Public Works and Government Services Canada

Requisition No. _____

SPECIFICATIONS
For
Km 197.6 Townsend Creek Culvert Drainage Improvements,
Alaska Highway, BC

Project No. R.017173.322 July, 2018

APPROVED BY:

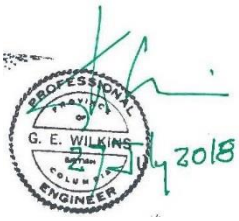
Aug. 02-2018
Alaska Hwy Program Manager, IAM Date

2018-08-02
Construction Safety Coordinator Date

TENDER:

Aug 1-2/18
Project Manager Date

Real Property Services Branch, Professional and Technical Services, Pacific Region
219 - 800 Burrard Street, Vancouver, B.C. V6Z 0B9



APPENDICES

REFERENCE DOCUMENTATION

Standards and Best Practices for Instream Works, British Columbia Ministry of Land and Air Protection Ecosystem Standards and Planning Biodiversity Branch – March 2004.
Available online at:
http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf

Land Development Guidelines for the Protection of Aquatic Habitat, Fisheries and Oceans – September 1993.
Available online at:
http://www.dfo-mpo.gc.ca/Library/165353.pdf

Manual of Standard Traffic Signs & Pavement Markings, BC Ministry of Transportation and Highways – September 2000
Available online at:
http://www.th.gov.bc.ca/publications/eng_publications/electrical/most_pm.pdf

BC Ministry of Transportation and Infrastructure, 2015 Interim Traffic Management Manual for Work on Roadways and applicable Amendments available at time of tender closing.
Available online at:
http://www2.gov.bc.ca/gov/content/transportation/transportation-infrastructure/engineering-standards-guidelines/trafficmanagementmanual

2016 Standard Specifications for Highway Construction, BC Ministry of Transportation and Infrastructure – July 1, 2016 – Volume 1 and 2 and applicable Amendments available at time of tender closing.
Available online at:
http://www2.gov.bc.ca/gov/content/transportation/transportation-infrastructure/engineering-standards-guidelines/standard-specifications-for-highway-construction

BC Ministry of Transportation and Infrastructure, Recognized Product List.
Available online at:
http://www2.gov.bc.ca/gov/content/transportation/transportation-infrastructure/engineering-standards-guidelines/recognized-products-list

Public Works and Government Services Canada – Acquisition Forms
Available online at:
http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/formulaires-forms-eng.html

British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) Section 11 Approval for Instream Work
Note: to be provided at a future date

LIST OF CONTRACT DRAWINGS (Issued for Tender Revision)

Sheet No.	Title	Drawing Number	Revision Number
1	COVER PAGE		0
2	PROJECT LOCATION, KEY PLAN, DRAWING INDEX, LEGEND & CONTROL MONUMENTS	C001	0
3	GENERAL ARRANGEMENT	C100	0
4	PLAN / PROFILE INLET DETAILS	C101	0
5	PLAN / PROFILE OUTLET DETAILS	C102	0
6	TYPICAL SECTIONS PAGE 1 OF 2	C103	0
7	TYPICAL SECTIONS PAGE 2 OF 2	C104	0
8	OVERFLOW CULVERT REPAIR DETAILS	C105	0
9	CROSS SECTIONS STA 1+010 TO STA 1+025	C106	0
10	CROSS SECTIONS STA 1+030 TO STA 1+100	C107	0
11	CROSS SECTIONS STA 1+105 TO STA 1+115	C108	0
12	CROSS SECTIONS STA 1+120 TO STA 1+125	C109	0

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Order of Precedence.

1.2 Work Covered by Contract Documents.

1.3 Codes.

1.4 Contractor's Use of Site.

1.5 Owner Supplied Materials (Outside Limit of Work).

1.6 Use of Owner Quarries

PART 2:

2.1 Products

PART 3:

3.1 Site Inspection.

3.2 Work Completion.

3.3 Special Precautions.

3.4 Survey.

3.5 Contract Drawings.

3.6 Electronic Contract Drawings.

3.7 Contract Submittals.

3.8 Supervisory Personnel.

3.9 Work by Others.

1.1 Order of Precedence

.1 In the event of any discrepancy or conflict, order of precedence shall be in accordance with GC1.2.2 – Order of Precedence and as follows:

.1 The Division 1 Sections of these Specifications take precedence over the other sections of the Specifications.

.2 In the event that two or more plans show conflicting information, the information on the most recently

dated plan shall govern.

.3 If conflict arises between an item in the main body of these Specifications (Division 1 – Division 33) and an item found in one of the Appendices (Reference Documents), the main body of the Specifications (Division 1 – Division 33) shall govern.

.4 Any technical and manufacturer's standard, Government Act, Regulation or Code of practice referred to in the Contract documents shall be the version current at the time of tender closing.

1.2 Work Covered by Contract Documents

.1 The project includes installation of one new culvert, modifications to an existing culvert and repairs to two existing culverts. The site is located at the Townsend Creek crossing at Km 197.6 on the Alaska Highway between Fort St. John and Fort Nelson, BC.

For reference, Dawson Creek is at Km 0, Fort St. John is at approximately Km 75, Fort Nelson is at approximately Km 455, and Watson Lake is at approximately Km 986 on the Alaska Highway.

.2 The work under this contract generally comprises of the following but is not limited to:

.1 Contract submittals (using CentralCollab) prior to and during the work (see Contract Specifications Section 01 33 00 – Submittal Procedures and Section 01 25 20 – Mobilization and Demobilization, Item 2.8 – Contract Submittals).

.2 Traffic control for the duration of the works, including the installation and removal of temporary barriers, privacy fence and signage (as required).

.3 Quality Management.

.4 Development of construction access and temporary berms to facilitate construction in the dry, including restoration of the disturbed areas following completion of the construction.

.5 Installation of one 3200 mm diameter (or larger) Steel Pipe Culvert (complete with fish baffles and Natural Substrate) using trenchless technologies. Culvert installation via cut and cover construction techniques will not be accepted.

.6 Line existing 1800 mm diameter Corrugated Steel Pipe (CSP) with a 1200 mm diameter Steel Pipe Liner,

including backfilling of void space between 1800 mm diameter CSP and 1200 mm Steel Pipe Liner with Concrete in accordance with the Contract Drawings and to the satisfaction of the Departmental Representative.

.7 Repair / Reattach Existing dual 900 mm diameter CSP Overflow Culvert Inlets and Outlets in accordance with the Contract Drawings and to the satisfaction of the Departmental Representative.

.8 Regrading, excavation, and offsite disposal associated with the construction of drainage channels and supply and placement of Riprap erosion protection. Removal and disposal of gabion mats as indicated on the Contract Drawings. Temporary stockpile of gabion mat rock fill onsite for later reuse as Riprap Infill.

.9 Supply of temporary pumps and construction of berm and implementation of other measures as necessary to complete the work in the dry.

.10 Restoration to pre-construction conditions and Hydraulic Seeding of all disturbed areas.

.11 Surveys (construction layout, payment quantities, as-built survey, and others as required).

.12 Environmental protection.

.13 Work completed by Change Order (if required and approved by Departmental Representative).

1.3 Codes

.1 Meet or exceed requirements of:

.1 Contract Documents;

.2 Specified standards, applicable legislation, codes, and referenced documents; and,

.3 Other codes of Local, Provincial, or Federal application (in the case of conflict or discrepancy, the more stringent requirements shall apply).

.2 Perform all instream work and riparian work in accordance with the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) Section 11 Approval for Instream Work, and the contract requirements.

1.4 Contractor's Use of Site

.1 Restrict work to within the limits construction footprint shown on the Contract Drawings and as agreed to by the Departmental Representative.

.2 Any additional areas required by the Contractor outside the lands owned by the Departmental Representative and designated for use on this project, shall be the Contractor's responsibility to organize. Any costs associated with the use of these additional lands shall be the Contractor's responsibility.

.3 Assume full responsibility for protection and safekeeping of products under this contract.

1.5 Owner Supplied Materials (Outside Limits of Work)

.1 PWGSC is providing access to Trutch Quarry (Km 310 of the Alaska Highway, 8 km haul from highway) in-situ materials.

.1 Various sizes of riprap may be available for use by the Contractor as riprap or the Contractor may have to manufacture riprap from the in-situ materials. The Contractor will be responsible for sorting through and stockpiling rock and selecting the appropriate rock size or manufacturing the appropriate rock size (see Section 31 37 00 – Riprap for more details).

1.6 Use of Owner Quarries

.1 The Contractor's use of PWGSC's quarries for the purposes of material storage and extraction / manufacture of rock, as listed elsewhere within the Contract Specifications, shall be subject to the following:

.1 Other Contractors may be working in the quarries completing similar or different types of work. Coordination with these other Contractors may be required.

.2 Laydown areas for equipment and stockpiles may be restricted due to other works ongoing or the existing size of the gravel pits.

.3 The Contractor is responsible to provide all equipment required to excavate, manufacture (as necessary), load, and haul the material from PWGSC's quarries.

.4 Should the Contractor choose to undertake blasting operations within the quarries for the purposes of material extraction, permitting requirements for blasting shall be the responsibility of the Contractor.

.5 The security of equipment parked and material manufactured and stockpiled in the quarries along with the safety of the Contractor's personnel remains the Contractor's responsibility.

.6 The Contractor shall be responsible for maintaining

access roads into the quarry and for haul roads required to access the material sources for the duration of the project. At a minimum, developing and maintaining access may include grading and snow removal. At the conclusion of the works all access roads and haul roads shall be left in equal or better condition than prior to commencement of the project.

PART 2 – PRODUCTS

2.1 Products .1 Not used.

PART 3 - EXECUTION

3.1 Site Inspection .1 Submission of tender is deemed to be confirmation that the Contractor has inspected the site and is conversant with all conditions affecting execution and completion of the work.

3.2 Work Completion .1 Preparation of required submittals to commence immediately upon receipt of notice to proceed and to be completed prior to commencement of work (unless specified otherwise).

.2 Achieve Substantial Performance by October 31, 2018.

.3 Achieve Completion by November 7, 2018.

.4 The instream construction on this project shall be completed within the dates indicated on the FLNRORD Section 11 Approval and "DFO Authorization for Instream Work". Approval to complete instream works outside of these dates can only be provided by FLNRORD. It will be the Contractor's responsibility to apply for and receive these additional approvals should it be required.

.5 Works may need to be temporarily shut down during high flow, heavy rain events, or other adverse weather conditions. The works may be stopped by the following processes:

.1 The Contractor with approval from the Departmental Representative shall suspend works should the stream water level or poor weather conditions adversely affect the Contractor's ability to achieve the Contract Specifications for quality of work.

.2 The Contractor's Environmental Monitor with approval from the Departmental Representative may suspend work should they feel it is not be possible to achieve the environmental requirements.

.3 The Departmental Representative in conjunction with

British Columbia Ministry of Environment and Climate Change Strategy (MoE) may suspend instream works should they feel that it is not possible to achieve the environmental requirements or the Contract Specifications for quality of work.

.6 Regardless of who suspends the work, the Contractor will be responsible for maintaining the site and protecting the works throughout the suspension period to ensure the site is in a safe and acceptable condition for the public.

.7 The Contractor shall account for the possibility of not being able to complete work due to high water flows or adverse weather conditions in their construction schedule and unit prices. No payment for temporary work stoppages due to high water flows or adverse weather conditions will be made.

3.3 Special Precautions

.1 The Contractor's attention is drawn to the possibility of impacting utilities (e.g. fibre optic cables) within the limits of work. The Contractor shall confirm the locations of all such utilities. All costs for utility locates shall be incidental to the work. The Contractor shall notify the Departmental Representative should utilities be located in areas other than those shown on the drawings or if they conflict with the construction, and await instructions from the Departmental Representative before proceeding with work in the vicinity of such encountered services and utilities.

.2 Relocation of the existing fibre optic utility will be undertaken by others prior to the commencement of the project work. The existing fiber optic conduit and cable shown on the drawings will be abandoned and a new fiber optic conduit and cable will be installed beyond the limits of work. See Contract Specifications Section 01 14 00 – Work Restrictions, Access Development, Construction Staging, and Restoration, Item 1.3 – Utilities for further details.

.3 Existing road surface, structures, signs, utilities, asphalt, culverts, gabion mats, and all other structures, services, piping or equipment within the limits of work shall be properly protected from any injury or damage, direct or indirect. Any damage that is caused as a result of the operations of the Contractor shall be repaired and made good at the Contractor's expense, to the satisfaction of the Departmental Representative.

3.4 Survey

.1 The Contractor shall be responsible for all layout surveys to complete the work per the design lines and grades, survey of construction for measurement for payment (see Section 01 29 00 – Payment Procedures), and As-Built surveys (see Section 01 78 00 – Closeout Submittals). All surveys shall be

in accordance with the following:

.1 Be collected to an accuracy of +/-0.02 m horizontal and +/-0.02 m vertical or better and shall be referenced / tie into PWGSC's monument / coordinate system as shown on the Contract Drawings.

.2 Use industry standards, methods, equipment, and the survey requirements of Section 01 29 00 – Payment Procedures, and other approaches (if necessary) as pre-approved by the Departmental Representative.

.2 Unless specified otherwise in the Contract Specifications, all layout surveys and quantity surveys shall be considered incidental to the work and not measured for payment.

.3 The Contractor shall utilize a qualified registered surveyor licensed to practice in British Columbia, acceptable to the Departmental Representative, to perform all the required surveying on the project. Name and address of selected surveyor to be submitted to Departmental Representative prior to commencing onsite works.

.4 Report any discrepancies between project survey control monuments, Contract Drawings, and existing conditions to the Departmental Representative as soon as they are discovered. Should a discrepancy be found, await written approval from the Departmental Representative prior to proceeding.

.6 Establish / layout the proposed alignment(s) and grades using paint lines and survey stakes based on working control points and survey control monuments provided.

.7 The Departmental Representative may elect to verify surveys. Verification of the survey by the Departmental Representative does not abdicate the Contractor's responsibility for the correctness and accuracy of the survey.

.8 Maintain a complete, accurate log of control and survey work as it progresses. On request of the Departmental Representative, submit documentation to verify the accuracy of the field engineering work.

.9 The Contractor shall regularly monitor the condition of the Work Site and of property on and adjoining the Work Site throughout the construction period, and shall immediately notify the Owner if any deterioration in condition is detected. Such monitoring shall cover all pertinent features and property including, but not limited to, buildings, structures, roads, walls, fences, slopes, sewers, culverts and landscaped areas.

.10 The Departmental Representative may, but shall not be obligated to, survey and record the condition of the Work Site and of property on or adjoining the Work Site prior to the commencement of construction by the Contractor. If a survey is undertaken and if requested by the Contractor, the Departmental Representative will provide a copy of the survey records to the Contractor for reference.

.11 Whenever supplied with survey records, the Contractor shall satisfy itself as to the accuracy and completeness of the survey records provided by the Departmental Representative for any area before commencing construction in that area. Commencement of construction in any area shall be interpreted to signify that the Contractor has accepted such survey records as being a true record of the existing conditions prior to construction.

.12 The provision of the records of a survey of existing conditions by the Departmental Representative shall in no way limit or restrict the Contractor's responsibility to exercise proper care to prevent damage to all property within or adjacent to the Work Site, whether or not all such property is covered by the survey.

3.5 Contract Drawings

.1 Upon award of the project, PWGSC will at the request of the successful Contractor provide the successful Contractor with up to 2 × 609.6 mm × 914.4 mm (24" × 36") and 4 × 279.4 mm × 431.8 mm (11" × 17") "Issued for Construction" or "Issued for Tender" hard copy contract drawing sets. Preparation and plotting of the hard copy drawing sets may take PWGSC up to 14 days to prepare (excluding shipping).

.2 Upon award of the project, PWGSC will provide the successful Contractor with a digital PDF version of the "Issued for Construction" or "Issued for Tender" Contract Drawings. Preparation of the PDF drawing file may take PWGSC up to 14 days to prepare.

3.6 Electronic Contract Drawings

.1 If requested by the Contractor, the Departmental Representative will provide the Contractor with available Contract Drawings in electronic format for the Contract to reference throughout the work.

.2 The format and software of the Electronic Contract Drawings shall be at the Departmental Representative's discretion.

.3 The Departmental Representative accepts no responsibility for the accuracy or completeness of the Electronic Contract Drawings. Should the Contractor choose to reference the

Electronic Contract Drawings, the Contractor shall satisfy itself as to the accuracy and completeness of the Electronic Contract Drawings before commencing construction. Should a discrepancy between the Electronic Contract Drawings and the hard copy Contract Drawings be discovered (at any time during the work), the hard copy Contract Drawings shall govern. The Contractor will be responsible for all costs associated with any corrections to ensure the work is in conformance with the hard copy Contract Drawings. The Departmental Representative shall not be responsible for updating or correcting any discrepancies between the Electronic Contract Drawings and the hard copy Contract Drawings identified by the Contractor.

3.7 Contract Submittals

.1 Complete and submit for the Departmental Representative's review, all required Contract Submittals as detailed in the relevant sections of the Contract Specifications. Work affected by the Contract Submittals shall not proceed until the applicable submittal is received and accepted by the Departmental Representative. Allow for submittal review periods as required for each submittal and as detailed in Section 01 33 00 – Submittal Procedures. Required submittals include but are not limited to the following:

.1 Project Schedule (see Section 01 32 16).

.2 Traffic Management Plan (see Section 01 35 00).

.3 Health and Safety Plan (see Section 01 35 33).

.4 Environmental Protection Plan (see Section 01 35 43).

.5 Quality Management Plan and related Quality Management documentation (see Section 01 45 00).

.6 As-built Survey, and As-built Drawing mark-ups, and if applicable, Shop Drawing mark-ups (see Section 01 78 00).

.7 Shop Drawings (if applicable, including professional seal for design work required).

.8 Preliminary Hazard Assessment Form (Appendix A).

.9 Confirmation of Prime Contractor's Main Responsibilities Under the WorkSafeBC Occupational Health and Safety Regulations and Worker's Compensation Act form (Appendix B).

3.8 Supervisory Personnel

.1 Within five days of contract award notification, the Contractor shall submit to the Departmental Representative confirmation

of the names of the supervisory personnel and other key staff designated for assignment on the Contract. At a minimum the following personnel shall be included on the list:

.1 Project Superintendent.

.2 Deputy Project Superintendent.

.3 Health and Safety Coordinator.

.4 Quality Control Manager.

.5 Environmental Monitor.

.2 The above personnel shall perform the following duties:

.1 Project Superintendent: shall be employed full-time and shall be present on the Work Site each and every work day that Work is being performed, from the commencement of work, to Substantial Performance and Completion of the Work.

.2 Deputy Project Superintendent: shall have the authority of the Project Superintendent during the latter's absence for short periods of time.

.3 Health and Safety Coordinator: shall possess safety experience in general construction. Duties shall encompass all matters of safety activities from commencement of work until Substantial Performance and Completion of the Work (see Section 01 35 33 – Health and Safety for further requirements).

.4 Quality Control Manager: shall be experienced in Quality Management, dedicated to quality matters from commencement of work until Substantial Performance and Completion of the Work, and remain onsite at all times the Contractor is performing work which must be tested or inspected in-process (see Section 01 45 00 – Quality Management for further requirements).

.5 Environmental Monitors: shall be a P.Biol, RPBio or Qualified Environmental Professional (QEP) (see Section 01 35 43 – Environmental Protection for further requirements).

3.9 Work by Others

.1 The Contractor is advised that utility relocations within the limits of the work may be undertaken by others before work on this project commences. See Section 01 14 00 - Work Restrictions, Access Development, Construction Staging, and

Restoration for further details.

END OF SECTION

PART 1 – GENERAL

Section Includes PART 1:

1.1 Use of Work Site.

1.2 Work Conducted in and Adjacent to Waterways.

1.3 Utilities.

1.4 Protection of Persons and Property.

1.5 Use of Public Areas.

1.6 Construction Signage.

1.7 Access Development.

1.8 Construction Staging.

1.9 Restoration.

1.1 Use of Work Site

.1 The Work Site will be specified by the Departmental Representative and shall only be used for the purposes of the work. The Work Site will be made available to the Contractor for its exclusive use for the duration of the work, unless otherwise specified in the Contract Documents.

.2 The Contractor's office trailer may be set up in the locations identified in Section 01 52 00 – Construction Facilities. The Contractor's construction camp may be set up in the locations identified in Section 01 59 10 – Construction Camp.

.3 While the Work Site is under the Contractor's control, the Contractor shall be entirely responsible for the security of the Work Site and of the work.

.4 The Contractor shall keep the Work Site clean and free from accumulation of waste materials and rubbish regardless of the source. Snow/ice shall be removed by the Contractor as necessary for the performance and inspection of the work.

.5 The Contractor shall provide sanitary facilities for the work force in accordance with governing regulations and the Environmental Procedures for this project. The Contractor shall post notices and take such precautions as required by local health authorities and keep area and premises in sanitary condition.

.6 Any damage to the Work Site caused by the Contractor shall be repaired by the Contractor at the Contractor's expense.

.7 The Contractor may complete onsite highway work during daylight hours only, seven days per week with the following restrictions.

.1 Work in excess of 12 hrs per day shall require pre-approval from the Departmental Representative. At a minimum, pre-approval shall require a plan from the Contractor to ensure all necessary QC work per the contract requirements is completed during all times of work. The Departmental Representative may withdraw approval for the extended work hours at any time should the Contractor fail to achieve all necessary QC requirements or any other contractual requirement as a result of the extended work hours.

.2 Request for approval to work in excess of 12 hrs per day must be submitted in writing to the Departmental Representative a minimum of five (5) days in advance of the planned change in working hours.

.3 No hauling of material during inclement weather.

1.2 Work Conducted in and Adjacent to Waterways

.1 All components of the work shall be conducted in accordance with Section 01 35 43 – Environmental Protection.

1.3 Utilities

.1 There are active utilities within the highway right-of-way. The Contractor shall be responsible for all utility locates.

.2 The locations of utilities shown on the Contract Drawings are not necessarily exact nor is there any guarantee that all utilities in existence within the limits of the Work Site have been shown on the Contract Drawings.

.3 Prior to the commencement of onsite work, the existing fiber optic line shown on the drawing will be abandoned and a new fiber optic cable will be placed on the native ground surface outside the limits of the work. The Contractor shall take necessary precautions to ensure this temporary fibre optic cable is not damaged by the works.

.4 If it is determined by the Departmental Representative that utilities are affected by the permanent work, the utilities will be relocated by Other Contractors. The Contractor shall cooperate and coordinate as required with Other Contractors engaged in utility relocation operations on the Work Site.

.5 The Contractor shall notify the Departmental Representative

and the utility companies at least seven (7) days in advance of any activities which may interfere with the operation of such utilities.

.6 Whenever working in the vicinity of utilities, the Contractor shall locate such utilities and expose those that may be affected by the work, using hand labour as required.

.7 The Contractor shall assess the possible impact of its operation on all utilities and shall protect, divert, temporarily support or relocate, or otherwise appropriately treat such utilities to ensure that they are preserved.

.8 The Contractor shall immediately report any damage to utilities to the Departmental Representative and to the utility company or authority affected, and shall promptly undertake such remedial measures as are necessary at no additional cost to the Owner.

1.4 Protection of Persons and Property

.1 The Contractor shall comply with all applicable safety regulations of WorkSafeBC including, but not limited to, Workers Compensation Act, Occupational Health and Safety Regulations, Industrial First Aid Regulations, and Workplace Hazardous Materials Information System Regulations (see Section 01 35 33 – Health and Safety for additional requirements).

.2 The Contractor shall take all necessary precautions and measures to prevent injury or damage to persons and property on or near the Work Site.

.3 The Contractor shall promptly take such measures as are required to repair, replace or compensate for any loss or damage caused by the Contractor to any property.

1.5 Use of Public Areas

.1 Off-road construction equipment (equipment which exceeds legal highway load limits or dimensions) will not be allowed on the Alaska Highway. Steel tracked equipment with cleats will not be allowed on the asphalt concrete pavement driving surface unless appropriate measures have been taken to protect the asphalt concrete pavement from the cleats. Any damage to the asphalt concrete pavement caused by the Contractor's tracked equipment shall be repaired to the satisfaction of the Departmental Representative at the Contractor's expense.

.2 The Contractor shall ensure that its vehicles and equipment do not cause nuisance in public areas. All vehicles and equipment leaving the Work Site and entering public roadways shall be cleaned of mud and dirt clinging to the body and wheels of the vehicle. All vehicles arriving at or leaving the Work Site and

transporting materials shall be loaded in a manner which will prevent dropping of materials or debris on the roadways, and, where contents may otherwise be blown off during transit, such loads shall be covered by tarpaulins or other suitable covers. Spills of material, including rocks and debris from loaded trucks, shall be removed or cleaned immediately by the Contractor at no cost to the Owner. All activities shall be in accordance with Section 01 35 43 – Environmental Protection and the Environmental Protection Plan prepared by the contractor for the project. Hauling units on Alaska Highway are not to exceed legal highway load limits or dimensions. The traveled lanes of the Alaska Highway shall remain a Public Highway subject to the rules and laws of Public Highways in the Province of British Columbia. The Contractor is responsible for ensuring all equipment accessing the Highway meets all requirements for vehicles traveling on Public Highways in the Province.

1.6 Construction Signage

.1 No Signs or advertisements, other than regulatory or warning signs, PWGSC supplied signage, and portable electrically illuminated message signs are permitted on site.

.2 Signs and notices for Safety and instruction shall be provided by the Contractor (see Section 01 35 00 – Special Procedures – Traffic Control for additional details).

.3 Maintain approved signs and notices in good condition for duration of Project, and dispose of off-site on completion of Project or earlier as directed by the Departmental Representative.

.4 Signage shall be coordinated with other Contractors working in the area as needed.

1.7 Access Development

.1 The Contractor is required to develop access to the required work areas. The Contractor is fully responsible for the selection and implementation of all methods to accomplish this requirement. Any access roads or trails extending outside the limits of the work shall be submitted to the Departmental Representative for approval on the Construction Staging / Traffic Management Drawings. All construction access shall be completed in conformance with the requirements of Section 01 35 43 – Environmental Protection and the Contractor's Environmental Protection Plan.

.2 Construction equipment shall not be allowed on the existing gabion mats not designated for removal as part of the project work.

1.8 Construction Staging

.1 The Contractor shall stage the work ensuring that:

.1 All design requirements as specified in the Contract Drawings, contractor prepared Shop Drawings, and Contract Specifications are achieved.

.2 All requirements of Section 01 35 00 – Special Procedures – Traffic Control are achieved.

.3 All requirements of the Section 01 35 43 – Environmental Protection and the Contractor's Environmental Protection Plan (EPP) are achieved. This includes submission of the Contractor's EPP to the Departmental Representative in sufficient time to allow for review and re-submission if necessary and then submission by the Departmental Representative to Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) to complete the environmental Approval / permitting process. As noted in Section 01 35 43 – Environmental Protection, item 1.4 – Regulatory Overview, the review of the Contractor's EPP by FLNRORD can take up to 20 days and no work within 30 m of the watercourse can commence until the environmental Approval / permitting process is complete.

.4 The work is completed in accordance with the Substantial Performance and Completion Dates provided in Section 01 11 10 – Summary of Work.

.5 All trenching and access to complete the repairs to the existing overflow culverts (inlets and outlets) shall be staged per the requirements of the P.Eng. engaged by the Contractor to ensure trench slopes are suitable for access (see Section 31 23 33 – Excavation and Backfill for further details).

The Contractor is fully responsible for the selection and implementation of all methods to accomplish this requirement.

1.9 Restoration

.1 Remove access points, roads, detours, laydowns areas, pads, and all other works installed during access development and construction staging. Re-instate the worksite to a condition equal to or better than the site condition prior to construction by:

.1 Restoring organic soils (if removed or damaged during access development or other works).

.2 Eliminating uneven areas and low spots.

.3 Restoring existing and proposed drainage patterns as shown on the Contract Drawings.

.4 Removal of all gravels, other materials, or structures placed to create access points, roads, detours, or pads. Dispose of gravels, other materials, or structures at an off-site disposal facility acceptable to the Departmental Representative.

.5 Hydraulically Seed all disturbed areas and areas designated for Hydraulic Seeding, in accordance with Section 32 93 21 – Hydraulic Seeding.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Definitions.

1.2 Measurement and Payment Procedures.

1.1 Definitions

.1 Mobilization and Demobilization: Consists of preparatory work and operations, including but not limited to:

.1 Preparation and acceptance of submittals (Construction Schedule, Traffic Management Plan, Quality Management Plan, Environmental Protection Plan, Construction Staging Plans, Site Specific Health and Safety Plan, and any other submittals required prior to starting work).

.2 Work and costs incurred necessary for the movement of personnel, equipment, supplies and incidentals to / from the work site.

.3 Work and cost incurred in the establishment and operation of offices, and other facilities necessary to undertake the work.

.4 Work and costs incurred in project completion and clean-up.

.5 All other work and costs incurred in the successful completion of Mobilization and Demobilization.

1.2 Measurement and Payment Procedures

.1 Payment for Mobilization and Demobilization will be made on the basis of the Price per Unit Bid for Mobilization and Demobilization in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs associated with the items of work listed in Item 1.1 Definitions above.

.2 Measurement for Payment for completion of Mobilization and Demobilization will be made at the Lump Sum price and will be scheduled as follows:

.1 50% of the Lump Sum bid price to a maximum of 5% of the Total Tender price at the beginning of construction after the Contractor's required submittals (including Construction Schedule, Traffic Management Plan, Quality Management Plan, Environmental Protection Plan, Construction Staging Drawings, and any other submittals noted in the specifications as being required prior to starting work) have been submitted for

review and accepted, and work onsite has commenced to the satisfaction of the Departmental Representative. Should the Departmental Representative allow the work to start prior to submission or acceptance by the Departmental Representative of any of submittals listed above, the Departmental Representative may choose to hold back a minimum of 5% of the 50% Mobilization & Demobilization payment for each outstanding submittal until an acceptable submission is provided.

.2 50% once the project has achieved "Completion" and all equipment has been demobilized from the site, the site has been cleaned to the satisfaction of the Departmental Representative, remaining deficiencies identified during final inspection (Section 01 77 00 – Closeout Procedures) are corrected, and all closeout submittals are provided and accepted by the Departmental Representative.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Terms of Payment.

1.2 Basis of Payment.

1.3 Survey.

1.1 Terms of Payment

.1 The Project's Terms of Payment shall be per General Conditions (GC) 5 – Terms of Payment. Progress payments shall be submitted by the Contractor on a monthly basis unless accepted otherwise by the Departmental Representative. The progress payment shall use PWGSC's Request for Progress Payment – Construction Contracts form: PWGSC-TPSGC 1792, found online (see link to Public Works and Government Services – Acquisition Forms within the Reference Documentation section of the Table of Contents for link).

With each progress payment, provide to the Departmental Representative:

.1 Documentation required by General Conditions (GC) 5 – Terms of Payment.

.2 WorkSafeBC Clearance Letter, indicating the Contractor is in active and good standing per the end date of the progress payment in accordance with Section 51 of the Workers Compensation Act (Departmental Representative may waive this requirement).

1.2 Basis of Payment

.1 Basis of payment shall be per the Measurement and Payment Procedures in the applicable Contract Specification Section. Where not specified, basis of payment for all work included in these specifications or Contract Drawings not specifically mentioned is considered incidental to other work and is part of the Total Contract Amount. No additional payment will be made for incidental work.

.2 Payment for work shall be made per the Price per Unit as shown in the Unit Price Table.

.3 For Unit Price Items in the Bid and Acceptance Form, progress payments shall be made based on the quantities of work in place (completed), compacted (if required), surveyed, and accepted by the Departmental Representative in the field. Provide survey data at each stage of construction for each Unit Price Item to the Departmental Representative prior to payment for approval.

.4 For lump sum items in the Bid and Acceptance Form, progress payments shall be made based on the percent of work completed and accepted by the Departmental Representative at the time of the monthly progress payment (Excluding Mobilization and Demobilization which is paid per 1.2 of Section 01 25 20 – Mobilization and Demobilization).

.5 The Contractor must support any claims for products purchased, manufactured, or delivered to the place of work but not yet incorporated into work. The support for such claims must include such evidence as may be required by the Departmental Representative to establish value and the percentage of the work completed.

.6 Any work called for in the Contract Specifications or shown on the Contract Drawings but not specifically mentioned as an item for which payment will be made, will be considered incidental to the items of work listed. No additional payment will be made for this incidental work.

.7 All equipment, materials, and labour necessary to complete any item of work shall be included in the cost of that work.

.8 Measurement for Payment will be based upon survey data collected by the Contractor. Materials shall be excavated or placed within the specified tolerances of the design grades but not uniformly high or low. Materials excavated or placed outside the specified tolerances will not be measured for payment unless pre-approved by the Departmental Representative.

.9 Measurement for Payment will be at the Departmental Representative's discretion using one or more of the following methods:

.1 Based upon the survey data collected by the Contractor: when the materials have been excavated or placed within the specified tolerances of the design lines and grades shown on the Contract Drawings but not uniformly high or low.

.2 Based upon the survey data collected by the Contractor: when the Contractor's or Departmental Representative's survey data indicates that less material was excavated or placed than called for by the design lines and grades on the Contract Drawings.

.3 By the design grade / design drawing neat lines: when the Contractor's or Departmental Representative's

survey data indicates that materials were excavated or placed outside / beyond the specified tolerances of the design lines and grades on the Contract Drawings.

1.3 Survey

.1 Surveys shall be undertaken by the Contractor to verify quantities for payment purposes. The length of culvert and culvert liner installed as part of the works will be determined through the use of a post-construction survey. The survey shall be considered incidental to the work and not measured for payment.

.2 All quantity surveys and quantity calculations for the purposes of progress payments shall be completed by a Professional Engineer, an Applied Science Technologist or Certified Engineering Technician, or other qualified surveyor, with the knowledge, skills and abilities acceptable to the Departmental Representative. The surveyor or person(s) used for this task shall have a minimum of 5 years' experience working on projects of similar size, scope and cost. A resume detailing this experience shall be provided to the Departmental Representative for review and acceptance if requested.

.3 Survey data collected shall be of sufficient density to fully characterize the work. Survey methods and location of surveyed cross sections is subject to prior approval of the Departmental Representative. At a minimum the Contractor shall survey the location of all treatment boundaries including changes in material type / placement, changes in surface treatment, and changes in the terrain.

.4 A survey of the existing ground surface, stream channel, and existing infrastructure, shall be undertaken by the Contractor prior to initiation of construction. The survey shall be provided to the Departmental Representative for review and acceptance. Additionally, during construction no material shall be placed unless the applicable surveys on the existing surfaces have been carried out and the data accepted by the Departmental Representative, and the completed surface has been inspected and accepted by the Departmental Representative.

.5 Survey data shall be collected at an accuracy of +/-0.02 m horizontal and +/-0.02 m vertical or better and shall be referenced to PWGSC's survey control monuments / coordinate system as shown on the Contract Drawings.

.6 Survey data shall be provided to the Departmental Representative in digital xyz format with an appropriate descriptor code as to the type of material, surface, or feature being surveyed. All survey data provided to PWGSC shall tie into the survey control monuments / utilize the coordinate

system as shown on the Contract Drawings.

.7 Surveys may be subject to verification by the Departmental Representative. In case of discrepancy, the Departmental Representative's survey will govern.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Pre-Construction Meeting.

1.2 On-Site Documents.

1.3 Schedules.

1.4 Construction Progress Meetings.

1.5 Written Communication / Document Management.

1.6 Submittals.

1.7 Close-Out Procedures.

1.1 Pre-Construction Meeting

.1 Following tender closing and prior to the construction start, attend in person or via teleconference a Pre-Construction meeting organized by the Departmental Representative.

.2 Departmental Representatives and senior representatives of the Contractor, including but not necessarily limited to the Project Superintendent, Deputy Project Superintendent, Health and Safety Coordinator, Quality Control Manager, and Environmental Monitor, and major subcontractors shall attend in person or via teleconference.

.3 The Departmental Representative shall establish a time, location, and teleconference number for the meeting and notify the Contractor a minimum of five (5) days prior to the meeting. The Contractor shall notify all concerned parties of the meeting.

.4 The agenda is to include but is not limited to the following:

.1 Appointment of the official representative of participants in the work and lines of communication.

.2 Schedule of work and progress scheduling in accordance with Section 01 32 16 – Construction Progress Schedules – Bar (Gantt) Chart.

.3 If applicable, schedule of submission of Shop Drawings, etc. in accordance with Section 01 33 00 – Submittal Procedures.

.4 Requirements for temporary facilities, site signage, offices, construction camp, storage sheds, utilities, and

fencing.

.5 Delivery schedule of specified equipment in accordance with Section 01 32 16 – Construction Progress Schedules – Bar (Gantt) Chart.

.6 Site security in accordance with Section 01 52 00 – Construction Facilities.

.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.

.8 As-built drawings in accordance with Section 01 78 00 – Closeout Submittals.

.9 Take-over procedures, acceptance, and warranties in accordance with Section 01 77 00 – Closeout Procedures.

.10 Monthly progress claims, administrative procedures, photographs, and holdbacks.

.11 Contractor's Quality Management and Quality Assurance undertaken by the Departmental Representative.

.12 Contractor's Site-Specific Health and Safety Plan.

.13 Insurances and transcript of policies.

.14 Other business as required by the Departmental Representative or Contractor.

.5 Within 14 days of the Pre-Construction meeting, the Departmental Representative shall distribute meeting minutes to the Contractor. The Contractor shall review the meeting minutes and provide any comments within 5 working days.

1.2 On-Site Documents .1 Maintain at job site, one copy each of the following:

.1 Contract Drawings.

.2 Contract Specifications.

.3 Addenda.

.4 Reviewed and accepted submittals.

.5 Change orders.

.6 Other modifications to the Contract.

.7 Field test reports.

.8 Copy of approved work schedule.

.9 Manufacturer's installation and application instructions (if applicable).

.10 All permits (FLNRORD, DFO, NWPA, and/or others as required by the Contractor).

.11 Meeting minutes.

.12 Contractor's Site -Specific Health and Safety Plan.

.13 Contractor's Environmental Protection Plan (EPP).

.14 Contractor's Traffic Management Plan.

.15 One set of "Issued for Construction" Contract Drawings (or "Issued for Tender" Contract Drawings if being used for construction), Contract Specifications, and Shop Drawings for as-built purposes.

1.3 Schedules

.1 Submit preliminary construction progress schedule in accordance with Section 01 32 16 – Construction Progress Schedules – Bar (Gantt) Chart to the Departmental Representative.

.2 After review by Departmental Representative, revise project schedule to comply with comments given.

.3 During progress of work, revise and resubmit as directed by the Departmental Representative.

1.4 Construction Progress Meetings

.1 During the course of work and two weeks prior to project completion, the Departmental Representative may schedule Construction Progress Meetings.

.2 Departmental Representatives, Contractor and major subcontractors shall be in attendance, either in person or via teleconference.

.3 The Departmental Representative shall establish a time, location, and teleconference number for the meeting and notify the Contractor a minimum of three days prior to the meeting.

The Contractor shall notify all concerned parties of the meeting.

.4 The meetings may be held on-site provided teleconference capabilities are available or at PWGSC's office in Fort Nelson. If held on site, the Contractor shall provide physical space and make arrangements for the meetings.

.5 Agenda to include following:

.1 Review and approval of minutes of previous meeting.

.2 Review of work progress since previous meeting.

.3 Field observations, problems, and conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules (if applicable).

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule and project submittals.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for effect on construction schedule and on completion date.

.12 Other business.

.6 Within 14 days of the Construction Progress Meeting, the Departmental Representative shall distribute meeting minutes to the Contractor. The Contractor shall review the meeting minutes and provide any comments within 5 working days.

1.5 Written Communication / Document Management

.1 Written communication & document management shall be completed per the Written Communication / Document Management Protocol prepared by the Departmental Representative following award of the contract. The Written Communication / Document Management Protocol will resemble the template provided in Appendix C.

1.6 Submittals

.1 If applicable, submit Shop Drawings, product data and samples in accordance with Section 01 33 00 – Submittal Procedures for review for compliance with Contract Documents, field dimensions and clearances, compatibility and available space, and for relation to work of other contracts. If requested, after receipt of Departmental Representative comments, revise and resubmit.

.2 Submit requests for payment through the Departmental Representative via PWGSC's cloud based document filing system "CentralCollab". Support claims for payment with survey data and other evidence as required by the Departmental Representative.

.3 Submit requests for interpretation of Contract Documents, and obtain instructions through Departmental Representative. If required by the Departmental Representative, provide supporting documents for proposed substitutions via PWGSC's cloud based document filing system "CentralCollab".

.4 Process substitutions through Departmental Representative. If required by the Departmental Representative, provide supporting documents for proposed substitutions via PWGSC's cloud based document filing system "CentralCollab".

.5 Process change orders through Departmental Representative via PWGSC's cloud based document filing system "CentralCollab".

.6 Deliver closeout submittals for review and preliminary inspections, for transmittal to Departmental Representative via PWGSC's cloud based document filing system "CentralCollab".

1.7 Close-Out Procedures

.1 Notify Departmental Representative when work is considered ready for Substantial Performance.

.2 Accompany Departmental Representative on preliminary inspection to determine items listed for completion or correction.

.3 Comply with Departmental Representative's instructions for correction of items of work listed in executed certificate of Substantial Performance.

.4 Notify Departmental Representative of instructions for completion of items of work determined in Departmental Representative's final inspection.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Project Schedule.

1.2 Schedule Format.

1.3 Submission of Schedules.

1.4 Project Schedule Reporting During the Work.

1.1 Project Schedule

.1 Develop detailed Project Schedule conforming to the project completion dates found in Section 01 11 10 – Summary of Work and the Construction Staging requirements outlined in Section 01 14 00 - Work Restrictions, Access Development, Construction Staging, and Restoration.

.2 Ensure detailed Project Schedule includes as a minimum all relevant milestone activity types as follows:

.1 Project Award.

.2 Receipt of Necessary Permits.

.3 Submittal Schedule:

.1 Pre-Construction survey

.2 Environmental Protection Plan.

.3 Traffic Management Plan.

.4 Quality Management Plan.

.5 Site-Specific Health and Safety Plan, including MSDS sheets.

.6 Hazardous Materials Management Plan.

.7 Shop Drawings and Product Samples (if applicable).

.8 As-built Survey and As-Built Drawing Mark-ups.

.9 Test results.

.4 Mobilization.

.5 Work activities by segment / locations

.6 Interim inspections.

.7 Site Clean-up / Demobilization.

.8 Project Substantial Completion and Project Completion dates.

.3 Indicate dates for submitting, review time, resubmission time, and last date for meeting fabrication schedule.

.4 Include dates when reviewed submittals will be required from the Departmental Representative.

1.2 Schedule Format

.1 Prepare schedule in form of a horizontal Gantt bar chart.

.2 Provide a separate bar for each major item of work or operation.

.3 For submission during the work, split horizontally for projected and actual performance.

.4 Format for listings: the chronological order of start of each item of work.

.5 Include complete sequence of construction activities and identify critical path and critical path work items in identifying colour.

.6 Include dates for commencement and completion of each major element of construction.

1.3 Submission of Schedules

.1 Submit initial format of schedules within fifteen (15) days after award of Contract but in all cases prior to starting onsite work.

.2 Submit schedules in electronic format, forwarded via email to the Departmental Representative. Provide schedules as a single PDF file format document (multiple files will not be accepted).

.3 If requested submit two (2) hard copies to be retained by the Departmental Representative.

.4 The Departmental Representative will review the schedule and return any comments within ten (10) days after receipt.

.5 Resubmit finalized schedule within seven (7) days after return of review copy.

.6 Distribute copies of revised schedule to:

.1 Job site office.

.2 Subcontractors.

.3 Other concerned parties.

.7 Instruct recipients to report to Contractor within ten (10) days any problems anticipated by timetable shown in the schedule.

1.4 Project Schedule Reporting During the Work

.1 Update project schedule whenever changes to the Contractor's schedule or sequencing of the work occurs or as requested by the Departmental Representative, reflecting activity changes and completions, as well as activities in progress.

.2 Include as a baseline each line item and details from the initial project schedule accepted by the Departmental Representative at the start of the project. Indicate progress of each activity to date of schedule submission.

.3 Show changes occurring since previous submission of schedule:

.1 Major changes in scope.

.2 Activities modified since previous submission.

.3 Revised projections of progress and completion.

.4 Other identifiable changes.

.4 Provide a narrative report to define:

.1 Problem areas, anticipated delays, and impact on schedule.

.2 Corrective action recommended and its effect.

.3 Effect of changes on schedules of other Prime Contractor's.

.5 Discuss project schedule at Construction Progress Meetings, identify activities that are behind schedule and provide measures to regain slippage. If requested by the Departmental Representative, provide a schedule recovery plan with details of the approach and changes the Contractor is planning on implementing to bring the project back on schedule.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 General Requirements.

1.2 Shop Drawings and Product Data.

1.3 Samples.

1.1 General Requirements

.1 Submit to the Departmental Representative submittals listed for review. Submit with reasonable promptness (per the timelines indicated, if applicable) and in an orderly sequence so as to not cause delay in work. Failure to submit in ample time is not considered sufficient reason for an extension of contract Substantial Completion Date, and no claim for extension by reason of such default will be allowed.

.2 Unless specified otherwise or requested by the Departmental Representative, submittals shall be submitted to the Departmental Representative in electronic format via PWGSC's cloud-based document filing system "CentralCollab" (login details to be provided by Departmental Representative at time of submission following contract award). Submittals shall be named and filed on "CentralCollab" in accordance with the Written Communication / Document Management Protocol (see template Appendix C). Each submittal shall be compiled into a single PDF document (multiple files will not be accepted).

.3 The Departmental Representative will review the project submittals for accuracy against the appropriate project specifications and contract requirements, and endeavor to complete the reviews within the review time specified for each particular submittal, however a longer review period may be required. If a longer review period is required, the Contractor will be notified prior to the passing of the specified review period. Upon completion of the submittal reviews by the Departmental Representative, comments and or acceptance of the submittals will be given. Upon review by the Departmental Representative, should comments be provided, the Contractor shall revise the submittal as required and re-submit the complete revised submittal back to the Departmental Representative for review within one week (or within a time pre-approved by the Departmental Representative). The submittals will not be accepted until all comments from all reviews have been addressed to the satisfaction of the Departmental Representative. Despite acceptance of a particular submittal, the Departmental Representative reserves the right to provide additional comments to ensure the

correction of any deficiencies with particular submittals at any time during the project.

.4 Work affected by a submittal shall not proceed until the submittal is completed, reviewed, and accepted by the Departmental Representative.

.5 Present all necessary drawings, Shop Drawings, product data, samples, and mock-ups in SI Metric units.

.6 Where items or information is not produced in SI Metric units, converted values are acceptable.

.7 Review submittals prior to submission to the Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with the requirements of work and Contract Documents. Submittals not stamped, signed, dated, and identified as to a specific project will be returned without being examined and shall be considered rejected.

.8 Notify the Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents and stating reasons for deviations.

.9 Prior to any submission, verify field measurements and affected adjacent work included on the submission are coordinated.

.10 Contractor's responsibility for errors and omissions in submission is not relieved by the Departmental Representative's review of submittals.

.11 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.12 Keep one reviewed copy of each submission on -site.

1.2 Shop Drawings and Product Data

.1 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data that are to be provided by the Contractor to illustrate details of a portion of work.

.2 Indicate materials, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of work or as indicated elsewhere in the specifications. Where articles or equipment attach or connect to other articles or equipment,

indicate that such items have been coordinated, regardless of the section under which adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.

.3 Adjustments made on Shop Drawings by the Departmental Representative are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Departmental Representative prior to proceeding with work.

.4 Make changes in Shop Drawings as the Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify the Departmental Representative in writing of any revisions other than those requested.

.5 Accompany submissions with a transmittal letter, in duplicate, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each Shop Drawing, product data, and sample.

.5 Other pertinent data.

.6 Submissions shall include:

.1 Date and revision dates.

.2 Project title and number.

.3 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

.4 Contractor's stamp, signed by the Contractor's authorized representative certifying approval of submissions, verification of field measurements, and compliance with Contract Documents and requirements.

.5 Details of appropriate portions of work as applicable:

.1 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Single line and schematic diagrams.

.9 Relationship to adjacent work.

.6 Professional seal and signature of the engineer certifying approval of the work (if required).

.7 After the Departmental Representative's review and acceptance, distribute copies.

.8 Submit an electronic copy of the Shop Drawing for each requested within the specification sections. Submit hard copies as requested by the Departmental Representative.

.9 Submit electronic copies of product data sheets or brochures for requirements requested in specification sections and as requested by the Departmental Representative where Shop Drawings will not be prepared due to standardized manufacture of product.

.10 Delete information not applicable to project.

.11 Supplement standard information to provide details applicable to the project.

.12 If upon review by the Departmental Representative no errors or omissions are discovered or if only minor corrections are made, copies will be returned, and fabrication and installation of work may proceed. If Shop Drawings are rejected, noted copy will be returned and resubmission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of work may proceed.

.13 The review of Shop Drawings by the Departmental Representative is for the sole purpose of ascertaining conformance with general concept. This review shall not mean that the Departmental Representative approves the detail design inherent in Shop Drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in Shop Drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of work of all sub-trades.

.14 Work affected by Shop Drawing shall not proceed until the Shop Drawing is reviewed, and accepted by the Departmental Representative.

1.3 Samples

.1 Submit for review samples in duplicate as requested in respective specification sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's site office or to a location as directed by the Departmental Representative.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of work, state such in writing to Departmental Representative prior to proceeding with work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

.8 Work affected by the sample shall not proceed until the sample is reviewed, and accepted by the Departmental Representative.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Measurement and Payment Procedures.

1.2 References.

1.3 Definitions.

1.4 Submittals.

PART 2:

2.1 Temporary Traffic Control Devices.

PART 3:

3.1 General.

3.2 Traffic Management.

3.3 Protection of Public Traffic.

1.1 Measurement and Payment Procedures

.1 Payment for the cost of Traffic Control will be made on the basis of the Price per Unit Bid for Traffic Control and Access Development in the Bid and Acceptance Form. The Price per Unit Bid shall include the completion of the Traffic Management Plan, construction signage, traffic flaggers, pilot vehicles, temporary concrete barriers and privacy fence (if required), access development (including access points, roads, pads, etc.), restoration of all access development areas, detours (if required), and all other items necessary for the successful completion of the task.

.2 Measurement for Payment for completion of the Traffic Control and Access Development will be made by Lump Sum based on the percentage of the work completed and accepted by the Departmental Representative.

1.2 References

.1 British Columbia Ministry of Transportation and Highways.

.1 Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim)

.2 Supplement to TAC Geometric Design Guide (latest edition).

.2 Transportation Association Canada.

.1 Geometric Design Guide for Canadian Roads (latest edition).

1.3 Definitions

.1 Delay – The total amount of time vehicles are stopped by all flaggers or automated traffic control devices due to the contractors operations while driving through the limits of the work. The delay time includes the time for a vehicle to come to a stop position behind a queue of vehicles and then start moving again following a long queue of vehicles. The maximum allowable delay on this project is defined below in Sub-Section 3.2.1.8 – Traffic Management (15 minutes).

1.4 Submittals

.1 Traffic Management Plan:

.1 Submit to the Departmental Representative for review and acceptance a Traffic Management Plan. The Traffic Management Plan shall function as a standalone document, be signed/sealed by a P.Eng. and provide a complete and unambiguous plan of the traffic accommodation strategies proposed for use during the work and incorporate the following requirements.

.1 Fully integrated with the Contactor's plan, schedule, and the accepted construction staging drawings for carrying out the work.

.2 Shall provide a complete and unambiguous plan for the traffic accommodation strategies proposed for use during the work using the allowed products, strategies, layouts, and management techniques as described in Part 2 – Products and Part 3 – Execution of this specification.

.3 Shall be in accordance with Section 3: Traffic Management Plans of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim).

.4 Developed and conform with the standards for Category 2 Traffic Management Plans as defined in Section 3: Traffic Management Plans of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim). As defined by Section 3.4.2, the Category 2 Traffic Management Plan shall be developed per the requirements of Section 3.4.2 and shall be signed and sealed by a Professional

Engineer who is licensed in British Columbia and qualified and experienced in traffic management.

.5 Shall at a minimum include all headings and details as provided in the Template for Category 2 Traffic Management Plan found in Appendix C: Templates for Traffic Management Plan in the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim). PWGSC has the right to reject the Traffic Management Plan if the correct headings from this document are not used by the Contractor.

.6 Shall include procedures for the review and analysis of work zone incidents and near misses per the requirements of Section 3.6 – Analysis of Work Zone Incidents and Near Misses and for the documentation of traffic control records per the requirements of Section 3.7 – Traffic Control Records as provided in the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim).

.7 DMS message signs may be used at the Contractor's discretion. If used the messages shall be per Section 4 – Temporary Traffic Control Devices (Table 4.5 and Table 4.2) of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim). Additional messages required or anticipated to be required on the project not provided tables listed above shall be outlined in Traffic Management Plan.

.8 Shall include details of the procedures, processes, and sequencing used to determine the layout of the signs in the field and the order of installation and order of removal of the signs in the field. Refer to Section 6: Traffic Control Layouts – General Instructions of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim) for further details. At a minimum the text and figures included in Item 6.7.4 – Two-Lane, Two-Way

Roadways shall be included within the Contractor's Traffic Management Plan for reference during the work (in main body of the plan or in Appendices of the plan with reference to applicable Appendix in main body of the plan). The Contractor shall customize the details of the steps for the project as required.

.2 The Contractor's Traffic Management Plan shall be submitted to the Departmental Representative as a single PDF document (multiple files will not be accepted) for review and acceptance in accordance with the procedures outlined in Section 01 33 00 – Submittal Procedures. The Departmental Representative will review the plan (first submission and if required all subsequent re-submissions) within 14 days of submission. Upon review of the plan the Departmental Representative will do one of the following:

.1 Accept the plan.

.2 Accept portions of the plan and provide comments outlining required changes or additional information in other sections. Following completion of edits by the Contractor, the Contractor shall re-submit the complete plan for review.

.3 Reject the plan and provide comments outlining required changes or additional information needed before the plan will be reviewed in detail. Following completion of edits by the Contractor, the Contractor shall re-submit the complete plan for review.

.3 The Contractor shall allow time in the schedule for the reviews, and subsequent edits / re-submission.

.4 Work affected by the Traffic Management Plan (as determined by the Departmental Representative) shall not proceed until acceptance of the Traffic Management Plan by the Departmental Representative.

.5 The review of the Traffic Management Plan by the Departmental Representative shall not relieve the Contractor of responsibility for errors or omissions in the accepted Traffic Management Plan or of

responsibility for meeting all requirements of construction and Contract Documents or for ensuring safe and appropriate traffic management.

.6 Should deficiencies in the Contractor's Traffic Management Plan be noted following acceptance of the submittal by the Departmental Representative but during the project work, the Departmental Representative reserves the right to provide additional comments to the Contractor and require re-submission of the Traffic Management Plan to ensure the correction of any deficiencies.

.2 Other Submittals:

.1 Any other traffic control related documents such as incident reports, daily check sheets, daily reports, etc. shall be distributed to the Departmental Representative in electronic format via "CentralCollab" as discussed in Section 01 33 00 – Submittal Procedures of these specifications.

PART 2 – PRODUCTS

2.1 Temporary Traffic Control Devices

.1 Temporary Traffic Control Devices shall be in accordance with Section 4.0: Temporary Traffic Control Devices of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim) and the following requirements.

.1 If used by the Contractor, portable dynamic message signs (DMS) shall have a minimum of 3 lines with 8 characters per line (minimum 450 mm character size).

.2 Unless preapproved by the Departmental Representative, where 45 cm, 70 cm, or 90 cm cones are called for by the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim), 100 cm tubular markers shall be used.

.3 Automated Flagger Assistance Devices (AFADs) shall not be used on the project.

.2 Sign sizes used shall conform with the requirements of Appendix B.2: Sizes and Applications of Individual Signs of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim).

PART 3 – EXECUTION

3.1 General

.1 All traffic control on the project shall be undertaken in accordance with Section 1.1.3 – Applying the Principles in the Manual as defined in the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim).

.2 Responsibilities for traffic control shall be undertaken in accordance with Section 1.2.3 – Traffic Control Responsibilities of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim) and as follows.

.1 Road Authority shall be Public Works and Government Services Canada (PWGSC).

.2 Prime Contractor shall be the Contractor as defined by GC1.1.2 – Terminology.

.3 Management and site supervision shall be the responsibility of the Contractor including the:

.1 Site Supervisor / Foreman / Superintendent

.2 Traffic Control Manager; and,

.3 Traffic Control Supervisors and Traffic Control Persons.

.3 PWGSC will assist the Contractor with the Public Information Plan by notifying DriveBC of the work and posting notice of the project on PWGSC's permanent variable message signs along the highway. All other requirements of the Public Information Plan (Section 3.2.3 of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim) shall be included in the Traffic Management Plan and by undertaken / implemented by the Contractor prior to commencing work.

3.2 Traffic Management

.1 Traffic management shall be undertaken in accordance with the requirements of:

.1 The reviewed and accepted Traffic Management Plan prepared by the Contractor (see Section 1.4 - Submittals).

.2 Section 2: Fundamentals of Traffic Management and Traffic Control of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways –

2015 Office Edition (Interim) and as follows.

.1 Section 2.5.3 – Road Authority Acceptance shall be replaced with the requirements of Section 1.4 – Submittals within this specification.

.2 References to Ministry shall be replaced with PWGSC.

.3 Section 5: Traffic Control Persons (TCP's) of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim).

.4 Section 6: Traffic Control Layouts – General Instructions of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim).

.5 Section 7: Traffic Control Layouts – Two-Lane, Two-Way Roadways of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim) and as follows.

.1 Traffic control layouts as described in the following sections shall not be used on this project.

.1 7.3 – Emergent Work (<5 Minutes) – Two-Lane, Two Way Roadway.

.2 7.4 – Brief-Duration Work (<15 Minutes) – Two-Lane, Two-Way Roadway.

.3 7.6 – Work in Parking Lane – Urban Area.

.4 7.7 – Roadside Work – Encroachment into Travel Lane – Short Duration.

.5 7.9 – Lane Closure with AFADs – Short and Long Duration.

.6 7.11 – Work on Low Volume Roadway – No Centerline – Short Duration.

.7 7.12 – Work on Low-Volume Roadway – No Centerline – Long Duration.

.8 7.13 – Two-Way Left-Turn Lane Closed – Short and Long Duration.

.9 7.15 – One-Lane Bridge or Roadway – Short and Long Duration.

.10 7.16 – Pilot Cars.

.2 Signage as described in Section 7.2 - Typical Construction Speed Zone Signing – Two-Lane, Two-Way Roadway shall be used on the project in conjunction with other acceptable signage/traffic control layouts as described in Section 7 and with the following revisions.

.1 The DMS (if used by the contractor) and sign C 082 shall be added to the signage outside the Limits of Construction in both directions. The DMS shall be positioned approximately 300 m prior to the sign C-018-2A. The sign C 082 shall be positioned following the sign C-018-2A and shall be appropriately spaced within the 2 km zone provided.

.2 Any duplicate signage resulting from the use of other layouts as provided in Section 7 and the Typical Construction Speed Zone Signing layout shown in Section 7.2 shall be removed.

.3 Single lane alternating traffic temporary traffic signals as described in Section 7.10 – Lane Closure with Temporary Signals – Single Lane Alternating – Short and Long Duration can be used subject to the following.

.1 Temporary traffic signals shall only be used during non-working hours. During work hours, Traffic Control Persons and applicable signage as described in Section 7.8 – Lane Closure with TCPs – Single Lane Alternating – Short and Long

Duration shall be used.

.2 Temporary traffic signals shall only be used when the distance between the temporary signals is less than or equal to 150 m and a direct line of sight is available.

.3 A stop bar from removable pavement markings shall be used in conjunction with the R-025-R sign.

.6 Section 15: Traffic Control Layouts – Surveying of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2015 Office Edition (Interim). The following are minimum requirements if the Contractor's surveyor will be on site prior to the Contractor setting up signage as per Section 7.2 of the above manual.

.1 Section 15: Legend, Table A, and Table B.

.2 15.2: Surveying on shoulder.

.3 15.3: Surveying on centerline.

.7 Maintain existing conditions for traffic throughout the Contract period, except when required for Contract construction and when measures have been taken as specified herein and reviewed by the Departmental Representative to protect and control public traffic. Existing conditions for traffic may be restricted to single lane (min 3.5 m lane width with 1.0 m shoulder on both sides) alternating traffic during completion of the work. Speed limit reduced during these times to 50 km/h (or 30 km/h, at the Contractor's discretion).

.8 The maximum allowable delay to any individual motorist travelling through the project limits as a result of the Contractor's operations will be 15 minutes.

.9 Load limit restrictions will be in accordance with British Columbia Highway Traffic Act pertaining to registered weight limits and vehicle size both within and outside Contract Limits.

3.3 Protection of Public Traffic .1 Ensure traffic control and other measures as necessary are in place for the duration of the works to protect and accommodate public traffic as follows:

.1 Ensure that all vehicles can safely travel and traverse the entire length of the project (including detours) without damage to vehicles regardless of the material type placed and used as a driving surface.

.2 Protect passing vehicles from damage caused by extraneous materials from construction activities at the site.

.3 Keep travelled way graded, free of pot holes, and of sufficient width for required number of lanes of traffic.

.4 Provide well graded, signed, and maintained temporary traffic lanes to facilitate passage of vehicles through limits of construction.

.5 Provide dust control, (if necessary).

.6 Provide and maintain reasonable access to property in vicinity of contract work and in other area as indicated, unless other reasonable means of road access exist that meet approval of Departmental Representative.

.7 Provide temporary concrete barriers and privacy fence if deemed necessary for the safety of the Contractor's workers and travelling public.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 References.

1.2 Workers' Compensation Coverage.

1.3 Compliance with Regulations.

1.4 Submittals.

1.5 Site-Specific Health and Safety Plan.

1.6 Contractor's Responsibility.

1.7 Health and Safety Coordinator.

1.8 General.

1.9 Project / Site Conditions.

1.10 Regulatory Requirements.

1.11 Work Permits.

1.12 Filing of Notice.

1.13 Emergency Procedures.

1.14 Hazardous Products.

1.15 Overloading.

1.16 Fire Safety Requirements.

1.17 Unforeseen Hazards.

1.18 Posted Documents.

1.19 Correction of Non-Compliance.

1.20 Medical.

1.21 Accidents and Accident Reports.

1.1 References

.1 Government of Canada:

.1 Canada Labour Code - Part II

.2 Canada Occupational Health and Safety Regulations.

.2 National Building Code of Canada (NBC):

.1 Part 8, Safety Measures at Construction and Demolition Sites.

.3 Canadian Standards Association (CSA) as amended:

.1 CSA Z797-2009 Code of Practice for Access Scaffold.

.2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes.

.3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures.

.4 Fire Protection Engineering Services, HRSDC:

.1 FCC No. 301, Standard for Construction Operations.

.2 FCC No. 302, Standard for Welding and Cutting.

.5 American National Standards Institute (ANSI):

.1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

.6 Province of British Columbia:

.1 Workers Compensation Act Part 3-Occupational Health and Safety.

.2 Occupational Health and Safety Regulation.

.7 Preliminary Hazard Assessment Form (Appendix A).

.8 Confirmation of Prime Contractor’s Main Responsibilities Under the WorkSafeBC Occupational Health and Safety Regulations and Worker’s Compensation Act form (Appendix B).

1.2 Workers' Compensation Coverage

.1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.

.2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.3 Compliance with Regulations

.1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.

.2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

1.4 Submittals

.1 The Contractor's Health and Safety Plan shall be submitted to the Departmental Representative as a single PDF document (multiple files will not be accepted) for review and acceptance in accordance with the procedures outlined in Section 01 33 00 – Submittal Procedures. The Departmental Representative will review the plan (first submission and if required all subsequent re-submissions) within 14 days of submission. Upon review of the plan the Departmental Representative will do one of the following:

.1 Accept the plan.

.2 Accept portions of the plan and provide comments outlining required changes or additional information in other sections. Following completion of edits by the Contractor, the Contractor shall re-submit the complete plan for review.

.3 Reject the plan and provide comments outlining required changes or additional information needed before the plan will be reviewed in detail. Following completion of edits by the Contractor, the Contractor shall re-submit the complete plan for review.

.2 Submit the following to the Departmental Representative in accordance with the procedures outlined in Section 01 33 00 – Submittal Procedures:

.1 Preliminary Hazard Assessment Form

(Appendix A).

.2 Confirmation of Prime Contractor's Main Responsibilities Under the WorkSafeBC Occupational Health and Safety Regulations and Worker's Compensation Act form (Appendix B).

.3 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.

.4 Copies of incident and accident reports.

.5 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.

.6 Emergency Procedures.

.7 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.

.3 The Contractor shall allow time in the schedule for the reviews, and subsequent edits / re-submission.

.4 Work affected by the submittal (as determined by the Departmental Representative) shall not proceed until acceptance of the submittal by the Departmental Representative.

.5 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative are for information and reference purposes only. It shall not:

.1 Be construed to imply approval by the Departmental Representative.

.2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.

.3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

.6 Should deficiencies in the Contractor's Health and Safety Plan be noted following acceptance of the submittal by the Departmental Representative but during the project work,

the Departmental Representative reserves the right to provide additional comments to the Contractor and require re-submission of the Health and Safety Plan to ensure the correction of any deficiencies.

1.5 Site-Specific Health and Safety Plan

.1 The Contractor shall prepare and comply with the Site-Specific Health and Safety Plan. The preparation and details of the Site-Specific Health and Safety Plan shall include conducting a site-specific hazard assessment based on review of Contract Documents, required work, and project site. The Site-Specific Health and Safety Plan shall address all concerns / requirements identified in the Contract Documents and identify any known and potential health risks and safety hazards including, but not limited to, the following:

.1 Primary requirements:

.1 Contractor's safety policy.

.2 Identification of applicable compliance obligations.

.3 Definition of responsibilities for project safety/organization chart for project.

.4 General safety rules for project.

.5 Job-specific safe work procedures.

.6 Inspection policy and procedures.

.7 Incident reporting and investigation policy and procedures.

.8 Occupational Health and Safety Committee/Representative procedures.

.9 Occupational Health and Safety meetings.

.10 Occupational Health and Safety communications and record keeping procedures.

.11 Maps identifying the location of the nearest hospital(s) to the project site. The maps shall be of appropriate scale and sufficient detail allowing for their use to navigate to the hospital(s) in the event of an emergency.

.12 Blank copy of Contractor's daily toolbox meeting form.

.13 Emergency contact information including PWGSC personnel (including Consultants), Contractor office and field staff, air ambulance, and forest fire reporting.

.2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.

.3 List hazardous materials to be brought on-site as required by work.

.4 Indicate engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.

.5 Identify personal protective equipment (PPE) to be used by workers.

.6 Identify personnel and alternates responsible for site safety and health.

.7 Identify personnel training requirements and training plan, including site orientation for new workers and personnel designated by the Departmental Representative as needing to visit the site.

.8 Identify wildlife management plans for large mammal safety and other animals.

.9 Identify employee training plans for wildlife encounters and prevention.

.10 Identify fire safety, fire reporting, and fire evacuation procedures.

.2 Include with the Health and Safety plan, resume(s) or certification(s) of Health and Safety Coordinator(s) responsible for site safety.

.3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.

.4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of Health and Safety Plan by Public Works and Government Services Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract Documents.

1.6 Contractor's Responsibility

.1 Be responsible for health and safety of persons on-site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with Site-Specific Health and Safety Plan.

.3 The protection of persons off-site and the environment such that they may be affected by the conduct of the work.

1.7 Health and Safety Coordinator

.1 Employ and assign to work, a competent and authorized representative as Health and Safety Coordinator. The Health and Safety Coordinator shall:

.1 Be responsible for completing all health and safety training, site orientations, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.

.2 Be responsible for implementing, daily enforcing, and monitoring the Site-Specific Health and Safety Plan.

.3 Be on site during execution of critical elements of the work or as required by the Contractor.

.4 Have a minimum of two (2) years site-related working experience specific to activities associated with Construction.

.5 Have working knowledge of occupational safety and health regulations.

.6 Attend Pre-Construction and Construction Progress

Meetings as required or as requested by the Departmental Representative.

1.8 General

.1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.

.2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.

.1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.

.2 Secure site during non-work at night time or provide security guard as deemed necessary to protect site against entry.

.3 Conduct daily safety meetings and task specific meetings (toolbox) as required by special work. At a minimum, meetings shall include refresher training for existing equipment and protocols, review ongoing safety issues and protocols, and examine new site conditions as encountered. Keep records of meetings.

1.9 Project / Site Conditions

.1 Work at the site will, at a minimum, involve contact with:

.1 Utilities.

.2 General public (including large transport trucks) and PWGSC maintenance personnel travelling the highway.

.3 Local wildlife.

.4 Unpredictable and adverse weather conditions.

1.10 Regulatory Requirements

.1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations on-site.

.2 In event of conflict between any provisions of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.11 Work Permits

.1 Obtain specialty permit(s) related to the project before start of work.

1.12 Filing of Notice

.1 The Contractor is to complete and submit an Advance Notice of Project as required by the Worker's Compensation Board and any other authority in effect at the place or work.

.2 Provide copies of all notices to the Departmental Representative.

1.13 Emergency Procedures

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names / telephone numbers) of:

.1 Designated personnel from Contractor's company.

.2 Regulatory agencies applicable to work and as per legislated regulations.

.3 Local emergency resources.

.4 Departmental Representative.

.2 Include the following provisions in the emergency procedures:

.1 Notify workers and the first-aid attendant, of the nature and location of the emergency.

.2 Evacuate all workers safely.

.3 Check and confirm the safe evacuation of all workers.

.4 Notify the fire department or other emergency responders.

.5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.

.6 Notify Departmental Representative.

.3 Provide written rescue/evacuation procedures as required for, but not limited to:

.1 Work at high angles.

.2 Work in confined spaces or where there is a risk of entrapment.

.3 Work with hazardous substances.

.4 Underground work.

.5 Work on, over, under and adjacent to water.

.6 Workplaces where there are persons who require physical assistance to be moved.

.4 Design and mark emergency exit routes to provide quick and unimpeded exit.

.5 Emergency drills must be held at least once each year for all projects lasting longer than one year. The purpose of these drills is to ensure awareness and effectiveness of emergency exit routes and procedures. A record of the drills must be kept by the Contractor.

.6 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

1.14 Hazardous Products

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canadian Labour Code.

.2 Where use of hazardous and toxic products cannot be avoided:

.1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00 – Submittal Procedures.

.2 Provide adequate means of ventilation acceptable to the Departmental Representative and suitable for the hazard.

1.15 Overloading

.1 Ensure no part of the work is subject to a load which will endanger its safety or will cause permanent deformation.

1.16 Fire Safety Requirements

.1 Store oily / paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.17 Unforeseen Hazards

.1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

.2 Should contaminated site conditions be encountered when completing the work, refer to GC4.4 – Contaminated Site Conditions for procedures which the Contractor shall undertake.

1.18 Posted Documents

.1 Post legible versions of the following documents on-site:

.1 Site-Specific Health and Safety Plan.

.2 Sequence of work.

.3 Emergency procedures.

.4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshaling station, and the emergency transportation provisions.

.5 Notice of Project.

.6 Floor plans or site plans.

.7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.

.8 Workplace Hazardous Materials Information System (WHMIS) documents.

.9 Material Safety Data Sheets (MSDS).

.10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

.2 Post all Material Safety Data Sheets (MSDS) on-site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.

.3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

1.19 Correction of Non-Compliance

.1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.

.3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor / subcontractors will be responsible for any costs arising from such a "stop work order".

1.20 Medical

.1 Provide and maintain first aid facilities for all workers as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

.2 Provide the appropriate first aid kit, based on the number of workers, in accordance with the Workers' Compensation Act or the Occupational Health and Safety Regulations.

.3 Establish an emergency response plan acceptable to Departmental Representative, for the removal of any injured person to medical facilities or a doctor's care in accordance with applicable legislative and regulatory requirements.

.4 Provide proof of First Aid credentials to Departmental Representative prior to the start of construction. Provide the appropriate number of first aid attendants on site in accordance with Workers' Compensation Act or the Occupational Health and Safety Regulations.

.5 Emergency and First Aid Equipment:

.1 Locate and maintain emergency and first-aid equipment in appropriate location on site including first-aid kit to accommodate number of site personnel; portable emergency eye wash; fire protection equipment as required by legislation.

.2 Locate sufficient blankets and towels, stretcher, and one (1) hand-held emergency siren in all confined access locations.

.3 Provide a minimum of one (1) qualified first-aid attendant as per Workers' Compensation Act or the Occupational Health and Safety Regulations on site at all times when Work activities are in progress. Duties of first aid attendant may be shared with other Work related, light duty activities.

1.21 Accidents and Accident Reports

.1 Immediately report, verbally, followed by a written report within 24 hours, to Departmental Representative, all accidents of any sort arising out of or in connection with the performance of the Work, giving full details and statements of witnesses. If death or serious injuries or damages are caused, report the accident promptly to Departmental Representative by telephone in addition to any report required under Federal and territorial laws and regulations.

.2 If a claim is made by anyone against the Contractor or Sub-Contractor on account of any accident, promptly report the facts in writing to Departmental Representative, giving full details of the claim.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Measurement and Payment.

1.2 Definitions.

1.3 References.

1.4 Regulatory Overview.

1.5 Submittals.

1.6 Environmental Protection Plan (EPP).

1.7 Environmental Site Inspection Memo.

1.8 Environmental Monitoring Report.

1.9 Notification

PART 2:

2.1 Environmental Monitoring.

2.2 Site Access and Parking.

2.3 Protection of Work Limits.

2.4 Erosion Control.

2.5 Pollution Control.

2.6 Equipment Maintenance, Fueling, and Operation.

2.7 Operation of Equipment.

2.8 Managing Invasive Plant Vegetation.

2.9 Fires and Fire Prevention and Control.

2.10 Wildlife.

2.11 Relics and Antiquities.

2.12 Waste Materials Storage and Removal.

2.13 Wastewater Discharge Criteria.

2.14 Water Management and Drainage.

2.15 Environmental Protection Supplies.

1.1 Measurement and Payment

.1 Payment for the cost of Environmental Monitoring and Water Management will be made on the basis of the Price per Unit Bid for Environmental Monitoring and Water Management in the Bid and Acceptance Form. The Price per Unit Bid shall include the preparation of the Environmental Protection Plan, environmental monitoring, water management including staging of the work and necessary pumps and berms, and all other items necessary for the successful completion of the task.

.2 Measurement for Payment for completion of the Environmental Monitoring and Water Management will be made by Lump Sum based on the percentage of the work completed and accepted by the Departmental Representative.

1.2 Definitions

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

.3 Wetted Perimeter: area of stream where water is currently running or pooled.

.4 In-stream Work: any work performed below the high-water mark, either within or above the Wetted Perimeter of any Fisheries Sensitive Zone.

.5 Fisheries Sensitive Zone: in-stream aquatic habitats and out of stream habitat features such as side channels, wetlands, and riparian areas.

.6 Invasive plants: are any alien plant species that have the potential to pose undesirable or detrimental impacts on humans, animals or ecosystems. Invasive plants have the capacity to establish quickly and easily on both disturbed and un-disturbed sites, and can cause widespread negative

economic, social and environmental impacts.

.7 Noxious weeds: are invasive plants that have been designated under the BC Weed Control Act. This legislation imposes a duty on all land occupiers to control a set list of identified invasive plants.
https://www.for.gov.bc.ca/hra/plants/legislation.htm

1.3 References

.1 Standards and Best Practices for Instream Works, British Columbia Ministry of Land and Air Protection Ecosystem Standards and Planning Biodiversity Branch – March 2004 (see Reference Documentation – Table of Contents).

.2 Land Development Guidelines for the Protection of Aquatic Habitat, Fisheries and Oceans – September 1993 (see Reference Documentation – Table of Contents).

.3 Environmental Protection Plan (EPP) – Checklist (Appendix D).

.4 Responsibility Checklist For Authorizations / Approvals / Notifications / Permitting (Appendix E).

.5 Relevant Environmental Publications (Appendix F).

.6 British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) Section 11 Approval for Instream Work.

1.4 Regulatory Overview

.1 The Departmental Representative will complete the environmental Approval / permitting required under Provincial regulations (Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) and or British Columbia Ministry of Environment and Climate Change Strategy (MoE)), prior to the start of the project. The Contractor shall be aware that submission of the Contractor's Environmental Protection Plan (EPP) to FLNRORD / MoE may be required before for this environmental Approval / permit is issued by FLNRORD / MoE. Further, FLNRORD / MoE may take up to 20 days from receipt of the EPP before the environmental Approval / permit is issued by FLNRORD / MoE. Work by the Contractor within 30 m of any fisheries sensitive zone cannot commence until the environmental Approval / permit response from FLNRORD / MoE is received.

.2 Comply with all applicable environmental laws, regulations and requirements of Federal, Provincial, and other regional authorities, and acquire and comply with such permits, approvals and authorizations as may be required.

.3 Comply with and be subject to those permits and approvals obtained from the Departmental Representative to conduct the Work.

.4 Pay specific attention to the Provincial BC Land Use Permit, Water License and Quarry Permit.

.5 Pay specific attention to the Migratory Birds Convention Act, as amended in 1994.

.6 Pay specific attention to the Provincial BC guidelines under Peace Region Least Risk Timing Windows: Biological Rational (2009).

.7 Pay specific attention to provincial standards for instream works, refer to British Columbia Ministry of Land and Air Protection Ecosystem Standards and Planning Biodiversity Branch publication, Standards and Best Practices for Instream Works – March 2004 (see Reference Documentation – Table of Contents).

.8 The Contractor is required to apply for and obtain a fish salvage permit from the applicable regulatory authorities for use on the project as needed.

1.5 Submittals

.1 The Contractor is required to prepare an Environmental Protection Plan (EPP), Environmental Site Inspection Memos, and an Environmental Monitoring Report. Each memo /report shall be submitted to the Departmental Representative as a single PDF document (multiple files will not be accepted) for review and acceptance in accordance with the procedures outlined in Section 01 33 00 – Submittal Procedures. The Departmental Representative will review the EPP, Environmental Site Inspection Memos, and Environmental Monitoring Report (first submission and if required all subsequent re-submissions) within 14 days of submission. Upon review of the plan / report / memo the Departmental Representative will do one of the following:

.1 Accept the plan / memo / report.

.2 Accept portions of the plan / memo / report and provide comments outlining required changes or additional information in other sections. Following completion of edits by the Contractor, the Contractor shall re-submit the complete plan / memo / report for review.

.3 Reject the plan / memo / report and provide

comments outlining required changes or additional information needed before the plan / memo / report will be reviewed in detail. Following completion of edits by the Contractor, the Contractor shall re-submit the complete plan / memo / report for review.

.2 The Contractor shall allow time in the schedule for the reviews, and subsequent edits / re-submission.

.3 Work affected by the submittal (as determined by the Departmental Representative) shall not proceed until acceptance of the EPP by the Departmental Representative.

.4 Upon Departmental Representative acceptance of the Contractor's EPP, the Departmental Representative may submit the EPP as part of the environmental notification / permitting process to FLNRORD / MoE.

.5 The review of the EPP, Environmental Site Inspection Memos, and Environmental Monitoring Report by the Departmental Representative shall not relieve the Contractor of responsibility for errors or omissions in the accepted submittals or of responsibility for meeting all requirements of the Contract Documents.

.6 Should deficiencies in the Contractor's EPP be noted following acceptance of the submittal by the Departmental Representative but during the project work, the Departmental Representative reserves the right to provide additional comments to the Contractor and require re-submission of the EPP to ensure the correction of any deficiencies.

1.6 Environmental Protection Plan (EPP)

.1 The Contractor is required to prepare an EPP. The EPP should include and address all relevant environmental impacts / issues at the site as indicated by the EPP Checklist (Appendix D) and as identified in this Section of the Contract Specifications. The EPP will require the Contractor to carefully think through the entire project, including identifying what activities and works will be occurring, both generally and at specific sites, and by what methods. The EPP shall be completed by a P.Biol or RPBio, or other qualified professional, and shall, at a minimum include the following:

.1 The specifics of a detailed monitoring program (to be completed by the Contractor). This includes details and rational concerning sampling locations, timing, duration, and methods, and identification of the person(s) who will be carrying out the monitoring program. Include resumes of proposed environmental monitors and personnel responsible for the

preparation of the EPP.

.2 The process and protocol for ensuring that supervisors and individual staff employed by the Contractor are very clear on which environmental standards need to be achieved, how they will be achieved, and establishing how the Contractor will ensure that this is successfully occurring.

.3 Erosion, drainage, and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with the requirements of the applicable Provincial regulatory requirements (FLNRORD / MoE) approval or notification for instream work or under FLNRORD / MoE guidelines, and all other applicable regulations including the requirements of these specifications.

.4 Drawings should show locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of any excess or spoil materials including methods to control runoff and to contain materials onsite.

.5 Drawings with details of the proposed staging approach to divert creek flows such that the work is completed in the dry. Details to include locations of berms, temporary pumps, and other proposed measures.

.6 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.

.7 Spill Control Plan: including procedures, instructions, and reports to be used in the event of unforeseen spill of regulated substance.

.8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.9 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent

introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.10 Outline the avoidance and mitigate measures which the Contractor will undertake and implement to ensure compliance with the environmental regulations applicable to the project (which may include requirements provided in FLNRORD Approval or Notifications for Instream Work, NWPA Approval for Instream Work, DFO Fisheries Act requirements etc.) and these contract specifications.

.11 The procedures for stopping the work and implementing changes to the construction methods should the Contractor not be achieving the environmental requirements as outlined in these specifications.

.12 The procedures for stopping work should the Contractor encounter archaeological anomalies or human remains.

1.7 Environmental Site Inspection Memo

.1 The Contractor shall submit an Environmental Site Inspection Memo every five (5) days of fulltime site inspections. The Environmental Site Inspection Memo shall include the following:

.1 Date and times when environmental monitor onsite.

.2 General site conditions / construction activities ongoing at the time of the inspection.

.3 Findings, non-conformances with EPP, and items requiring correction by the Contractor from the Environmental Monitor's review and inspection of environmentally sensitive activities including but not limited to:

.1 Fuel and Oil Storage and Fueling Practices

.2 Care and Maintenance of Construction Equipment

.3 Spill Response Preparedness

.4 Construction Activities and Construction Site Management

.5 Erosion and Sediment Issues

.6 Wildlife Observations/Mitigation and Sensitive Habitat

.7 Culvert/In-Stream Work

.8 Other/Comments.

.4 Photos of any concerns, non-conformances with EPP, or items requiring attention.

1.8 Environmental Monitoring Report

.1 The Contractor shall submit an Environmental Monitoring Report within 60 days of project completion. The report shall be completed for MoE / FLNRORD but submitted first to the Departmental Representative for review and acceptance.

.2 The Environmental Monitoring Report shall use the recommended format as outlined in Section 8 – Monitoring and Reporting of the BC MoE Standards and Best Practices for Instream Works and summarized below as follows:

.1 Project Description: project name; site location; type of works; and person or organization undertaking the works.

.2 Site Inspections: frequency of monitoring; staff member(s) conducting the inspection; dates and times of inspection; extent of inspection; summary description of each inspection visit; and weather on the day of inspection and during the period immediately preceding the inspection.

.3 Construction Stage: a brief description of the construction activities completed; and a brief description of planned construction activities for the period following the site inspections.

.4 Mitigation Measures/Structures: recommended mitigation measures, including the maintenance of previously constructed measures, and the construction, installation or implementation of new measures; and review of previously recommended mitigation measures.

.5 Salvage Results: results of fish and amphibian salvages conducted prior to works, including, at a minimum, a specific site location, list of species, and numbers salvaged.

.6 Comments/Other: description of any incidents related to environmental issues or emergencies that occurred on the site and how they were monitored, mitigated and remediated; and description of any outstanding mitigative measures or monitoring programs needed for until the completion of site restoration.

.7 Photographs: representative date stamped photographs should be taken during each site inspection, and during and after all incidents.

1.9 Notification

.1 Departmental Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, etc.

.2 Contractor: after receipt of such notice, shall inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

.3 Departmental Representative will issue stop order of Work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 – EXECUTION

2.1 Environmental Monitoring

.1 At a minimum the environmental monitoring shall be completed by P.Biol, RPBio, or Qualified Environmental Professional (QEP). If a QEP completes the monitoring, the QEP must work under the direction of the P.Biol or RPBio who completes the Environmental Protection Plan.

.2 The monitoring program must be anticipatory and responsive to construction practices or environmental changes, reflecting the site-specific conditions, level of sensitivity of the receiving environment, potential adverse effects, and level of environmental risk. Submitted documents regarding the proposed monitoring program should clearly identify how monitoring will adhere to this approach.

.3 At a minimum, the Environmental Monitor shall be onsite and visit all areas of active construction as follows:

.1 Be onsite full-time during all stages of the project when work is being completed on the highway embankment slopes, within the wetted perimeter of the creek, and within 30 m of the creek.

2.2 Site Access and Parking	.1	The Contractor shall review both short-term and long-term access requirements with the Departmental Representative, both at the start-up and on an on-going basis. In consultation with the Departmental Representative, the Contractor shall formulate an agreement for worker transportation to and from the work site and where workers shall park their private vehicles. Generally, personal vehicles should be parked at least ten (10) meters from any water course.
	.2	The Contractor shall ensure that the environment beyond the work limits is not negatively impacted or damaged by workers' vehicles or construction machinery and shall instruct workers to ensure the "footprint" of the project is kept within defined boundaries.
2.3 Protection of Work Limits	.1	The Contractor shall include in the EPP details on the work limits, how these shall be marked and what procedures will be employed to ensure trespass outside these limits does not occur, to the satisfaction of the Departmental Representative.
2.4 Erosion Control	.1	Erosion control measures that prevent sediment from entering any waterway, water body or wetland in the vicinity of the construction site are critical elements of the project and shall be implemented by the Contractor.
	.2	If necessary, on-site sediment control measures shall be constructed and functional prior to initiating activities associated with the construction activities. The Contractor shall prepare an Erosion Control Plan, to be part of the EPP, to the satisfaction of the Departmental Representative.
	.3	The regular monitoring and maintenance of all erosion control measures shall be the responsibility of the Contractor. If the design of the control measures is not functioning effectively they are to be repaired. The Departmental Representative will monitor the Contractor's erosion control performance.
	.4	Erosion control measures must be in compliance with both Federal and Provincial legislation where required. Contractors should be referencing the Provincial MoE Standards and Best Practices for Instream Works (2004).
2.5 Pollution Control	.1	The Contractor shall prevent any deleterious and objectionable materials from entering streams, rivers, wetlands, water bodies or watercourses that would result in damage to aquatic and riparian habitat. Hazardous or toxic products shall be stored no closer than 100 metres to any surface water.

.2 A Spill Response Plan will be prepared as part of the EPP and shall detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products, to the satisfaction of the Departmental Representative, and in accordance with all applicable Federal and Provincial legislation. The EPP shall include a list of products and materials to be used or brought to the construction site that are considered or defined as hazardous or toxic to the environment. Such products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, hot poured rubber membrane materials, asphalt cement and sand blasting agents.

.3 The containment, storage, security, handling, use, unique spill response requirements and disposal of empty containers, surplus product or waste generated in the use of any hazardous or toxic products shall be in accordance with all applicable Federal and Provincial legislation. Hazardous products shall be stored no closer than 100 metres from any surface water.

.4 An impervious berm shall be constructed around fuel tanks and any other potential spill area. The berms shall be capable of holding 110% of tank storage volumes and shall be to the satisfaction of the Departmental Representative. Measures such as collection/drip trays and berms lined with occlusive material such as plastic and a layer of sand, and double lined fuel tanks can prevent spills into the environment.

.5 The Contractor shall prevent blowing dust and debris by covering and/or providing dust control for temporary roads and on-site work such as rock drilling and blasting by methods that are approved by the Departmental Representative.

.6 The Contractor shall provide spill kits, to the satisfaction of the Departmental Representative, at refueling, lubrication and repair locations that will be capable of dealing with 110% of the largest potential spill and shall be maintained in good working order on the construction site. The Contractor and site staff shall be informed of the location of the spill response kit(s) and be trained in its use.

.7 Timely and effective actions shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The Departmental Representative and Provincial Authorities shall be notified immediately of any spill. Basic instructions and phone numbers shall be part of the Contractor's EPP.

.8 In the event of a major spill, the Contractor shall prioritize the cleanup and all other work shall be stopped, where

appropriate, and devote personnel to spill containment and cleanup.

.9 The costs involved in a major spill incident (control, clean up, disposal of contaminants, and site remediation to pre-spill conditions), shall be the responsibility of the Contractor. The site will be inspected to ensure completion to the pre-spill condition to the satisfaction of the Departmental Representative.

2.6 Equipment Maintenance, Fueling, and Operation

.1 The Contractor shall ensure that all soil, seeds and any debris attached to construction equipment to be used on the project site shall be removed (e.g. power washing) outside before delivery to the work site.

.2 Equipment fueling sites will be identified by the Contractor to the satisfaction of the Departmental Representative. Except for chain saws, any fueling closer than 100 metres to any surface water (streams, wetlands, water bodies or watercourses) shall require discussion with the Departmental Representative. Regardless of fueling location, personnel shall maintain a presence during refueling with immediate attention to the fueling operations.

.3 Diesel and gasoline delivery vehicles, including bulk tankers shall be not be parked within 100 metres from any surface water unless actively being used for refueling. Immediately following refueling bulk tankers shall be moved to a location 100 m or greater from any surface water. Gravity fed fuel systems are not allowed. Manual or electric pump delivery systems shall be used.

.4 Mobile fuel containers (e.g. slip tanks, small fuel carboys) shall remain in the service vehicle at all times. Protection and containment of approved fuel storage sites is addressed in Item 3.5 - Pollution Control.

.5 Equipment used on the project shall be fueled with E10, and low Sulphur diesel fuels where available, and shall conform to local emission requirements. The Contractor is to ensure that unnecessary idling of the vehicles is avoided.

.6 Oil changes, lubricant changes, greasing and machinery repairs shall be performed at locations satisfactory to the Departmental Representative. Waste lubrication product (e.g. oil filters, used containers, used oil, etc.) shall be secured in spill-proof containers and properly recycled or disposed of at an approved facility. No waste petroleum, lubricant products or related materials are to be discarded, buried or disposed of in borrow pits, turnouts, picnic areas, viewpoints, etc. or

anywhere within the work area.

.7 The Contractor shall ensure that all equipment is inspected daily for fluid/fuel leaks and maintained in good working condition. Maintenance certificates or maintenance logs for all equipment shall be available onsite during work.

.8 Fuel containers and lubricant products shall be stored only in secure locations to the satisfaction of the Departmental Representative. Fuel tanks or other potential deleterious substance containers shall be secured to ensure they are tamperproof and cannot be drained by vandals when left overnight. Alternatively, the Contractor may hire a security person employed to prevent vandalism.

.9 Equipment shall use environmentally sensitive / biodegradable hydraulic fluid in case of accidental loss.

2.7 Operation of Equipment

.1 Equipment movements shall be restricted to the "footprint" of the construction area. The work limits shall be identified by stake and ribbon or other methods to the satisfaction of the Departmental Representative. No machinery will enter, work in or cross over streams, rivers, wetlands, waterbodies or watercourse, nor damage aquatic and riparian habitat or trees and plant communities outside the identified work limits. Where construction activities require working close to surface water or in the water, the Contractor is required to describe measures to be employed to ensure fugitive materials (e.g. rocks, soil, branches) and especially deleterious substances (e.g. chemicals) do not enter any surface water areas.

.2 The Contractor shall instruct workers to prevent pushing, placement, raveling, storage or stockpiling of any materials (e.g. slash, rock, fill or top soils) in the trees bordering the right-of-way or into surface water.

.3 When, in the opinion of PWGSC, negligence on the part of the Contractor results in damage or destruction of vegetation, or other environmental or aesthetic features beyond the designated work area, the Contractor shall be responsible, at his or her expense, for complete restoration including the replacement of trees, shrubs, topsoil, grass, etc. to the satisfaction of the Departmental Representative.

.4 Restrict vehicle movements to the work limits.

.5 Workers vehicles are to remain within the construction footprint.

2.8 Managing Invasive Plant

.1 Keep equipment clean and avoid parking, turning around or

Vegetation		staging equipment in known invasive species infested areas, or mow prior to use.
	.2	Wash equipment prior to mobilization to site.
	.3	Minimize unnecessary disturbance of roadside aggregates or soil, and retain desirable roadside vegetation whenever possible.
	.4	Where possible, begin mowing or brushing in "invasive plant free" areas and end in infested areas.
	.5	Where possible, use only clean fill material from an "invasive plant free" source.
	.6	Whenever possible, re-seed with grass mixtures that are free of weeds, locally adapted, non-invasive, and quick to establish. Spread seed in the early spring or late fall to ensure successful establishment.
2.9 Fires and Fire Prevention and Control	.1	Fires or burning of waste materials is not permitted.
	.2	A fire extinguisher shall be carried and available for use on each machine in the event of fire. The Contactor's staff shall receive basic training in early response to wildfire events during the "environmental briefing" presented by the Contractor.
	.3	Construction equipment shall be operated in a manner and with all original manufacturers' safety devices to prevent ignition of flammable materials in the area.
	.4	Care shall be taken while smoking on the construction site to ensure that the accidental ignition of any flammable material is prevented.
	.5	In case of fire, the Contractor or worker shall take immediate action to extinguish the fire provided it is safe to do so. The Departmental Representative and applicable Provincial Authorities shall be immediately notified of any fire. Basic instruction and phone numbers will be provided on site by the Contractor and will be discussed in the project Pre-Construction Meeting.
	.6	Provide supervision, attendance and fire protection measures as directed by the Departmental Representative or other authorities.
2.10 Wildlife	.1	Avoid or terminate activities onsite that attract or disturb wildlife. Stay away from bears, cougars, wolves, elk, moose,

or bison, or other animals that display aggressive behavior or persistent intrusion. Extra care to control materials that might attract wildlife (e.g. lunches and food scraps) must be exercised at all times.

.2 Notify the Departmental Representative immediately of the presence of dens, litters, nests, etc., carcasses (road kills) and bear activity or encounters on or around the site or crew accommodations. Other wildlife related encounters are to be reported within 24 hours.

2.11 Relics and Antiquities

.1 Artifacts, relics, antiquities, and items of historical interest such as cornerstones, commemorative plaques, inscribed tablets and any objects found on the work site that may be considered artifacts shall be reported to the Departmental Representative immediately. The Contractor shall wait for instruction from the Departmental Representative before proceeding with work at the location where relics or antiquities are discovered.

.2 All historical or archaeological objects found in the rock quarry are protected under Federal and Provincial Acts and regulations. The Contractor and workers shall protect any articles found and request direction from the Departmental Representative.

.3 Human remains must be reported immediately to the local RCMP.

2.12 Waste Materials Storage and Removal

.1 The Contractor and workers shall dispose of hazardous wastes in conformance with the applicable Federal and Provincial regulations and should be part of the EPP. All waste materials shall be disposed of at a disposal facility acceptable to the Departmental Representative. No waste materials shall be buried onsite.

.2 All wastes originating from construction, trade, hazardous and domestic sources shall not be mixed, and shall be kept separate.

.3 Construction, trade, hazardous waste and domestic waste materials shall not be burned, buried, or discarded at the construction site. These wastes shall be contained and removed by the Contractor and workers in a timely manner and disposed of at an appropriate waste landfill site located outside the work area.

.4 A concerted effort shall be made by the Contractor and workers to reduce, reuse and recycle materials where possible.

.5 Sanitary facilities, such as portable container toilets, shall be provided by the Contractor and maintained in a clean condition.

2.13 Wastewater Discharge Criteria

.1 Wash water, meltwater collection, rinse water resulting from the cleaning of fuel tanks and pipelines, contaminated groundwater, and/or any other liquid effluent stream will be released onto the ground at a location that is a minimum of 30 m from natural drainage courses and 100 m from fish bearing waters, and will conform to the discharge requirements set out in the Provincial Water Act Permit:

.2 Contractor must obtain approval from the Provincial Water Act Officer prior to discharging any treated wastewater.

2.14 Water Management and Drainage

.1 Stage the work and complete excavation work, placement of all erosion protection materials and culvert installation in the dry. Provide temporary drainage, pumping, and construct berms as necessary to keep excavations and the work area free from water. Drainage plans shall be part of the EPP.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements such as the Provincial Water Act.

.4 Provide an Erosion and Sediment Control Plan that identifies type and location of erosion and sediment controls to be provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.5 As part of the EPP, submit details of proposed erosion, sediment and drainage control to Departmental Representative for review and approval prior to commencing work in fisheries sensitive areas or in areas that may affect fisheries sensitive areas and specifically address the protection of water bodies, water courses, and the following:

.1 Details of grading work to prevent surface drainage into or out of work areas.

.2 Details of erosion control works and materials to be used, including the deployment of silt fencing, floating silt curtains and containment booms during construction and excavation activities.

.3 Work schedule including the sequence and duration of all related work activities.

.4 The treatment of site runoff to prevent siltation of watercourses.

.5 Dewatering procedures for excavated materials including silt removal procedures prior to discharge.

.6 Stabilizing procedures during excavation.

.7 Maintenance of filters and sedimentation traps.

.6 Any dewatering activities will be released onto the ground at a location that is a minimum of 30 m from natural drainage courses and 100 m from fish bearing waters.

.7 Have on hand sufficient pumping equipment, machinery, and tankage in good working condition for ordinary emergencies, including power outage, and competent workers for operation of pumping equipment.

2.15 Environment Protection Supplies

.1 Comply with Federal and Provincial fisheries and environmental protection legislation, including preventing the loss or destruction of fish habitat, and minimizing the impact of sedimentation, siltation or otherwise causing a degradation in water quality.

.2 Provide a minimum of 30 m or more and as required of polypropylene silt fence (typical height of 0.9 m) and the necessary stakes for installation. This will be used as necessary to prevent sediment transport into water bodies.

.3 Provide a minimum of 50 lineal metres or more as required of 200 mm diameter hydrophobic, sorbent booms. This will be used as necessary to prevent the migration of hydrocarbons.

.4 Supply, transport, install and maintain erosion, sediment and drainage controls necessary to complete the work to the satisfaction of the Departmental Representative.

.5 At the completion of construction, leave silt fence(s) in place, if requested by the Departmental Representative.

.6 Unused Erosion, Sediment and Drainage Control supplies will remain the property of Departmental Representative until the completion of the Contract.

.7 Provide inventory of environmental protection supplies prior to mobilization.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Measurement and Payment Procedures.

1.2 References.

1.3 Definitions.

1.4 Responsibilities.

1.5 General.

1.6 Quality Management Plan.

1.7 Quality Control Personnel.

1.8 QC Documentation and Submittal to Departmental Representative.

1.9 QC Testing by the Contractor.

1.10 Non-Conformance Reports.

1.11 Frequency of QC Documentation and Submittal to Departmental Representative.

1.12 Departmental Representative Inspection and Audits.

1.1 Measurement and Payment Procedures

.1 Payment for Quality Management will not be made and shall be considered incidental to the applicable payment item of work.

1.2 References

.1 British Columbia MoTI – 2016 Standard Specifications for Highway Construction.

.2 American Society for Testing and Materials (ASTM), latest edition.

.1 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.2 ASTM D5519, Standard Test Methods for Particle Size Analysis of Natural and Man-Made Riprap Materials.

.3 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-

m/m^3)).

.4 ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

.5 ASTM C143, Standard Test Method for Slump of Hydraulic-Cement Concrete.

.6 ASTM C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

.7 ASTM D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 Definitions

.1 Quality Control (QC): The process of independently checking specific product or services to determine if they comply with the contract documents and relevant quality standards and identifying ways to eliminate causes of unsatisfactory product or service performance.

.2 Quality Assurance (QA): The process of ensuring that the Contractor's Quality Management Plan (QMP) (QC, non-conformances, etc.) are being followed. The results of the QA are provided as feedback to the QC team. Where required the Contractor shall implement changes to the project based on the feedback received from the QA process.

.3 Quality Management Plan (QMP): The complete details of the Contractor's plans and processes to ensure quality on the project.

.4 Deficiency / Non-conformance: Work or product failing to meet the conditions or requirements of the Contract (general conditions, specifications, drawings, or other section(s) forming the project contract).

1.4 Responsibilities

.1 The quality management responsibilities for this project are as follows:

.1 Quality Control: The Contractor's responsibility.

.2 Quality Assurance: The Departmental Representative's responsibility.

.3 Quality Management Plan: Prepared by the Contractor.

.4 Non-conformance Report: Prepared by the

Contractor's QC in conjunction with the Contractor and if necessary prepared by the Departmental Representative.

1.5 General

.1 The Contractor shall be responsible for ensuring the product meets the contractual quality requirements and that Quality Control measuring and documenting the quality of the work is completed by qualified person or persons from the Contractor's organization or hired by the Contractor. Quality Control work includes monitoring, inspecting, testing, and documenting the means, methods, materials, workmanship, processes and products of all aspects of the work as necessary to ensure conformance with the Contract.

.2 The Contractor shall provide unrestricted access to all Quality Control operations and documentation produced by or on behalf of the Contractor and shall allow the Departmental Representative full access at any time during working hours.

.3 The Departmental Representative will review the Contractor's performance of the work and determine the acceptability of the work based on the Departmental Representative's Quality Assurance results and, where deemed appropriate by the Departmental Representative, supplemented by the Contractor's Quality Control results. If needed, the Departmental Representative may request further testing.

.4 Work failing to meet the conditions of the Contract shall be considered a non-conformance. A non-conformance report will then be issued by the Contractor's Quality Manager. Non-conforming work shall be removed / replaced from the work unless an exception to the contract documents is accepted by the Owner.

.5 The Contractor shall not be entitled to payment for work that lacks the appropriate Quality Control documentation, verified by the Quality Control Manager, as required by the Contract or is subject to an unresolved NCR.

.6 The Contractor shall implement a well-coordinated approach to all operations related to the work and will organize its team and operations in keeping with the goal of doing things right the first time.

1.6 Quality Management Plan

.1 The Contractor shall prepare a Quality Management Plan. The purpose of the plan is to ensure the performance of the work in accordance with Contract requirements.

.2 The Contractor's Quality Management Plan shall be submitted to the Departmental Representative for review and acceptance.

The Departmental Representative will review the plan (first submission and if required all subsequent re-submissions) within 14 days of submission. Upon review of the plan the Departmental Representative will either:

.1 Accept the plan.

.2 Accept portions of the plan and provide comments outlining required changes or additional information in other sections. Following completion of edits, re-submit the plan for review.

.3 Reject the plan and provide comments outlining required changes or additional information needed. Following completion of edits, re-submit the plan for review.

.3 The Contractor shall allow time in the schedule for the reviews, and subsequent edits / re-submission.

.4 No work shall be undertaken on any element of Project Work (including payments, incidental work, or submittals for review) for which the applicable portions of the Quality Management Plan have not been accepted by the Departmental Representative.

.5 The Quality Management Plan is required to cover the work in its entirety, including without limitation all materials the Contractor and Subcontractors are supplying, monitoring and testing of the construction, documentation, and all items and phases of construction on the Project. At a minimum this shall include:

.1 Testing and survey to be completed by the Contractor (e.g. compaction, concrete, aggregate gradation, and tolerances of the work completed).

.2 Procedures for verifying and documenting conformance of the work to the contract requirements including but not limited to review of the work and completion of check sheets and daily reports.

.3 Procedures for the review of the Quality Control submissions by the Contractor prior to submission to the Departmental Representative for review approval.

.4 Resumes of Quality Control Manager and designated replacement (if applicable) detailing the Quality Control Manager's / Personnel's previous experience performing similar roles on similar projects.

.5 Procedure for immediately notifying the Contactor's management so work can be stopped and corrective action taken when material, product, processes or submittals are deficient or non-compliant with the contract requirements.

.6 List of the testing and survey checks, including minimum frequencies, to be completed by the Contractor (e.g. compaction, concrete, aggregate gradation, and tolerances of the work completed).

.7 The environmental monitoring and reporting procedures to assure that the Environmental Monitoring and all work is being completed in compliance with the requirements of the EPP, FLNRORD Section 11 Approval for Instream Work, and all other applicable regulations including the requirements of these specifications.

.8 All forms to be filled in by the Quality Control Personnel (ex. check sheets, test forms, NCR's, etc.).

.9 Procedures for the review of the project submissions by the QC Manager and Contractor to ensure accuracy and completeness of each submission against the project / specification requirements by the Contractor prior to submission to the Departmental Representative for review approval.

.6 The Quality Management Plan will include the following information:

.1 The name of the Quality Control Staff / Manager, (including names, qualifications and relevant experience) and their assigned roles and work scheduling in performing Quality Control Duties.

.2 The name of Quality Control testing person or agencies and details of their qualifications and relevant experience to provide the specific services required for the project.

.3 A list of testing equipment to be used for the work.

.7 The Contractor shall ensure that all workers are familiar with the Quality Management Plan, its goals, and their role under it, as well as the Contract Specifications associated with the work they are to undertake.

1.7 Quality Control Personnel

.1 The Contractor shall appoint a qualified and experienced Quality Control Manager and if necessary other staff who are responsible for quality matters, and who will report regularly to the Contractor's management at a level which shall ensure that Quality Management requirements are not subordinated to manufacturing, construction or delivery. The Quality Control Manager shall be a qualified Professional Engineer, Certified Engineering Technician, or Applied Science Technologist, or other person with knowledge, skills and abilities acceptable to the Departmental Representative.

.3 The Quality Control Personnel (including Quality Control Manager) shall remain on site at all times the Contractor is performing work which must be tested or inspected in-process, and must be readily accessible and able to return when off-site.

.4 At a minimum the Quality Control Manager shall:

.1 Be responsible to measure conformance of the work with the contract requirements and ensure that quality is not being compromised by production measures.

.2 Be empowered by the Contractor to resolve Quality Control matters.

.3 Direct and monitor Quality Control work completed by Quality Control testing agencies and Quality Control Staff.

.4 Review, sign, and be responsible for all reports (material and testing results).

.5 Immediately notify the Contactor's management so work can be stopped and corrective action taken when material, product, processes or submittals are deficient or non-compliant with the Contract Requirements.

.6 Complete internal Non-conformance Reports (NCR's).

.7 Respond to NCR's issued by the Departmental Representative.

.8 Attend pre-construction and construction progress meetings.

.5 PWGSC reserves the right to reject one or more of the Contractor's Quality Control Personnel and require the Contractor to find alternative Quality Control Personnel prior to or during the work should the Quality Control Personnel not

have the necessary qualifications as listed in this specification or not provide quality control services as required by this specification during the work. Should Quality Control Personnel be rejected, any work which cannot undergo complete quality control as outlined in these specifications shall stop while the Contractor finds replacement Quality Control Personnel.

1.8 QC Documentation and Submittal to Departmental Representative

.1 Check sheets:

.1 Check sheets to verify and document conformance of the work to the quality requirements of the contract are fundamental to the QC process. The check sheets prepared as part of the Quality Management Plan shall include all components of the project work and all checks required to ensure the components of the work are completed in conformance with the requirements of the Contract Documents.

.2 The frequency of check sheets completed by the Quality Control Staff to verify and document conformance of the work to the quality requirements of the contract shall be established by the Quality Control Manager to ensure the quality of the work is thoroughly documented. At a minimum, the frequency of check sheets shall achieve the following:

.1 Daily (relative to the work being performed).

.2 All check sheets and daily reports shall be reviewed and signed by the Quality Control Manager prior to submission to the Departmental Representative.

.3 Check sheets, daily reports, NCR's, test results, and other documents and forms prepared as part of the Quality Management Plan and completed throughout the project to verify conformance with the contract requirements shall be distributed to the Departmental Representative in electronic format via PWGSC's cloud based document filing system "CentralCollab" within 48 hrs. of the completion. Submit to the Departmental Representative hard copies of the same documents, forms, and test results if requested.

1.9 QC Testing by the Contractor

.1 Testing required to provide Quality Control to assure that the work strictly complies with the Contract requirements shall be completed by the Contractor during times of construction activity and at a minimum include:

.1 All testing required to confirm aggregate properties, aggregate gradation, and compaction where specified.

.2 All testing specified in the Contract Documents.

.3 Any other testing required as a condition for deviation from the specified Contract procedures.

.2 At a minimum the Contractor shall achieve the most stringent Quality Control testing frequencies as follows:

.1 The specific frequencies defined elsewhere in these specifications.

.2 The minimum QC testing frequencies as defined in Table 01 45 00 – 01.

Table 01 45 00 - 01: Minimum QC Testing Frequencies

Activity	Test / Inspection	Frequency
Cast-in-place Concrete	Compressive Strength Test (ASTM C39)	Minimum one (1) set of four (4) (one 7-day and three 28-day) per every one (1) day of concrete pour
Cast-in-place Concrete	Concrete Slump (ASTM C143)	Minimum one (1) Test per every one (1) day of concrete pour
Cast-in-place Concrete	Air Content (ASTM C173)	Minimum one (1) Test per every one (1) day of production
Gradation – Crushed Base Gravel, 75 mm Clear Crushed Base Gravel, Natural Substrate (Imported)	ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates	One per source at the discretion of the Departmental Representative
Screening / Sorting / Manufacture – Riprap	ASTM D5519, Particle Size Analysis of Natural and Man-Made Riprap Materials	One (1) Test per every one (1) day of production
Placement / Site Tolerance – Embankment	Survey	Final Lift, 1 survey shot every 5 m^2
Placement / Site Tolerance – Culverts	Survey	One (1) survey point (invert or top of culvert) every 2 m length of culvert section installed
Placement / Site Tolerance – Culvert Bedding	Survey	One (1) survey point every 1 m^2 of placed material.
Placement / Site Tolerance – Riprap	Survey	One (1) survey point every 5 m^2 or design change in grade of placed material.
Maximum Density – Embankment	Standard Proctor (ASTM D698)	One (1) for any change in nature or source of material
Maximum Density – Crushed Base Gravel	Standard Proctor (ASTM D698)	The more stringent of: - One (1) for each aggregate gravel pit source

		- One (1) for any change in nature of source of aggregate within a gravel pit
Compaction – Embankment	In-Place Density (ASTM D6938)	Three (3) randomly located tests per every lift of embankment material placed
Compaction – Crushed Base Gravel	In-Place Density (ASTM D6938)	Three (3) randomly located tests over the full length of the culvert reattachment section per each lift of material placed

.3 As defined in the BC MoTI 2016 Standard Specifications for Highway Construction (Volumes 1 and 2, and applicable Amendments available at time of tender closing). Should one of these specifications be silent on a particular testing frequency the testing frequencies shall be as defined in the Alberta Transportation Standard Specification for Highway Construction (latest edition and applicable Amendments available at time of tender closing). Wherever these standard specifications refer to standards (e.g. CSA, ASTM, and others) the minimum testing frequencies in these standards shall be utilized.

.4 One test per each individual area / location the material is utilized.

.3 Quality Control Testing agencies, their inspectors, and their representatives are not authorized to revoke, alter, relax, or release any requirement of the Contract Documents, nor to approve or accept any part of the work.

.4 The Contractor shall complete testing in the following manner:

.1 Provide testing facilities and personnel for the tests and inform the Departmental Representative in advance to enable the Departmental Representative to witness the tests if so desired. Onsite testing laboratories to conform to 1.10.1 – QC Testing by the Contractor of this specification.

.2 Notify the Departmental Representative when sampling will be conducted.

.3 Within 48 hrs. of the completion of a test and prior to transport or placement of material, submit the test result to the Departmental Representative (hard copy if requested) and in electronic format via PWGSC's cloud based document system "CentralCollab".

.4 Identify test reports with the name and address of the organization performing all tests, and the date of the tests.

1.10 Non-Conformance Reports

.1 The Contractor shall and the Departmental Representative may review the work to determine conformance with the contract requirements.

.2 Should the Contractor's Quality Control reporting indicate that the work is not in conformance, the Quality Control Manager shall issue an internal Non-Conformance Report (NCR) to the Contractor, with a copy to the Departmental Representative. Included as part of the NCR will be a required response time.

The Contractor shall then respond to the Quality Control Manager, with a copy to the Departmental Representative, with respect to the NCR, within the specified response time, with proposed resolutions and corrective actions. The Contractor and/or the Quality Control Manager may consult with the Departmental Representative on the resolutions but is not required to do so.

Payment for the work for which the NCR has been issued may be withheld until the NCR issue is resolved.

.3 Should the Departmental Representative Quality Assurance reporting indicate that the work is not in conformance, the Departmental Representative will issue to the Contractor a NCR with a required response time.

The Contractor shall then respond to that NCR, within the specified response time, with proposed resolutions and corrective actions. The Departmental Representative will accept or reject the proposed resolution and corrective action proposal.

Quality Assurance testing and inspection may be performed by the Departmental Representative to determine if the corrective action has provided an acceptable product. Acceptance and rejection will continue until the Departmental Representative determines that a quality product has been achieved.

Payment for the work for which the NCR has been issued may be withheld until the NCR issue is resolved.

.4 If in the opinion of the Departmental Representative it is not expedient to correct non-conforming work or work not performed in accordance with Contract Documents, the Departmental Representative may deduct from the Contract Price the difference in value between work performed and that

called for by Contract Documents, the amount of which shall be determined by the Departmental Representative.

1.11 Frequency of QC Documentation and Submittal to Departmental Representative

.1 The frequency of QC Documentation (i.e. check sheets) completed by the Quality Control Staff to verify and document conformance of the work to the quality requirements of the contract shall be established by the Quality Control Manager to ensure the quality of the work is thoroughly documented. At a minimum the frequency of QC Documentation shall be daily (relative to the work being performed).

.2 Check sheets, Daily Reports, NCR's, test results, and other Documents and forms prepared as part of the Quality Management Plan and completed throughout the project to verify conformance with the contract requirements shall be distributed to the Departmental Representative in electronic format via PWGSC cloud based system "CentralCollab" within 48 hrs. of the completion. Submit to the Departmental Representative hard copies of the same documents, forms, and test results if requested.

1.12 Departmental Representative Inspection and Audits

.1 The Departmental Representative may perform quality assurance audits as desired. Such audits will not relax the responsibility of the Contractor to perform work in accordance with Contract Documents.

.2 Allow the Departmental Representative access to work. If part of the work is in preparation at locations other than the place of work, allow access to such work whenever it is in progress.

.3 If Contractor covers, or permits to be covered, work that has been designated for Quality Assurance testing, inspections, or approvals before such is made, uncover such work, have inspections or tests satisfactorily completed, and make good such work.

.4 Independent Inspection/Testing Agencies may be engaged by the Departmental Representative for the purpose of Quality Assurance inspection and/or testing portions of the work. Costs of such services will be borne by the Departmental Representative.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Installation and Removal.

1.2 Scaffolding.

1.3 Hoisting.

1.4 Site Storage / Loading.

1.5 Security.

1.6 Equipment, Tool, and Materials Storage.

1.7 Sanitary Facilities.

1.8 Construction Signage.

1.9 Construction Laydown Area, Construction Parking, and Site Office.

1.10 Power.

1.11 Communications.

1.12 Temporary Heating, Ventilation, and Lighting.

1.13 Fire Protection.

1.1 Installation and Removal

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.2 Scaffolding

.1 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, and temporary stairs as necessary to carry out work.

1.3 Hoisting

.1 Provide, operate, and maintain hoists and cranes as necessary for moving of workers, materials, and equipment.

.2 Hoists and cranes shall be operated by qualified operators.

1.4 Site Storage / Loading

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of work with a weight or

force that will endanger the work or existing infrastructure.

1.5 Security	.1	Provide and pay for responsible security personnel as required.
1.6 Equipment, Tool, and Materials Storage	.1	If required by the Contractor provide and maintain, in a clean and orderly condition, lockable weather proof sheds for storage of tools, equipment and materials.
	.2	Locate materials not required to be stored in weatherproof sheds onsite in a manner to cause least interference with public.
1.7 Sanitary Facilities	.1	Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
	.2	Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
1.8 Construction Signage	.1	No other signs or advertisements, other than those required by Section 01 35 00 – Special Procedures – Traffic Control, are permitted on site.
1.9 Construction Laydown Area, Construction Parking, and Site Office	.1	Confine construction laydown areas, site office locations, and construction parking to the locations identified below in compliance with Section 01 35 43 – Environmental Protection and as pre-approved by the Departmental Representative.
		.1 Within highway right-of-way, in areas previously disturbed, off the traveled potion of the highway, and outside the highway clear zone.
		.2 Other areas as pre-approved by the Departmental Representative.
1.10 Power	.1	Provide and pay for power as required for the completion of the works and operations for construction office.
1.11 Communications	.1	Ensure Contractor's onsite representatives have suitable onsite phone communications allowing the Departmental Representative reliable communication to the Contractor's onsite representative.
1.12 Temporary Heating, Ventilation, and Lighting	.1	Provide temporary heating, ventilation, and lighting as required during construction period to facilitate construction of the works.
1.13 Fire Protection	.1	Provide and maintain temporary fire protection equipment during performance of work.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Installation and Removal.

1.2 Hoarding.

1.3 Guiderails and Barricades.

1.4 Access to Site.

1.5 Public Traffic Flow.

1.6 Fire Routes.

1.7 Protection for Off-site and Public Property.

1.8 Protection of Structure Finishes.

1.1 Installation and Removal

.1 Provide temporary controls in order to execute work expeditiously.

.2 Remove from site all such controls after use.

1.2 Hoarding

.1 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures (see Section 01 35 43 – Environmental Protection for further information).

1.3 Guiderails and Barricades

.1 Provide secure, rigid guiderails and barricades around deep excavations and open shafts.

.2 Provide as required by governing authorities.

1.4 Access to Site

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to work.

1.5 Public Traffic Flow

.1 Provide and maintain competent signal flag persons, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the Public (see Section 01 35 00 – Special Procedures – Traffic Control for further information).

1.6 Fire Routes

.1 Maintain access to property for use by emergency response vehicles.

1.7 Protection for Off-site and Public Property

.1 Protect surrounding private and public property from damage during performance of work.

.2 Be responsible for damage incurred.

1.8 Protection of Structure Finishes

.1 Provide protection for finished and partially finished structure finishes and equipment during performance of work.

.2 Provide necessary screens, covers and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule three (3) days prior to installation.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 General Requirements.

1.2 Requirements of Regulatory Agencies.

PART 2:

2.1 Products.

PART 3:

3.1 Mobilization.

3.2 Maintenance.

3.3 Demobilization.

1.1 General Requirements

.1 The Contractor is to provide its own construction camp and office as necessary. The construction camp shall not be located within PWGSC's right-of-way. Obtain approval from land owner should Contractor choose to setup construction camp outside right-of-way.

.2 The Contractor shall be responsible for all utility services to the construction camp. The construction camp to be established and operated in accordance with local regulations.

1.2 Requirements of Regulatory Agencies

.1 Obtain necessary licenses and approvals required by Authority having Jurisdiction for authorized use of water and disposal of domestic sewage and other waste.

.2 Comply with Environmental regulations.

PART 2 – PRODUCTS

2.1 Products

.1 Not Used.

PART 3 – EXECUTION

3.1 Mobilization

.1 Mobilize equipment, personnel, and materials as necessary to establish temporary construction camp and offices. Obtain necessary licenses and approvals from Authorities having Jurisdiction prior to mobilization. Camp and service area location and layout plan to be submitted to Departmental Representative for review and acceptance.

.2 Temporary construction camps to be established and operated in accordance with local regulations.

3.2 Maintenance	.1	Maintain construction camp and offices in a neat and tidy condition.
3.3 Demobilization	.1	Upon vacating the construction camp, offices and temporary services, clean-up and leave site in a condition satisfactory to the Departmental Representative and the Authorities having Jurisdiction.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Project Cleanliness.

1.2 Final Cleaning.

1.1 Project Cleanliness

.1 Maintain work in a tidy condition, free from accumulation of waste products and debris.

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by the Departmental Representative.

.3 Make arrangements with and obtain permits from Authorities having Jurisdiction for disposal of waste and debris.

.4 Provide wildlife resistant containers for collection of waste materials and debris.

.5 Dispose of waste materials and debris off-site.

.6 Clear snow and ice from areas of work.

1.2 Final Cleaning

.1 When work is substantially performed, remove surplus products, tools, construction machinery, and equipment not required for performance of remaining work.

.2 Remove waste products, debris, and materials used in construction. Reinstate the work site to the conditions pre-existing and to the satisfaction of the Departmental Representative.

.3 Prior to final review, remove surplus products, tools, construction machinery, and equipment.

.4 Make arrangements with and obtain permits from Authorities having Jurisdiction for disposal of waste and debris.

.5 Inspect finishes and fitments and ensure specified workmanship and operation.

.6 Remove dirt and other disfiguration from exterior surfaces.

.7 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.8 Sweep and wash clean paved or BST finished areas.

.9 Clean drainage systems.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Inspection and Declaration.

1.1 Inspection and Declaration

.1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify the Departmental Representative in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made.

.2 Request the Departmental Representative's Inspection.

.2 Departmental Representative's Inspection: The Departmental Representative and Contractor will perform inspection of work to identify obvious defects or deficiencies. Contractor shall correct work accordingly.

.3 Completion: Submit written certification that the following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Work is complete and ready for final inspection.

.4 Final Inspection: When the items noted above are completed, request final inspection of work by the Departmental Representative and Contractor. If work is deemed incomplete by the Departmental Representative, complete the outstanding items and request re-inspection.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Submissions.

1.2 Recording As-Built Conditions (As-Built Drawings).

1.3 As-Built Survey.

1.1 Submissions

.1 Submissions from the Contractor to the Departmental Representative for review will be returned with comments. Contractor to revise and re-submit submissions per the comments provided.

.2 Provide the following submissions to the Departmental Representative within two (2) weeks of substantial performance:

.1 As-built drawing and Shop Drawing mark-ups.

.2 As-built survey.

1.2 Recording As-Built Conditions (As-Built Drawings)

.1 The Departmental Representative will provide one set of Issued for Construction (or Issued for Tender) drawings for use by the Contractor to record as-built conditions and submit at the completion of the project as the "As-built Drawings".

.2 Record information concurrently with construction progress on the Issued for Construction (or Issued for Tender) drawings. Do not conceal work until the required information is recorded.

.3 Legibly mark each item on the Issued for Construction (or Issued for Tender) drawings and Shop Drawings in red ink to record actual construction conditions and any changes made by addenda and change orders.

.4 Maintain record documents in clean, dry, and legible condition.

.5 Keep record documents available for inspection by the Departmental Representative.

.6 Submit to the Departmental Representative one (1) copy of Issued for Construction (or Issued for Tender) drawings which have been marked by the Contractor up to include all "As-built" conditions.

1.3 As-Built Survey

.1 At the completion of the work complete an as-built survey of the works. At a minimum the survey shall include:

.1 Topo of all areas disturbed and modified during construction.

.2 Culverts (size, type and length of culvert, invert elevations at inlet and outlet).

.3 Signage.

.4 Edge of asphalt.

.5 Gravel Shoulder.

.6 Pavement Markings.

.7 Riprap.

.8 Any other feature or elements of work incorporated into the project.

.2 The survey to include sufficient point density to adequately characterize the work. Survey methods and point density is subject to prior approval of the Departmental Representative. At a minimum the Contractor shall survey all features at 5 m station intervals and the location of all treatment boundaries including changes in material type / placement, changes in surface treatment, and changes in terrain.

.3 Survey data shall be collected at an accuracy of +/- 0.02 m horizontal and +/- 0.02 m vertical or better and shall be referenced / tie into the PWGSC's monument / coordinate system as shown on the Contract Drawings.

.4 Survey data shall be provided to the Departmental Representative in digital xyz format with an appropriate descriptor code as to the type of material surface or feature being surveyed.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Definitions.

1.2 Submittals.

1.3 Storage and Handling.

1.4 Transportation.

PART 2:

2.1 Materials.

PART 3:

3.1 Disposal.

1.1 Definitions

.1 Dangerous Goods: Product, substance, or organism that is specifically listed or meets the hazard criteria established in Transportation of Dangerous Goods Regulations.

.2 Hazardous Material: Product, substance, or organism that is used for its original purpose and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.

.3 Hazardous Waste: Any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment, or disposal.

.4 Workplace Hazardous Materials Information System (WHMIS): A Canada-wide system designed to give employers and workers information about hazardous materials used in the workplace. Under WHMIS, information on hazardous materials is to be provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by a combination of Federal and Provincial laws.

1.2 Submittals

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit to the Departmental Representative a current Material Safety Data Sheet (MSDS) for each hazardous material required prior to bringing hazardous material onsite.

.3 Submit Hazardous Materials Management Plan to the Departmental Representative that identifies all hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.

1.3 Storage and Handling

.1 Abide by internal requirements for labeling and storage of materials and wastes. If required, coordinate storage of hazardous materials with the Departmental Representative.

.2 Store and handle hazardous materials and wastes in accordance with applicable Federal and Provincial laws, regulations, codes, and guidelines.

.3 Store and handle flammable and combustible materials in accordance with current National Fire Code of Canada requirements.

.4 Store all flammable and combustible liquids in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval.

.5 Transfer of flammable and combustible liquids is prohibited within buildings.

.6 Transfer of flammable and combustible liquids will not be carried out in the vicinity of open flames or any type of heat-producing devices.

.7 Flammable liquids having a flash point below 38°C, such as naphtha or gasoline, will not be used as solvents or cleaning agents.

.8 Store flammable and combustible waste liquids for disposal in approved containers located in a safe, ventilated area. Keep quantities to a minimum.

.9 Observe smoking regulations at all times. Smoking is prohibited in any area where hazardous materials are stored, used, or handled.

.10 Abide by the following storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 L for liquids:

.1 Store hazardous materials and wastes in closed and sealed containers that are in good condition.

.2 Label containers of hazardous materials and wastes in accordance with WHMIS.

.3 Store hazardous materials and wastes in containers compatible with that material or waste.

.4 Segregate incompatible materials and wastes.

.5 Ensure that different hazardous materials or hazardous wastes are not mixed.

.6 Store hazardous materials and wastes in a secure storage area with controlled access.

.7 Maintain a clear egress from storage area.

.8 Store hazardous materials and wastes in a manner and location which will prevent them from spilling into the environment.

.9 Have appropriate emergency spill response equipment available near the storage area, including personal protective equipment.

.10 Maintain an inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

.11 Ensure personnel have been trained in accordance with WHMIS requirements.

.12 Report spills or accidents involving hazardous materials immediately to Emergency Management BC 24-hour phone line at 1-800-663-3456, other local Authority having Jurisdiction, and the Departmental Representative. Submit a written spill report to the Departmental Representative within 24 hours of incident.

.13 Store and handle all hazardous materials away from any water course as outlined in Section 01 35 43 – Environmental Protection.

1.4 Transportation

.1 Transport hazardous materials and wastes in accordance with Federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable Provincial regulations.

.2 If exporting hazardous waste to another country, ensure compliance with Federal Export and Import of Hazardous Waste Regulations.

PART 2 – PRODUCTS

2.1 Materials

.1 Only bring onsite the quantity of hazardous materials required to perform the work.

.2 Maintain MSDS in proximity to where the materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

PART 3 – EXECUTION

3.1 Disposal

.1 Dispose of hazardous waste materials in accordance with applicable Federal and Provincial acts, regulations, and guidelines. Costs for disposal to be considered incidental to the work.

.2 Recycle hazardous wastes for which there is an approved, cost-effective recycling process available.

.3 Send hazardous wastes only to authorized hazardous waste disposal or treatment facilities.

.4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.

.5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

.6 Dispose of hazardous wastes in a timely fashion in accordance with applicable Provincial regulations.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 General.

1.2 Measurement and Payment.

1.3 References.

1.4 Submittals.

1.5 Quality Management.

PART 2:

2.1 Concrete.

2.2 Concrete Mix.

2.3 Formwork / Falsework Materials.

2.4 Form Ties.

2.5 Form Release Agent.

PART 3:

3.1 Site Preparation.

3.2 Delivery, Storage, and Handling.

3.3 Environmental Requirements.

3.4 Formwork / Falsework Fabrication and Erection.

3.5 Concrete Placement and Finishing.

3.6 Curing.

3.7 Removal of Formwork / Falsework.

3.8 Cleaning.

3.9 Field Quality Control.

1.1 General

.1 Following placement of the 1200 mm diameter liner in the existing 1800 mm diameter culvert, the void space between the 1200 mm diameter liner and existing 1800 mm diameter

culvert is to be filled with Concrete as per this specification.

1.2 Measurement and Payment .1 Payment for the completion of Concrete shall not be made and shall be considered incidental to the applicable payment item found in Section 33 42 13 - Pipe Culverts.

1.3 References .1 Canadian Standards Association (CSA International), latest edition.

.1 CSA 23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA-A23.2, Methods of Test for Concrete.

.3 CSA-A5, Portland Cement.

.4 CSA A283, Qualification Code for Concrete Testing Laboratories.

.5 CSA A363, Cementitious Hydraulic Slag.

.6 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.7 CAN/CSA-S269.3-M92, Concrete Formwork, National Standard of Canada.

.8 CSA-O86S1, Supplement No. 1 to CAN/CSA-086-01, Engineering Design in Wood.

.9 CSA-0121, Douglas Fir Plywood.

1.4 Submittals .1 Undertake the Concrete mix design and pay for all costs associated with the development, testing, and submissions of the mix design. Additional requirements of the mix design:

.1 Expected method of batching, transporting, and placing concrete.

.2 Distance and expected travel time from batch plant location to project site.

.2 Prepare a written concrete installation memo with the methodology / procedures proposed for use to ensure the entire void space between the 1200 mm diameter culvert liner and the 1800 mm diameter culvert is filled with concrete and no void space is remaining at the conclusion of the work. The submittal shall include sufficient details of all aspects of the

proposed plan such that the Departmental Representative can ascertain the effectiveness of the proposed plan.

.3 Prepare a written submittal with drawings (as necessary) of concrete Formwork / Falsework which will be used during the concrete installation to prevent any concrete from entering the creek. The submittal shall include sufficient details of all aspects of the proposed plan such that the Departmental Representative can ascertain the effectiveness of the proposed plan.

.4 The Contractor's Concrete mix design, submittal of methodology / procedures to ensure void spaces are filled with concrete, and Concrete Formwork / Falsework submittal shall be submitted to the Departmental Representative as one single PDF document per submittal (multiple files will not be accepted) for review and acceptance in accordance with the procedures outlined in Section 01 33 00 – Submittal Procedures. The Departmental Representative will review the submittals (first submission and if required all subsequent re-submissions) within seven (7) days of submission. Upon review of the submittals the Departmental Representative will do one of the following:

.1 Accept the submittals.

.2 Accept portions of the submittals and provide comments outlining required changes or additional information in other sections. Following completion of edits by the Contractor, re-submit the complete submittals for review.

.3 Reject the submittals and provide comments outlining required changes or additional information needed before the submittals will be reviewed in detail. Following completion of edits by the Contractor, re-submit the complete submittals for review.

.3 The Contractor shall allow time in the schedule for the reviews, and subsequent edits / re-submission.

.4 No Concrete shall be placed prior to receiving the Departmental Representative's acceptance of the submittals.

.5 Acceptance of the submittals by the Departmental Representative does not constitute acceptance of the Concrete. Acceptance of the Concrete will be based upon the test results and the performance and quality of the Concrete and concrete components placed on the project.

1.5 Quality Management

.1 Quality Control and Quality Assurance in accordance with Section 01 45 00 – Quality Management.

.2 Quality Control testing frequency: Minimum test frequency as described in Table 01 45 00 – 01: Minimum QC Testing Frequencies unless advised otherwise by the Departmental Representative following a review of the Concrete Mix Design but in advance of the work.

.3 In the case of ambiguity whether the product or work conforms to the applicable standard, the Departmental Representative reserves the right to have such product tested or re-inspected to ascertain the conformance.

PART 2 – PRODUCTS

2.1 Concrete

.1 Portland cement: to CAN3-A23.1-M

.2 Water: to CAN3-A23.1-M

.3 Aggregates: to CAN3-A23.1-M

.4 Air entraining Admixtures: to CAN3-A266.1-M

.5 In no case will batch adjustment relieve the Contractor of the responsibility for the durability, strength, or acceptability of Concrete concerned. The Departmental Representative reserves the right to reject any batch in case of confirmed unacceptability and to require immediate removal of any Concrete from this batch from the work.

2.2 Concrete Mix

.1 Proportion Concrete in accordance with CAN3-A23.1 to yield the following properties.

.1 Type 10 cement, 300 kg/m³.

.2 Minimum compressive strength at 28 days: 30 MPa.

.3 Nominal size of coarse aggregate: 20 mm.

.4 Slump at time and point of discharge: 130 mm, +/- 30 mm.

.5 Air content: 4-7%.

.6 Water cement ratio: 0.40.

.7 Maximum 25% by mass of cementitious materials.

.8 Calcium Chloride or admixtures containing chloride ions shall not be permitted.

.9 Consistency that will result in a flowable product at the time of placement which does not require manual means to move it into place.

.2 Do not change Concrete Mix without prior approval of the Departmental Representative. Should change in material source be proposed, a new Concrete mix design to be submitted to the Departmental Representative for compliance acceptance.

2.3 Formwork / Falsework Materials

.1 Formwork / Falsework materials in accordance with CSA-0121 with waterproof adhesive and smooth finish on face in contact with concrete.

2.4 Form Ties

.1 Form ties shall be removeable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

2.5 Form Release Agent

.1 Non-staining compound, effective in preventing adhesion of concrete to forms and providing clean, oil, and grease-free contact surfaces.

PART 3 – EXECUTION

3.1 Site Preparation

.1 Obtain the Departmental Representative's approval before placing concrete.

.1 Provide the Departmental Representative 24 hours' minimum notice prior to each concrete pour.

.2 Use pumps and other means to ensure the existing 1800 mm diameter culvert is clear of standing water and other debris before the Concrete is placed.

.3 Using form work, ensure Concrete does not escape the void space between the existing 1800 mm diameter culvert and 1200 mm diameter steel culvert liner during placement.

3.2 Delivery, Storage, and Handling

.1 Deliver, store, and handle forming materials such to prevent warping, twisting, and other damage.

.2 Concrete shall be fully discharged and placed within 3 hours after water and cement have been combined. Any proposed deviation from this requirement must be pre-approved by the Departmental Representative. To obtain pre-approval, the Contractor shall submit in writing the proposed methodology

to ensure all concrete strength and other requirements are achieved. Regardless of the proposed methodology submitted, the Departmental Representative is under no obligation to deviate from this requirement.

.3 Concrete delivery: ensure that continuous Concrete delivery from plant meets CSA A23.1/A23.2.

.4 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Dispose of waste forming materials at a disposal facility approved by the Departmental Representative.

.3 Divert unused Concrete materials to a local landfill facility approved by the Departmental Representative.

.4 Provide an appropriate area on the job site where concrete trucks can be safely washed.

.5 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground, or in other locations where it could pose a health or environmental hazard.

.6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial, and National regulations.

3.3 Environmental Requirements .1 Concrete and grouting will follow BC WLAP Standards and Best Practices for Instream Works Section 14.6 Concrete Materials Use.

.2 Concrete shall not be deposited, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place will remain inside formed structure.

.3 A carbon dioxide (CO_2) tank with regulator, hose and gas diffuser will be readily available during concrete work. Carbon dioxide gas will be released into the affected area to neutralize pH levels should a spill occur.

.4 The Contractor shall provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment and other tools and equipment.

.5 All spills will be reported to Emergency Management BC (1-800-663-3456) and where possible, immediate removal of materials from the water and implementation of emergency mitigation and cleanup measures will be initiated.

.6 Isolation of all concrete work from any water within or entering into any watercourse.

.7 Monitoring of pH levels in the watercourse immediately downstream of the works will be conducted if the stream is not iced. Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0 pH units.

3.4 Formwork / Falsework Fabrication and Erection

.1 Verify lines, levels and centres before proceeding with Formwork / Falsework end ensure dimensions agree with Contract Drawings.

.2 Construct Formwork / Falsework in accordance with CAN3-A23.1.

.3 Erect Formwork / Falsework true to line, brace and strut to prevent deformation under the weight and pressure of wet concrete, construction loads, wind and other forces. Ensure deflection does not exceed 5 mm.

.4 Erect Formwork / Falsework such that the variation in location, elevation, and alignment from established position / dimension on the Contractor's Construction Formwork / False Work submittal is as follows:

.1 Of the contract work area in relation to the established benchmark and reference points: +/- 50 mm.

.2 Within the contract work area in relation to the proposed culvert liner: +/- 20 mm.

.3 Strength and rigidity of Formwork / Falsework shall be such that they will not leak mortar or result in visible irregularities in the finished concrete.

3.5 Concrete Placement and Finishing

.1 Prior to placing concrete, submit and obtain approval for Concrete Mix design, Concrete Installation memo, and Concrete Formwork / Falsework written submission (see Item 1.4 – Submittals).

.2 Prior to placing concrete, obtain approval from the Departmental Representative of proposed method of protection of concrete during placing an occurring in adverse weather conditions or when air temperatures are less than 5°C or greater than 30°C.

.3 Comply with hot/cold weather Concrete fabrication, placement, and curing requirements as per CSA-23.1-09.

.4 Convey the Concrete at the site utilizing equipment of the design, size, and condition to deposit a continuous and adequate supply of Concrete of the specified mix and consistency without segregation at the required locations.

.5 During concreting operations:

.1 Development of cold joints is not permitted.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling and without damage to existing structure or work.

.3 Addition of water to the batch is not permitted.

.4 One adjustment of air onsite may be permitted provided the adjustment is done under the supervision of a qualified personnel.

.6 Ensure reinforcements and inserts are not disturbed during concrete placement.

.7 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature, and test samples taken.

.8 Ensure Concrete is placed in accordance with the Contract Drawings and has filled all areas of the void space. If required, use manual means to move Concrete into all areas of the void space.

.9 Honeycombed concrete should be cut out and replaced.

.10 Ensure minimum cover to reinforcement is maintained during concrete pour.

.11 The Departmental Representative may request the Contractor prove that all void spaces have been filled, through actions such as drilling, at the Contractor's expense.

3.6 Curing

.1 Maintain moist curing in accordance with CAN3-23.1 and subject to the approval of the Departmental Representative.

.2 Curing compounds may only be applied at the acceptance of the Departmental Representative. Only curing compounds which meet the requirements of ASTM C309 will be accepted for use.

3.7 Removal of Formwork / Falsework

.1 Remove Formwork / Falsework not structurally supporting concrete only after a period of not less than 24 hours at a surface temperature of the concrete of 10°C or such longer period as necessary to ensure that the concrete is sufficiently hard so as not to damage the concrete by removing Formwork / Falsework, and curing and protection operations are maintained.

.2 Use proper tools as recommended by the manufacturer for the removal of form ties.

.3 Remove Formwork / Falsework with care to prevent marring of concrete surfaces.

3.8 Cleaning

.1 Thoroughly clean surfaces, remove fines, and laitance.

.2 Clean up debris to the satisfaction of the Departmental Representative.

3.9 Field Quality Control

.1 Conduct the following site tests and submit reports to the Departmental Representative in accordance with Section 01 33 00 – Submittal Procedures.

.1 Concrete pours.

.2 Slump tests.

.3 Air content.

.4 Temperature.

.5 Compressive strength.

.2 Inspection and testing of concrete and concrete materials will be carried out by the Contractor in accordance with CSA-A23.1/A23.2.

.1 Ensure that the testing laboratory is certified in accordance with CSA A283.

.3 The frequency of testing shall be as outlined in the Quality Management Plan but at a minimum achieve the frequency requirements of Section 01 45 00 – Quality Management.

.4 The Contractor will take additional test cylinders during cold weather concreting.

.5 Inspection or testing by the Departmental Representative will not augment or replace the Contractor's Quality Control nor relieve the Contractor of their contractual responsibility.

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Measurement and Payment Procedures.

1.2 References.

1.3 Submittals.

1.4 Quality Management.

PART 2:

2.1 Aggregate Source.

2.2 Aggregates General.

2.3 Riprap.

2.4 Crushed Base Gravel.

2.5 75 mm Clear Crush Culvert Bedding.

2.6 Riprap Infill.

2.7 Natural Substrate.

PART 3:

3.1 Preparation.

3.2 Processing.

3.3 Handling and Transportation.

3.4 Stockpiling.

3.5 Cleaning.

1.1 Measurement and Payment Procedures

.1 Measurement and Payment for Aggregate Materials shall not be paid separately and shall be incidental to other works. Measurement and Payment for Aggregate Materials shall be per the applicable work included in Section 33 42 13 – Pipe Culverts, and any other section as required by these specifications.

1.2 References

.1 American Society for Testing and Materials (ASTM), latest edition.

.1 ASTM C136, Sieve Analysis of Fine and Coarse Aggregates.

.2 British Columbia Motor Vehicle Act, Motor Vehicle Act Regulations, Division 19 – Miscellaneous, latest edition.

1.3 Submittals

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.4 Quality Management

.1 Quality Control and Quality Assurance in accordance with Section 01 45 00 – Quality Management.

.2 In addition to the Quality Control undertaken by the Contractor, the Departmental Representative may undertake, through an independent testing firm, random sampling, inspection, and testing for the purpose of Quality Assurance.

.3 Provide access to all portions of the work for sampling by the Departmental Representative.

PART 2 – PRODUCTS

2.1 Aggregate Source

.1 The Contractor shall provide his own source(s) for all aggregate materials for this project. The Contractor will be solely responsible for ensuring that the aggregate source(s) selected by the Contractor continuously achieves all aggregate material properties, quality, and gradation requirements as outlined in this Contract Specification for the materials' intended use.

.2 A minimum of seven (7) calendar days prior to supply or commencement of manufacture of materials from the Contractor's selected aggregate source(s), provide to the Departmental Representative for review and acceptance the location, name, and owner of material source.

2.2 Aggregates General

.1 All aggregate materials on the project shall at a minimum achieve the following requirements. Should more stringent requirements for a specific aggregate be provided elsewhere in this Contract Specification, the more stringent requirement shall apply.

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals or other substances that would act in deleterious manner for use intended.

.2 Flat and elongated particles of coarse aggregate (ASTM D4791) to:

.1 Flat and elongated particles are those whose greatest dimension exceeds five times their least dimension.

2.3 Riprap

.1 Riprap shall be in conformance with Section 31 37 00 – Riprap.

2.4 Crushed Base Gravel

.1 Crushed Base Gravel shall conform with the following requirements:

.1 The material shall consist of hard durable particles free from clay lumps, frozen material, organic matter, and other deleterious materials.

.2 When tested in accordance to ASTM C136/C136M, the material shall have a gradation conforming to the following gradation limits:

Table 31 05 16 – 01: Gradation Limits: Crushed Base Gravel

Sieve Designation (mm)	Percent Passing by Weight
19	100
12.5	70 – 100
4.75	40 – 70
2.00	23 – 50
0.425	7 – 25
0.075	3 - 8

.3 Liquid limit when tested in accordance to ASTM D4318, maximum 25.

.4 Plasticity index when tested in accordance to ASTM D4318, maximum 6.

.5 Los Angeles degradation when tested in accordance to ASTM C131/C131M, maximum percent loss by weight 35.

.6 Fracture: at least 60% of particles by mass retained on 4.75 mm sieve to have at least one fractured face.

2.5 75 mm Clear Crush Culvert Bedding

.1 The 75 mm Clear Crush Culvert Bedding shall conform with the following requirements:

.1 When tested in accordance to ASTM C136/C136M, the material shall have a gradation conforming to the following gradation limits:

Table 31 05 16 – 02: 75 mm Clear Crush Culvert Bedding

Sieve Designation (mm)	Percent Passing by Weight

75.0	100
50.0	0 - 10

.2 Stone consisting of hard durable particles free from clay lumps, frozen material, and other deleterious materials, and free from splits, seams, or defects likely to impair its soundness during handling.

2.6 Riprap Infill

.1 Riprap Infill shall be placed in the proposed riprap voids and shall be sourced from the material extracted from within the existing Gabion Mats designated for removal from the site and temporarily stockpiled for later reuse as Riprap Infill. Prior to placement the Contractor shall ensure the Riprap Infill material is clean and free of deleterious material and acceptable for use as determined by the Departmental Representative.

2.7 Natural Substrate

.1 Natural Substrate shall be placed within the proposed 3200 mm diameter steel pipe culvert and shall be imported from an offsite source and achieve the following requirements.

.1 Natural Substrate shall be a 150 mm minimum material comprised of rounded aggregates produced from sorting, screening, and / or blending of materials. The materials shall have a generally uniform gradation conforming to the following gradation limits:

Table 31 05 16 – 03: Gradation Limits: Natural Substrate

Sieve Designation (mm)	Percent Passing by Weight
150.0	100
75.0	50 – 80
50.0	30 – 60
25.0	20 – 50
9.5	0 – 5

PART 3 – EXECUTION

3.1 Preparation

.1 Prior to excavating materials for aggregate production, strip off and stockpile unsuitable surface material.

.2 Strip area ahead of quarrying of excavating operation sufficient to prevent contamination of aggregate by deleterious material.

3.2 Processing

.1 Process aggregate uniformly using methods that prevent contamination, segregation, and degradation.

.2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Departmental Representative.

	.3	Wash aggregates, if required, to meet specifications. Use only equipment approved by Departmental Representative.
	.4	When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.
3.3 Handling and Transportation	.1	Avoid segregation, contamination, and degradation of aggregate during handling and transporting.
	.2	Load limit restrictions will be in accordance with British Columbia Highway Motor Vehicle Act pertaining to registered weight limits and vehicle size.
	.3	The Contractor shall be responsible for all haul roads required to access aggregate sources. All haul roads used shall be maintained at the Contractor's expense and at the conclusion of the works, left in a condition acceptable to the haul road owner.
3.4 Stockpiling	.1	Should stockpiles on highway right-of-way or on PWGSC property be required, stockpile aggregates in locations directed by Departmental Representative. Do not stockpile on completed pavement surfaces.
	.2	Stockpile aggregates in sufficient quantities to meet project schedules.
	.3	Stockpile sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
	.4	Except where stockpiled on acceptably stabilized areas, provide compacted Crushed Base Gravel not less than 300 mm in depth to prevent contamination of aggregate. Do not incorporate compacted base of pile into work.
	.5	Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
	.6	Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative.
	.7	Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpiles as required to prevent segregation.
	.8	Do not cone piles or spill material over edges of piles.
	.9	Prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.5 Cleaning

.1 Any stockpiles temporarily placed on the highway right-of-way or on PWGSC property will be completely removed and the site restored to its natural condition.

.2 The Contractor shall be responsible for any cleanup of aggregate sources.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Measurement and Payment Procedures.

1.2 Definitions

1.3 References.

1.4 Submittals.

PART 2:

2.1 Embankment Fill.

2.2 Crushed Base Gravel.

2.3 75 mm Clear Crushed Culvert Bedding.

PART 3:

3.1 Excavation – Embankment.

3.2 Excavation – Channel Re-alignment and Erosion Protection.

3.3 Disposal of Excavated Embankment Material.

3.4 Placement of Embankment Fill.

1.1 Measurement and Payment Procedures

.1 Payment for the completion of Excavation and Backfill shall not be made and shall be considered incidental to the applicable payment item found in Section 31 37 00 – Riprap and Section 33 42 13 – Pipe Culverts.

1.2 Definitions

.1 Stripping: excavation of organic material covering the original ground.

.2 Organic Material: soil in which plants can grow, comprising primarily of mineral particles mixed with decayed organic matter and having the capability of retaining water. Typically dark brown or black in colour.

.3 Excavation: removal of materials that are not rock excavation or stripping.

.4 Embankment: gravels and rock material containing no more than 3% organic matter by mass and free from weds, sod, roots, logs, stumps, frozen lumps, snow, ice, or any other unsuitable materials determined by the Departmental

Representative. The maximum size of embankment rock placed within 300 mm of final grade of embankment material shall be 200 mm in diameter.

.5 Topsoil: organic material derived from stripping free of rocks > 150 mm in diameter and other debris hindering good vegetative growth.

1.3 References

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM D698-00a, Test method for Laboratory Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft3) (600 kN-m/m3).

.2 British Columbia MoT – 2016 Standard Specifications for Highway Construction.

1.4 Submittals

.1 A minimum of seven (7) days in advance of undertaking the excavation work to complete the repairs to the inlet and outlet ends of the overflow culverts, submit to the Departmental Representative written procedures for shoring or other measures needed to safely complete the excavation. The Contractor shall be responsible for all costs associated with the development of the written procedures. The written procedures shall be developed and sealed by a P.Eng. registered in BC and qualified to undertake such work. The written procedures shall include sufficient written details and figures such that the proposed approach can be reviewed and understood by the Departmental Representative in advance of the work and the Contractor can follow the necessary approach in the field.

PART 2 – PRODUCTS

2.1 Embankment Fill

.1 Embankment Fill material shall be material excavated from the project site, temporarily stockpiled, and classified by the Departmental Representative as suitable for re-use. Unless approved otherwise by the Departmental Representative, the material shall be stockpiled for a sufficient length of time to allow the material to dry prior to placement. If necessary or if Directed by the Departmental Representative, the Contractor shall cover the embankment material while stockpiled with an insulated tarp to protect the material from the weather and keep the material dry for later re-use.

2.2 Crushed Base Gravel

.1 Crushed Base Gravel shall be in accordance with Contract Specifications Section 31 05 16 – Aggregate.

2.3 75 mm Clear Crush Culvert Bedding

.1 Crushed Base Gravel shall be in accordance with Contract Specifications Section 31 05 16 – Aggregate.

PART 3 – EXECUTION

3.1 Excavation - Embankment

.1 Remove and temporarily stockpile riprap placed on the highway embankment side slopes to the limits as necessary to facilitate the work. Strip organic material and temporarily stockpile for later re-use as topsoil.

.2 Excavate highway embankment to facilitate repairs to the existing 900 mm diameter overflow culvert inlets and outlets, installation of the new 3200 mm diameter (minimum) culvert, and installation of the 1200 mm diameter liner in the existing 1800 mm diameter culvert. Complete the excavations in compliance with the Occupational Health and Safety Regulations applicable to the location of the work. Where excavation limits require, engage a Professional Engineer to complete an assessment of the slope, design shoring, or take other means necessary to provide a safe excavation within the limits shown on the Contract Drawings (see Item 1.3 – Submittals for more information).

.3 Temporarily stockpile excavated materials onsite for inspection by the Departmental Representative. Excavated materials classified by the Departmental Representative as suitable for re-use shall be re-used as Embankment Fill. Excavated materials classified by the Departmental Representative as unsuitable for re-use and / or excess excavation shall be disposed of per Item 3.3 – Disposal of Excavated Embankment Material. Cover entire embankment material stockpile when directed by the Departmental Representative with an impermeable insulated tarp to protect the embankment material from the weather. Remove tarp as directed by the Departmental Representative during times of dry weather to allow material to dry.

.4 Excavate the proposed stream bed and stream slopes to the lines, grades, elevations, and dimensions as indicated on the Contract Drawings. Excavation to be completed to within +/- 100 mm of the line, grades, and elevations measured normal to the finish surface but not uniformly high or low.

3.2 Excavation – Channel Re-alignment and Erosion Protection

.1 Install temporary drainage and pumping and construct berms as outlined in the accepted EPP to keep excavations and the work area free from water to the maximum extent possible (see Section 01 35 46 – Environmental Protection).

.2 Complete all work in accordance with the British Columbia Ministry of Forests, Lands, Natural Resource Operations and

Rural Development (FLNRORD) Section 11 Approval for Instream Work.

.3 Remove and temporarily stockpile existing riprap for later re-use as Riprap within the limits of excavation shown on the Contract Drawings. All riprap stockpiled for later re-use shall achieve the size requirements for Riprap.

.2 Cut the existing gabion mats using hand tools at the joint nearest to the cut location shown on the Contract Drawings or in a location approved by the Departmental Representative. Remove all gabion mat wire from gabion mats designated for removal and dispose of gabion mat wire at an offsite disposal facility pre-approved by the Departmental Representative. Protect and leave intact gabion mats designated to remain to the maximum extent possible.

.3 Remove and temporarily stockpile existing gabion mat material for re-use later as Riprap Infill. Gabion mat material shall be removed from all gabion mats designated for removal to the maximum extent possible.

.4 Complete excavation of the natural ground to the lines and grades shown on the contract drawings in preparation for channel re-alignment and Riprap erosion protection.

.5 Dispose of excess excavated material from channel re-alignment and erosion protection works at an offsite disposal facility outside PWGSC's ROW, chosen by the Contractor and pre-approved by the Departmental Representative.

3.3 Disposal of Excavated Embankment Material

.1 Excavated material classified by the Departmental Representative as unsuitable for re-use as Embankment Fill and or excess excavation shall be disposed of offsite outside PWGSC's ROW at a disposal facility chosen by the Contractor and pre-approved by the Departmental Representative.

3.4 Placement of Embankment Fill

.1 Prior to backfill of the embankment material, complete culvert installations per the requirements of Section 33 42 13 – Pipe Culverts.

.2 Prior to placement of excavated material temporarily stockpiled and classified by the Departmental Representative as suitable for re-use as embankment, the material shall have been stockpiled for a sufficient length of time to allow the material to dry (unless approved otherwise by the Departmental Representative).

.3 Finished surfaces of Embankment Fill to be within

+/- 100 mm of the lines and grades shown in the contract drawings but not uniformly high or low.

.4 Place Embankment Fill in 250 mm lifts to the extents shown on the Contract Drawings. Compact lifts to 98% maximum dry density in accordance with ASTM D698. Compact final 500 mm to 100% maximum dry density in accordance with ASTM D698.

.5 Dewater excavation by sumps and pumps, if required, to limit sloughing and allow for placement and compaction of materials in a dry condition.

.6 Grade Embankment Fill to the design lines and grades shown on the Contract Drawings.

.7 Place riprap excavated from the embankment side slopes and temporarily stockpiled back on the surface of the embankment side slopes.

.8 Place stripped material as topsoil on embankment side slopes. Place topsoil material around individual riprap rocks such that the riprap rocks are partially buried.

.9 Place Hydraulic Seeding on all Embankment Fill and all disturbed areas within the construction limits (see Section 32 93 21 – Hydraulic Seeding for details).

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Measurement and Payment Procedures.

1.2 References.

PART 2:

2.1 Riprap.

2.2 Nonwoven Geotextile.

PART 3:

3.1 Placement of Nonwoven Geotextile.

3.2 Placement of Riprap.

1.1 Measurement and Payment Procedures

.1 Payment for the completion of inlet and outlet channel re-alignment and erosion protection will be made on the basis of the Price per Unit Bid for Inlet Channel Re-alignment and Erosion Protection and Outlet Channel Re-alignment and Erosion Protection in the Bid and Acceptance form. The Price per Unit Bid shall include all costs for the removal and temporary stockpile of existing riprap, removal of existing gabions, removal and temporary stockpile of gabion basket material, excavation and offsite disposal of excess excavated material. The price shall further include the supply and installation of nonwoven geotextile, the manufacture, supply, transport and placement of Riprap, the placement of gabion basket material as Riprap Infill, cutting of PVC and perforated pipe to match proposed Riprap elevation, ditch regrading and all other items necessary for the successful completion of the work.

.2 Measurement for Payment for Inlet Channel Re-alignment and Erosion Protection and Outlet Channel Re-alignment and Erosion Protection will be made at the Lump Sum based on the percentage of work completed and accepted by the Departmental Representative.

1.2 References

.1 British Columbia MoT – 2016 Standard Specifications for Highway Construction.

PART 2 – PRODUCTS

2.1 Riprap

.1 The Riprap shall conform with the following requirements:

.1 Crushed / blasted angular stone consisting of hard durable particles free from clay lumps, frozen material and other deleterious materials, and free from splits, seams or defects likely to impair its soundness during handling or under action of water.

.2 Is a graded material conforming with the following gradation limits:

Table 31 37 00 – 01: 50 Kg Class Riprap		
Mass (kg) *	**Nominal Diameter @ 2640 kg/m³ (mm)**	**Percent Greater Than**
300	600	0
150	510	15
50	350	50
5	160	85
1	95	100

Table 31 37 00 – 02: 150 Kg Class Riprap		
Mass (kg) *	**Nominal Diameter @ 2640 kg/m³ (mm)**	**Percent Greater Than**
750	850	0
450	725	15
150	500	50
15	225	85
1	95	100

* Mass governs the gradation of Riprap. Nominal diameter is provided for informational purposes only. Nominal size is defined according to the following expression: Nominal Size (mm) = 1150 times the cube root of the mass (kg) divided by the density of the rock (kg/m^3).

.3 Neither the breadth or the thickness of any individual piece of Riprap material is to be less than on third of its length. A maximum of 2.0 percent by weight of such pieces will be permitted.

.2 Should the Contractor choose, PWGSC's Trutch Quarry (Km 310, 8 km Haul from the highway) may be used by the Contractor as a source for rock which can be broken / blasted and manufactured into the various sizes of Riprap required on the project. The Contractor will be responsible for all manufacture / blasting required (including permits), sorting of rock to select the appropriate sized rock for use as Riprap, hauling of the riprap to the project site (Km 197.6), and all cleanup of the site to PWGSC's satisfaction.

.3 The Riprap shall be stockpiled at the site for inspection by the Departmental Representative prior to placement. Stockpiles for inspection shall contain a minimum of 10 tonnes of material.

2.2 Nonwoven Geotextile

.1 The Nonwoven Geotextile shall achieve or exceed the following minimum requirements:

Table 31 37 00 – 03: Nonwoven Geotextile

Property	Test	Unit	Value
Grab Tensile Strength	ASTM-D4632	N (lb)	1335 (300)
Elongation	ASTM-D4632	%	50
CBR Puncture	ASTM-D6241	N (lb)	3671 (825)
Trapezoidal Tear	ASTM-D4533	195	512 (115)
Apparent Opening Size	ASTM-D4751	Mm (US Sieve)	0.150 (100)
Permittivity	ASTM-D4491	sec^{-1}	1.0
Water Flow Rate	ASTM-D4491	$l/m/m^2$ (gpm/ft^2)	3056 (75)
UV Resistance	ASTM-D4355	% retained at 500 hrs	70

PART 3 – EXECUTION

3.1 Placement of Nonwoven Geotextile

.1 Install temporary drainage and pumping and construct berms as outlined in the accepted EPP to keep excavations and the work area free from water to the maximum extent possible (see Section 01 35 46 – Environmental Protection).

.2 Complete all work in accordance with the British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) Section 11 Approval for Instream Work.

.3 Place Nonwoven Geotextile on a clean surface, properly shaped per the lines and grades shown in the Contract Drawings and free from debris, snow and ice or other deleterious material.

.4 Place Nonwoven Geotextile material by unrolling onto excavated / graded surface in orientation, manner and locations indicated on Contract Drawings and retain in position with pins. All Nonwoven Geotextile placed on a slope shall at a minimum be secured with pins a minimum 300 mm long every 2 m^2 of geotextile.

.5 Place Nonwoven Geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.6 Place Nonwoven Geotextile on sloping surfaces in one

continuous length from toe of slope to upper extent of Nonwoven Geotextile.

.7 Overlap each successive strip of Nonwoven Geotextile 1000 mm over previously laid strip. When Nonwoven Geotextile are placed on a slope, ensure overlap is as follows:

.1 Nonwoven Geotextile placed higher on slope is placed above Nonwoven Geotextile placed lower on slope.

.8 Pin successive strips of Nonwoven Geotextile with securing pins at 1000 mm interval at midpoint of lap.

.9 Protect installed Nonwoven Geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.10 Replace damaged or deteriorated Nonwoven Geotextile to approval of the Departmental Representative.

.11 Construction equipment is not permitted on the Nonwoven Geotextile at any stage of construction.

.12 Upon acceptance by the Departmental Representative, place succeeding material as shown on the Contract Drawings.

3.2 Placement of Riprap

.1 Install temporary drainage and pumping and construct berms as outlined in the accepted EPP to keep excavations and the work area free from water to the maximum extent possible (see Section 01 35 46 – Environmental Protection).

.2 Complete all work in accordance with the British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) Section 11 Approval for Instream Work.

.3 The Riprap material shall be loaded, transported, and placed with care to ensure that material does not break or reduce in size smaller than the actual material size requirements when placed.

.4 Place Riprap materials on a clean surface, properly shaped per the lines and grades shown in the Contract Drawings and free from debris, snow and ice or other deleterious material.

.5 Riprap materials shall be placed to the lines and thickness shown on the Contract Drawings. The finished surface of the Riprap shall be within +200 mm / -100 mm of the finished design grades but not uniformly high or low.

.6 Place Riprap material using methods that do not lead to segregation or degradation of aggregate. Do not place by end dumping from haul units.

.7 Do not drop Riprap from a height greater than 0.5 m vertically from its final position.

.8 Place Riprap commencing at the toe of the slope and proceeding up the slope. Material shall be densely placed and individual stones shall be worked with placement equipment to form a well-keyed surface.

.9 Riprap not conforming to the requirements of this section shall be removed from the project site with the expense of the removal borne by the Contractor.

.10 The Contractor shall ensure that the construction methods adopted produces a finished surface that is comprised of the full spectrum of particle sizes continuously throughout its length and breadth.

.11 Dress all Riprap voids so that the final surface is well keyed, densely placed, and uniform. The Departmental Representative will require that all surface voids be filled into which a rock having a mass equal or greater than 25% of the maximum stone mass can be placed.

.12 Upon achieving Riprap void requirements, place all available Riprap Infill (material temporarily stockpiled from existing Gabion Mats removed) into remaining Riprap voids. Riprap Infill material shall be placed / spread evenly over all Riprap.

.13 Construction equipment is not permitted on the Riprap or Riprap Infill at any stage of construction.

.14 Maintain finished material surfaces in a condition conforming to this section until acceptance.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Measurement and Payment Procedures.

1.2 Product Data.

1.3 Scheduling.

1.4 Product Handling and Storage.

PART 2:

2.1 Materials.

2.2 Equipment.

PART 3:

3.1 Application.

3.2 Workmanship.

3.3 Protection of Surfaces.

3.4 Preparation of Slurry.

3.5 Slurry Application.

3.6 Warranty and Maintenance.

1.1 Measurement and Payment Procedures

.1 Payment for Hydraulic Seeding will be made on the basis of the Price per Unit Bid for Hydraulic Seeding in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs for supply, placement, warranty, and maintenance of the Hydraulic Seeding in all areas of topsoil, cut slopes, excavation, access development, and other disturbed areas as detailed in these Contract Specifications or as directed by the Departmental Representative.

.2 Measurement for Payment for completion of Hydraulic Seeding will be made by Lump Sum based on the percentage of the work completed and accepted by the Departmental Representative.

1.2 Product Data

.1 Provide product data, prior to seeding for:

.1 Seed:

.1 Shipping Bill: issued by supplier of material, identifying manufacturer and supplier, material, and net mass or volume in each container.

.2 Mulch.

.1 Shipping Bill: issued by supplier of material, identifying manufacturer and supplier, material, and net dry-air mass in each container.

.3 Tackifier.

.1 Shipping Bill: issued by supplier of material, identifying manufacturer and supplier, material, and net dry-air mass in each container.

.4 Fertilizer

.1 Shipping Bill: issued by supplier of material, identifying manufacturer and supplier, material, and net dry-air mass in each container.

.2 Guarantees.

.3 Chemical Analysis.

.2 Unless advised otherwise in advance of the work by the Departmental Representative, submit in writing to the Departmental Representative 14 days prior to commencing work:

.1 Volume capacity of hydraulic seeder in litres.

.2 Amount of material to be used per tank based on volume.

.3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

1.3 Scheduling

.1 Schedule hydraulic seeding to coincide with the completion of other related works on which the hydraulic seeding shall be applied.

1.4 Product Handling and Storage

.1 Deliver and store seed in original containers individually labeled in accordance with "Seeds Regulations" and indicating name of supplier.

.2 Deliver and store mulch, tackifier, and fertilizer in moisture-proof containers displaying product date.

.3 Protect all product as required during transportation and storage.

.4 Remove from project area, product that has become wet or otherwise damaged during transportation or storage, or does not meet requirements specified.

PART 2 – PRODUCTS

2.1 Materials

.1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.

.1 Grass Mixture: "Certified", Canada No. 1 seed for common cultivars in accordance with Government of Canada Seeds Act and Regulations and shall conform to the following:

Table 32 93 21 – 01: Grass Seed Mix

% By Weight	Species
30%	Creeping Red Fescue
20%	Slender Wheatgrass
10%	Alsike Clover
10%	Timothy
10%	Canada Bluegrass
15%	Smooth Brome Grass
5%	Sheep Fescue

.2 Fall rye.

.2 Wood Fiber Mulch shall be specifically manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with the following properties:

.1 Made from wood cellulose fibre.

.2 Organic matter content: 95% +/- 0.5%

.3 Value of pH: 6.0

.4 Potential water absorption: 900%

.3 Tackifier shall be powder produced from natural plant gum or acceptable equivalent and with the following properties:

.1 Free flowing.

.2 Non-corrosive.

.3 Biodegradable.

.4 Water dilutable.

.5 Liquid dispersion.

.4 Water: free of impurities that would inhibit germination and growth.

.5 Fertilizer:

.1 To Canada Fertilizers Act and Regulations.

.2 Complete synthetic, 50% slow release sulfur coated urea. Ratio: 18:18:18.

2.2 Equipment

.1 Capable of mixing and evenly distributing seed, fertilizer, and mulch mixtures for efficient treatment of areas to be seeded.

.2 Agitation system:

.1 To be built-in.

.2 To have sufficient capacity to agitate, suspend and homogeneously mix slurry of materials in amounts specified using slurry recirculation or mechanical agitation method.

.3 To be capable of operating during seeding and charging of the tank.

.3 Slurry tank to have working capacity of at least 4,500 litres with pump capable of maintaining continuous, nonfluctuating stream of slurry. Distribution lines to be equipped with appropriate nozzles and of sufficient diameter to prevent blockage. Tank volume to be certified by certifying authority and identified by authorities with the Volume Certification Plate.

.4 Capable of seeding by 50 m hand operated hose and appropriate nozzles.

PART 3 – EXECUTION

3.1 Application

.1 Apply Hydraulic Seeding in all areas of topsoil, cut slopes, excavation, access development, areas disturbed by construction, or other areas as detailed in these Contract Specifications, Contract Drawings or as directed by the Departmental Representative.

3.2 Workmanship

.1 Do not spray onto structures, signs, guiderails, plant material, and other than surfaces intended.

.2 Clean-up immediately, any material sprayed where not intended, to satisfaction of Departmental Representative.

.3 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water, or other adverse conditions unless otherwise pre-approved by the Departmental Representative.

.4 Protect seeded areas from trespass until plants are established.

3.3 Protection of Surfaces

.1 Fine grade areas to be seeded free of humps and hollows. Ensure areas are free of deleterious and refuse materials.

.2 Obtain Departmental Representative's review of grade and topsoil depth before starting to seed.

3.4 Preparation of Slurry

.1 Measure quantities of materials by weight or weight-calibrated volume measurement. Supply equipment required for this work.

.2 Calculate amount of material to be used and area to be covered for each tank load utilizing size of slurry tank and carrying capacities of water.

.3 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder. Use optimum carrying capacity of water relative to mulch as follows:

.1 Spray mulch 55kg/1000 L.

.2 Silva-Fiber 43kg/1000 L.

.3 Verdyol Standard 38kg/1000 L.

.4 Fibramulch 47kg/1000 L.

.4 After all other material is in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete

slurry.

3.5 Slurry Application

.1 Hydraulic seeding equipment:

.1 Slurry tank.

.2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and /or mechanical agitation method.

.3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.

.2 Slurry mixture applied per hectare:

.1 Seed mixture: 125kg.

.2 Fall rye: 110kg.

.3 Mulch: 1500 kg/ha

.4 Tackifier: 45 kg on slopes 3H:1V or steeper.

.5 Water: Minimum 30,000 L.

.6 Fertilizer: 360kg.

.3 Thoroughly mix and uniformly apply slurry, at optimum angle of application for adherence to surfaces and germination of seed over area to be seeded.

.1 Using correct nozzle for application.

.2 Using hoses for surfaces difficult to reach and to control application.

.4 Blend application 300 mm into adjacent grass areas previous applications to form uniform surfaces.

.5 Re-apply where application is not uniform.

.6 Immediately remove slurry from items and areas not designated to be sprayed.

.7 Protect seeded areas from trespass and damage.

.8 Remove protection devices.

3.6 Warranty and Maintenance

.1 The Contractor shall warranty the Hydraulic Seeding free of

defects in accordance with General Conditions (GC3.13), for one full growing season or 12 months from the date of Substantial Performance, whichever is greater.

.2 It is the responsibility of the Contractor to complete maintenance as the Contractor deems necessary on the Hydraulic Seeding such that a 90% survival rate is achieved at the end of the warranty period.

.3 If at the end or prior to the end of the warranty period a 90% survival rate is not achieved the Contractor shall at his own expense replace Hydraulic Seeding not surviving or in poor condition except when the loss or damage can be proven to be due to abnormal weather, or any causes beyond the control of the Contractor.

.4 An end-of-warranty inspection will be conducted by the Departmental Representative.

END OF SECTION

PART 1 – GENERAL

Section Includes

PART 1:

1.1 Measurement and Payment Procedures.

1.2 References.

1.3 Definitions.

1.4 Submittals.

1.5 Environmental.

1.6 Delivery, Storage, and Handling.

PART 2:

2.1 Steel Pipe Culverts (Trenchless Culvert Installation).

2.2 Steel Pipe Liner.

2.3 Welding Materials.

2.4 Culvert Coupler.

2.5 Riprap.

2.6 Bentonite.

2.7 Natural Substrate.

2.8 Concrete.

2.9 Nonwoven Geotextile.

2.10 Crushed Base Gravel.

2.11 75 mm Clear Crush Culvert Bedding.

2.12 Embankment.

PART 3:

3.1 Trenchless Culvert Installation.

3.2 Steel Pipe Liner Installation.

3.3 Existing Overflow Culvert Repairs (Inlets and Outlets).

3.4 Culvert Inlet and Outlet Protection.

3.5 Ditch Realignment.

3.6 Clean-up.

1.1 Measurement and Payment Procedures

.1 Payment for Culvert Installation (Trenchless) – Min. 3200 mm Diameter will be made on the basis of the Price per Unit Bid for Culvert Installation (Trenchless) – Min. 3200 mm Diameter in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs for supply, transport and trenchless installation of Steel Pipe Culvert, excavation for working gravel pad or to accommodate length of Steel Pipe Culvert, removal and offsite disposal of earth material inside the steel pipes, supply and install natural substrate material, fish baffles, restoration and all other items necessary for successful completion of the work.

.2 Measurement for Payment for Culvert Installation (Trenchless) – Min. 3200 mm Diameter will be made on the length of culvert installed surveyed in lineal metres, measured parallel to the direction of the culvert along the invert of the culvert, completed in accordance with the Contract Drawings and to the satisfaction of the Departmental Representative.

.3 Payment for the install of the 1200 mm Liner in the existing 1800 mm diameter culvert will be made on the basis of the Price per Unit Bid for Install 1200 mm Liner in Existing 1800 mm Diameter Culvert in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs for supply, transport and culvert liner installation, filling of the void space between the two culverts, concrete, restoration and all other items necessary for successful completion of the work.

.4 Measurement for Payment for Install 1200 mm Liner in Existing 1800 mm Diameter Culvert will be made on the length of culvert liner installed surveyed in lineal metres, measured parallel to the direction of the culvert along the invert of the culvert, completed in accordance with the Contract Drawings and to the satisfaction of the Departmental Representative.

.5 Payment for Bentonite Cutoff Wall will be made on the basis of Price per Unit bid for Bentonite Cutoff Wall in the Bid and Acceptance Form. The Price per Unit bid shall include all costs associated with supply, transport and Bentonite Cutoff Wall installation, supply and installation of the crushed base gravel, and all other items necessary for the successful completion of the work.

.6 Measurement for Payment for completion of Bentonite Cutoff Wall will be made at the Lump Sum price based on the percentage of the work completed and accepted by the Departmental Representative.

.7 Payment for the completion of existing overflow culvert repairs (inlets and outlets) will be made on the basis of the Price per Unit bid for Existing Overflow Culvert Repairs Inlets and Existing Overflow Culvert Repairs Outlets in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs included with the stripping and temporary stockpile of topsoil for later reuse, excavation and temporary stockpile for later reuse as embankment, dewatering (as required), removal, and reattachment of the existing culvert segments, and the supply, transport, install of new culvert bedding material (crushed base gravel and 75 mm Clear Crush Culvert Bedding), Nonwoven Geotextile, and all other items (couplings, fittings, and hardware) required to repair the culvert and all other items necessary for the successful completion of the work. The price shall further include the costs of placement and compaction of the temporarily stockpiled embankment, and placement of the temporarily stockpiled topsoil.

.8 Measurement for Payment for completion of Existing Overflow Culvert Repairs Inlets and Existing Overflow Culvert Repairs Outlets will be made by Lump Sum based on the percentage of the work completed and accepted by the Departmental Representative.

1.2 References

.1 Canadian Standards Association (CSA International), latest edition:

.1 CSA-G401, Corrugated Steel Pipe Products.

.2 CSA W59, Welded Steel Construction (metal arc welding).

.3 CSA W48, Filler metals and allied materials for metal arc welding.

.2 The Pipe Jacking Association – Guide to Best Practices for the Installation of Pipe Jacks and Microtunnels.

.3 American Society for Testing and Materials (ASTM), latest edition:

.1 ASTM A252, Standard Specification for Welded and Seamless Steel Pipe Products.

.2 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).

.4 Geotechnical Data Report for Drainage Structure Replacement at Townsend Creek, Km 197.6 of the Alaska Highway, BC, Tetra Tech – April 2018.

1.3 Definitions

.1 Trenchless: Culvert installation through the existing ground within strict alignment and grade tolerances using hydraulic equipment, without the need for the excavation of the existing ground.

.2 Obstruction: Rock or other material which must be removed prior to the continuation of the Pipe Jacking work. Refer to the Tetra Tech Geotechnical Data Report for Drainage Structure Replacement at Townsend Creek, Km 197.6 of the Alaska Highway, BC for anticipated soil site conditions. Only materials (rocks, stumps etc.) not found in any of the Geotechnical drill holes will be considered an Obstruction.

1.4 Submittals

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 For the Culvert Installation (Trenchless) – Min. 3200 mm Diameter works, submit to the Departmental Representative for review and acceptance the following submittals:

.1 The steel producer's mill certificates for the steel pipe culverts in accordance with ASTM A252.

.2 A Tunneling Methodology report, containing sufficient detail to convey the following:

.1 Proposed method of tunnel construction and type of face support.

.2 Manufacturer and type of tunneling equipment proposed.

.3 Sequence of operations.

.4 Method of spoil transportation from the face and surface storage.

.5 Capacity of jacking equipment and cushioning.

.6 Identify critical utility crossings and special precautions proposed.

.7 Slurry injection system details (if required).

.3 A Monitoring Plan for assessing ground movement (settlement and heave) due to Trenchless Culvert Installation operations. The plan shall identify the location of settlement monitoring points, reference benchmarks, survey frequency and procedures, instrument monitoring, and reporting formats.

.3 For Install 1200 mm Liner in Existing 1800 mm Diameter culvert works, submit to the Departmental Representative for review and acceptance the following submittals:

.1 The Steel Pipe Liner manufacturer's mill certificates for the Steel Pipe Liner in accordance with ASTM A252.

.2 Complete and obtain approval for related submittals as detailed in Section 03 40 00 – Concrete.

.4 For Existing Overflow Culvert Repairs (Inlets and Outlets), submit to the Departmental Representative for review and acceptance the following submittals:

.1 Written procedures signed and sealed by a P.Eng. for shoring or other measures needed to safely to complete the excavation of the highway embankment in areas of repairs to the inlet and outlet ends of the overflow culverts (see Section 31 23 33 – Excavation and backfilling for further details).

1.5 Environmental

.1 Complete culvert installation and related works in conformance with the requirements of Section 01 35 43 – Environmental Protection, the Contractor's accepted Environmental Protection Plan (EPP).

.2 The Contractor shall account for the possibility of not being able to complete work due to high flows or adverse weather conditions in the construction schedule and in the unit prices. No payment for temporary work stoppages due to high flows or adverse weather conditions will be made. See Contract Specification Section 01 11 10 – Summary of Work, Item 3.2 – Work Completion, Sub-Section .5 through .7 for further information.

1.6 Delivery, Storage, and Handling

.1 Handle and store pipe culvert products in a manner to avoid damage, alteration, deterioration and spoiling.

.2 Where the material supplied is damaged, the contractor shall immediately separate nested sections of the plate or pipe to facilitate more detailed inspection by the Departmental Representative. Culvert material designated by the Departmental Representative as unacceptable, due to damage or failure to meet specified requirements, shall be immediately repaired or replaced by the Contractor to the acceptance of the Departmental Representative.

PART 2 – PRODUCTS

2.1 Steel Pipe Culverts (Trenchless Culvert Installation)

.1 Provide Steel Pipe Culverts of required diameter, minimum 25.4 mm wall thickness (see Item .2 below for more information), and length as shown on the Contract Drawings. Substitution of pipe with larger diameter to suit material or equipment availability or ground conditions shall be pre-approved by the Departmental Representative. The substitution of pipe with smaller diameter or lesser wall thickness than shown on the Contract Drawings will not be permitted.

.2 The Contractor shall be responsible for selection of appropriate pipe, pipe joints and pipe wall thickness to carry the thrust of any trenchless installation forces or any other construction loads in combination with overburden, earth and hydrostatic loads. The design for the Steel Pipe Culverts shown on the Contract Drawings does not take into account any construction loads. The trenchless installation equipment shall not unduly damage or distort the ends of the Steel Pipe Culverts during the installation process.

.3 Steel Pipe Culverts shall be seamless or welded pipe (spiral or seam) conforming with the requirements of ASTM A252, Grade 3 with a minimum yield strength of 310 MPa.

.4 Steel Pipe Culverts shall be delivered to the site in uniform lengths.

.5 The Steel Pipe Culvert shall come complete with fish baffles to the size and spacing shown on the Contract Drawings. Secure fish baffles using welds as indicated on the Contract Drawings. Complete welding in accordance with CSA W59.

2.2 Steel Pipe Liner

.1 Provide a Steel Pipe Liner of required diameter, wall thickness and length as shown on the Contract Drawings. Substitution of pipe with larger diameter or greater wall thickness to suit equipment availability or ground conditions shall be pre-approved by the Departmental Representative. The substitution of pipe with smaller diameter or lesser wall thickness than shown on the Contract Drawings will not be

permitted.

.2 The Steel Pipe Liner shall be seamless or welded pipe conforming with the requirements of ASTM A252, Grade 3 with a minimum yield strength of 310 MPa.

.3 The Steel Pipe Liner shall be delivered to the site in uniform lengths.

2.3 Culvert Couplers

.1 The Contractor shall supply and transport to site a sufficient quantity of Double Annular Corrugated Couplers to reattach all the Existing 900 mm diameter Overflow Culvert Inlets and Outlets and a sufficient quantity of Double Dimpled Coupling Bands to reattach all the Overflow Culvert Inlets and Outlets.

2.4 Welding Materials

.1 Welding materials to CSA W59.

.2 Welding electrodes to CSA W48 Series.

2.5 Riprap

.1 Riprap for the Culvert end protection shall be in accordance with Section 31 37 00 – Riprap.

2.6 Bentonite

.1 The Contractor shall propose to the Departmental Representative a sodium bentonite product for use as self-sealing low permeability barrier. The sodium bentonite shall be provided in powder form, insoluble in water, and have low thickening and good binding properties.

2.7 Natural Substrate

.1 Natural Substrate shall be in accordance with Section 31 05 16 – Aggregates: General.

2.8 Concrete

.1 The void space between the existing 1800 mm diameter corrugated steel pipe culvert and the 1200 mm diameter steel pipe liner shall be backfilled with Concrete in accordance with Section 03 40 00 – Concrete.

2.9 Nonwoven Geotextile

.1 Nonwoven Geotextile shall be in accordance with Section 31 37 00 – Riprap.

2.10 Crushed Base Gravel

.1 Crushed Base Gravel shall be in accordance with Section 31 05 16 – Aggregate: General.

2.11 75 mm Clear Crush Culvert Bedding

.1 75 mm Clear Crush Culvert Bedding shall be in accordance with Section 31 05 16 – Aggregate: General.

2.12 Embankment

.1 Embankment (backfill above culvert bedding) shall be in accordance with Section 31 23 33 – Excavation and Backfill.

PART 3 – EXECUTION

3.1 Trenchless Culvert Installation

.1 Equipment:

.1 The Contractor shall be responsible for selection of pipe jacking equipment which based on past experience has proven to be capable of handling the culvert size, anticipated ground conditions and existing soils likely to be encountered. Additionally, the equipment shall provide satisfactory support of the excavated face.

.2 Installation:

.1 Complete all work in accordance with the MoE Approval for Instream Work (Appendix E) and the EPP prepared by the Contractor for this work.

.2 Use trenchless installation methods that will minimize movement of the ground in front of and surrounding the Steel Pipe Culverts.

.3 Perform trenchless installation so as to avoid interference with the operation of the vehicles travelling the highway.

.4 Excavation diameter should be a minimum size to permit trenchless culvert installation with an allowance for bentonite injection into the annular space (if necessary for install, see item .11 below)

.5 Install suitable gravel pad and/or thrust reaction blocks as required for trenchless installation equipment. Complete excavation as necessary for installation of the pipe lengths while keeping the construction footprint to the minimum extent possible.

.6 Divert stream water, drainage, and discharge from dewatering away from the trenchless installation operations to a location in compliance with the Contractor's accepted EPP.

.7 Install steel pipe culvert to +/- 100 mm of the true line and level at any point along the culvert. Adjustments to the line and level should be gradual to ensure that the steel pipe or joints are not damaged. Monitor line and level of the culvert with appropriate instruments.

.8 Monitor ground movement (settlement and heave) throughout the trenchless installation operation using survey points installed prior to the work and sampled

at regular intervals throughout the work. Halt all operations, take immediate remedial action (including notification to the Departmental Representative) if ground movements greater than +/- 50 mm are detected.

.1 If ground movements in excess of +/- 50 mm are detected, the Departmental Representative will consult with the Contractor and others if required to determine the most appropriate course of action. The installation of the steel pipe culverts can only commence again following approval from the Departmental Representative.

.9 Cushion pipe joints as necessary to transmit the trenchless installation forces without damage to the steel pipe or steel pipe joints.

.10 Fuse Steel Pipe Culverts sections using Full Penetration Butt welds. Complete welding in accordance with CSA W59.

.11 If necessary, maintain an envelope of bentonite slurry around the exterior of the pipe during the trenchless installation to reduce the exterior friction and reduce the possibility of pipe seizing in place.

.12 If the steel pipe culvert seizes in place and Contractor elects to construct a recovery access shaft, pre-approval must first be obtained from the Departmental Representative.

.13 In the event a section of pipe is damaged during the trenchless installation operation, or joint failure occurs, as evident by inspection, visible ground water inflow or other observations, the Contractor shall submit for approval their methods for repair or replacement of the steel pipe culvert. Any steel pipe culvert damage or misalignment of the steel pipe culvert (except as caused by an unanticipated obstruction) shall be removed and replaced by the Contractor at no additional costs to PWGSC.

.14 Overcutting shall be remedied by grouting along the entire length of the installation.

.15 In the event an obstruction is encountered during the trenchless installation process, notify the Departmental Representative immediately. Await

further instruction from the Departmental Representative before proceeding.

.16 Remove soil materials from within the steel pipes using appropriate equipment. Temporarily stockpile materials for re-use as Embankment Fill or off-site disposal, at the discretion of the Departmental Representative.

.17 Trim ends of steel pipe culverts per the lines shown on the Contract Drawings.

.18 Install Natural Substrate in the bottom of the culvert to the depths and locations shown on the Contract Drawings. See Section 31 05 16 – Aggregates – General for further details.

.19 Install the Bentonite Cutoff Wall and Crushed Base Gravel per the contract drawings.

3.2 Steel Pipe Liner Installation .1 Steel Pipe Liner Installation:

.1 Divert the existing flows from the area of work using a berm or pumps as required and prevent sediment-laden water from entering the watercourse.

.2 Install a suitable gravel pad as required for Steel Pipe Liner Installation equipment. Complete excavation as necessary for installation of the Steel Pipe Liner lengths while keeping the construction footprint to the minimum extent possible.

.3 Install the Steel Pipe Liner to +/- 50 mm of the true line and level at any point along the culvert, such that when complete the inlet elevation, outlet elevation, minimum clearances and all other elements are in accordance with the Contract Drawings. Adjustments to the line and level should be gradual to ensure that the Steel Pipe Liner or joints are not damaged. Monitor line and level of the culvert with appropriate instruments.

.4 Fuse Steel Pipe Culverts sections using Full Penetration Butt welds. Complete welding in accordance with CSA W59.

.2 Void Space Backfill with Concrete.

.1 The void space between the newly installed 1200 mm diameter Steel Pipe Liner and the existing 1800 mm

diameter Corrugated Steel Pipe culvert shall be filled with Concrete in accordance with Section 03 40 00 – Concrete.

.3 Bentonite Cutoff Wall.

.1 Install the Bentonite Cutoff Wall and Crushed Base Gravel around the outside of the existing 1800 mm CSP pipe per the contract drawings.

3.3 Existing Overflow Culvert Repairs (Inlets and Outlets)

.1 Excavation and Culvert Removal (Inlet and Outlet Sections):

.1 Remove and temporarily stockpile existing riprap placed on the highway embankment side slopes to the limits shown on the Contract Drawings and as necessary to facilitate the work. Strip organic material and temporarily stockpile for later re-use as topsoil.

.2 Excavate highway embankment to facilitate repairs to the existing 900 mm diameter overflow culvert inlets and outlets. Temporarily stockpile excavated material for re-use as Embankment Fill, should the material be classified by the Departmental Representative as suitable for re-use (refer to Section 31 23 33 – Excavation and Backfill for further details).

.3 Remove and reinstate at the correct grade, overflow culvert inlet and outlet sections and associated components to the limits indicated on the Contract Drawings. Secure overflow culvert inlet and outlet sections which have become detached using new coupling devices as follows:

.1 Double Annular Corrugated Couplers shall be utilized should the corrugation type be annular at the point of detachment within the Existing Overflow Culverts Inlets and Outlets.

.2 Double Dimpled Coupling Bands shall be utilized should the corrugation type be helical at the point of detachment within the Existing Overflow Culverts Inlets and Outlets.

.2 Culvert Bedding and Culvert Section Reinstallation (Inlet and Outlet Sections):

.1 Complete excavation and dewater as necessary, to

allow placement of culvert bedding material in dry condition. Excavate to the lines and grades necessary to facilitate repairs to the existing 900 mm diameter Overflow Culvert Inlets and Outlets, and as shown on the Contract Drawings.

.2 Place required Nonwoven Geotextile and 75 mm Clear Crush Culvert Bedding material in preparation for culvert placement, to the thickness and locations shown on the Contract Drawings. Place Culvert Bedding material in an unfrozen condition in 150 mm lifts to the full width of the trench. Compact lifts to a minimum 98% of the standard maximum dry density in accordance with ASTM D698. Compact final 150 mm lift of bedding material on bottom side of culvert to 95% of the standard maximum dry density in accordance with ASTM D698.

.3 Shape Culvert Bedding Material to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to the camber as indicated on the Contract Drawings, free form sags or high points.

.4 Replace culvert sections (inlets and outlets) such that when complete the alignment, grade, camber, location and inverts are in compliance with the Contract Drawings. Ensure bottom of pipe is in contact with shaped bed throughout its length.

.5 Backfill with 75 mm Clear Crush Culvert Bedding material and Crushed Base Gravel around and over culverts as indicated on the Contract Drawings. Place Culvert Bedding material in 150 mm lifts, alternating on each side of the culvert, so as not to allow movement or uplift of the culvert. Compact lifts to a minimum 98% of the standard maximum dry density in accordance with ASTM D698. Hand tamp where necessary to obtain compaction.

.6 Do not allow water to flow through pipes during re-installation except as permitted by the Departmental Representative and in accordance with the accepted EPP.

.3 Culvert Joints:

.1 Install culvert joints per the manufacturer's recommendations and the following requirements.

.1 Repair spots where damage has occurred to coating by applying two coats of zinc rich paint. Allow each coat to dry before placing second coat, bedding or backfill.

.4 Embankment and Topsoil:

.1 Replace Embankment (material above culvert bedding material) in 150 mm lifts to full width of trench and compact each lift to a density not less than 98% of the standard maximum dry density in accordance with ASTM D698. Add water or dry Embankment material as needed according to ASTM D698. Break Embankment material down to sizes that enable required compaction and mix for uniform moisture to full depth of lift. Embankment materials which cannot be compacted to the required density due to high moisture content, or Embankment Materials with a natural moisture content greater than optimum, shall not be used without prior aeration and drying by the Contractor.

.2 Protect installed culvert with minimum 900 mm cover of compacted fill before heavy equipment is permitted to cross. During construction, width of fill, at its top, to be at least twice diameter or span of pipe and with slopes not steeper than 2H:1V.

.3 Place Embankment material in an unfrozen condition, free of snow and ice.

.4 Place riprap excavated from the side slopes and temporarily stockpiled back on the surface of the embankment side slopes.

.5 Place stripped material as topsoil on embankment side slopes. Place topsoil material around individual riprap rocks such that the riprap rocks are partially buried.

.6 Dispose of unused excavated material (Embankment Material) or material not meeting the properties of embankment to a location approved by the Departmental Representative.

3.4 Culvert Inlet and Outlet Protection

.1 Excavate ground to the lines and grades shown on the Contract Drawings to facilitate the installation of the Inlet and Outlet Protection. Ensure excavation will allow for positive drainage upon placement of Riprap. Complete Riprap to Section 31 37 00 – Riprap.

3.5 Ditch Realignment	.1	Re-establish ditch to the existing width, grades, and cut slope angles shown on the Contract Drawings. Ensure positive drainage to / from inlets and outlets of culverts (refer to Section 31 23 33 – Excavation and Backfill for further details).
3.6 Clean-up	.1	Clean-up all disturbed areas to an equal or better condition to that prior to construction (refer to Section 01 74 11 – Cleaning for further details).
	.2	Complete Hydraulic Seeding of all disturbed areas (refer to Section 32 93 21 – Hydraulic Seeding for further details).

END OF SECTION

R.017173.322
Appendix A

Preliminary Hazard Assessment Form

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

PRELIMINARY HAZARD ASSESSMENT FORM

Project Number:	**R.017173.322**
Location:	**Km 197.6 of the Alaska Highway, BC**
Date:	Summer / Fall 2018
Name of Departmental Representative:	Alex Taheri
Name of Client:	PWGSC
Name of Client Project Co-ordinator	Alex Taheri PH: (604)-666 -9374

Site Specific Orientation Provided at Project Location **Yes** ☐ **No** ☒

Notice of Project Required **Yes** ☒ **No** ☐

NOTE:
PWGSC REQUIRES A Notice of Project FOR ALL CONSTRUCTION WORK RELATED ACTIVITIES

NOTE:
OHS law is made up of many Municipal, Provincial, and Federal acts, regulations, bylaws and codes. There are also many other pieces of legislation in British Columbia that impose OHS obligations.

Important Notice: This hazard assessment has been prepared by PWGSC for its own project planning process, and to inform the service provider of actual and potential hazards that may be encountered in performance of the work. PWGSC does not warrant the completeness or adequacy of this hazard assessment for the project and the paramount responsibility for project hazard assessment rests with the service provider.

TYPES OF HAZARDS TO CONSIDER	Potential Risk for:				COMMENTS
Examples: Chemical, Biological, Natural, Physical, and Ergonomic Listed below are common construction related hazards. Your project may include pre-existing hazards that are not listed. Contact the Regional Construction Safety Coordinator for assistance should this issue arise.	**PWGSC, OGD's, or tenants**		**General Public or other contractors**		Note: When thinking about this pre-construction hazard assessment, remember a **hazard** is anything that may cause harm, such as chemicals, electricity, working from heights, etc.; the **risk** is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.
	Yes	**No**	**Yes**	**No**	

Typical Construction Hazards					
Concealed/Buried Services (electrical, gas, water, sewer etc.)	X		X		
Slip Hazards or Unsound Footing	X		X		
Working at Heights	X		X		
Working Over or Around Water	X		X		
Heavy overhead lifting operations, mobile cranes etc.	X		X		
Marine and/or Vehicular Traffic (site vehicles, public vehicles, etc.	X		X		
Fire and Explosion Hazards	X		X		
High Noise Levels	X		X		
Excavations	X		X		
Blasting		X		X	

Canada

Construction Equipment	X		X		
Pedestrian Traffic (site personnel, tenants, visitors, public)	X		X		
Multiple Employer Worksite	X		X		Example: Contractor working in an occupied Federal Employee space.

Electrical Hazards					**Comments**
Contact With Overhead Wires	X		X		
Live Electrical Systems or Equipment		X		X	
Other:					
Physical Hazards					
Equipment Slippage Due To Slopes/Ground Conditions	X		X		
Earthquake	X		X		
Tsunami		X		X	
Avalanche		X		X	
Forest Fires	X		X		
Fire and Explosion Hazards	X		X		
Working in Isolation	X		X		
Working Alone	X		X		
Violence in the Workplace	X		X		
High Noise Levels	X		X		
Inclement weather	X		X		
High Pressure Systems	X		X		
Other:					
Hazardous Work Environments					
Confined Spaces / Restricted Spaces	X		X		Review and provide confined space assessment(s) from PWGSC or client confined space inventories. Refer to PWGSC Standard on Entry into Confined Spaces. Contact the Regional Construction Safety Coordinator.
Suspended / Mobile Work Platforms	X		X		
Other:					
Biological Hazards					
Mould Proliferations		X		X	
Accumulation of Bird or Bat Guano	X		X		
Bacteria / Legionella in Cooling Towers / Process Water		X		X	
Rodent / Insect Infestation	X		X		
Poisonous Plants	X		X		
Sharp or Potentially Infectious Objects in Wastes	X		X		
Wildlife	X		X		
Chemical Hazards					
Asbestos Materials on Site		X		X	If “yes” a pre-project asbestos survey report is required. Provide Contractor with DP – 057 ELF Form 16 “Contractor Notification and Acknowledgement”

Designated Substance Present		X		X	If “yes” a pre-project designated substance survey report is required.
Chemicals Used in work	X		X		
Lead in paint		X		X	If “yes” a pre-project lead survey report is required.
Mercury in Thermostats or Switches		X		X	If “yes” a pre-project mercury survey report is required.
Application of Chemicals or Pesticides		X		X	
PCB Liquids in Electrical Equipment		X		X	
Radioactive Materials in Equipment		X		X	
Other:					
Contaminated Sites Hazards					
Hazardous Waste		X		X	
Hydrocarbons		X		X	
Metals		X		X	
Other:					

Security Hazards					**Comments**
Risk of Assault	X		X		
Other:					
Other Hazards					

Other Compliance and Permit Requirements[1]	**YES**	**NO**	**Notes / Comments[2]**
Is a Building Permit required?		X	
Is an Electrical permit required?		X	
Is a Plumbing Permit required?		X	
Is a Sewage Permit required?		X	
Is a Dumping Permit required?	X		
Is a Hot Work Permit required?		X	
Is a Permit to Work required?	X		Mandatory for ALL AFD managed work sites.
Is a Confined Space Entry Permit required?	X		Mandatory
Is a Confined Space Entry Log required	X		Mandatory for all Confined Spaces
Discharge Approval for treated water required	X		

Notes:

(1) Does not relieve Service Provider from complying with all applicable Federal, Provincial, and Municipal laws and regulations.

(2) TBD means To Be Determined by Service Provider.

Service Provider Acknowledgement: We confirm receipt and review of this Pre-Project Hazard Assessment and acknowledge our responsibility for conducting our own assessment of project hazards, and taking all necessary protective measures (which may exceed those cited herein) for performance of the work.			
Service Provider Name			
Signatory for Service Provider		**Date Signed**	
RETURN EXECUTED DOCUMENT TO PWGSC DEPARTMENTAL REPRESENTATIVE PRIOR TO ANY WORK COMMENCING			

R.017173.322
Appendix B

Confirmation of Prime Contractor's Main Responsibilities Under the WorkSafeBC Occupational Health and Safety Regulations and Worker's Compensation Act

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

Confirmation of Prime Contractor's Main Responsibilities Under the WorkSafeBC Occupational Health and Safety Regulations and *Worker's Compensation Act*

Name of Project: Km 197.6 Townsend Creek Culvert Drainage Improvements, Alaska Highway, BC

Owner: Public Works and Government Services Canada

Contractor: _____

Consulting Engineer: Tetra Tech

	YES	NO
1.The Contractor acknowledges appointment as Prime Contractor on the construction project noted below	☐	☐
2.The name of the Prime Contractor's Qualified Coordinator of occupational health and safety activities for this project has been submitted to the Owner and is as shown below.	☐	☐
3. The Prime Contractor understands that in any conflict of directions, WCB OH&S Regulations and/or the Worker's Compensation Act shall prevail.	☐	☐
4. The Prime Contractor understands and will direct that all supervisors/coordinators must immediately report any apparent conflict as described above.	☐	☐
5. The Prime Contractor agrees that their supervisor shall immediately notify the consulting Engineer's representative of any reported conflict.	☐	☐
6. The Prime Contractor has requested and received information from the Owner regarding any known hazards to the health and safety of persons pre-existing at the workplace.	☐	☐
7. The Prime Contractor has conducted an inspection of the workplace to verify the presence of any hazards.	☐	☐
8. The Prime Contractor will communicate hazards information to any persons who may be affected and ensure that appropriate measures are taken to effectively control or eliminate the hazards.	☐	☐
9. The Prime Contractor accepts that written documentation such as notes, records, inspections, meeting minutes, etc., on all health and safety issues must be available upon request to the PWGSC departmental representatives and/or to a WCB officer at the workplace.	☐	☐
10. The Prime Contractor will confirm that all workers are suitably trained and competent to perform the duties for which they have been assigned.	☐	☐
11. The Prime Contractor confirms that safety orientation of all new workers will be conducted.	☐	☐
12. The Prime Contractor's written Safety Program has been provided to the Owner's representative.	☐	☐
13. The Prime Contractor confirms that meetings to exchange information on any safety issues, concerns, hazards or safety directives will be conducted weekly or more often if required.	☐	☐
14. The Prime Contractor confirms that before the commencement of work, crews will attend a daily crew safety meeting.	☐	☐
15. The Prime Contractor confirms that their supervisor has assessed and will coordinate the workplace first-aid requirements	☐	☐
16. The Prime Contractor confirms that the procedure to transport injured workers is established	☐	☐

Prime Contractor Representative's

Name:_____

Title:_____ Signature:_____

Date:_____

Prime Contractor's OH&S Coordinator

Name:_____

Title:_____ Signature:_____

Date:_____

Canada

R.017173.322
Appendix C

Written Communication / Document Management Protocol

Alaska Highway Km XXXX – XXXX Project: Written Communication / Document Management Protocol

Communication for the Alaska Highway Km XXX Project (R.017173.XXX) will occur using CentralCollab, email, telephone, and through the delivery of hardcopy documents (if requested by PWGSC). CentralCollab will act as the primary communication and document management tool throughout the project. It will act as the central file storage location for all project documents, allows for retrieval of these documents at any time during the project by group members and is capable of storing and sharing large electronic files.

Email and telephone may be used for general communication, transitory information and other communications where a record is not considered necessary (e.g. day-to-day coordination, in-depth discussion of project elements, etc.). Email shall not be used for the submission of deliverables or other project documentations. Email contact information for project members is provided in the project contact list.

Hardcopy documents are to only be provided if specifically requested by PWGSC. The Departmental Representative will provide the Contractor with the necessary address information at the time of the request. Material samples shall be provided directly to the testing lab specified by the Departmental Representative for Quality Assurance purposes or be delivered to the project site.

CentralCollab

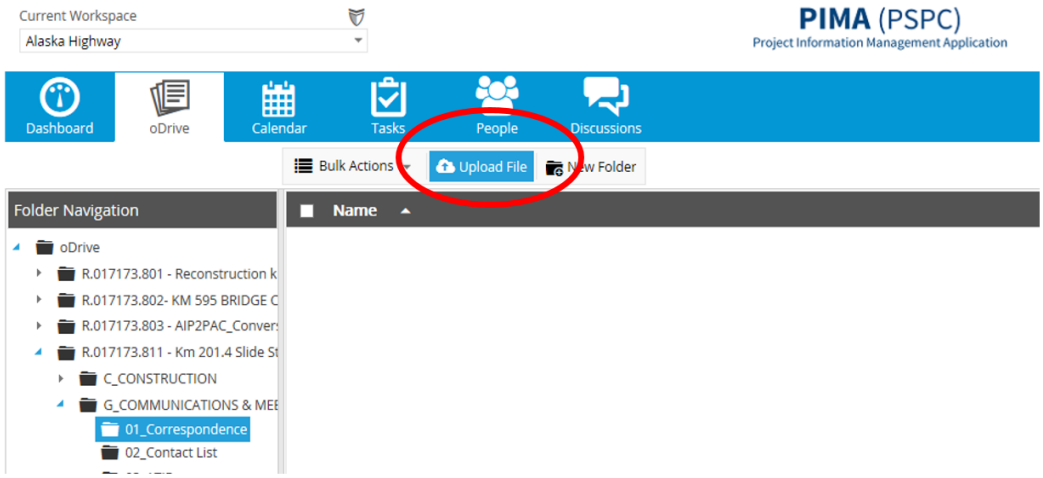
CentralCollab is a web-based collaborative platform that is used to submit and store project documentation. It is the responsibility of the submitting party to upload documents to CentralCollab in the correct folder and with the correct file naming convention.

CentralCollab can be accessed at the following address: https://app.centralcollab.com/
The contractor is encouraged to have CentralCollab accounts for project team members who are involved with accessing or posting project documentation. Accounts can be created by PWGSC throughout the project by contacting the PWGSC project team.

Project documentation includes but is not limited to: submittals, deliverables, drawings, reports, meeting minutes, project schedules, notifications, contemplated change notices, change orders, etc.

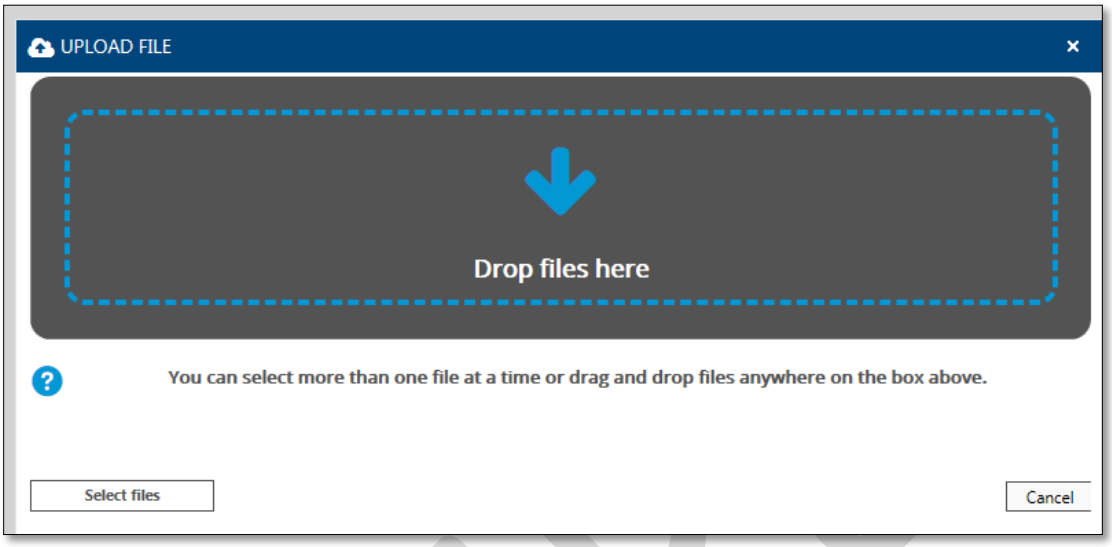
1 Uploading to CentralCollab

Upload individual documents to the appropriate folder on CentralCollab. For folder names, refer to Table 2 of this document. To add files, click on **Upload File**:

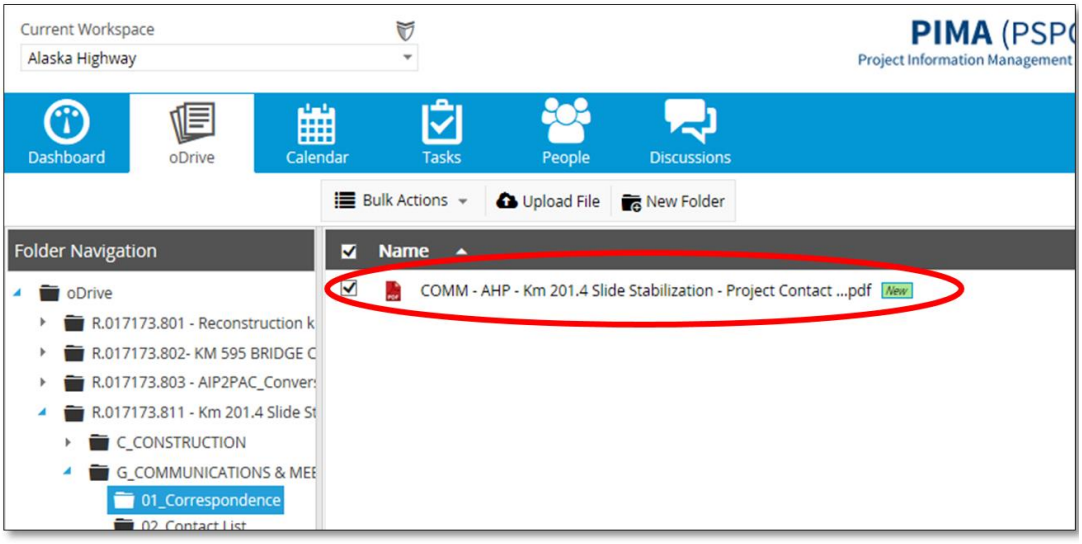


Drag and drop your document(s), then press Save.

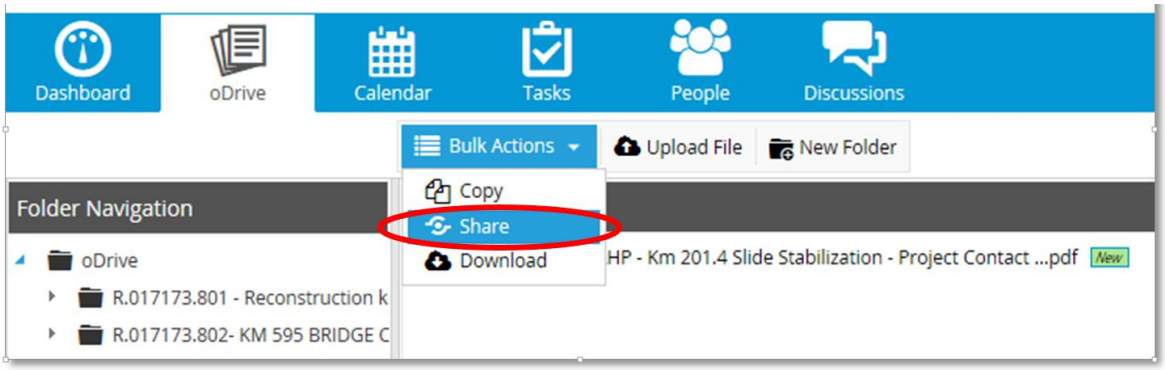
NOTE: Make sure you have named your document correctly, as explained in Section 2.2 CentralCollab File Naming Convention.



Once saved, you will see your new document (circled below), but no one else will be notified until you share it.



To **notify members** of the new document, check the box next to the document √ then click **Bulk Actions > Share** :

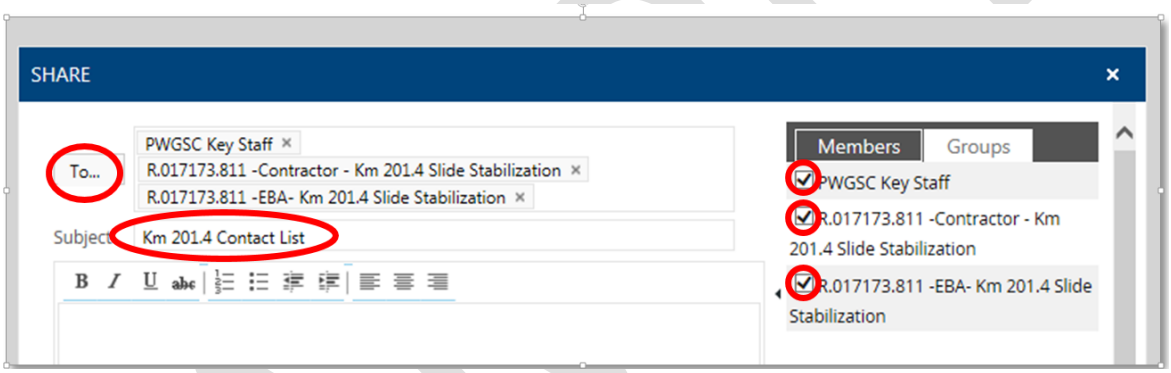


Once the new window opens, select **To,** and then <u>select all pre-set groups:</u>

√ PWGSC Key Staff

√ R.017173.XXX – Contractor – Km XXX Project

√ R.017173XXX – Consultant – Km XXX Project



If desired, insert a message related to the uploaded submittal in the form or **subject line** before sending. To ensure the entire project team is aware of CentralCollab postings, unless instructed otherwise, notification of the pre-set group is preferred rather than selection of individual users.

2. CentralCollab File Naming Convention:

All CentralCollab users shall upload files named according to the following convention:

Doc Type – AHP – Km XXX Project – File Description or Document Name – YYYY MM DD

Example file names:

- Plan – AHP – Km XXX Project – Quality Management Plan – 2017 02 15
- Schedule – AHP – Km XXX Project – Project Schedule – 2017 02 20
- Finance – AHP – Km XXX Project – Progress Payment 01 – 2017 02 26

The file description should clearly identify the document. The Document type should be selected from the options provided in Table 1:

Table 1: Document Type Options

Document Type Acronym	Description
Comm	Communication related docs; correspondence, letters, memos, briefing notes, contact lists
Contract	Request for Information (RFI), Contemplated Change Notices (CCN), Change Orders (CO)
Email	Emails
Draw	Drawings and site plans
Finance	Project financial documentation
Image	All non-drawing images, photos etc.
Minutes	Meeting minutes, agendas, and associated documents
Plan	Planning documents, BMPs, SOPs, workplans
Report	Reports of all types- most frequently used for consultant deliverables
Schedule	Any project related schedules
Specs	Specs and terms of references
Other	Other document types, project specific, one-off documents

3. CentralCollab Folder Arrangement:

All files must be uploaded to the correct folder in CentralCollab. To aid in the filing of documents, a listing of common filing / folder locations has been prepared as shown in Table 2.

Table 2: Common Document Filing / Folder Locations	
Folder Names	**Description of Typical Documents**
CentralCollab folder: R.017173.XXX – Km XXX Project > C_CONSTRUCTION > Contract >	
01_Contract	Contract Documents (typically related to documents posted to Buyandsell.gc.ca)
02_Request for Information	Request for Information from Contractor
03_Permits	Permits obtained by Contactor or PWGSC
04_Site Instructions	Site Instructions (typically generated by PWGSC)
05_CCN	Contemplated Change Notice forms generated by PWGSC and pricing responses from Contractor
06_Change Orders	Change Orders (typically generated by PWGSC)

Table 2: Common Document Filing / Folder Locations	
Folder Names	**Description of Typical Documents**
07_Progress Payments	Progress Payment documents (as instructed by PWGSC)
08_Field Reviews	Field Review forms (typically generated by PWGSC)
09_Health & Safety	Health and Safety related documentation including Health and Safety Plan, Tailgate Safety Meeting documentation, and other Health and safety related submittals.
10_Testing Services	Testing Reports completed by Contractor's QC
11_Environmental Plan	Environmental Protection Plan and other environmental related documents
12_Environmental Reporting	Environmental monitoring reports generated by the Contractor's environmental monitor
13_Shop Drawings	Shop drawing submissions provided by the Contractor as required by the contract specifications
14_Deliverables	Contractor Deliverables as required by the contract specifications throughout the project including such items as: • Project Schedule • Traffic Management Plan • Construction Staging Drawings • Culvert Mill Certificates • Other supplier information as needed
15_Deficiency List	Deficiency lists (typically generated by PWGSC)
16_Certificate of Substantial Performance	Certificate of Substantial Performance as generated by PWGSC
17_Certificate of Completion	Certificate of Completion as generated by PWGSC
18_Claims	Documentation related to any claims on the project
19_Contract Close out	Documentation related to contract closeout including closeout submittals such as: • As-built Surveys • As-built Redline Drawing Mark-ups • Warranties • Instruction Manuals
20_Advisory	Advisories in response to RFIs or other notices as generated by PWGSC.
21_Quality Management	Quality control and Quality Assurance documentation generated by the Contractor and PWGSC • Quality Management Plan • Check Sheets • Daily Reports • NCR's

Table 2: Common Document Filing / Folder Locations	
Folder Names	**Description of Typical Documents**
CentralCollab folder: R.017173.XXX – Km XXX Project > G_COMMUNICATIONS & MEETINGS >	
01_Correspondence	Emails and other correspondence requiring posting to CentralCollab, generated by the Contractor or PWGSC
02_Contact List	Project contact list generated by PWGSC
03_ATIP	
04_Communications Plan	Communication plan generated by PWGSC
05_Supporting Documents	
06_Meeting Minutes	Meeting minutes as generated by PWGSC
07_Inquiries	
08_Public Notices	
09_Other	
CentralCollab folder: R.017173.XXX – Km XXX Project > H_PROJECT MONITORING>	
01_Project Time Scope Budget	For PWGSC only
02_Progress Report	For PWGSC only
03_Photos	For PWGSC only
04_Project Commissioning	For PWGSC only
05_Compliance & Audits	For PWGSC only
CentralCollab folder: R.017173.XXX – Km XXX Project > Z_BASE DATA>	
01_Base Data	Digital drawings and other documentation required by the Contractor (typically generated by PWGSC)

Typical folders Users are encouraged to create sub-folders and categorize documents of similar or related data.

Example sub-folders:

- 09_Health & Safety > **Tailgate Meetings > February**
- 14_Deliverables > **Project Schedule**
- 21_Quality Management > **Check Sheets > February**

.

R.017173.322
Appendix D

Environmental Protection Plan (EPP) – Checklist

Environmental Protection Plan (EPP) — Checklist

Note: This checklist was developed to assist the Contractor in determining and mitigating environmental issues at site. It is considered a generic checklist and it is in the Contractor's best interest to review the PWGSC Environmental Management Plan (EMP) or the Environmental Assessment (EA) as supporting documents in the completion of the site Environmental Protection Plan (EPP). This EPP Checklist does not need to be submitted for review by the Departmental Representative.

EPP Framework	Content Requirements	No	Yes	N/A
Project Setting and Site Activities				
Project Description	A brief description of the project and its location is provided.			
Environmental Sensitivities	Sensitive or protected features that could be impacted as a result of the Contractor's activities are described.			
Site Activities	A scope of work and a list of all construction or related activities to be undertaken during the project are provided.			
Project Schedule and Site Drawings				
Project Schedule	A project schedule is provided, including scheduled shut-downs and restricted work periods due to environmental requirements.			
Site Drawing	One or more site drawings(s) are provided, indicating the site location; site set-up and layout; erosion and sediment controls; in-stream work areas; and environmental sensitivities.			
Potential Environmental Impacts and Controls				
Potential Environmental Issues and Impacts	The potential environmental issues and impacts that may result from the construction activities are described. Environmental Reports (Environmental Assessments; Fish Habitat and Compensation etc.) will be provided to the contractor especially with respect to any in-stream work procedures that will be required. For example, in-stream works will impact fish and fish habitat in the surrounding ecosystem. It is the Contractor's responsibility to ensure the work is completed in a manner that causes the least impact on the ecosystem (see section on Mitigation).			
Permits, Approvals, and Authorizations	List required permits, approvals and authorizations. As applicable, environmental mitigation measures prescribed by regulatory agencies and included in project permits, approvals and authorizations are described. NOTE: DFO, MoE and NWPA approvals and authorizations for in-stream works are PWGSC's responsibility however, the Contractor must be aware of the requirements of these approvals/authorizations. Permitting for water withdrawal from the waterbody as part of construction activities is part of the Contractor's responsibility.			
Mitigation Strategies	Procedures, controls or best management practices (BMPs) to prevent or reduce adverse impacts on the environment are provided. All work in BC must adhere to the BC MoE "Standards and Best Practices for Instream Works".			
Erosion and Sediment	Erosion and sediment controls are provided, as appropriate for the jurisdiction.			

Waste Management and Hazardous Materials				
Waste Management and Hazardous Materials	Hazardous materials that will be used and/or stored on site are listed. Expected hazardous and non-hazardous waste materials along with proper handling, containment, storage, transportation and disposal methods are listed. As appropriate for the jurisdiction, estimated waste quantities and specific handling procedures are also provided. For example, refueling of equipment will be conducted at least 100m away from any active drainage courses.			
EPP Implementation				
Site Representative	Name(s) and contact details for the person(s) who will be the Contractor's Site Representative(s) are provided.			
Training and Communication	Training and communication details are provided.			
Monitoring and Reporting	Monitoring and inspection procedures, including a schedule of monitoring activities and reporting procedures are provided. For example, this would include downstream monitoring activities for increased siltation during in-stream works.			
Documentation	Information and/or records that will be maintained relating to the EPP and end environmental matters on the project site are described.			
EPP Update	EPP review and update procedures are provided.			
Environmental Emergency Response Procedures				
Environmental Emergency Response Procedures	Potential incidents that may impact the environment are identified, and emergency response procedures to prevent and respond to incidents are provided. An environmental emergency response contact list is also provided.			

R.017173.322
Appendix E

Responsibility Checklist for Authorizations / Approvals / Notifications / Permitting

Responsibility Checklist For Authorizations/Approvals/Notifications/Permitting

Project Title	
Project Description	
Project Type	
Comments	

Issued By	Document Type	Yes	No	N/A
PWGSC Responsibility				
Federal				
DFO - Fisheries Act http://laws.justice.gc.ca/en/F-14/	Section 35(2) Authorization for Harmful Alteration Disruption or Destruction (HADD) to fish habitat (e.g. new bridges that are not clear span; erosion protection works that extend into the river channel).			
	Section 32 Authorization for Destruction of Fish (when explosives are used). Protects fish from being destroyed except by fishing or as Authorized by DFO.			
	Section 20 Approval – The Need for Safe Fish Passage – Every obstruction across or in any stream where DFO determines it necessary that a fish-pass should exist requires either a fish way or canal around the obstruction.			
	Notification process required for culverts and those works that fall under DFO Operational Statements. Stream Crossings by Roads: • Clear Span Bridges • Temporary Ford Stream Crossing • Ice Bridges and Snow Fills • Bridge Maintenance • Maintenance of Riparian Vegetation in Existing Rights-of Way			
	Section 36 – under this Section of the Fisheries Act the proponent can be FINED resulting from deposition of substances deleterious to fish in waters frequented by fish – this includes release of silt laden waters from construction activities.			

Transport Canada NWPA http://laws.justice.gc.ca/en/N-22/text.html	Section 5(1) Formal Approval for construction of new structures (new bridges, culverts, scour protection).			
	Section 5(2) Work Assessment for work resulting in insignificant impacts on navigability.			
	Section 6(4) Formal Approval for existing structures (existing bridges).			
	Minor Works and Waters Order – This is an amendment to the NWPA that streamlines the Federal review process by establishing classes of waters and works (projects) that do not require an Application or Approval through the NWPP because they are "minor" in nature. These would include such “works” as repairs to riprap (no gryones) or “waters” that are not large enough for vessel traffic (i.e. Contact Creek). http://www.tc.gc.ca/eng/marinesafety/oep-nwpp-minorworks-menu-1743.htm			
Indian and Northern Affairs Canada – Indian Act	Approval for activities on lands under their jurisdiction. This is addressed under the EA review process in most cases. If the project is exempt from an EA it must be addressed by the PM or ES personnel.			
Migratory Birds Convention Act (MBCA)	Environment Canada is responsible for implementing the *Migratory Birds Convention Act*, which provides for the protection of migratory birds through the *Migratory Birds Regulations*. This is addressed under the EA review process in most cases. If the project is exempt from and EA it must be addressed by the PM or ES personnel.			
ECMP	Has taken over for our old CEAA form. The ECMP Checklist and the Preliminary Identification of Environmental Support Required (PIESR) Form have been developed to ensure that applicable environmental legislation and relevant aspects are identified during a project. The ECMP Checklist replaces the PWGSC CEAA Checklist, and will be the mechanism by which project information is submitted to PWGSC Environmental Services to determine whether environmental support is required. The ECMP Checklist is located in ELF (Form 183_e). By completing and submitting the ECMP Checklist to Environmental Services, PWGSC project managers1 will ensure that their projects are systematically evaluated for compliance with environmental			

[1] Project Manager refers to anyone who leads, manages or delivers a project

	legislation, policies and sustainable development requirements			
Species at Risk Act (SARA) http://www.sararegistry.gc.ca/default_e.cfm	A list of Federally-listed species at risk likely to occur at a given subject site must be compiled in order to identify potential impacts & propose mitigation measures for minimizing impacts to these species as a result of project activities. In cases where suitable habitat for a given species exists at/near the project site, mitigation measures are recommended, including avoidance of areas containing said habitat and informing site workers of these issues to prevent incidents.			
First Nations Notifications and Consultations http://clss.nrcan.gc.ca/googledata-donneesgoogle-eng.php	Natural Resources Canada has developed an overlay to be used with Google Earth & Google Maps to identify First Nations lands throughout the country. Notifications of projects within 5 km of such lands and/or directly upstream from such lands should be submitted to the relevant First Nations for a determination of their interest in a given project and/or to request any traditional knowledge they may have to offer.			
Provincial – **Note one submission package for instream works is sent to FrontCounter BC at MoE who then send off to the appropriate departments for approval/notification/permitting – this does not apply to the archeological.**				
Wildlife Act – WLAP – MoE http://www.qp.gov.bc.ca/statreg/stat/W/96488.01.htm	Wildlife Act – Section 34 – Birds, Nests and Eggs – vegetation clearing should not occur during critical bird nesting periods, which typically occur in the spring and summer. Contact the local WLAP for vegetation clearing timing windows.			
Water Act - Water Stewardship Division - Ministry of Forests, Lands and Natural Resources Operations	Section 11 – regulates changes in or about a stream and ensure that water quality, riparian habitat, and the rights of licensed water users are not compromised. This is an approval process and takes approximately 140 days. An application fee is also required. Works requiring approval include channel realignment, retaining wall or bank protection stabilization etc.			
Environmental Stewardship Division - MoE	Notification process for such works as replacement and maintenance of culverts and outfalls; temporary stream diversions around a worksite and takes approximately 45 days to receive notification approval. In general, those works requiring a notification are those that do not involve any diversion of water.			
Fish Protection Act – MoE http://wlapwww.gov.bc.ca/habitat/fishprotectionact/	This Act was passed in 1997 and is reviewed as part of the Water Act under Section 11 when applying for approval.			
Ministry of Forests, Lands and Natural Resources Operations	When completing projects such as quarry pits and new highway alignments, a request is put			

Archaeological http://www.for.gov.bc.ca/archaeology/requesting_archaeological_site_information/process_steps.htm *Contact: Hayley Bond (250) 953-3343*	into the archaeological branch of MFLNSO via the EA process to search the data base. An archaeological assessment may be required on those areas that are previously undisturbed or undeveloped.			
BC Parks	Various permits are required when completing construction activities within the Parks. Please note that all works within 150 feet of the centreline of the highway (Right-of-Way) are NOT subject to construction permitting. (this does not include permitting for fish surveys).			
Canada-British Columbia Agreement for Environmental Assessment Cooperation http://www.ceaa.gc.ca/default.asp?lang=En&n=04A20DBC-1	Most Alaska Highway Projects will not trigger this agreement, as both the Vancouver CEAA office and the Victoria BC Environmental Assessment Office (EAO) have confirmed that the types and scopes of the projects are not described in the BC Environmental Assessment Act – Reviewable Projects Regulation. However, for due diligence, it is recommended that notifications for all Alaska Highway projects be submitted to CEAA (info@ceaa-acee.gc.ca) for review and, if necessary, a determination of whether or not CEAA and/or the BC EAO should be involved.			
BC Ministry of Environment – BC Species and Ecosystems Explorer http://a100.gov.bc.ca/pub/eswp/	A list of Provincially-listed species at risk likely to occur at a given subject site must be compiled in order to identify potential impacts & propose mitigation measures for minimizing impacts to these species as a result of project activities. This process involves conducting a search of the BC Species and Ecosystems Explorer inventory for the specific area of BC containing the proposed project site.			
Consultant Responsibility				
Provincial				
BC Parks ***Ministry of Forests, Lands and Natural Resources Operations*** *http://www.env.gov.bc.ca/bcparks/permits/*	Permit to Collect Fish For a Scientific Purpose - Regulation Research activities in parks and protected areas, including: collection; monitoring; survey and inventory; and, other research trigger a Park Permit - – Ministry of Forests, Lands and Natural Resources Operations is responsible for the administration of fish and wildlife permits. Note that these permits are taking approx. 6 months to receive due to recent involvement and subsequent consultation with Treaty 8.			
Water Act – Regulation's Protection of Habitat - Section 42(1)	Permit to Collect Fish For a Scientific Purpose – Sub-Section 42(1)(e) – It is the responsibility of the salvage crew to obtain the necessary permit required to complete a fish and amphibian salvage – in conjunction with the BC Parks permitting.			

Note: research projects and inventory projects are under the same Permit and are applied for under the "Application to Collect Fish for a Scientific Purpose". **http://www.env.gov.bc.ca/pasb/applications/process/scientific_fish_collect.html#a5**				
Contractor Responsibility				
Federal				
DFO – End of Pipe Guidelines	End-of- pipe guidelines for freshwater intake to avoid fish entrainment.			
Provincial				
Water Act - MoE	Schedule A – Water License Applications – use of water from waterbody for road maintenance.			

R.017173.322
Appendix F

Relevant Environmental Publications

Relevant Environmental Publications

The below list of documents are those commonly used when determining how to design and advance a project with the potential to impact a waterbody.

Agency	Publications	Summary
DFO	***Land Development Guidelines for the Protection of Aquatic Habitat - 1993***	This document is a good reference guide for any works that are occurring in or around the water.
	Canada's Fish Habitat Law	Document explaining the fish and fish habitat laws under the Fisheries Act.
	Riparian Revegetation	Information on minimizing, stabilizing and revegetating construction areas.
	Freshwater Intake End-of Pipe Fish Screen Guideline - 1995	Provides guidelines for the contractor to follow to ensure fish screens are used during freshwater intake operations at construction sites.
	Operational Statements Stream Crossings by Roads: • Clear Span Bridges • Temporary Ford Stream Crossing • Ice Bridges and Snow Fills • Bridge Maintenance • Maintenance of Riparian Vegetation in Existing Rights-of Way	Fisheries and Oceans Canada has developed a series of Operational Statements to streamline the undertaking of low risk activities. The Operational Statements outline conditions and measures for avoiding harmful alteration, disruption and destruction (HADD) of fish habitat, and applying them will ensure the project complies with Sub-Section 35(1) of the *Fisheries Act*. You are NOT required to submit a proposal for review by Fisheries and Oceans Canada when you incorporate the measures and conditions outlined in an appropriate Operational Statement into your plans. http://www.pac.dfo-mpo.gc.ca/habitat/os-eo/index-eng.htm
MoE	***Fish-stream Crossing Guidebook - 2002***	Guidelines in protection of fish and fish habitat and the safe passage of fish during construction at/on stream crossings.
	Standards and Best Practices for Instream Works - 2004	Guide to planning and carrying out the proposed construction activities to comply with relevant legislation, regulations and policies.
	A User's Guide to Working In and Around Water - 2005	Understanding the regulation under British Columbia's Water Act.
	Fish-Stream Identification Guidebook - 1998	Assists in providing information on determining fish streams.
	The Streamkeepers Handbook	A practical guide to stream and wetland care in regards to rehabilitation planting.

R.017173.322
Appendix G

Geotechnical Data Report for Drainage Structure Replacement at Townsend Creek, Km 197.6 of the Alaska Highway, BC

TETRA TECH

OQM CERTIFIED

Geotechnical Data Report for Drainage Structure Replacement at Townsend Creek, km 197.6 of the Alaska Highway, BC.



PRESENTED TO
Public Works and Government Services Canada

APRIL 25, 2018
ISSUED FOR REVIEW
PWGSC PROJECT NUMBER: R.017173.231
TETRA TECH FILE: 704-TRN.VHWY03110-01

Tetra Tech Canada Inc.
150, 1715 Dickson Avenue
Kelowna, BC V1Y 9G6 CANADA
Tel 250.862.4832 Fax 250.862.2941

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF TABLES IN TEXT

APPENDIX SECTIONS

FIGURES

APPENDICES

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Public Works and Government Services Canada and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Public Works and Government Services Canada., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by Public Works and Government Services Canada (Public Works) to carry out engineering services for the Townsend Creek culvert crossing at km 197.6 of the Alaska Highway, in northern BC, Canada.

The scope of this work plan is developed based on PWGSC's Terms of Reference (ToR) for Project # R.017173.231 and subsequent correspondence between PWGSC and Tetra Tech. The project was completed under the Standing Offer Agreement (SOA) No. EZ899-161629/001/TPV.

This report provides the results of the geotechnical investigation.

2.0 GEOTECHNICAL INVESTIGATION

2.1 Description of Fieldwork

Fieldwork was carried out under supervision of a Tetra Tech representative on March 8th and 9th, 2018. Three testholes were drilled on the shoulder of the road: all three were advanced with solid stem auger for soil sampling. Dynamic cone penetration testing (DCPT) was used for measurement of penetration resistance. In addition to the testholes, two testpits were advanced on either side of the highway, at the toe of the embankment. Upon completion the testholes were backfilled with drill cuttings and capped with a bentonite seal in accordance with the BC Groundwater Protection Regulation (2016).

The truck-mounted auger rig was provided and operated by Peace River Drilling Ltd. of Fort St. John, BC. The testpits were excavated with a JD250 Excavator provided by Haab Contracting Ltd. Utility locates and clearances were provided by Northwestel Inc. Table 1 provides a summary of the testholes. Testhole logs are included in Appendix C.

Table 1: Testhole Collar Data

Testhole Name	Testhole Location	Testhole Depth (m)	Northing*	Easting*
TH18-01	South Shoulder	31.4	6315136	552654
TH18-02	North Shoulder	18.1	6315143	552668
TH18-03	North Shoulder	10.5	6315150	552642
TP18-01	South Embankment Toe	10.5	6315116	552645
TP18-02	South Embankment Toe	10.5	6315164	552656

*UTM coordinates Zone 10 and obtained with handheld GPS.

2.1.1 Field Testing

DCPTs were carried out with a 63.5 kg standard weight hammer in both TH18-01, TH18-02 and TH18-03. DCPTs were continued every 1.5 to 3 m following an earlier refusal. In both testholes, DCPTs refused early as a result of frozen ground at depths of 1.5 m and 3 m. Select pocket penetrometer and pocket torvanes were performed on relatively intact disturbed samples.

2.2 Sample Collection and Laboratory Testing

A laboratory sampling and testing program was carried out to assess the geotechnical parameters of select soil samples. Disturbed samples were collected in both the testholes and testpits. The testholes were sampled every 1.5 m or at a change in lithology. The testpits were sampled at every metre of depth.

Laboratory testing was carried out in general accordance with the American Society for Testing and Materials (ASTM) standards. The program included Atterberg limits and moisture content testing. Samples were sent to Tetra Tech's laboratory in Nanaimo for analysis and testing. Soils were assigned descriptions and classifications (i.e., clays, silts) based on their behavior rather than their grain sizes, as per Tetra Tech's work method WM4400. A summary of the test methods and number of tests performed is presented in Table 2.

Table 2: Laboratory Testing

Borehole	Atterberg Limits Test	Moisture Content Test	Total
ASTM	D4318	D2216	
TH18-01	1	4	5
TH18-02	-	2	2
TH18-03	1	2	3
TP18-01	-	1	1
TP18-02	-	2	2
		Total	13

Index test results were incorporated into soil classification and are presented in the testhole logs in Appendix C. Laboratory test results are provided in Appendix F.

2.3 Subsurface Conditions

The soil and foundation characteristics were observed from the testhole and laboratory data. Immediately beneath the asphalt and road base to a depth of 7 m, the soil stratigraphy consists of a dense silty sand fill, with trace to some gravel. This unit overlies a native clayey silt, with some sand and gravel. Moisture was observed in the soils at about 7.5 m below grade. However, no discernable groundwater table was observed in the testholes. Water was observed at 3 m depth in TP18-01. Density was observed to increase with depth. At the time of drilling, the near surface soils were frozen and as such, insitu density estimates may not be representative of soil conditions in warmer periods of the year. Bedrock was not encountered.

2.4 Interpreted Soil Parameters

The interpreted soil profile and soil parameters adopted for the geological model were developed based on historical construction information, the testhole logs, and the laboratory test results.

Moisture contents of samples collected in the testholes ranged between 8% and 21% (by weight). In the testpits, located closer to the toe of the embankment, moisture contents ranged from 16% to 23%. . Plasticity Index (PI) vs. Liquid Limit (LL) for two of the fine grained samples are plotted in Figure 2. Soil texture is classified largely as a medium plastic clay or silt. The soil abbreviations are defined in Table 4 as per ASTM D2487. Sieve analysis test results of coarser grained soils are presented in Table 5.

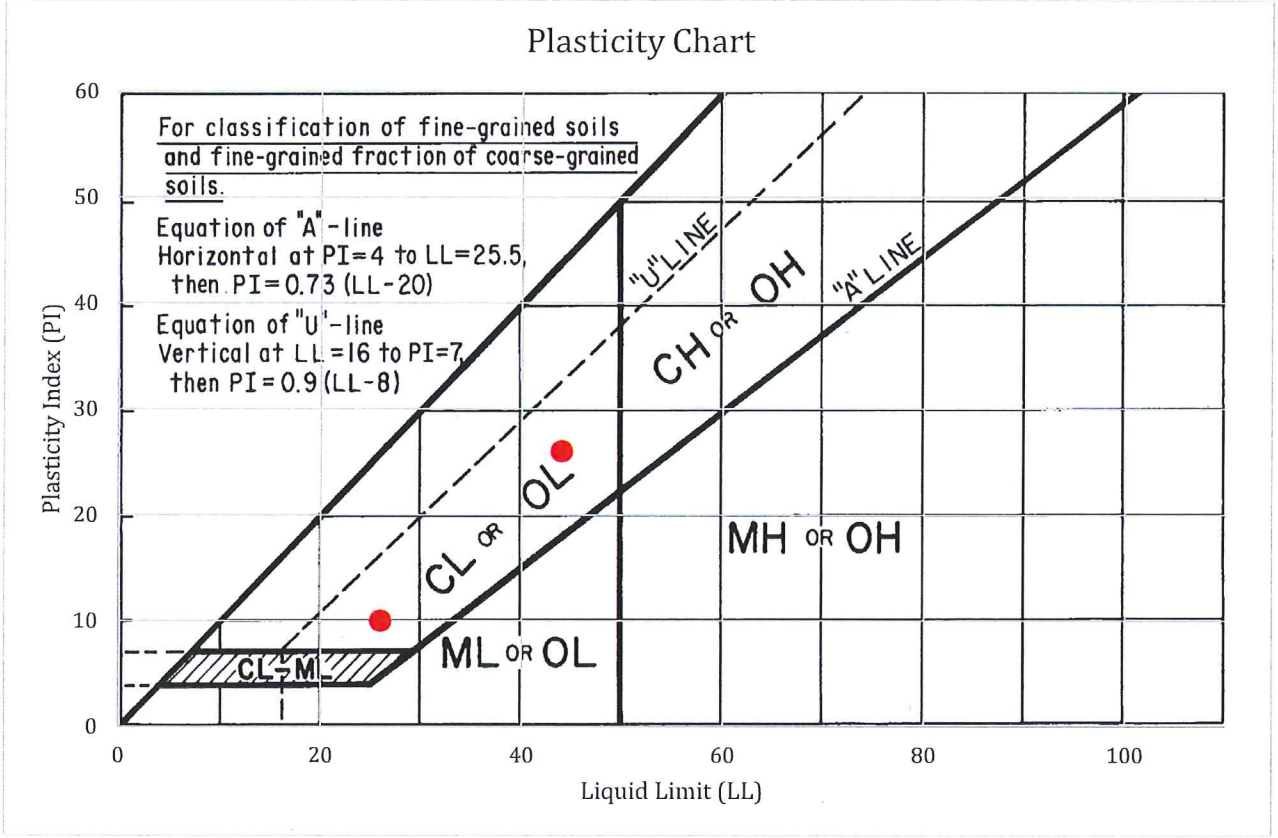


Figure 1: Plasticity Index vs. Liquid Limit for Fine Grained Soil Samples (ASTM D2487)

Table 3: ASTM D2487 Classification of Fine Grained Soils

Classification	Name	Classification	Name
ML	Silt	MH	Elastic Silt
CL	Lean Clay	CH	Fat Clay
OL	Organic Silt	OH	Organic Silt

3.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

Issued for Review

Prepared by:
Omar Berbar, EIT
Junior Geotechnical Engineer
Direct Line: 778.945.5728
Omar.Berbar@tetratech.com

/OB/KJ

Issued for Review

Reviewed by:
Kim Johnston, M.Sc., P.Eng., PE
Principal Specialist - Geotechnical
Direct Line: 778.945.5885
Kim.Johnston@tetratech.com

REFERENCES

ASTM D2216-10, Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass, ASTM International, West Conshohocken, PA, 2010, www.astm.org

ASTM D2487-17, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM International, West Conshohocken, PA, 2017, www.astm.org

ASTM D4318-17e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM International, West Conshohocken, PA, 2017, www.astm.org

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

1.9 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

1.15 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.17 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.

APPENDIX B

GEOTECHNICAL TESTHOLE LOGS

Public Works and Government Services Canada

Testhole No: **TH18-01**

Project: Townsend Creek Drainage Structure Upgrade	Project No: TRN.VHWY03110-01
Location: Alaska Highway, km 197.6	Ground Elev: 879 m
British Columbia	UTM: 552654 E; 6315136 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	USC	Sample Type	Sample Number	DCPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	DCPT (N) (20 40 60 80)	Elevation (m)
0		GRAVEL (FILL), coarse grained, subrounded gravel									879
		SAND (FILL), silty, trace to some gravel, dry, brown, subrounded gravel				1					
1											878
							100				
2						2					877
3											876
						3		8			
4											875
							14				
5							14				874
	Solid stem auger					4	22				
							20				
6							14				873
							30				
							100				
7						5		12			872
		SILT, clayey, some sand to sandy, trace gravel, very soft to hard, high plasticity, grey, coarse sand, subrounded gravel					9				
8							16				871
						6	17				
							18				
9							24				870
		- becomes moist below 9.14 m					28				
							38				
10						7	49				869

TETRA TECH

Contractor: Peace Drilling and Research Ltd.	Completion Depth: 13.7 m
Drilling Rig Type: Truck-Mounted Solid Stem Auger	Start Date: 9 March 2018
Logged By: OB	Completion Date: 9 March 2018
Reviewed By:	Page 1 of 2

Public Works and Government Services Canada

Testhole No: **TH18-01**

Project: Townsend Creek Drainage Structure Upgrade	Project No: TRN.VHWY03110-01
Location: Alaska Highway, km 197.6	Ground Elev: 879 m
British Columbia	UTM: 552654 E; 6315136 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	USC	Sample Type	Sample Number	DCPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	DCPT (N) (20 40 60 80)	Elevation (m)
10											869
							47				
							61				
							44				
11	Solid stem auger					8	55	12			868
							61				
							60				
12							67				867
							48				
							66				
13				CI		9	84	18			866
							100				
		Testhole terminated at 13.7 m. DCPT terminated at 13.4 m - Upon completion, testhole was backfilled to surface with bentonite chips and auger cuttings. - Soil description is based on visual assessment. - Estimates of soil consistency were determined from drill rig performance, in situ test results, and visual classification of recovered samples. These estimates are based on engineering judgment - Moisture content values may not be representative of in situ conditions due to drilling disturbance. - Testhole elevation and coordinates are approximate and were recorded using a handheld Garmin GPS.									865
14											
15											864
16											863
17											862
18											861
19											860
20											859

TETRA TECH

Contractor: Peace Drilling and Research Ltd.	Completion Depth: 13.7 m
Drilling Rig Type: Truck-Mounted Solid Stem Auger	Start Date: 9 March 2018
Logged By: OB	Completion Date: 9 March 2018
Reviewed By:	Page 2 of 2

Public Works and Government Services Canada

Testhole No: TH18-02

Project: Townsend Creek Drainage Structure Upgrade	Project No: TRN.VHWY03110-01
Location: Alaska Highway, km 197.6	Ground Elev: 879 m
British Columbia	UTM: 552669 E; 6315145 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	DCPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	DCPT (N) (20 40 60 80)	Elevation (m)
0		GRAVEL (FILL), coarse grained, subrounded gravel								879
		SAND (FILL), trace to some gravel, dry, brown, subrounded gravel								
1	Solid stem auger				1					878
2					2		10			877
3						63				876
						59				
					3	50				
4						46				875
						22				
						29				
5						46				874
					4	29				
						20				
6						19				873
		- becomes silty below 6.4 m				20				
						33				
7					5	24	13			872
						25				
		SILT, clayey, some sand to sandy, trace gravel, stiff to hard, low plasticity, grey, coarse sand, subrounded gravel				25				
						38				
8						47				871
					6	48				
						60				
9										870
		Testhole terminated at 9.14 m. DCPT terminated at 8.84 m.								
		- Upon completion, testhole was backfilled to surface with bentonite chips and auger cuttings.								
		- Soil description is based on visual assessment.								
10		- Estimates of soil consistency were determined from drill rig								869

TETRA TECH

Contractor: Peace Drilling and Research Ltd.	Completion Depth: 9.14 m
Drilling Rig Type: Truck-Mounted Solid Stem Auger	Start Date: 9 March 2018
Logged By: OB	Completion Date: 9 March 2018
Reviewed By:	Page 1 of 2

Public Works and Government Services Canada

Testhole No: **TH18-02**

Project: Townsend Creek Drainage Structure Upgrade	Project No: TRN.VHWY03110-01
Location: Alaska Highway, km 197.6	Ground Elev: 879 m
British Columbia	UTM: 552669 E; 6315145 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	DCPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	◆ DCPT (N) ◆ (20 40 60 80)	Elevation (m)
10		performance, in situ test results, and visual classification of recovered samples. These estimates are based on engineering judgment - Moisture content values may not be representative of in situ conditions due to drilling disturbance. - Testhole elevation and coordinates are approximate and were recorded using a handheld Garmin GPS.								869
11										868
12										867
13										866
14										865
15										864
16										863
17										862
18										861
19										860
20										859

TETRA TECH

Contractor: Peace Drilling and Research Ltd.	Completion Depth: 9.14 m
Drilling Rig Type: Truck-Mounted Solid Stem Auger	Start Date: 9 March 2018
Logged By: OB	Completion Date: 9 March 2018
Reviewed By:	Page 2 of 2

Public Works and Government Services Canada

Testhole No: TH18-03

Project: Townsend Creek Drainage Structure Upgrade	Project No: TRN.VHWY03110-01
Location: Alaska Highway, km 197.6	Ground Elev: 879 m
British Columbia	UTM: 552643 E; 6315152 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	DCPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	DCPT (N) (20 40 60 80)	Elevation (m)
0		GRAVEL (FILL), coarse grained, subrounded gravel								879
		SAND (FILL), trace to some gravel, dry, brown, subrounded gravel								
1	Solid stem auger				1					878
2					2					877
3						32				876
						100				
					3					
4										875
5		- becomes silty below 5.18 m			4					874
6						12				873
						10				
7		SILT, clayey, some sand to sandy, trace gravel, very soft to hard, high plasticity, dense to very dense, grey, coarse sand, subrounded gravel			5	21	21			872
						16				
						22				
						28				
8						40				871
					6	55				
						84				
9						88				870
10		Testhole and DCPT terminated at 9.14 m. - Upon completion, testhole was backfilled to surface with bentonite chips and auger cuttings. - Soil description is based on visual assessment. - Estimates of soil consistency were determined from drill rig								869

TETRA TECH

Contractor: Peace Drilling and Research Ltd.	Completion Depth: 9.14 m
Drilling Rig Type: Truck-Mounted Solid Stem Auger	Start Date: 9 March 2018
Logged By: OB	Completion Date: 9 March 2018
Reviewed By:	Page 1 of 2

Public Works and Government Services Canada

Testhole No: **TH18-03**

Project: Townsend Creek Drainage Structure Upgrade	Project No: TRN.VHWY03110-01
Location: Alaska Highway, km 197.6	Ground Elev: 879 m
British Columbia	UTM: 552643 E; 6315152 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	DCPT (N)	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	◆ DCPT (N) ◆ (20 40 60 80)	Elevation (m)
10		performance, in situ test results, and visual classification of recovered samples. These estimates are based on engineering judgment - Moisture content values may not be representative of in situ conditions due to drilling disturbance. - Testhole elevation and coordinates are approximate and were recorded using a handheld Garmin GPS.								869
11										868
12										867
13										866
14										865
15										864
16										863
17										862
18										861
19										860
20										859

TETRA TECH

Contractor: Peace Drilling and Research Ltd.	Completion Depth: 9.14 m
Drilling Rig Type: Truck-Mounted Solid Stem Auger	Start Date: 9 March 2018
Logged By: OB	Completion Date: 9 March 2018
Reviewed By:	Page 2 of 2

Public Works and Government Services Canada

Testhole No: TP18-01

Project: Townsend Creek Drainage Structure Upgrade	Project No: 704-TRN.VHWY03110-01
Location: Alaska Highway, km 197.6	Ground Elev: 873 m
British Columbia	UTM: 552638 E; 6315145 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	Elevation (m)
0								873
1	Excavator	CLAY, sandy, silty, trace gravel, medium to hgih plasticity, very dense, dark grey brown; gravel is subrounded			1			872
2					2	16		871
3		SILT, sandy, some clay, trace to some gravel, medium plasticity, trace to some organics, organic odour, moist, dense to very dense, brown			3			870
		SAND, silty, dark brown, some organics, wet						
4		SILT, sandy, some clay, trace to some gravel, medium plasticity, trace to some organics, organic odour, moist, dense to very dense, brown			4			869
5					5			868
6		Testpit terminated at 5 m. - Upon completion, testpit was backfilled to surface with bentonite chips and auger cuttings. - Soil description is based on visual assessment. - Estimates of soil consistency were determined from, in situ test results, and visual classification of recovered samples. These estimates are based on engineering judgment - Moisture content values may not be representative of in situ conditions due to drilling disturbance. - Testpit elevation and coordinates are approximate and were recorded using a handheld Garmin GPS.						867
7								866
8								865
9								864
10								863

TETRA TECH

Contractor: Peace Drilling and Research Ltd.	Completion Depth: 5 m
Drilling Rig Type: Truck-Mounted Solid Stem Auger	Start Date: 8 March 2018
Logged By: OB	Completion Date: 8 March 2018
Reviewed By:	Page 1 of 1

Public Works and Government Services Canada

Testhole No: **TP18-02**

Project: Townsend Creek Drainage Structure Upgrade	Project No: 704-TRN.VHWY03110-01
Location: Alaska Highway, km 197.6	Ground Elev: 875 m
British Columbia	UTM: 552656 E; 6315164 N; Z 10

Depth (m)	Method	Soil Description	Graphical Representation	Sample Type	Sample Number	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	Elevation (m)
0								875
1	Excavator	CLAY, sandy, silty, trace gravel, medium to hgih plasticity, very dense, dark grey brown; gravel is subrounded			1			874
2					2			873
3					3	23		872
4					4			871
5		Testpit terminated at 4 m. - Upon completion, testpit was backfilled to surface with bentonite chips and auger cuttings. - Soil description is based on visual assessment. - Estimates of soil consistency were determined from, in situ test results, and visual classification of recovered samples. These estimates are based on engineering judgment - Moisture content values may not be representative of in situ conditions due to drilling disturbance. - Testpit elevation and coordinates are approximate and were recorded using a handheld Garmin GPS.			5			870
6								869
7								868
8								867
9								866
10								865

TETRA TECH

Contractor: Peace Drilling and Research Ltd.	Completion Depth: 4 m
Drilling Rig Type: Truck-Mounted Solid Stem Auger	Start Date: 8 March 2018
Logged By: OB	Completion Date: 8 March 2018
Reviewed By:	Page 1 of 1

APPENDIX C

LABORATORY DATA

MOISTURE CONTENT TEST RESULTS

ASTM D2216

Project:	Townsend Creek	Sample No.:	101
Project No.:	704-TRN.VHWY03110-01	Date Tested:	March 19, 2018
Client:	Public Works and Government Services Canada	Tested By:	Brian Gummeson
Project Engineer:	Kim Johnston, Omar Berbar	Page:	1 of 1

B.H. Number	Sample Number Depth (m)	Moisture Content (%)	Visual Description of Soil
TH18-01	S3 @ 3.7-4.0	7.7	SAND and GRAVEL, trace silt, moist, brown
	S5 @ 6.7-7.0	12.1	SAND, trace gravel, silt inclusions, moist, brown
	S8 @ 11.0-11.3	12.2	SILT, some clay, some sand, trace gravel, moist, brown
	S9 @ 12.8-13.1	18.1	CLAY, silty, trace sand, trace gravel, moist, brown
TH18-02	S2 @ 2.1-2.4	9.7	SILT and SAND, trace gravel, damp, brown
	S5 @ 6.7-7.0	13.4	SILT and SAND, trace clay, trace gravel, very stiff, moist, brown
TH18-03	S3 @ 3.7-4.0		SAND and GRAVEL, some silt, damp, brown
	S5 @ 6.7-7.0	21.1	CLAY, some silt, trace sand, trace gravel, hard, moist, brown
TP18-01	S2 @ 1.9-2.1	15.9	SILT and SAND, some clay, some gravel, firm, moist, grey
TP18-02	S1 @ 0.9-1.1		SANDSTONE fragments, some silt, trace gravel, damp, brown
	S3 @ 2.9-3.1	22.9	CLAY, silty, trace sand, trace gravel, trace organics, stiff, moist, brown

Reviewed By: _____ P.Eng.

TETRA TECH

ATTERBERG LIMITS - LABORATORY RESULTS SUMMARY

ASTM D4318

Project:	Townsend Creek	Test Hole No.:	TH18-01 and 02		
Project No.:	704-TRN.VHWY03110-01	Submitted By:	Omar Berbar	Sampled By:	Omar Berbar
Client:	Public Works and Government Services Canada	Date Sampled:	March 14, 2018	Tested By:	Brian Gummeson
Attention:		Date Tested:	March 22, 2018	Laboratory:	Nanaimo

Test Hole Number	Sample ID	Depth (m)	Moisture Content (%)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Mod. USCS	Soil Description Type, constituants/composition, structure, moisture, consistency, plasticity, colour, odour, inclusions.
TH18-01	S9	12.8-13.1	18.1	26	16	10	CL	CLAY, silty, some sand, trace gravel, moist, dark brown
TH18-03	S5	6.7-7.0	21.1	44	18	26	CI	CLAY, some silt, trace sand, trace gravel, hard, moist, brown

Remarks:

Reviewed By: P.Eng

TETRA TECH