019. Lillooet River Flood Mitigation Program- Preliminary Sediment Management Plan. Final Report. Revision No. 3. Prepared by Northwest Hydraulic Consultants Ltd. for the Pemberton Valley Dyking District. Dated March 25, 2019.

Village of Pemberton, 2012. “Noise Regulation Bylaw No. 699, 2012”. Accessed on January 7, 2016 from http://www.pemberton.ca/media/140237/699%20-%20Noise%20Regulation%20Bylaw%20-%204th%20and%20Final%20-%20June%205.pdf.