



**Public Works and
Government Services Canada**

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SPECIFICATIONS
for

**Bridge-Culvert Replacement
Km 595.3, Alaska Highway, British Columbia**

Project No. R.017173.802 March 2014

APPROVED BY:

22 March 2016
Program Manager, Alaska Highway Date

2016-03-22
Construction Safety Coordinator Date

TENDER:

Mar/22/2016
Project Manager Date



PWGSC

Culvert Replacement
km 595.3, Alaska Highway, British Columbia
Project No. R.017173.802

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PART 1 - GENERAL

- 1.1 Codes, Bylaws, Standards .1 Perform work to CURRENT Codes, Construction Standards and Bylaws, including Amendments.
- .2 Perform work in accordance with the National Building Code of Canada (NBC) 2010, the Canadian Highway Bridge design code CAN/CSA S6-06 and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local application.
- .3 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.
- .4 Meet or exceed requirements of Contract documents, specified standards, codes, and referenced documents.
- .5 In any case of conflict or discrepancy, the most stringent requirements shall apply.
- 1.2 Contract Documents .1 The Contract Documents, drawings and specifications, are intended to complement each other, and to provide for and include everything necessary for the completion of the Work.
- .2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.
- .3 If anything is found by the Contractor to be missing from the Contract Documents immediately inform the Departmental Representative.
- 1.3 Other Contracts .1 Further Contracts may be awarded while this contract is in progress.
- .2 Cooperate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.
- .3 Coordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of this Work.
- 1.4 Division of Specifications .1 The specifications are subdivided in accordance with the current 5 or 6-digit National Master Specifications System.
- .2 A division may consist of the work of more than 1 subcontractor. Responsibility for determining which subcontractor provides the
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- labour, material, equipment and services required to complete the work rests solely with the Contractor.
- .3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.
- 1.5 Time of Completion .1 Complete the Work within 16 weeks after Contract Award.
- 1.6 Section Includes .1 In general, Work under this Contract covers the:
- .1 Construction of a detour around the crossing prior to culvert replacement and removal of the detour after construction is complete.
 - .2 Removal and disposal of existing SPCSP culverts.
 - .3 Installation of precast concrete box culverts, km 595.3, Alaska Highway, British Columbia to replace the existing SPCSP pipe culverts.
 - .4 Installation of substrate material and large diameter rocks inside the culvert.
 - .5 Installation of riprap around the inlet and outlet.
 - .6 Installation of precast concrete roadside barriers and associated embankment fill to accommodate new barriers.
 - .7 Backfilling, re-establishment of roadways, and embankment slopes disturbed by the work.
- 1.7 Work Included .1 Work includes, but is not limited to:
- .1 Removal and disposal of existing SPCSP culverts.
 - .2 Supply and installation of precast concrete box culvert.
 - .3 Supply and installation of substrate material and 50 kg riprap for culvert bottom.
 - .4 Supply and installation of clay seal at culvert inlets.
 - .5 Supply and installation of precast concrete roadside barriers and associated embankment fill to accommodate new barriers.
 - .6 Installation of riprap and re-establishment of roadways and embankments at completion of Contract.
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- .7 Backfilling behind culvert with soil or gravel.
 - .8 Supply of construction equipment and personnel.
 - .9 Staging of construction and traffic accommodation including construction of a detour prior to culvert replacement and removal of the detour after culvert replacement is complete.
 - .10 Maintaining the stability of the roadway embankment fill during construction.
 - .11 Coordination and communication with other Contractors and agencies involved with Project, if applicable.
 - .12 Management of Environment.
 - .2 "Green" requirements:
 - .1 Use only environmentally responsible green materials/ products with no VOC emissions or minimum VOC emissions of indoor off-gassing contaminants for improved indoor air quality - subject of Departmental Representative's approval of submitted MSDS Product Data.
 - .2 Use materials/products containing highest percentage of recycled and recovered materials practicable - consistent with maintaining cost effective satisfactory levels of competition.
 - .3 Adhere to waste reduction requirement for reuse or recycling of waste materials, thus diverting materials from landfill.
 - .3 Unless specifically stated otherwise, the Work is to include the furnishing of all labour, materials, equipment, and services necessary to complete the Work. The intent is that the Contractor provides a complete Job.
 - 1.8 Contractor's Responsibility
 - .1 Give all required Notices and comply with all local, provincial, and federal laws, bylaws, ordinances, rules, regulations, codes, and orders relating to the Work which are or become in force during the Performance of the Work.
 - .2 As Prime Contractor, coordinate all the Work and provide all labour, materials, equipment, and services necessary for delivery, storage, handling, protection, installation, removal, inspection, and replacement or maintenance as required to provide a complete
-

- Project.
- 1.9 Hours of Work .1 Restrictive as follows:
- .1 Notify Departmental Representative of all after hours work, including weekends and holidays.
 - .2 After hours work is likely required for Work near the centreline of the roadway.
- 1.10 Work Schedule .1 Carry on work as follows:
- .1 Within 10 working days after Contract award, provide a "phasing bar chart" and a schedule showing anticipated progress stages and final completion of the Work within the time period required by the Contract documents. Indicate the following:
 - .1 Submission of shop drawings, product data, MSDS sheets, and samples.
 - .2 Commencement and completion of Work of each section of the specifications or drawings as outlined.
 - .3 Final completion date within the time period required by the Contract documents.
 - .2 Do not change approved Schedule - without notifying Departmental Representative.
 - .3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.
- 1.11 Cost Breakdown .1 Before submitting the first progress claim, submit a breakdown of the Contract lump sum prices in detail as directed by the Departmental Representative and aggregating Contract price.
- 1.12 Documents Required .1 Maintain 1 copy each of the following at the job site:
- .1 Contract drawings.
 - .2 Contract specifications.
 - .3 Addenda to Contract documents.
 - .4 Copy of approved work schedule.
 - .5 Reviewed/approved shop drawings.
 - .6 Change orders.
 - .7 Other modifications to Contract.
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- .8 Field test reports.
 - .9 Reviewed/approved samples.
 - .10 Manufacturers' installation and application instructions.
 - .11 One set of record drawings and specifications for "as-built" purposes.
 - .13 Current construction standards of workmanship listed in technical Sections.
 - .14 Project Safety Plan / Traffic Control Plan.
 - .15 Copy of approved Work schedule.
 - .16 Labour conditions and wage schedules.
 - .17 Environmental Protection Plan
- 1.13 Regulatory Requirements .1 Obtain and pay for Building Permit, Certificates, Licenses, and other permits required by regulatory municipal, provincial or federal authorities to complete the work.
- .2 Provide inspection authorities with plans and information required for issue of acceptance certificates.
- .3 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.
- 1.14 Contractor's Use of Site .1 Use of site:
- .1 Exclusive and complete for execution of Work.
 - .2 Assume responsibility for assigned premises for performance of this Work.
 - .3 Be responsible for coordination of all Work activities on site, including the Work of other contractors engaged by the Departmental Representative.
- .2 Perform Work in accordance with Contract documents. Ensure work is carried out in accordance with indicated phasing.
- .3 Do not unreasonably encumber site with material or equipment
- 1.15 Examination .1 Examine site and be familiar and conversant with existing conditions likely to affect work.
- .2 Provide photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.
- 1.16 Existing Services .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by the authorities having jurisdiction.
-

- 1.17 Location of Equipment and Fixtures .1 Location of equipment, fixtures, and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures, and distribution systems to provide minimum interference and maximum usable space, and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative of impending installation and obtain his approval for actual location.
- .4 Submit field drawings or shop drawings to indicate the relative position of various services and equipment when required by the Departmental Representative and/or as specified.
- 1.18 Cutting and Patching .1 Cut existing surfaces only as required to accommodate new work and as directed by the Departmental Representative.
- .2 Remove items so shown or specified.
- .3 Do not cut, bore, or sleeve load-bearing members unless instructed to do so by the drawings and/or specifications.
- .4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .5 Fit work airtight to pipes, sleeves, ducts and conduits.
- .6 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.
- .7 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when viewed from 1.5 metres in ambient light, and includes painting the whole surface to the next change in plane.
- 1.19 Setting Out Work .1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- .2 Assume full responsibility for dimensions, spacings, overall fit with field components, and exact locations of bolt holes and their spacings.
- .3 Provide devices needed to lay out and construct work.
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- .4 Supply such devices as templates required to facilitate Departmental Representative's inspection of work.
- 1.20 Quality of Work
- .1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.
 - .2 The workmanship, erection methods, and procedures to meet minimum standards set out in the applicable codes and standards.
 - .3 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.
- 1.21 Works Coordination
- .1 Coordinate work of subtrades:
 - .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.
 - .2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.
 - .1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.
 - .2 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.
 - .1 Identify on coordination drawings, structural elements, services lines, rough-in points, and indicate location of services entrance to site.
 - .3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign off on drawings.
 - .4 Publish minutes of each meeting.
 - .5 Plan and coordinate work in such a way to minimize quantity of service line offsets.
 - .6 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.
 - .7 Coordinate and plan for all necessary road/lane closures ahead of time.
-

- .3 Submit shop drawings and order of prefabricated equipment or rebuilt components only after coordination meeting for such items has taken place.
 - .4 Work cooperation:
 - .1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.
 - .2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching, and removal or replacement of completed work.
 - .3 Ensure disputes between subcontractors are resolved.
 - .5 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.
 - .6 Maintain efficient and continuous supervision.
 - 1.22 Approval of Shop Drawings, Product Data and Samples
 - .1 In accordance with Section 013300, submit the requested shop drawings, product data, MSDS sheets, and samples indicated in each of the technical Sections.
 - .2 Allow sufficient time for the following:
 - .1 Review of product data.
 - .2 Approval of shop drawings.
 - .3 Review of re-submission.
 - .4 Ordering of approved material and/or products.
 - 1.23 Relics and Antiques
 - .1 Relics and antiquities and items of historical or scientific interest shall remain property of Department. Protect such articles and request directives from Departmental Representative.
 - .2 Give immediate notice to Departmental Representative if evidence of archeological finds are encountered during excavation/construction, and await Departmental Representative's written instructions before proceeding with work in this area.
 - 1.24 Project Meetings
 - .1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.
 - 1.25 Testing and Inspections
 - .1 Particular requirements for inspection and testing to be carried out
-

by testing service or laboratory approved by the Departmental Representative are specified in Section 014500 – Quality Control.

- .2 The Contractor will appoint and pay for the services of testing agencies and/or testing laboratories to meet the requirements specified in the Contract documents and where required for the following:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Tests specified to be carried out by Contractor under the Departmental Representative's supervision.
- .3 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the Departmental Representative may require to verify acceptability of corrected work.
- .4 Contractor shall notify Departmental Representative in advance of planned testing.
- .5 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .6 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.
- .7 The Departmental Representative may require, and pay for, additional inspection and testing services not included here.
- .8 Provide Departmental Representative with 2 copies of testing laboratory reports and mill tests and certificates of compliance as soon as they are available.

1.26 As-Built Documents

- .1 The Departmental Representative will provide to the Contractor 2 sets of drawings, 2 sets of specifications, and 2 copies of the original AutoCAD files for "as-built" purposes.
 - .2 As work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings, and shop drawings as changes occur.
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- 1.27 Cleaning .1 Conduct daily cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.
- .2 Ensure cleanup of the work areas each day after completion of work.
- .3 In preparation for inspections:
- .1 Examine all sight-exposed interior and exterior surfaced and concealed spaces.
- .2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces.
- .4 Use cleaning materials and methods in accordance with instructions of the manufacturer of the surface to be cleaned.
- 1.28 Environmental Protection .1 Prevent extraneous materials from contaminating air, land, or water beyond construction area, by providing temporary enclosures during work.
- .2 Do not dispose of waste or volatile materials into water courses, storm or sanitary sewers.
- .3 Ensure proper disposal procedures in accordance with all applicable territorial regulations.
- 1.29 Additional Drawings .1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract documents.
- .2 Upon request, Departmental Representative may furnish up to a maximum of 6 sets of Contract documents for use by the Contractor at no additional cost. Should more than 6 sets of documents be required the Departmental Representative will provide them at additional cost.
- 1.30 System of Measurement .1 The metric system of measurement (SI) will be employed on this Contract.
- 1.31 Familiarization with Site .1 Before submitting tender, it is recommended to visit bridge site to become familiar with all conditions likely to affect the cost of the Work.
- 1.32 Submission of Tender .1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and is fully
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PWGSC

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**GENERAL
INSTRUCTIONS**

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conversant with all conditions therein.

1.33 Basis of Payment

.1

For any work listed in Division One Sections there will be no separate payment but is considered incidental unless noted otherwise.

END OF SECTION

PART 1 - GENERAL

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|--------------------------|----|---|
| 1.1 Related Sections | .1 | Section 013500 – Special Procedures for Traffic Control. |
| | .2 | Section 015600 - Temporary Barriers and Enclosures. |
| | .3 | Section 013216 - Construction Progress and Reporting. |
| 1.2 Access and Egress | .1 | Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations. |
| 1.3 Use of Site | .1 | Execute work with least possible interference or disturbance to normal use of highway. Make arrangements with Departmental Representative to facilitate work as stated. |
| | .2 | Traffic control to be carried out according to Section 013500 – Special Procedures for Traffic Control. |
| 1.4 Existing Services | .1 | Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission. |
| | .2 | There is a Northwest Tel Fibre Optic line that is buried along the highway approaches but comes out of the ground travels overhead, above the highway and existing structures on utility poles. Relocation of this utility should not be necessary during construction. Protect this utility during construction. |
| | .3 | Construct barriers in accordance with Section 015600 - Temporary Barriers and Enclosures. |
| 1.5 Special Requirements | .1 | Submit schedule in accordance with Section 013216 - Construction Progress and Reporting. |
| | .2 | Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations. |

END OF SECTION

PART 1 - GENERAL

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|-----------------------------|----|--|
| 1.1 Related Sections | .1 | Section 01 52 00 – Construction Facilities |
| 1.2 Description | .1 | Consists of preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, camp, buildings, shops, offices, supplies and incidentals to and from the project site. |
| 1.3 Measurement for Payment | .1 | Fifty (50) percent of Lump Sum Contract Price for Mobilization and Demobilization, not to exceed five (5) percent of the Contract Value, to be paid when mobilization to site is complete. |
| | .2 | Remainder of Lump Sum Contract Price for Mobilization and Demobilization to be paid when work is complete and all materials, equipment, camp, buildings, shops, offices and other facilities have been removed from site and site cleaned and left in condition to the satisfaction of the Departmental Representative and all other agencies having jurisdiction. |

END OF SECTION

PART 1 - GENERAL

- 1.1 Section Includes .1 Coordination of Work with work by others under administration of Departmental Representative.
- .2 Scheduled preconstruction and progress meetings.
- 1.2 Description .1 Coordination of progress schedules, submittals, use of sites, temporary utilities, construction facilities, and construction Work, with progress of work by others under instructions of Departmental Representative.
- 1.3 Construction Progress Meetings .1 and Project Meetings .1 The Departmental Representative will schedule and administer biweekly project meetings throughout progress of the Work.
- .2 Agenda to include, but not limited to, the following:
- .1 Review and approval of minutes of previous meeting.
- .2 Review of Work progress since previous meeting.
- .3 Field observations, problems, conflicts.
- .4 Problems that impede construction schedule.
- .5 Review of off-site fabrication delivery schedules.
- .6 Corrective measures and procedures to regain projected schedule.
- .7 Revision to construction schedule.
- .8 Progress schedule, during succeeding work period.
- .9 Review submittal schedules: expedite as required.
- .10 Maintenance of quality standards.
- .11 Review proposed changes for affect on construction schedule and on completion date.
- .12 Review of Safety and Security issues.
- .13 Schedule next meeting.
- .14 Other business.
- .3 The Contractor shall provide physical space and make arrangements for meetings.
- .4 The Departmental Representative will record minutes, including significant proceedings and decisions, identify action by parties, and set time and date for next progress meeting.
- .5 The Departmental Representative will reproduce and distribute copies of minutes within three days after each meeting and transmit to meeting participants, affected parties not in attendance, and Contractor.
- 1.4 Construction Organization .1 Within 15 days after award of Contract, request a meeting of parties
-

- and Start-up
- in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representatives and senior representatives of the Contractor, major Subcontractors (if applicable), field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Agenda to include, but not limited to, the following:
- .1 Appointment of official representative of participants in Work.
- .2 Schedule of Work, progress scheduling in accordance with Section 013216 - Construction Progress and Reporting.
- .3 Schedule of submission of shop drawings, samples, etc. in accordance with Section 013300 - Submittal Procedures.
- .4 Requirements for temporary facilities, storage sheds, utilities, etc. in accordance with Section 015100 - Temporary Utilities.
- .5 Delivery schedule of specified equipment in accordance with Section 013217 - Construction Progress and Reporting.
- .6 Site security in accordance with Section 015200 - Construction Facilities.
- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
- .8 Take-over procedures, acceptance, and warranties in accordance with Section 017700 - Closeout Procedures.
- .9 Monthly progress claims, administrative procedures, photographs, and holdbacks.
- .10 Appointment of inspection and testing agencies or firms in accordance with Section 014500 - Quality Control.
- .11 Insurances and transcript of policies.
- .12 Proposed list of
- .13 Other business.
- .5 Comply with Departmental Representative's allocation of mobilization areas of sites; for field offices and sheds, construction camp(s) and camp utilities, access, traffic, and parking facilities.
- .6 During construction, coordinate use of sites and facilities with Departmental Representative.
- .7 Comply with instructions of Departmental Representative for use of temporary utilities and construction facilities.
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- 1.5 On-Site Documents .1 Maintain 1 copy each of the following at the job site:
- .1 Contract drawings.
 - .2 Contract specifications.
 - .3 Addenda to Contract documents.
 - .4 Copy of approved work schedule.
 - .5 Reviewed/approved shop drawings.
 - .6 Change orders.
 - .7 Other modifications to Contract.
 - .8 Field test reports.
 - .9 Reviewed/approved samples.
 - .10 Manufacturers' installation and application instructions.
 - .11 One set of record drawings and specifications for "as-built" purposes.
 - .13 Current construction standards of workmanship listed in technical Sections.
 - .14 Project Safety Plan / Traffic Control Plan.
 - .15 Copy of approved Work schedule.
 - .16 Labour conditions and wage schedules.
 - .17 Environmental Protection Plan.
 - .18 All applicable Federal, Provincial and Municipal regulations, Permits and Licenses.
- 1.6 Schedules .1 Submit preliminary construction progress schedule in accordance with Section 013216 - Construction Progress and Reporting to Departmental Representative coordinated with Departmental Representative's project schedule.
- .2 After review, revise and resubmit schedule to comply with revised project schedule.
 - .3 During progress of Work revise and resubmit as directed by Departmental Representative.
- 1.7 Submittals .1 Submit preliminary shop drawings and product data and samples in accordance with Section 013300 for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Departmental Representative.
- .2 Submit requests for payment for review, and for transmittal to Departmental Representative.
 - .3 Submit requests for interpretation of Contract Documents, and obtain instructions through Departmental Representative.
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- .4 Process substitutions through Departmental Representative.
 - .5 Process change orders through Departmental Representative.
 - .6 Deliver closeout submittals for review and preliminary inspections, for transmittal to Departmental Representative.
- 1.8 Closeout Procedures
- .1 Notify Departmental Representative when Work is considered ready for Substantial Performance, in accordance with Section 017700 – Closeout Procedures.
 - .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

- 1.1 Section Includes
- .1 Schedule, form, and content.
 - .2 Staged construction.
 - .3 Scheduled revisions.
 - .4 Critical path scheduling.
- 1.2 Definitions
- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
 - .2 Actual Finish Date (AF): point in time that Work actually ended on activity.
 - .3 Actual Start Date (AS): point in time that Work actually started on activity.
 - .4 Bar Chart (Gantt chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars.
 - .5 Baseline: original approved plan (for Project, work package, or activity), plus or minus approved scope changes.
 - .6 Completion Milestones: they are firstly Substantial Completion and secondly Final Certificate.
 - .7 Constraint: applicable restriction that will affect performance of Project. Factors that affect activities can be scheduled.
 - .8 Control: process of comparing actual performance with planned performance, analyzing variances, evaluating possible alternatives, and taking appropriate corrective action as needed.
 - .9 Critical Activity: any activity on a critical path. Most commonly determined by using critical path method.
 - .10 Critical Path: series of activities that determines duration of Project. In deterministic model, critical path is usually defined as those activities with float less than or equal to specified value, often zero. It is longest path through Project.
-

- .11 Critical Path Method (CPM): network analysis technique used to predict Project duration by analyzing which sequence of activities (which path) has least amount of scheduling flexibility (least amount of float).
 - .12 Data Date (DD): date at which, or up to which, Project's reporting system has provided actual status and accomplishments.
 - .13 Duration (DU): number of work periods (not including holidays or other non-working periods) required to complete activity or other Project element. Usually expressed as workdays or work weeks.
 - .14 Early Finish Date (EF): in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can finish, based on network logic and schedule constraints. Early finish dates can change as Project progresses and changes are made to Project plan.
 - .15 Early Start Date (ES): in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can start, based on network logic and schedule constraints. Early start dates can change as Project progresses and changes are made to Project Plan.
 - .16 Finish Date: point in time associated with activity's completion. Usually qualified by one of following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.
 - .17 Float: amount of time that activity may be delayed from its early start without delaying Project finish date. Float is mathematical calculation, and can change as Project progresses and changes are made to Project plan. This resource is available to both PWGSC and Contractor.
 - .18 Lag: modification of logical relationship that directs delay in successor task.
 - .19 Late Finish Date (LF): in critical path method, latest possible point in time that activity may be completed without delaying specified milestone (usually Project finish date).
 - .20 Late Start Date (LS): in critical path method, latest possible point in time that activity may begin without delaying specified milestone (usually Project finish date).
 - .21 Lead: modification of logical relationship that allows acceleration of successor task.
-

- .22 Logic Diagram: see Project network diagram.
 - .23 Master Plan: summary-level schedule that identifies major activities and key milestones.
 - .24 Milestone: significant event in Project, usually completion of major deliverable.
 - .25 Monitoring: capture, analysis, and reporting of Project performance, usually as compared to plan.
 - .26 Near-Critical Activity: activity that has low total float.
 - .27 Non-Critical Activities: activities which when delayed, do not affect specified Contract duration.
 - .28 Project Control System: fully computerized system utilizing commercially available software packages.
 - .29 Project Network Diagram: schematic display of logical relationships of Project activities. Always drawn from left to right to reflect Project chronology.
 - .30 Project Plan: formal, approved document used to guide both Project execution and Project control. Primary uses of Project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines. Project plan may be summary or detailed.
 - .31 Project Planning: development and maintenance of Project Plan.
 - .32 Project Planning, Monitoring, and Control System: overall system operated by Departmental Representative to enable monitoring of Project Work in relation to established milestones.
 - .33 Project Schedule: planned dates for performing activities and planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy project objectives. Monitoring and control process involves using project schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
 - .34 Quantified Days Duration: working days based on 5 day work week, discounting statutory holidays.
 - .35 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on Project's objectives.
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- .36 Scheduled Finish Date (SF): point in time that Work was scheduled to finish on activity. Scheduled finish date is normally within range of dates delimited by early finish date and late finish date.
 - .37 Scheduled Start Date (SS): point in time that Work was scheduled to start on activity. Scheduled start date is normally within range of dates delimited by early start date and late start date.
 - .38 Start Date: point in time associated with activity's start, usually qualified by one of following: actual, planned, estimated, scheduled, early, late, target, baseline, or current.
 - .39 Work Breakdown Structure (WBS): deliverable-oriented grouping of project elements that organizes and defines total Work scope of Project. Each descending level represents increasingly detailed definition of Project Work.
- 1.3 System Description
- .1 Construction Progress Schedule (Project Time Management): describes processes required to ensure timely completion of Project. These processes ensure that various elements of Project are properly coordinated. It consists of planning, time estimating, scheduling, progress monitoring, and control.
 - .2 Planning: this is most basic function of management, that of determining presentation of action, and is essential.
 - .1 It involves focusing on objective consideration of future, and integrating forward thinking with analysis; therefore, in planning, implicit assumptions are made about future so that action can be taken today.
 - .2 Planning and scheduling facilitates accomplishment of objectives and should be considered continuous interactive process involving planning, review, scheduling, analysis, monitoring and reporting.
 - .3 Ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made. This implies progressively more reliability of scheduling data. Detail Project schedule is used for analysis and progress monitoring.
 - .4 Ensure project schedule efficiencies through monitoring.
 - .1 When activities begin on time and are performed according to estimated durations without interruptions, original
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Critical Path will remain accurate. Changes and delays will however, create an essential need for continual monitoring of Project activities.

- .2 Monitor progress of Project in detail to ensure integrity of Critical Path, by comparing actual completions of individual activities with their scheduled completions, and review progress of activities that has started but are not yet completed.
- .3 Monitoring should be done sufficiently often so that causes of delays are immediately identified and removed if possible.

- .5 Project monitoring and reporting: as Project progresses, keep team aware of changes to schedule, and possible consequences. In addition to Bar Charts and CPM networks, use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.

- .6 Narrative reporting begins with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.

1.4 CPM Requirements

- .1 Ensure Master Plan and Detail Schedule are practical and remain within specified Contract duration.
 - .2 Master Plan and Detail Schedule deemed impractical by Departmental Representative are revised and resubmitted for approval.
 - .3 Acceptance of Master Plan and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract. Duration of Contract may only be changed through bilateral Agreement.
 - .4 Consider Master Plan and Detail Schedule deemed practical by Departmental Representative, showing Work completed in less than specified Contract duration, to have float.
 - .5 First Milestone on Master Plan and Detail Schedule will identify start Milestone with an "ES" constraint date equal to Award of Contract date.
 - .6 Calculate dates for completion milestones from Plan and Schedule using specified time periods for Contract.
 - .7 Substantial Completion with "LF" constraint equal to calculated
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- date.
- .8 Calculations on updates to be such that if early finish of Interim Certificate falls later than specified Contract duration then float calculation to reflect negative float.
 - .9 Delays to non-critical activities, those with float may not be basis for time extension.
 - .10 Do not use float suppression techniques such as software constraints, preferential sequencing, special lead/lag logic restraints, extended activity times or imposed dates other than required by Contract.
 - .11 Allow for and show Master Plan and Detail Schedule adverse weather conditions normally anticipated. Specified Contract duration has been predicated assuming normal amount of adverse weather conditions.
 - .12 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration. Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.
 - .13 Arrange participation on and off site of subcontractors and suppliers, as required by Departmental Representative, for purpose of network planning, scheduling, updating and progress monitoring. Approvals by Departmental Representative of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.
 - .14 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this Contract.
- 1.5 Submittals
- .1 Provide submittals in accordance with Section 013300 - Submittal Procedures.
 - .2 Submit to Departmental Representative Project Control System for planning, scheduling, monitoring, and reporting of project progress.
 - .3 Submit Project Control System to Departmental Representative for approval; failure to comply with each required submission, may result in payment being withheld.
 - .4 Include costs for execution, preparation, and reproduction of schedule submittals in bid documents.
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- .5 Submit letter ensuring that schedule has been prepared in coordination with major Subcontractors, if applicable.
- .6 Submit Project planning, monitoring, and control system data as required by Departmental Representative in following form:
 - .1 CD files in original scheduling software and PDF formats containing schedule and cash flow information, labelled with data date, specific update, and person responsible for update.
 - .2 Master Plan Bar Chart.
 - .3 Construction Detail schedule Bar Chart.
 - .4 Listing of project activities including milestones and logical connectors, networks (sub-networks) from Project start to end. Sort activities by activity identification number and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.
 - .5 Criticality report listing activities and milestones with up to 5 days total float used as first sort for ready identification of critical or near critical paths through entire project. List early and late starts and finishes dates, together with durations, codes and float for critical activities.
 - .6 Progress report in early start sequence, listing for each trade, activities due to start, underway, or finished. List activity identification number, description and duration. Provide columns for entry of actual start and finish dates, duration remaining and remarks concerning action required.
 - .7 Within 2 weeks after Contract award, every 2 weeks thereafter during performance of the Contract, and within 2 weeks after final completion of the Work, provide to Departmental Representative:
 - .1 Statement of total person days of labour used on site in performance of Contract, including labour provided under subcontracts.
 - .2 Estimate of total value in dollars of material delivered to site and installed, including material provided and installed under sub-contracts.

- 1.6 Quality Assurance .1 Use experienced personnel, fully qualified in planning and scheduling, to provide services from start of construction to Final Certificate, including Commissioning.

- 1.7 Project Meeting .1 Meet with Departmental Representative within 5 working days of Award of Contract date, to establish Work requirements and approach to project construction operations.

- 1.8 Work Breakdown Structure .1 Prepare construction WBS within 15 working days of Award of Contract date. Develop WBS through at least five levels: project, stage, element, sub-element and work package.

- 1.9 Project Milestones .1 Project milestones form targets for both Master Plan and Detail Schedule of CPM construction network system. Include:
 - .1 Setup of site.
 - .2 Completion of Detour.
 - .3 Completion of work at South Culvert.
 - .4 Completion of work at North Culvert.
 - .5 Final Certificate completion.

- 1.10 Master Plan .1 Structure and base CPM construction networks system on WBS coding in order to ensure consistency throughout Project.
 - .2 Prepare comprehensive construction Master Plan (CPM logic diagram) and dependent Cash Flow Projection within 15 working days of finalizing Agreement to confirm validity or alternates of identified milestones.
 - .1 Master Plan will be used as baseline.
 - .1 Revise baseline as conditions dictate and as required by Departmental Representative.
 - .2 Departmental Representative will review and return revised baseline within 10 work days.
 - .3 Reconcile revisions to Master Plan and Cash Flow Projections with previous baseline to provide continuous audit trail.
 - .4 Initial and subsequent Master Plans will include:
 - .1 CD containing schedule and cash flow information, clearly labelled with data date, specific update, and person

- responsible for update.
 - .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
 - .3 Network diagram showing coding, activity sequencing (logic), total float, early/late dates, current status and durations.
 - .4 Actual/projected monthly cash flow: expressed monthly and shown in both graphical and numerical form.
- 1.11 Detail Schedule
- .1 Structure and base CPM construction networks system on WBS coding in order to ensure consistency throughout Project.
 - .2 Prepare comprehensive construction Master Plan (CPM logic diagram) and dependent Cash Flow Projection within 15 working days of finalizing Agreement to confirm validity or alternates of identified milestones.
 - .1 Master Plan will be used as baseline.
 - .1 Revise baseline as conditions dictate and as required by Departmental Representative.
 - .2 Departmental Representative will review and return revised baseline within 10 work days.
 - .3 Reconcile revisions to Master Plan and Cash Flow Projections with previous baseline to provide continuous audit trail.
 - .4 Initial and subsequent Master Plans will include:
 - .1 CD containing schedule and cash flow information, clearly labelled with data date, specific update, and person responsible for update.
 - .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
 - .3 Network diagram showing coding, activity sequencing (logic), total float, early/late dates, current status and durations.
 - .4 Actual/projected cash flow: expressed monthly and shown in both graphical and numerical form.
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- .5 Provide detailed project schedule (CPM logic diagram) within 15 working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
 - .1 Shop drawings.
 - .2 Samples.
 - .3 Approvals.
 - .4 Procurement.
 - .5 Construction.
 - .6 Installation.
 - .7 Site works.
 - .8 Testing.
 - .9 Shutdown or closure activity.
 - .10 Commissioning and acceptance.
 - .6 Detail CPM schedule to cover in detail minimum period of 6 months beginning from Award of Contract date with each activity duration approximately 3 to 15 days.
 - .1 Show remaining activities for CPM construction network system up to Final Certificate and develop complete detail as project progresses.
 - .2 Detail activities completely and comprehensively throughout duration of project.
 - .7 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Plan.
 - .8 Clearly show sequence and interdependence of construction activities and indicate:
 - .1 Start and completion of all items of Work, their major components, and interim milestone completion dates.
 - .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
 - .1 Time for submittals, resubmittals and review.
 - .2 Time for fabrication and delivery of manufactured products for Work.
 - .3 Interdependence of procurement and construction activities.
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- .3 Include sufficient detail to assure adequate planning and execution of Work. Activities should generally range in duration from 3 to 15 workdays each.
 - .9 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow coordination and control of project activities. Show continuous flow from left to right.
 - .10 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of activities throughout length of Project to form "Critical Path". Increased number of critical activities is seen as indication of increased risk.
 - .11 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to Departmental Representative for review effects created by insertion of new Change Order.
 - 1.12 Review of the Construction Detail Schedule
 - .1 Allow 10 work days for review by Departmental Representative of proposed construction Detail Schedule.
 - .2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Departmental Representative for review within 5 work days.
 - .3 Promptly provide additional information to validate practicability of Detail Schedule as required by Departmental Representative.
 - .4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.
 - 1.13 Compliance with Detail Schedule
 - .1 Comply with reviewed Detail Schedule.
 - .2 Proceed with significant changes and deviations from scheduled sequence of activities that cause delay, only after receipt of approval by Departmental Representative.
 - .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.
 - .1 Corrective measures may include:
 - .1 Increase of personnel on site for effected activities or work package.
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coding structures as project develops and changes.

- .3 Perform Detail Schedule update at least once per Project with status dated (Data Date). Update to reflect activities completed to date, activities in progress, logic and duration changes.
- .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
- .5 Submit to Departmental Representative copies of updated Detail Schedule.
- .6 Requirements for progress monitoring and reporting are basis for progress payment request.
- .7 Submit written report at least once per Project based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
 - .1 Description of progress made.
 - .2 Pending items and status of: permits, shop drawings, Change Orders, possible time extensions.
 - .3 Status of Contract completion date and milestones.
 - .4 Current and anticipated problem areas, potential delays and corrective measures.
 - .5 Review of progress and status of Critical Path activities.

1.15 Progress Photographs

- .1 Provide digital photographs with dates and descriptions on CD disk with progress reports. Relate dates and descriptions to photo file names in a separate text file on disk.
 - .2 Number of photographs: minimum of 100 photos per work at each culvert.
 - .3 Viewpoints: determined by Departmental Representative.
 - .4 Frequency: with progress statement, at completion of each construction stage, and as directed by Departmental Representative.
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PWGSC

Culvert Replacement
km 595.3, Alaska Highway, British Columbia
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**CONSTRUCTION
PROGRESS AND REPORTING**

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END OF SECTION

PART 1 - GENERAL

- 1.1 Section Includes .1 This section includes but is not limited to the following:
- .1 Shop drawings.
 - .2 Product data.
 - .3 Samples.
 - .4 Waste Management Work Plan.
 - .5 Environmental Plan.
 - .6 Traffic Management Plan.
 - .7 Health and Safety Plan.
 - .8 Certificates and transcripts.
 - .9 Survey and Quality Testing Reports.
 - .10 Quality Control Plan.
- 1.2 Administrative .1 Submit to Departmental Representative submittals listed for review. Submit with reasonable promptness and in 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 Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present shop drawings, product data, samples, and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to 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 requirements of Work and Contract Documents. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are coordinated. It is recommended that Contractor become familiar with all site conditions likely to affect the cost of the Work before submission of their Tender documents.
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- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.
- 1.3 Shop Drawings and Product Data
- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by 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. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Each shop drawing submitted that involves the provision of engineering design to bear signature and stamp of qualified professional engineer registered or licensed in province of British Columbia, Canada. These include but are not limited to:
- .1 Falsework and/or shoring. It is the Contractor's responsibility to ensure that the structure is adequately braced at all times during the performance of the Contract, if and when necessary.
- .4 Allow 10 days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings 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 shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
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- .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data, sample, etc.
 - .5 Other pertinent data.

 - .8 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 Contractor's authorized representative certifying approval of submissions, verification of field measurements, and compliance with Contract Documents.
 - .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 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.

 - .9 After Departmental Representative's review, distribute copies.

 - .10 Submit electronic copies and originals on CD of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

 - .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
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- .12 Delete information not applicable to project.
 - .13 Supplement standard information to provide details applicable to project.
 - .14 If upon review by 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.
 - .15 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept. This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve 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 foregoing, 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 co-ordination of Work of all sub-trades.
- 1.4 Progress Photographs .1 Submit progress photographs in accordance with Section 013217 - Construction Progress and Reporting.
- 1.5 Survey and Quality Testing Reports .1 Submit certified survey and quality testing reports with progress reports.
- 1.6 Quality Control Plan .1 Prepare and submit to Departmental Representative for review and approval a Quality Control Plan including but not limited to:
- .1 Quality control processes and procedures.
 - .2 Quality control reporting and frequency.
 - .3 Testing agencies employed to provide materials testing.
 - .4 Frequency and types of testing.
 - .5 Verification of materials and installation procedures, including but not limited to structural steel, bolts, welds, paint.
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PWGSC

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**SUBMITTAL
PROCEDURES**

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- .6 Coating inspections.
- .7 Dimension checks of pre-fabricated and site-fabricated elements.

END OF SECTION

PART 1 - GENERAL

- 1.1 Section Includes .1 Informational and Warning Devices.
- .2 Protection and Control of Public Traffic.
- .3 Operational Requirements.
- 1.2 Measurement for Payment .1 Payments for Detour Design, Detour Construction, Detour Removal and Traffic Control to be included in Lump Sum for Detour and Traffic Control in the Schedule of Quantities and Unit Prices. Detour shown on drawings is indicative only. Detour Design is the responsibility of the Contractor.
- .2 Provide well-graded, signed, and maintained detour or temporary road to facilitate passage of traffic around restricted construction area as shown on drawings. Include maintenance of detour during construction and removal of detour back to original grades after construction is complete.
- .3 PWGSC will provide 1.2 m diameter CSP culverts for use by Contractor. Transport culverts from and back to PWGSC yards for use in the detour. Protect detour culverts against heavy construction equipment damage as per PWGSC standard Sheet 15 in specifications. Return culverts to PWGSC yards in similar condition to the culvert condition at the time they were received.
- .4 Location of PWGSC yards for obtaining temporary CSP culverts:
- .1 Fort Nelson Yard: km 451.0 Alaska Highway.
- .2 Liard Yard: km 762.5 Alaska Highway
- 1.3 References .1 "Traffic Control Manual for Work on Roadways" (distributed by Province of British Columbia, Ministry of Transportation and Highways).
- 1.4 Protection of Public Traffic .1 Comply with current requirements of Acts, Regulations, and By-Laws for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .2 When working on traveled way:
- .1 Position equipment to present minimum of interference and hazard to traveling public.
- .2 Keep equipment units as close together as working conditions permit and preferably on same side of traveled
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- way.
 - .3 Do not leave equipment on traveled way overnight.
 - .3 Do not close any lanes of road or highway without consulting Departmental Representative. Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in "Traffic Control Manual for Work on Roadways".
 - .4 Keep traveled way graded, free of pot-holes, and of sufficient width for required number of lanes of traffic.
 - .5 Provide well-graded, signed, and maintained detour or temporary road to facilitate passage of traffic around restricted construction areas.
 - .6 Provide and maintain reasonable access to property in vicinity of Work and in other areas as indicated.
 - 1.5 Informational and Warning Devices
 - .1 Provide, erect, and maintain signs, flashing warning lights, and other devices required to indicate construction activities and other temporary and unusual conditions resulting from Project Work that requires road user response as specified in "Traffic Control Manual for Work on Roadways".
 - .2 Supply signs, delineators, barricades, traffic cones, and miscellaneous warning devices, except those shown on plans as supplied by others, as specified in "Traffic Control Manual for Work on Roadways".
 - .3 Place signs and other devices in locations recommended in "Traffic Control Manual for Work on Roadways".
 - .4 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list and review with Departmental Representative.
 - .5 Continually maintain traffic control devices in use by:
 - .1 Checking signs daily for legibility, damage, suitability, and location. Clean, repair, or replace to ensure clarity and reflectance.
 - .2 Removing or covering signs which do not apply to conditions existing from day to day.
 - .6 Provide Type D traffic cones as specified in "Traffic Control Manual for Work on Roadways". Provide minimum of 100 cones for use on site.
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- .7 Ensure that necessary traffic cones and signs are in place prior to interference with traffic on existing roadways.
- 1.6 Control of Public Traffic
- .1 Provide traffic control in accordance with "Traffic Control Manual for Work on Roadways". Ensure that current copy of manual is available on site at all times.
 - .2 Flagpersons:
 - .1 Provide trained, competent flagpersons with proof of certification from recognized training program on traffic control procedures through construction zones.
 - .2 Provide flagpersons with proper equipment and clothing as specified in "Traffic Control Manual for Work on Roadways".
 - .3 Flagpersons are required in the following (but not limited to) situations:
 - .1 When public traffic is required to pass working vehicles or equipment that block all or part of traveled roadway.
 - .2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high, and traffic signal system is not in use.
 - .3 When workmen or equipment are employed on traveled way over brow of hills, around sharp curves, or at other locations where oncoming traffic would not otherwise have adequate warning.
 - .4 When temporary protection is required while other traffic control devices are being erected or taken down.
 - .5 For emergency protection when other traffic control devices are not readily available.
 - .6 In situations where complete protection for workers, working equipment, and public traffic is not provided by other traffic control devices.
 - .7 At each end of restricted sections where pilot cars are required.
 - .8 When construction traffic is crossing a roadway.
 - .3 Maximum delays to public traffic due to Contractor's operations: 15 minutes for total project length.
 - .4 Work of this Contract near the centreline of the roadway should be
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completed outside of peak traffic timings. Coordinate with Departmental Representative to confirm when Work near the centreline of the roadway should be completed.

- .5 Pilot Vehicles:
 - .1 Provide pilot vehicles as required.
 - .2 Equip pilot vehicles with orange flashing lights and signs clearly designating vehicles as pilot vehicles in following situations:
 - .1 Where equipment is working on section of roadway longer than 300m.
 - .2 Where traffic is required to travel on partially completed roadway or on detours longer than 300m.
 - .3 Where access through Work would be otherwise dangerous.
 - .6 Provide temporary lane control system where roadway carrying two-way traffic is to be restricted to one lane for 24 hours per day. Adjust, as necessary, and regularly maintain system during period of restriction. Signal system to meet requirements of "Traffic Control Manual for Work on Roadways".
 - .7 Changes to traffic control operation are to be reviewed by Departmental Representative.
 - .8 Safely control traffic through unique or varied construction situations.
- 1.7 Operational Requirements
- .1 Maintain existing conditions for traffic throughout period of Contract except when required for construction under Contract and when measures have been taken as specified herein and reviewed by Departmental Representative to protect and control public traffic.

END OF SECTION

PART 1 - GENERAL

- 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):
 - .1 CSA S269.1, Falsework for Construction Purposes.
 - .2 CSA S269.2, Access Scaffolding for Construction Purposes.
 - .3 CSA-S350, 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.
- 1.2 Related Sections
- .1 Refer to the following current Specification sections as required:
 - .1 Project Management: Section 013119
 - .2 Construction Progress and Reporting: Section 013216
 - .3 Submittal Procedures: Section 013300
 - .4 Special Procedures for Traffic Control: Section 013500
 - .5 Temporary Utilities: Section 015100
 - .6 Construction Facilities: Section 015200
 - .7 Temporary Barriers and Enclosures: Section 015600
- 1.3 Workers Compensation Board Coverage
- .1 Comply fully with the Workers' Compensation Act, regulations, and orders made pursuant thereto, and any amendments up to the
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- 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.
- 1.4 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.
- 1.5 Submittals .1 Submit to Departmental Representative for review all submittals listed.
- .2 Work affected by submittals shall not proceed until review(s) by Departmental representative is/are complete.
- .3 Submit the following:
- .1 Health and Safety Plan within 7 days after date of Notice to Proceed and prior to commencement of Work.
- .2 Copies of reports or directions issued by federal and provincial Health and Safety inspectors.
- .3 Copies of incident and accident reports.
- .4 Complete set of Material Safety Data Sheets (MSDS) and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
- .5 On site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
- .4 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within 7 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative for review upon request.
- .5 Medical surveillance: where prescribed by legislation, regulation, or safety program, submit certification of medical surveillance for
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site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.

.6 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative is 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.

1.6 Responsibility

.1 Assume responsibility as the Prime Contractor for Work under this Contract.

.2 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.

.3 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.

1.7 Health and Safety Coordinator .1

Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. The Health and Safety Coordinator must:

.1 Have site-related working experience.

.2 Have working knowledge of occupational Health and Safety regulations.

.3 Be responsible for completing all Health and Safety training, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform Work.

.4 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health and Safety Plan.

.5 Be on site during execution of work.

- 1.8 General Conditions
 - .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 Secure Work site before leaving each day as deemed necessary to protect site against entry from non-authorized persons / entry by animals overnight.
 - .3 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.
 - 1.9 Project/Site Conditions
 - .1 Potential work hazards onsite include: working over water, working in remote locations, highway traffic, bears, and extreme weather.
 - 1.10 Regulatory Requirements
 - .1 Comply with specified codes, acts, bylaws, standards, and regulations to ensure safe operations at site.
 - .2 In event of conflict between any provision 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 permit(s) related to project before start of work.
 - 1.12 Filing of Notice
 - .1 The Contractor is to file Notice of Project with Provincial authorities prior to beginning of Work.
 - .2 Provide copies of all notices to the Department Representative.
 - 1.13 Health and Safety Plan
 - .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
 - .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, 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.
-
- .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 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.
-
- .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 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.
-
- 1.14 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:
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- .1 Designated personnel from own 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 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.
- 1.15 Hazardous Products
- .1 Comply with requirements of WHMIS regarding use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of MSDSs acceptable to the Departmental Representative and in accordance with the Canada 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 013300 – Submittal Procedures.
- 1.16 Removal of Lead Containing .1 All paints containing TCLP lead concentrations above 5 ppm are
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Paints		classified as hazardous.
	.2	Carry out demolition activities involving lead-containing paints in accordance with applicable provincial regulations.
1.17 Overloading	.1	Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.
1.18 Falsework	.1	Design and construct falsework in accordance with CSA-S269.1.
1.19 Scaffolding	.1	Design, construct, and maintain scaffolding in a rigid, secure, and safe manner, in accordance with CAN/CSA-S269.2 and the British Columbia Occupational Health and Safety Regulations.
1.20 Confined Spaces	.1	Carry out work in confined spaces in compliance with provincial regulations.
1.21 Blasting	.1	Blasting or other use of explosives is not permitted.
1.22 Powder Actuated Devices	.1	Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.
1.23 Fire Safety and Hot Work	.1	Obtain Departmental Representative's authorization before any welding, cutting, straightening, or any other hot work operations can be carried out onsite.
	.2	Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.
1.24 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.
1.25 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.
1.26 Posted Documents	.1	Post legible versions of the following documents on site: .1 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 marshalling station, and the emergency transportation provisions.
 - .5 Notice of Project.
 - .6 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.
 - .7 WHMIS documents.
 - .8 MSDSs.
 - .9 List of names of Joint Health and Safety Committee members, or Health and Safety Representative.
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- .2 Post all MSDSs onsite, 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.
- 1.27 Meetings
- .1 Schedule and administer a Health and Safety meeting with Departmental Representative prior to commencement of Work.
 - .2 Attend the Health and Safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.
 - .3 Contractor to hold regular Health and Safety meetings onsite as required by applicable legislation.
 - .4 All Health and Safety documentation / meeting minutes completed by the Contractor are to be forwarded to the Departmental Representative.
- 1.28 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 issues identified.
 - .3 The Departmental Representative may issue a "stop work order" if non-compliance with 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".

END OF SECTION

PART 1 - GENERAL

1.1 Definitions

- .1 **Environmental Pollution and Damage:** presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably 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. www.agf.gov.bc.ca/cropprot/noxious.htm

1.2 Measurement Procedures

- .1 Preparation and implementation of the Environmental Protection Plan (EPP) in accordance with this Section 01 35 43 – Environmental Procedures will not be measured separately for payment and will be considered incidental to work.

1.3 Regulatory Overview

- .1 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.
- .2 Comply with and be subject to those permits and approvals obtained from the Departmental Representative to conduct the Work.
- .3 Pay specific attention to the provincial BC Land Use Permit, Water License and Quarry Permit.
- .4 Pay specific attention to the Migratory Birds Convention Act, as amended in 1994.
- .5 Pay specific attention to the provincial BC guidelines under Peace Region Least Risk Timing Windows: Biological Rational (2009)
- .6 Pay specific attention to provincial BC MOE guidelines in Standards and Best Practices for Instream Works (2004).

1.4 Submittals

- .1 The Contractor is required to prepare an Environmental Protection Plan (EPP) in accordance with Section 01 33 00 – Submittal Procedures. The EPP should include all relevant environmental

impacts/issues at the site as indicated by the completion of the EPP Checklist. Review of the PWGSC Environmental Effects Evaluation (EEE) will assist in completing this document. Prior to commencing construction activities or delivery of materials to site, submit the EPP (See Appendix C for Checklist) for review and approval by the Departmental Representative. The EPP will require the Contractor to carefully think through the entire project, including identifying what activities as works will be occurring, both generally and at specific sites, and by what methods. The Environmental Protection Plan 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. This includes details and rationale concerning sampling locations, timing, duration, and methods, and identification of the person(s) who will be carrying out the monitoring program.
- .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 MOE Approval or Notification for instream work or under 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 on-site.
- .5 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.
- .6 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .7 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .8 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.
- .9 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 MOE Approval or Notifications for Instream Work, NWPA Approval for Instream Work, DFO Fisheries Act requirements etc.) and these contract specifications.
- .10 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.

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

.2 All submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.5 Environmental Effects Evaluation

- .1 Execution of the work is subject to the provisions within the Environmental Effects Evaluation (EEE) completed by a PWGSC Environmental Services Representative for the project. See appendices for a copy of the EEE (NOTE: some projects will not require an EEE).
- .2 Pursuant to the expectations of the EEE, EPPs are the next step to achieve the desired results of minimal adverse environmental effect, as the project is constructed.
- .3 Failure to comply with or observe environmental protection measures as identified in these specifications may result in the work being suspended pending rectification of the problems.

1.6 Site Access and Parking

- .1 The Contractor shall review both short and long 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 shall be parked at least 10 metres distance from any watercourse.
- .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 so that the "footprint" of the project is kept within defined boundaries.

1.7 Protection of Work Limits

- .1 The Contractor shall include in the Environmental Protection Plan (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.

1.8 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 a critical element 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).

1.9 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 re-fuelling, 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 shall be notified immediately of any spill as well as the provincial authorities. 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 clean up and all other work shall be stopped, where appropriate, and personnel devoted to spill containment and clean up.
- .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.

1.10 Equipment Maintenance, Fuelling 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 fuelling sites will be identified by the Contractor to the satisfaction of the Departmental Representative. Except for chain saws, any fuelling closer than 100 metres to any surface water (streams, wetlands, water bodies or watercourses) shall require discussion with the Departmental

- Representative.
- .3 Diesel and gasoline delivery vehicles, including bulk tankers shall be parked more than 100 metres from any surface water. Gravity fed fuel systems are not allowed. Manual or electric pump delivery systems shall be used. Fuelling personnel shall maintain a presence during refuelling with immediate attention to the fuelling operations.
 - .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 1.9.4 of Pollution Control.
 - .5 Equipment use on the project shall be fuelled 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 sill-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.
 - .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.

1.11 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. Where construction activities require working close to surface 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) does 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.

1.12 Managing Invasive Plant Vegetation

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

1.12 Fire Prevention and Control

- .1 A fire extinguisher shall be carried and available for use on each machine and at locations within the quarry in the event of fire. Basic fire fighting equipment is recommended (e.g. a water truck; minimum 500 imperial gallons with 500 feet of fire hose and a pump capable of producing 45 psi water pressure at the nozzle, three shovels, two Pulaski's, and two five gallon backpack pumps) shall be maintained at the construction site at a location known and easily accessible to all Contractors' staff. Contactor's staff shall receive basic training in early response to wildfire events during the "environmental briefing".
- .2 Construction equipment shall be operated in a manner and with all original manufacturers' safety devices to prevent ignition of flammable materials in the area.
- .3 Care shall be taken while smoking on the construction site to ensure that the accidental ignition of any flammable material is prevented.
- .4 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 shall be notified of any fire immediately as well as the applicable Provincial Authorities. Basic instruction and phone numbers will be provided on-site by the Contractor and will be discussed in the project start-up meeting.
- .5 Fires or burning of waste materials is not permitted.
- .6 Where fires or burning is permitted, prevent staining or smoke damage to structures, materials or vegetation which is to be preserved. Restore, clean and return to new condition stained or damaged Work.
- .7 Provide supervision, attendance and fire protection measures as directed.
- .8 Obtain all required permits from the province.

1.14 Wildlife

- .1 Avoid or terminate activities on site that attract or disturb wildlife and vacate the area and stay away from bears, cougars, wolves, elk or moose 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 about dens, litters, nests. Carcasses (road kills), bear activity or encounters on or around the site or crew accommodations. Other wildlife related encounters are to be reported within 24 hours.

1.15 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 and workers shall wait for instruction before proceeding with their work.
- .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.

1.16 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.
- .2 All wastes originating from construction, trade, hazardous and domestic sources, shall not be mixed, but will 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 in a timely and approved manner by the Contractor and workers, 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.

1.17 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 metres from natural drainage courses and 100 metres 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.

1.18 Camp Wastewater Discharge Criteria

- .1 Camp wastewater will be released onto the ground at a location that is a minimum of 30 metres from natural drainage courses and 100 metres from fish bearing waters and conform to the discharge requirements set out in the provincial Water Act Permit.
- .2 If unable to meet the discharge criteria, provide additional storage and/or treatment necessary to meet criteria prior to discharge.
- .3 Treat all camp wastewater to conform to the discharge requirements set out in the Water Act Permit.
- .4 No direct discharge is allowed to wetland or surface waters.
- .5 Contractor must obtain approval from the Water Act Officer prior to discharging treated wastewater.

1.19 Drainage

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water. Drainage should 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 Submit an Erosion, Sediment and Drainage Control Plan 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 metres from natural drainage courses and 100 metres 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.

1.20 Site Clearing, Plant Protection, and Nesting Bird Protection

- .1 Any clearing done during nesting season must have a bird survey completed first and approved by the Departmental Representative. Information on nesting seasons can be found in the Peace Region Least Risk Timing Windows: Biological Rational (2009) produced by the BC provincial government.
- .2 Protect trees and plants on site and adjacent properties where indicated.
- .3 Wrap in burlap, trees and shrubs adjacent to construction Work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of [2] m.
- .4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .5 Minimize stripping of topsoil and vegetation.
- .6 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.21 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 and 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 in accordance with the requirements of Departmental Representative.
- .5 At the completion of construction, dispose of used silt fence off-site as non-Hazardous Waste.

- .6 Dispose of used absorbent boom in accordance with Section 02 61 33 - Hazardous Waste Material. 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.

1.22 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.

1.23 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 The monitoring program shall satisfy all regulatory requirements and terms of these specifications. The onus is on the Contractor to monitor and ensure compliance, to identify arising problems, and to subsequently take responsibility and all necessary measures in response.

PART 2 - PRODUCTS

2.1 Not Used

- .1 Not used.

PART 3 - EXECUTION

3.1 Not Used

END OF SECTION

PART 1 - GENERAL

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| 1.1 Section Includes | .1 | Methods and procedures for dismantling / deconstructing portions of the culverts. |
| | .2 | Removing concrete from existing backwall, deck, curb, and curtain wall sections without damaging existing rebar. |
| 1.2 Measurement for Payment | .1 | All materials, labour, equipment, services, etc. required under this Section (including waste removal) to be included in the lump sum price for Remove Existing Culverts in the Schedule of Quantities and Unit Prices. |
| 1.3 References | .1 | Canadian Standards Association. CSA S350-M1980(R1998), Code of Practice for Safety in Demolition of Structures. |
| | .2 | Comply with National Building code of Canada, Part 8, "Safety Measures at Construction and Demolition Sites", and Provincial requirements. |
| 1.4 Submittals | .1 | Submit for review, a minimum of 2 weeks before commencing Work, drawings, diagrams, or details showing sequence of Work and supporting of structures in accordance with Section 013300, Submittal Procedures. Include a list of equipment to be used and a schedule for the Work. |
| 1.5 Protection | .1 | Keep noise, dust, and inconvenience to traveling public to a minimum. |
| | .2 | Protect highway systems, services, and equipment. |
| | .3 | Take all appropriate measures to ensure that, during Work, no materials go adrift. Materials that go adrift must be recovered immediately. |
| | .4 | Do not drop any culvert fragments into the creek. |
| | .5 | Provide temporary dust screens, covers, railings, supports, and other protection as required. |
| | .6 | Perform all waste removal work in accordance with Section 017421, Waste Management and Disposal. |
| | .7 | Ensure Work is done in accordance with Section 013543, Environmental Procedures. Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air noise pollution. |
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- .8 It is the Contractor's responsibility to ensure that the structure is adequately braced at all times during the performance of the Contract.
 - .1 It is beneficial to have personnel onsite with deconstruction experience who can demonstrate techniques to workers unsure of how to disassemble certain assemblies. It is also beneficial to specify that qualified trades disassemble certain portions of the structure.
 - .2 Qualifications: provide adequate workforce training through meetings and demonstrations. Have someone onsite with deconstruction experience throughout project for consultation and supervision purposes.

 - 1.6 Existing Conditions
 - .1 It is recommended that the contractor shall visit the bridge site prior to submitting tender to satisfy himself/herself of the nature of the materials and the extent of the Dismantling Work required.

 - PART 2 - EXECUTION

 - 2.1 Salvage and Disposal
 - .1 Ensure Work is done in accordance with Section 017421, Waste Management and Disposal.
 - .2 Materials from existing bridge structure to be removed shall be the property of the Contractor to reuse or dispose of at his discretion.
 - .3 Dispose of removed materials off-site in suitably licensed facilities strictly in accordance with all current Federal, Provincial, and local legislation and requirements.
 - .4 Store materials salvaged for reuse and recycling or designated for alternate disposal in locations on site as directed by Departmental Representative.

 - 2.2 Removal of Culvert Members
 - .1 Demolish into manageable size pieces. Do not drop any sections into the water. Do not drag any sections along the bridge's deck.
 - .2 Removing concrete from existing backwall, deck, curb, and curtain wall sections must be done in such a manner to avoid damage to the existing internal rebar. If damage to the existing rebar occurs during such operations immediately contact the Departmental Representative for instruction.
 - .2 Separate, stockpile, and dispose of all demolished materials in accordance with Section 017421, Waste Management and Disposal.
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- .3 At end of each day's work, leave work in safe and stable condition.
- .4 Minimize dusting. Keep materials wetted as directed by Departmental Representative.
- .5 Store and handle hazardous materials and wastes in accordance with Section 026200, Hazardous Materials.
- .6 Organize site and workers in manner which promotes efficient flow of materials through disassembly, processing, stockpiling, and removal.

END OF SECTION

PART 1 - GENERAL

- 1.1 Quality Control Plan .1 Prepare and submit to Departmental Representative for review and approval a Quality Control Plan in accordance with Section 013300 – Submittal Procedures, prior to project startup.
- 1.2 Measurement for Payment .1 No separate payment will be made for quality control and testing. Include quality control and testing in all work as part of total contract amount.
- 1.3 Inspection .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.
- 1.4 Independent Inspection Agencies .1 Appoint and pay for services of third-party Independent Quality control testing laboratory and field staff including as follows:
- .1 Where specified in the text of these specifications, including but not limited to:
- .1 Onsite and laboratory testing.
- .2 Inspection and testing required by laws, ordinances, rules, regulations, or orders of public authorities.
- .3 Inspection and testing performed exclusively for Contractor's convenience.
- .4 Mill tests and certificates of compliance.
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- .5 Tests specified to be carried out by Contractor under the supervision of Departmental Representative.
 - .6 Additional tests specified in the following paragraph.
 - .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.
 - .3 Provide equipment required for executing inspection and testing by appointed agencies.
 - .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
 - .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.
- 1.5 Access to Work
- .1 Allow inspection/testing agencies access to Work and off-site manufacturing and fabrication plants.
 - .2 Cooperate to provide reasonable facilities for such access.
- 1.6 Procedures
- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
 - .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
 - .3 Provide labour and facilities to obtain and handle samples and materials onsite. Provide sufficient space to store test samples.
- 1.7 Rejected Work
- .1 Remove defective Work, whether result of poor workmanship, use of defective products, or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
 - .2 Make good other Contractor's work damaged by such removals or replacements promptly.
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- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Departmental Representative.
- 1.8 Reports
- .1 Submit 4 copies of inspection and test reports to Departmental Representative with all progress reports or, generally, as reports become available.
- .2 Provide copies to Subcontractor of Work being inspected or tested and to manufacturer or fabricator of material being inspected or tested.
- 1.9 Mill Tests
- .1 Submit mill test certificates as required of specification sections.

END OF SECTION

PART 1 - GENERAL

- 1.1 Section Includes .1 Temporary utilities.
- 1.2 Installation and Removal .1 Provide temporary utilities in order to execute Work expeditiously.
.2 Remove from site all such work after use.
- 1.3 Water Supply .1 Provide continuous temporary supply of potable water for construction use, if applicable.
.2 Remove or decommission temporary water supply facilities upon completion of project.
- 1.4 Sanitary Facilities .1 Provide sanitary facilities for construction use.
.2 Remove or decommission temporary sanitary facilities upon completion of project.
- 1.5 Temporary Heating and Ventilation of Work .1 Provide temporary heating required during construction period, including attendance, maintenance, and fuel.
.2 Construction heaters used inside buildings must be vented to outside or be flameless type. Solid fuel salamanders are not permitted.
.3 Provide temporary heat and ventilation in enclosed areas as required to:
.1 Facilitate progress of Work.
.2 Protect Work and products against dampness and cold.
.3 Prevent moisture condensation on surfaces.
.4 Provide ambient temperatures and humidity levels for storage and installation of materials.
.5 Provide adequate ventilation to meet health regulations for safe working environments.
.4 Ventilating:
.1 Prevent accumulations of dust, fumes, mists, vapours, or gases in areas occupied during construction.
.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied area.
.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons or the environment.
.4 Ventilate storage spaces containing hazardous or volatile materials.
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- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of Work process to assure removal of harmful contaminants.

- .5 Be responsible for damage to Work due to failure in providing adequate heat, ventilation, and protection during construction.

- 1.6 Temporary Power and Light
 - .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools and for construction use.
 - .2 Arrange for connection with appropriate utility company. Pay all costs for installation maintenance and removal.
 - .3 Provide and maintain temporary lighting throughout project, if applicable.

- 1.7 Temporary Communication Facilities
 - .1 Provide and pay for temporary telephone necessary for own use.

- 1.8 Fire Protection
 - .1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations, and bylaws.
 - .2 Burning rubbish and construction waste materials is not permitted onsite.

END OF SECTION

PART 1 - GENERAL

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|-------------------------------------|----|---|
| 1.1 Section Includes | .1 | Construction aids. |
| | .2 | Office and sheds. |
| | .3 | Parking. |
| | .4 | Project Identification. |
| 1.2 Installation and Removal | .1 | Provide construction facilities in order to execute work expeditiously. |
| | .2 | Remove from all sites all such facilities after use. |
| 1.3 Scaffolding | .1 | Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, and temporary stairs as necessary to carry out Work. |
| 1.4 Hoisting | .1 | Provide, operate, and maintain hoists and cranes required for moving of workers, materials, and equipment. Make financial arrangements with Subcontractors for use thereof. |
| | .2 | Hoists and cranes shall be operated by qualified operators. |
| | .3 | Hoists and cranes shall be used only outside of wetted perimeters. |
| 1.5 Site Storage/Loading | .1 | Confine Work and operations of employees to only that which is required by the Contract Documents. |
| | .2 | Do not unreasonably encumber premises with products. |
| | .3 | Do not load or permit to load any part of Work with a weight or force that will endanger the Work. |
| | .4 | Locations of heavy machinery with respect to loadings on the existing structures are the responsibility of the Contractor. |
| 1.6 Construction Access and Parking | .1 | Parking will be permitted onsite provided it does not disrupt performance of Work. |
| | .2 | Provide and maintain adequate access to project site. |
| | .3 | Build and maintain temporary roads where indicated or directed by Departmental Representative and provide snow removal during period of Work. |
| | .4 | If authorized to use existing roads for access to project sites, |
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- maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.
- 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 Locate project identification signs if and when directed by Departmental Representative.
 - .2 Direct requests for approval to erect a Consultant/Contractor signboard to Departmental Representative. Wording shall be in both official languages.
 - .3 Signs and notices for health, safety, traffic control, instruction, etc. shall be in both official languages. See Sections 013529, Health and Safety, and 013500, Special Procedures for Traffic Control, of these Specifications for more information.
 - .4 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

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| 1.1 Section Includes | .1 | Barriers. |
| | .2 | Environmental Controls. |
| | .3 | Traffic Controls. |
| 1.2 Installation and Removal | .1 | Provide temporary controls in order to execute Work expeditiously. |
| | .2 | Remove from all sites all such work after use. |
| 1.3 Protection for Trees | .1 | Provide barriers around trees and plants designated to remain.
Protect from damage by equipment and construction procedures. |
| | .2 | Replace any trees designated for saving in kind that are damaged during construction. |
| 1.4 Guard Rails and Barricades | .1 | Provide as required by governing authorities. |
| 1.5 Dust Tight Screens | .1 | Provide dust tight screens partitions to localize dust generating activities, and for protection of workers, finished areas of Work, and public. |
| | .2 | Maintain and relocate protection until such work is complete. |
| 1.6 Access to Site | .1 | Provide and maintain access roads as may be required for access to Work. |
| 1.7 Public Traffic Flow | .1 | Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public. |
| 1.8 Fire Routes | .1 | Maintain access to property for use by emergency response vehicles. |
| 1.9 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. |
| 1.10 Protection of Structure Finishes | .1 | Provide protection for existing structure and finished and partially finished structure finishes during performance of Work. |
| | .2 | Provide necessary screens, covers, and hoardings. |
| | .3 | Confirm with Departmental Representative locations and installation schedule 3 days prior to installation. |
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PWGSC

Culvert Replacement
km 595.3, Alaska Highway, British Columbia
Project No. R.017173.802

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**TEMPORARY BARRIERS
AND ENCLOSURES**

Page 2 of 2

- .4 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION

PART 1 - GENERAL

- 1.1 Preliminary Requirements .1 Camp and service area locations and layout plans to be submitted to Departmental Representative for review.
- .2 Temporary construction camps to be established and operated in accordance with local regulations.
- .3 Obtain necessary licenses and approvals required by Authorities having Jurisdiction.
- .4 Two potential options have been identified for construction camp location: Tetsa River Outfitters at km 576.5 and at Toad River km 647.
- 1.2 Environment .1 Comply with all environmental regulations.
- 1.3 Camp Installation and Removal .1 Mobilize equipment, camps, personnel, and materials.
- .2 Establish approved temporary buildings, shops, offices and facilities required.
- .3 Remove construction camps, clean up, and leave sites in condition satisfactory to Departmental Representative.
- 1.4 Maintenance .1 Maintain construction camps in tidy and sanitary condition.

END OF SECTION

PART 1 - GENERAL1.1 Products/Material and
Equipment

- .1 Use new products/material and equipment unless otherwise specified.
 - .2 Use products of one manufacturer for material and equipment of the same type or classification unless otherwise specified.
 - .3 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
 - .4 Notify Departmental Representative in writing of any conflict between these specifications and manufacturer's instructions. Departmental Representative will designate which document is to be followed.
 - .5 Metal fastenings:
 - .1 Prevent electrolytic action between dissimilar metals.
 - .2 Use non-corrosive fasteners, anchors, and spacers for securing exterior work.
 - .6 Fastenings which cause spalling or cracking are not acceptable.
 - .7 Bolts may not project more than 1 diameter beyond nuts.
 - .8 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in Work.
 - .9 Prevent damage, adulteration, and soiling of products during delivery, handling, and storage. Immediately remove rejected products from site.
 - .10 Store products in accordance with suppliers' instructions.
 - .11 Store products subject to damage from weather in weatherproof enclosures.
 - .12 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
 - .13 Touch-up damaged finished surfaces to Departmental Representative's satisfaction.
 - .14 Remove and replace damaged products at own expense and to
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satisfaction of Departmental Representative.

- 1.2 Quality of Products
- .1 Products, materials, equipment, and articles (referred to as products throughout Specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source, and quality of Products provided.
 - .2 Defective products will be rejected regardless of previous inspections.
 - .1 Inspection does not relieve responsibility, but is precaution against oversight or error.
 - .2 Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
 - .3 Retain purchase orders, invoices, and other documents to prove that all products utilized in this Contract meet the requirements of the specifications. Produce documents when requested by the Departmental Representative.
 - .4 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
 - .5 Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item throughout the site.
- 1.3 Availability of Products
- .1 Immediately upon signing the Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
 - .2 If delays in supply of products are foreseeable, notify Departmental Representative of such in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of the work.
 - .3 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.
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- 1.4 Manufacturer's Instructions .1 Unless otherwise indicated in Specifications, install or erect products in accordance with manufacturer's instructions.
- .1 Do not rely on labels or enclosures provided with products.
 - .2 Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between Specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.
- .4 Provide Manufacturer's instructions and specifications to Departmental Representative (and Engineer) for review prior to any installations.
- 1.5 Contractor's Options for Selection of Products for Tendering .1 Products are specified by "Prescriptive" specifications: select any product meeting or exceeding specifications.
- .2 Products specified under "Acceptable Products": select any one of the indicated manufacturers, or any other manufacturer meeting or exceeding the Prescriptive specifications and indicated Products.
 - .3 Products specified by performance and referenced standard: select any product meeting or exceeding the referenced standard.
 - .4 Products specified to meet particular design requirements or to match existing materials: use only material specified Approved Products. Alternative products may be considered provided full technical data is received in writing by Departmental Representative.
 - .5 When products are specified by a referenced standard or by Performance specifications, upon request of Departmental Representative obtain from manufacturer an independent laboratory report showing that the product meets or exceeds the specified requirements.
- 1.6 Substitution After Contract Award .1 No substitutions are permitted without prior written approval of the Departmental Representative.
- .2 Proposals for substitution may only be submitted after Contract award. Such request must include statements of respective costs of
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- items originally specified and the proposed substitution.
- .3 Proposals will be considered by the Departmental Representative if:
- .1 products selected by tenderer from those specified are not available;
 - .2 delivery date of products selected from those specified would unduly delay completion of Contract, or
 - .3 alternative product to that specified, which is brought to the attention of and considered by Departmental Representative as equivalent to the product specified, and will result in a credit to the Contract amount.
- .4 Should the proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on the Project. Pay for design or drawing changes required as result of substitution.
- .5 Amounts of all credits arising from approval of the substitutions will be determined by the Departmental Representative, and the Contract price will be reduced accordingly.
- 1.7 Transportation
- .1 Pay costs of transportation of products required in performance of Work.
- 1.8 Quality of Work
- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.
- 1.9 Coordination
- .1 Ensure cooperation of workers during Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves, and accessories.
- 1.10 Remedial Work
- .1 Perform remedial work required to repair or replace parts or
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portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

PART 2 - PRODUCTS

2.1 Acceptable Products

- .1 Submit product data sheets for all manufactured products used in the Work to Departmental Representative for review in accordance with Section 013300, Submittal Procedures.
- .2 Use best quality products.

END OF SECTION

PART 1 - GENERAL

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|----------------------------|-----|---|
| 1.1 Section Includes | .1 | Related Sections. |
| | .2 | Measurement Procedures |
| | .3 | Project Cleanliness |
| | .4 | Final Cleaning |
| 1.2 Related Sections | .1 | Section 01 35 43 - Environmental Protection |
| | .2 | Section 01 77 00 – Closeout Procedures |
| 1.3 Measurement Procedures | .1 | Cost for Cleaning will be considered incidental to the Work and no additional payment will be made. |
| 1.4 Project Cleanliness | .1 | Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Departmental Representative or other Contractors |
| | .2 | Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site. |
| | .3 | Clear snow and ice from access to road and bridge sites during active construction periods and when access to environmental protection facilities required outside active construction times. |
| | .4 | Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. |
| | .5 | Provide at least one (1) bear proof container on site for collection of waste materials and debris. |
| | .6 | Remove waste material and debris from site at end of each working day. |
| | .7 | Dispose of waste materials and debris off site. |
| | .8 | Store volatile waste in covered metal containers, and remove from premises at end of each working day. |
| | .9 | Provide adequate ventilation during use of volatile or noxious substances. |
| | .10 | Use only cleaning materials recommended by manufacturer of |
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- surface to be cleaned, and as recommended by cleaning material manufacturer.
- 1.5 Final Cleaning
- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
 - .2 Prior to final review, remove surplus products, tools, construction machinery and equipment.
 - .3 Remove waste products and debris including that caused by Departmental Representative or other Contractors.
 - .4 Do not burn waste materials on site.
 - .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
 - .6 Inspect finishes, and ensure specified workmanship and operation.
 - .7 Remove dirt and other disfiguration from exterior surfaces.
 - .8 Sweep and wash clean paved areas.
 - .9 Clean drainage systems.

END OF SECTION

PART 1 - GENERAL

- 1.1 Section Includes .1 Waste Management Workplan including Waste Audit, Waste Reduction Workplan and Demolition Waste Audit.
- 1.2 Definitions .1 Waste Management Coordinator (WMC): Designate individual who is in attendance onsite full-time. Designate, or have designated individuals from each Subcontractor to be responsible for waste management related to their trade and for coordinating activities with WMC.
- .2 Waste Audit (WA): Relates to projected waste generation. Involves measuring and estimating quantity and composition of waste, reasons for waste generation, and operational factors that contribute to waste.
- .3 Waste Reduction Workplan (WRW): Written report that addresses opportunities for reduction, reuse, or recycling of materials.
- .4 Materials Source Separation Program (MSSP): consists of a series of ongoing activities to separate reusable and recyclable waste materials into material categories from other types of waste at point of generation.
- 1.3 Documents .1 Maintain at the job site one copy of following documents:
- .1 Waste Management Workplan.
- 1.4 Use of Site and Facilities .1 Locate waste, refuse, recycling, etc. containers in locations to facilitate deposit of materials without hindering daily operations.
- .2 Locate separated materials in areas which minimize material damage.
- 1.5 Submittal .1 Submit requested submittals in accordance with Section 013300, Submittal Procedures.
- .2 Prepare and submit the following submittals within 14 days of the Award of Contract:
- .1 Submit 3 copies of completed Waste Management Workplan (WMW).
- .3 Provide Departmental Representative with receipts indicating quantity of material delivered to landfill.
- .4 Provide Departmental Representative with receipts indicating
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- quantity and type of materials sent for recycling.
- 1.6 Waste Management Workplan .1 Structure WMW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .2 Describe management of waste.
- .3 Identify opportunities for reduction, reuse, and/or recycling (3Rs) of materials.
- .4 Post workplan or summary where workers at site are able to review its content.
- 1.7 Waste Processing Sites .1 Provide waste processing sites as applicable within the Province of British Columbia to Departmental Representative within 14 days of the Award of Contract.
- 1.8 Disposal of Wastes .1 Burying of rubbish and waste materials is prohibited unless approved by Departmental Representative at off-site locations obtained by the Contractor.
- .2 Burning of rubbish and waste materials is prohibited unless permitted by British Columbia Ministry of Forests. Permit to be obtained by the Contractor.
- .3 Disposal of waste volatile materials, mineral spirits, oil, paint thinner, etc. into waterways or by dumping onsite is prohibited.
- 1.9 Storage and Handling .1 Store, materials to be reused, recycled, and salvaged in locations obtained by the Contractor and accepted by Departmental Representative.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- 1.10 Scheduling .1 Coordinate work with other activities at site to ensure timely and orderly progress of the Work.

PART 2 – EXECUTION

- 2.1 Application .1 Do work in compliance with the WMW.
- .2 Implement MSSP for waste generated on Project in compliance with approved methods and as approved by Departmental Representative.
- .3 Materials must be immediately separated into required categories
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for reuse or recycling.

.4 Materials in separated condition: collect, handle, store onsite, and transport off-site to an approved and authorized recycling facility.

.5 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

2.2 Cleaning

.1 Remove tools and waste materials on completion of work, and leave work area in clean and orderly condition.

.2 Cleanup work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

2.3 Diversion of Materials

.1 Create a list of materials to be separated from the general waste stream and stockpiled in separate containers, to the approval of the Departmental Representative and consistent with applicable fire regulations.

.1 Mark containers.

.2 Provide instruction on disposal practices.

.2 Onsite sale of salvaged, recovered, reusable, recyclable, etc. materials is not permitted.

END OF SECTION

PART 1 - GENERAL

- 1.1 Section Includes .1 Administrative procedures preceding preliminary and final reviews of Work.
- 1.2 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 Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
- .2 Request Departmental Representative's Inspection.
- .2 Departmental Representative's Review: Departmental Representative and Contractor will perform review of Work to identify obvious defects or deficiencies and to identify if Work has been completed according to the requirements of the Contract Documents. Contractor shall correct Work accordingly.
- .3 Completion: submit written certificate 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 Review.
- .4 Final Review: when items noted above are completed, request final review of Work by Departmental Representative. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request another review.
- .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Warranty Periods: date of Departmental Representative's acceptance of submitted declaration of Substantial Performance shall be date of commencement for warranty periods.
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**CLOSEOUT
PROCEDURES**

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- .7 Final Payment: When Departmental Representative considers final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request final review.

END OF SECTION

PART 1 - GENERAL

- 1.1 Related Requirements .1 Section 017700 – Closeout Procedures.
- 1.2 Administrative Requirements .1 Pre-warranty Meeting:
- .1 Convene meeting one week prior to contract completion with contractor's representative, Departmental Representative, in accordance with Section 01 31 19 - Project Management to:
- .1 Verify Project requirements.
- .2 Review warranty requirements.
- .2 Departmental Representative to establish communication procedures for:
- .1 Notifying construction warranty defects.
- .2 Determine priorities for type of defects.
- .3 Determine reasonable response time.
- .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.
- 1.3 Action and Informational Submittals .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide evidence, if requested, for type, source and quality of products supplied.
- 1.4 As-Built Documents and Samples .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Change Orders and other modifications to Contract.
- .5 Reviewed shop drawings, product data, and samples.
- .6 Field test records.
- .7 Inspection certificates.
- .8 Manufacturer's certificates.
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- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
 - .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
 - .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
 - .5 Keep record documents and samples available for inspection by Departmental Representative.
- 1.5 Recording Information on Project Record Documents
- .1 Record information on set of drawings, provided by Departmental Representative.
 - .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
 - .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
 - .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
 - .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and
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substitute items.

- .2 Changes made by Addenda and change orders.
 - .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
 - .7 Provide digital photos, if requested, for site records.
- 1.6 Final Survey
- .1 Submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

END OF SECTION

PART 1 - GENERAL

- 1.1 References
- .1 Canadian Environmental Protection Act, 1999 (CEPA 1999).
 - .1 Export and Import of Hazardous Waste Regulations (ETHW Regulations), SOR/2002-200.
 - .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS)
 - .3 National Fire Code of Canada 2005.
 - .4 Transportation of Dangerous Goods Act (TDG Act) 1999, (c.34).
 - .5 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2003-400).
- 1.2 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.
- 1.3 Submittals
- .1 Submit product data in accordance with Section 013300, Submittal Procedures.
 - .2 Submit to Departmental Representative current MSDSs for each hazardous material required prior to bringing it/them onsite.
 - .3 Submit a hazardous materials management plan to Departmental Representative that identifies all hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.
- 1.4 Storage and Handling
- .1 Coordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labeling and
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- storage of materials and wastes.
- .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 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene, and naphtha for ready use. Store all flammable and combustible liquids in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.
 - .5 Transfer of flammable and combustible liquids will not be carried out in the vicinity of open flames or any type of heat-producing devices.
 - .6 Flammable liquids having a flash point below 38 degrees Celsius, such as naphtha or gasoline will not be used as solvents or cleaning agents.
 - .7 Store flammable and combustible waste liquids for disposal in approved containers located in a safe, ventilated area. Keep quantities to an absolute minimum.
 - .8 Observe smoking regulations at all times. Smoking is prohibited in any area where hazardous materials are stored, used, or handled.
 - .9 Abide by the following storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids and 5 litres for liquids:
 - .1 Store hazardous materials and wastes in closed and sealed containers which 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.
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- .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 toxic wastes immediately to Departmental Representative and to appropriate regulatory authorities within 24 hours of incident. Take all reasonable measures to contain the release while ensuring health and safety is protected.
- 1.5 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.
 - .3 If hazardous waste is generated onsite:
 - .1 Coordinate transportation and disposal with Departmental Representative.
 - .2 Ensure compliance with applicable federal, provincial, and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
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- .4 Prior to shipping material obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material.
- .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
- .6 Ensure that trained personnel handle, offer for transport, or transport dangerous goods.
- .7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.
- .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to Departmental Representative.
- .9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Only bring onsite the quantity of hazardous materials required to perform Work.
 - .2 Maintain MSDSs 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.
 - .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.
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**HAZARDOUS
MATERIALS**

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- .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, the environment in general, 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

- 1.1 Measurement for Payment .1 No measurement will be made under this Section. Include costs in Lump Sum items of concrete work for which reinforcement is required.
- 1.2 References .1 American Concrete Institute (ACI):
- .1 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .2 American National Standards Institute/American Concrete Institute (ANSI/ACI):
- .1 ANSI/ACI 315, Details and Detailing of Concrete Reinforcement.
- .3 American Society for Testing and Materials (ASTM):
- .1 ASTM A143/A143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
- .2 ASTM A276 Standard Specification for Stainless Steel Bars and Shapes.
- .3 ASTM A775 Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 ASTM A955 Standard Specification for Deformed and Plain Stainless Steel Bars.
- .5 ASTM A959 Guide for specifying harmonized standard grade compositions for wrought stainless steels.
- .4 Canadian Standards Association (CSA):
- .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
- .2 CAN3-A23.3, Design of Concrete Structures for Buildings.
- .3 CAN3-G30.3, Cold Drawn Steel Wire for Concrete Reinforcement.
- .4 CSA G30.5, Welded Steel Wire Fabric for Concrete Reinforcement.
- .5 CSA G30.14, Deformed Steel Wire for Concrete Reinforcement.
- .6 CSA G30.15, Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- .7 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
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- .8 CAN/CSA-G40.21, Structural Quality Steels.
 - .9 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .10 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - .11 CAN/SGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.
 - .12 CAN/CSA-S6-06, Canadian Highway Bridge Design Code (CHBDC).
- .5 Reinforcing Steel Institute of Canada:
- .1 RISC, Reinforcing Steel Manual of Standard Practice.
- 1.3 Shop Drawings
- .1 Submit shop drawings including placing of reinforcement in accordance with Section 013300 - Submittal Procedures.
 - .2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings, lengths, and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada.
 - .3 Detail lap lengths and bar development lengths to CAN/CSA-S6-06, unless otherwise indicated.
- 1.4 Waste Management and Disposal
- .1 Separate and recycle waste materials in accordance with Section 017421 - Waste Management and Disposal.
- 1.5 Material Storage
- .1 Do not stockpile material so as to interfere with site operation and drainage.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Reinforcing steel: grade 400, deformed bars, epoxy coated, to CAN/CSA-G30.18, unless indicated otherwise.
 - .2 Substitute different size bars only if permitted in writing by Departmental Representative.
 - .3 Cold-drawn annealed steel wire ties: to CSA G30.3.
 - .4 Tie Wire: minimum 1.6 mm annealed type or patented system approved by Departmental Representative.
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- .5 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .6 Mechanical splices: subject to approval of Departmental Representative.
- 2.2 Fabrication
- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada unless indicated otherwise.
- .2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
- 2.3 Source Quality Control
- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 2 weeks prior to commencing reinforcing work.
- .2 Inform Departmental Representative of proposed source of material to be supplied.
- PART 3 - EXECUTION
- 3.1 Field Bending
- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars that develop cracks or splits.
- 3.2 Placing Reinforcement
- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1.
- .2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.
- .4 Secure all reinforcement steel by means of ties, spacers and supports as required.
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- .5 Chairs: where concrete is exposed to view, exposed to elements or where rust is possible, use plastic or non-corrosive material, or precast concrete made from concrete of equal strength and durability of concrete to be placed. Chairs used are not to result in voids or unacceptable appearance in exposed concrete surfaces.

END OF SECTION

Part 1 General**1.1 MEASUREMENTS FOR PAYMENTS**

- .1 Precast box culvert concrete is included in the unit price for supply of precast box culverts in the Schedule of Quantities and Unit Prices.
- .2 Precast approach roadside barrier concrete is included in the unit price for supply and install precast concrete barriers in the Schedule of Quantities and Unit Prices.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A185/A185M-[05a], Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM A775/A775M-[04a], Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .3 ASTM C260-[01], Standard Specification for Air-Entraining Admixtures for Concrete.
 - .4 ASTM D412-[98a(2002)e1], Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
 - .5 ASTM D2240-[05], Standard Test Method for Rubber Property - Durometer Hardness.
- .2 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-[1994], Stipulated Price Contract.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-[97], Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-[99], Ready Mixed Organic Zinc-Rich Coating.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-[2004], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-A23.3-[04], Design of Concrete Structures.
 - .3 CSA-A23.4-[05], Precast Concrete - Materials and Construction.
 - .4 CAN/CSA-A3000-[03], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-[03], Cementitious Materials for Use in Concrete.
 - .5 CAN/CSA-G30.18-[M92(R2002)], Billet-Steel Bars for Concrete Reinforcement.
 - .6 CAN/CSA-G40.20/G40.21-[2004], General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .7 CAN/CSA-G164-[M92(R2003)], Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .8 CAN/CSA-S6-[2005], Canadian Highway Bridge Design Code.
 - .9 CSA-W47.1-[03], Certification of Companies for Fusion Welding for Steel.

- .10 CAN/CSA W48-[01(R2006)], Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .11 CSA-W59-[03], Welded Steel Construction (Metal Arc Welding) (Metric version).
- .12 CSA-W186-[M1990(R2002)], Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .5 The Master Painters Institute (MPI) - Architectural Painting Specification Manual (ASM) - [February 2004]
 - .1 MPI # 18, Organic Zinc Rich Primer.
 - .2 MPI # 23, Oil Alkyd Primer.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-[05], Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 DESIGN REQUIREMENTS

- .1 Design precast elements to CSA-A23.3 and CSA-A23.4 to carry handling stresses.
- .2 Design precast elements to carry loads as indicated on the design drawings.

1.4 QUALIFICATIONS

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate category according to CSA-A23.4
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender bid and to specifically verify as part of tender that plant is currently certified in appropriate category.
- .3 Only precast elements fabricated in such certified plants to be acceptable to Engineer and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .4 Welding companies certified to CSA-W47.1.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle and store precast units according to manufacturer's instructions.
- .2 Protect unit corners from contacting earth to prevent from staining.

Part 2 Products**2.1 MATERIALS**

- .1 Portland cement Type GU (formerly Type 10) with 30% fly ash replacement to CAN/CSA-A3000.
- .2 Blended hydraulic cement: Type GU (formerly Type 10) to CAN/CSA-A3000.

- .3 Supplementary cementing materials: to CAN/CSA A3001.
- .4 Water: to CSA-A23.1/A23.1.
- .5 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.
- .6 Forms: to CSA-A23.4.
- .7 Anchors and supports: to CAN/CSA-G40.21 Type 300 W.
- .8 Welding materials: to CSA W48.
- .9 Welding electrodes: to CSA W48 certified by Canadian Welding Bureau.
- .10 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m² to CAN/CSA-G164.
- .11 Epoxy coating: to ASTM A775/A775M.
- .12 Steel primer: to CAN/CGSB-1.40 MPI #23.
- .13 Zinc-rich primer: to CAN/CGSB-1.181 MPI #18.

2.2 MANUFACTURED UNITS

- .1 Manufacture units in accordance with CSA-A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed.
- .3 Provide hardware suitable for handling elements.
- .4 Design tendons and anchorages and install post tensioning ducts in accordance with [CSA-A23.3] [CAN/CSA-S6].
- .5 Shop prime anchors after fabrication and touch up primer on anchors after welding. Do not apply primer to embedded portion of anchor or inserts.
- .6 Galvanize anchors after fabrication and touch up with zinc-rich primer after welding.

2.3 FINISHES

- .1 Finish units to standard grade to CSA-A23.4.

2.4 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4.
- .2 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Engineer for review upon request.

Part 3 Execution**3.1 ERECTION**

- .1 The trench to be prepared as required by the engineer. The bottom of the trench should be as true to grade as possible. The bedding material should be graded smooth and compacted to provide a flat, stable surface on which to place the box culvert sections.
- .2 Attach supplied lifting clutches to lifting inserts in box. Insure that the box is structurally sound prior to lifting. A quick visual examination of the joint areas should be done at this time.
- .3 The box should then be carefully lifted into the trench. At this time, the joint shall be rechecked to be sure that it is clean.
- .4 If the box is to be sealed using butyl mastic jointing material, the material should be installed at this time. The mastic is placed on the top of the spigot of the box being put in place and in the bottom of the bell of the box it is being placed into. Allow for 200mm overlap of material.
- .5 In order to allow a good installation the bedding material under the bell of the previous box should be dug out about 50mm deep, 150mm out along the width of the box. This will allow a space for bedding material to be displaced as the spigot is being homed without it boiling up into the joint.
- .6 The box is now carefully lowered into position to install. Due to the weight of the box culvert, it is important to get the box as close to grade as possible before attempting to home the joint. It should be noted that the box culvert joint design has an annular space (gap for gasket material) much larger than pipe. If the box is homed by pushing with a hoe or being dragged on the bedding you may have an offset of up to 10-12mm. It is very important that the box bedding be level as possible.
- .7 A method of preventing problems with dragging and boiling up of bedding material is to place a sheet of plywood under the joint area prior to installation.
- .8 After the box has been seated, it is important to keep some pressure on the joint as you set the box down. This will help prevent the joint from opening up.
- .9 Detach lifting clutches from inserts. Supplied clutches may be returned for credit if no longer required. Clean field welds with wire brush and touch-up shop primer with primer.

END OF SECTION

PART 1 - GENERAL

- 1.1 Basis of Payment .1 No measurement will be made under this Section. Include costs in items of Work for which aggregate is required.
- 1.2 References .1 ASTM D4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- 1.3 Samples .1 Submit samples in accordance with Section 013300 – Submittal Procedures.
- .2 Allow sampling by third-party tester during production.
- .3 Provide third-party tester with access to source and processed material for sampling if requested by Departmental Representative.
- .4 Install sampling facilities at discharge end of production conveyor, to allow third party tester to obtain representative samples of items being produced. Stop conveyor belt when directed by third-party tester to permit full cross section sampling.
- .5 Do not stockpile material so as to interfere with site operation and drainage.

PART 2 - PRODUCTS

- 2.1 Materials .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: to ASTM D4791.
- .1 Greater dimension to exceed 5 times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one or blend of following:
- .1 Natural sand.
- .2 Manufactured sand.
- .3 Screenings produced in crushing of quarried rock, boulders, or gravel.
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- .4 Coarse aggregates satisfying requirements of applicable section to be one or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
- 2.2 Source Quality Control
 - .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least 2 weeks prior to commencing production.
 - .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
 - .3 Advise Departmental Representative 2 weeks in advance of proposed change of material source.
 - .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 – EXECUTION

- 3.1 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.
 - .3 Wash aggregates, if required to meet specifications.
 - 3.2 Handling
 - .1 Avoid segregation, contamination, and degradation of aggregate during handling and transporting.
 - 3.3 Stockpiling
 - .1 Stockpile aggregates in locations as indicated unless directed otherwise 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.
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- .4 Provide compacted sand or crushed gravel base 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.
- .7 Stockpile aggregates in uniform layers of thickness as follows:
 - .1 Max 1.5 m for coarse aggregate and base course materials.
 - .2 Max 1.5 m for fine aggregate and sub-base materials.
 - .3 Max 1.5 m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.4 Cleaning

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles.

END OF SECTION

PART 1 - GENERAL

- 1.1 Measurement for Payment .1 Payment for excavation required for the installation of the culverts included in the unit price for excavation in the Schedule of Quantities and Unit Prices.
- .2 The excavations shall be the minimum required for the removal of existing SPCSP culverts and installation of the new concrete box culverts.
- .3 Payment for backfill required for the installation of the culverts included in the unit prices for backfill in the Schedule of Quantities and Unit Prices.
- .4 Contractor to repair portions of roadway damaged (intentionally or not) during construction to Departmental Representative's approval.
- .5 No extra payment will be made for excavating unnecessarily beyond lines shown on the drawings.
- 1.2 References .1 American Society for Testing and Materials (ASTM):
- .1 ASTM C 117, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D 422, Standard Test Method for Particle-Size Analysis of Soils.
- .4 ASTM D 698-00a_{el}, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) (600 kN-m/m).
- .5 ASTM D 1557-02_{el}, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft) (2,700 kN-m/m).
- .6 ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB):
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA):
- .1 CAN/CSA-A3000, Portland Cement.
- .2 CAN/CSA-A23.1, Concrete Materials and Methods of
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Concrete Construction.

1.3 Definitions

- .1 Excavation classes: two classes of excavation will be recognized: common excavation and rock excavation.
 - .1 Rock: material from solid masses of igneous, sedimentary or metamorphic rock that, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort from Caterpillar D9L or equivalent to be considered integral with parent mass. Boulder or rock fragments measuring in volume one cubic metre or more.
 - .2 Common excavation: excavation of materials of whatever nature, that are not included under definitions of rock excavation.
- .2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and seeding.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .5 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.2.
 - .2 Table:

<u>Sieve Designation</u>	<u>% Passing</u>
2.00 mm	100
0.10 mm	45 – 100
0.02 mm	10 – 80
0.005 mm	0 – 45
 - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

- .6 Unshrinkable fill:
 - .1 Very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

- 1.4 Quality Assurance
 - .1 Engage services of qualified Professional Engineer who is registered or licensed in Province of British Columbia, Canada in which Work is to be carried out to design and inspect shoring and bracing required for Work if required by applicable legislation.
 - .2 Submit shop drawings in accordance with Section 013300 – Submittal Procedures.
 - .3 At least 2 weeks prior to performing Excavation, Trenching, or Backfilling Work, Contractor to provide Departmental Representative with a Construction Sequence for the Work. Do not proceed with the Work until approval has been received from the Departmental Representative.

- 1.5 Waste Management and Disposal
 - .1 Dispose of waste materials in accordance with Section 017419 - Waste Management and Disposal and the Waste Management Workplan.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Ensure emptied containers are sealed and stored safely.

- 1.6 Protection of Existing Features
 - .1 Protect existing features in accordance with Section 015600 - Temporary Barriers and Enclosures and applicable local regulations.
 - .2 Existing surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing trees and other plants, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing surface features from damage while Work is in progress. In event of damage, immediately make repair to approval of Departmental Representative.
 - .3 Where required for excavation, cut roots or branches as approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 Materials .1 Type 1 and Type 2 fill: properties to Section 310516 - Aggregates: General and the following requirements:

- .1 Crushed, pit run or screened stone, gravel or sand.
- .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.

.3 Table:

Sieve Designation (mm)	% Passing Type 1	% Passing Type 2
75	-	100
50	-	-
37.5	-	-
25	100	-
19	75 - 100	-
12.5	-	-
9.5	50 - 100	-
4.75	30 - 70	22 - 85
2.00	20 - 45	-
0.425	10 - 25	5 - 30
0.180	-	-
0.075	3 - 8	0 - 10

- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 - EXECUTION

3.1 Site Preparation .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 Stripping of Topsoil .1 Commence topsoil stripping of areas as indicated after area has been cleared of brush, weeds, and grasses.

.2 Strip topsoil to depths as directed by Departmental Representative. Do not mix topsoil with subsoil.

.3 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2m.

.4 Dispose of unused topsoil as directed by Departmental Representative.

- 3.3 Stockpiling .1 Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- 3.4 Cofferdams, Shoring, Bracing and Underpinning .1 Construct temporary Works to depths, heights, and at locations as required to protect existing structures, embankment slopes, roadway embankment fill, etc. If required, temporary are works to be designed and stamped by a Professional Engineer registered in the Province of British Columbia.
- .2 During backfill operation:
- .1 Unless otherwise as indicated or as directed by Departmental Representative, remove sheeting and shoring from excavations.
- .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
- .3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500mm above toe of sheeting.
- .3 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- 3.5 Dewatering and Heave Prevention .1 Keep excavations free of water while Work is in progress.
- .2 Submit for Departmental Representative's review details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs, if required.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 013543 - Environmental Protection and in manner not detrimental to public and private property or any portion of Work completed or under construction.
- .6 Provide silt fences, settling basins, or other treatment facilities to
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- remove suspended solids or other materials before discharging to water courses or drainage areas.
- 3.6 Excavation
- .1 Excavate to lines, grades, elevations and dimensions as indicated on the drawings or as required.
 - .2 Excavation work to be as minimal as possible.
 - .3 Excavation must not interfere with capacities of adjacent roadway fills. It is the Contractor's responsibility to determine if any temporary works are required to maintain stabilities during construction.
 - .4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
 - .5 Dispose of surplus and unsuitable excavated material in approved location off site.
 - .6 Install temporary drainage measures to ensure all temporary detour culverts and permanent precast concrete culverts are installed in the dry. Carry out work within or near watercourse in accordance with Section 354210 – Preservation of Watercourses.
 - .7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
 - .8 Notify Departmental Representative when bottom of excavation is reached.
 - .9 Obtain Departmental Representative approval of completed excavation.
 - .10 Correct unauthorized over-excavation as follows:
 - .1 Fill with Type 2 fill compacted to not less than 95% of corrected maximum dry density.
 - .11 Hand trim, make firm, and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
- 3.7 Backfilling
- .1 Do not proceed with backfilling operations until Departmental Representative has approved.
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- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material that is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously at both sides of the culvert to equalize loadings on the structure as a whole. Difference not to exceed 0.3m from one side to the other.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .6 Install drainage system in backfill if indicated by Departmental Representative.
- .7 Care must be taken next to existing structures and next to new structures when performing backfilling operations.
- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 017419 - Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.

3.8 Restoration**END OF SECTION**

PART 1 - GENERAL

- 1.1 Measurement for Payment .1 Payment for excavation required for the installation of the culverts included in the unit price for excavations in the Schedule of Quantities and Unit Prices: Excavation and Re-Use as Embankment Material, and Excavation and Disposal Offsite.
- .2 The excavations shall be the minimum required for the removal of existing SPCSP culverts and installation of the new concrete box culverts.
- .3 Payment for backfill required for the installation of the culverts included in the unit price for backfill in the Schedule of Quantities and Unit Prices: Type 2 Backfill (place and compaction).
- .4 Contractor to repair portions of roadway damaged (intentionally or not) during construction to Departmental Representative's approval.
- .5 No extra payment will be made for excavating unnecessarily beyond lines shown on the drawings.
- 1.2 Source of Select Subgrade Material .1 A source of select subgrade material is located at the Stringer Pit at km 637.3 Alaska Highway.
- .2 The contractor will be allowed to extract material from this source, for processing to provide select subgrade granular material, if required.
- 1.3 References .1 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) (600 kN-m/m).
- 1.4 Definitions .1 Rock Excavation: excavation of:
- .1 Material from solid masses of igneous, sedimentary or metamorphic rock that, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort from Caterpillar D9L or equivalent to be considered integral with parent mass.
- .2 Boulder or rock fragments measuring in volume one cubic metre or more.
- .2 Common Excavation: excavation of materials that are not Rock Excavation or Stripping Excavation.
- .3 Stripping Excavation: excavation of organic material covering
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- original ground.
- .4 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
- .5 Waste material: material other than Stripping Excavation that is unsuitable for embankment construction or material surplus to requirements.
- .6 Borrow material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.
- .7 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and seeding.
- .8 Road Reclamation: excavation of existing road bed shall be treated as Common Excavation.
- 1.5 Requirements of Regulatory Agencies .1 Adhere to Provincial and Federal Environmental requirements if potentially toxic materials are involved.
- 1.6 Waste Management and Disposal .1 Separate and recycle waste materials in accordance with Section 017421 – Waste Management and Disposal.

PART 2 – PRODUCTS

- 2.1 Materials .1 Embankment materials require approval by Departmental Representative.
- .2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps, or any other unsuitable material.
- .3 Embankment material may come from the existing road bed if approved by Departmental Representative.

PART 3 - EXECUTION

- 3.1 Compaction Equipment .1 Compaction equipment must be capable of obtaining required densities in materials on project. Equipment that does not achieve specified densities must be replaced or supplemented.
- .2 Operate minimum equivalent of one 12 tonne vibratory packer continuously in each embankment when placing material.
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- .3 Care must be taken next to existing structures and next to new structures when performing compaction operations.
 - 3.2 Water Distributors
 - .1 Apply water with equipment capable of uniform distribution.
 - 3.3 Stripping
 - .1 Commence topsoil stripping of areas as indicated after brush, weeds and grasses have been removed from these areas.
 - .2 Strip to depths as indicated or as necessary to remove all organic material.
 - .3 Do not mix topsoil with subsoil.
 - .4 Stockpile in locations in accordance with Contract Documents or as directed by Departmental Representative.
 - .5 Dispose of unused stripped topsoil in accordance with Contract Documents or as directed by Departmental Representative.
 - .6 Prevent clearing and grubbing debris from mixing with stripped topsoil.
 - .7 Upon completion of excavation and embankment construction spread stripped topsoil on slopes and trim, as directed by the Departmental Representative.
 - 3.4 Excavating
 - .1 General:
 - .1 Notify Departmental Representative whenever waste materials are encountered. Remove to depth and extent directed.
 - .2 Sub-excavate 600mm below design subgrade in excavations and embankments unless otherwise directed. Compact each layer to minimum 95% standard dry density, and compact top 150mm below sub-excavate to minimum 100% maximum dry density, to ASTM D698 and ASTM D4718. Replace with approved embankment material and compact.
 - .3 Where subgrade is on transition from excavation to embankment treat ground slopes at grade points in accordance with typical drawing, or as directed by Departmental Representative.
 - .2 Drainage:
 - .1 Maintain profiles, crowns and cross slopes to provide good surface drainage.
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- .2 Provide ditches as work progresses to provide drainage.
 - .3 Construct interceptor ditches as shown on plans or as directed before excavating or placing embankment in adjacent area.
 - .3 Rock Excavation:
 - .1 If, during excavation, material appearing to conform to classification for rock is encountered, notify Departmental Representative and provide sufficient time to take measurements to determine volume of rock.
 - .2 Shatter rock to 300mm below subgrade elevation or as indicated on plans, if required.
 - .4 Borrow Excavation:
 - .1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.
 - .2 Departmental Representative to designate extent of borrow areas and depth of excavation.
- 3.5 Embankments
- .1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.
 - .2 Break up or scarify existing road surface prior to placing embankment material.
 - .3 Do not place material which is frozen nor place material on frozen surfaces.
 - .4 Maintain crowned surface during construction to ensure ready run-off of surface water.
 - .5 Drain low areas before placing materials.
 - .6 Place and compact to full width in layers not exceeding 20 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100mm.
 - .7 Where material consists of rock:
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- .1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1m.
 - .2 Carefully distribute rock material to fill voids with smaller fragments to form compact mass.
 - .3 Fill surface voids at subgrade level with rock spalls or selected material to form an earth-tight surface.
 - .4 Do not place boulders and rock fragments with dimensions exceeding 150mm within 300mm of subgrade elevation.

 - .8 Embankments to be sloped to Departmental Representative's requirements. Intent is that slopes be as gentle as possible within limitations of site geometry. Intent is that slopes to be reinforced with riprap to prevent future roadway embankment and river slope erosion, scour, migration, etc.
- 3.6 Subgrade Compaction
- .1 Break material down to sizes that enable required compaction and mix for uniform moisture to full depth of layer.
 - .2 Compact each layer to minimum 95% maximum dry density, to ASTM D698 and ASTM D4718 except top 150mm of subgrade. Compact top 150 mm to 100% maximum dry density.
 - .3 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.
- 3.7 Finishing
- .1 Shape entire roadbed to within 25mm of design elevations and to Departmental Representative's satisfaction.
 - .2 Finish slopes and ditch bottoms to neat condition, true to lines, grades and drawings where applicable.
 - .3 Remove rocks over 150mm in any dimension from slopes and ditch bottoms.
 - .4 Hand finish slopes that cannot be finished satisfactorily by machine.
 - .5 Round top of backslope 1.5 m on both sides of top of slope.
 - .6 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags, ruts, and protruding stones.
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PWGSC

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**ROADWAY EXCAVATION,
EMBANKMENT, AND COMPACTION**

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3.8 Protection

- .1 Maintain finished surfaces in condition conforming to this Section until placement of subsequent materials.

END OF SECTION

PART 1 - GENERAL

- 1.1 Section Includes .1 Materials and installation of polymeric geotextiles used in revetments, breakwaters, retaining wall structures, filtration, drainage structures, roadbeds and railroad beds purpose of which is to:
- .1 Separate and prevent mixing of granular materials of different grading.
 - .2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.
- 1.2 Measurement for Payment .1 Payment for geotextiles required for the installation of the culverts included in the unit price for geotextiles in the Schedule of Quantities and Unit Prices.
- 1.3 References .1 American Society for Testing and Materials International, (ASTM)
- .1 ASTM D4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .2 ASTM D4595-86(2001), Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .3 ASTM D4716-01, Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .4 ASTM D4751-99a, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-4.2 No. 11.2-[M89(April 1997)], Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
 - .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
 - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.

- 1.4 Submittals
 - .1 Submit samples in accordance with Section 013300 - Submittal Procedures.
 - .2 Submit to Departmental Representative following samples at least 4 weeks prior to beginning Work.
 - .1 Minimum length of 2 m of roll width of geotextile.
 - .2 Minimum of 1 m seam with at least 300 mm of geotextile on both sides of seam.
 - .3 Submit to Departmental Representative copies of mill test data and certificate at least 4 weeks prior to start of Work, and in accordance with Section 013300 - Submittal Procedures.

- 1.5 Delivery and Storage
 - .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

- 1.6 Waste Management and Disposal
 - .1 Separate waste materials for reuse and recycling in accordance with Section 017421 - Waste Management and Disposal.
 - .2 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

PART 2 - PRODUCTS

- 2.1 Material
 - .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
 - .1 Composed of: minimum 85% by mass of polypropylene or polyester.
 - .2 Physical properties:
 - .1 Thickness: to CAN/CGSB-148.1, No.3, minimum 1.5 mm.
 - .2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 150 g/m².
 - .3 Grab tensile strength and elongation: to CAN/CGSB-148.1, No.7.3.
 - .1 Breaking force: minimum 875 N, wet condition.

- .2 Elongation at future: maximum 50%.
 - .4 Puncture strength: 550 N
 - .5 Bursting strength: to CAN/CGSB-148.1, No.6.1 minimum 2.7 MPa, wet condition.
 - .6 Trapezoidal Tear: 350 N.
 - .7 UV Resistance: 70% @ 500 hr.
 - .8 Apparent Opening Size: 0.212 mm
 - .9 Seam strength to be equal to or greater than tensile strength.
- .3 Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to CAN/CSA G164.

PART 3 - EXECUTION

3.1 Installation

- .1 Prepare slope by grading to provide a smooth, uniform surface. Remove all stumps, large rock, brush or other debris that could damage the fabric. Fill all holes and depressions so that the fabric does not bridge them. Replace loose or unstable soils.
- .2 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with securing pins.
- .3 Place geotextile material smooth in a loose fashion and free of tension stress, folds, wrinkles and creases.
- .4 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .5 Overlap each successive strip of geotextile 1.0 m over previously laid strip.
- .6 Pin successive strips of geotextile with 6 mm diameter steel securing pins fitted with washers at 1.0 m intervals along the overlaps and at mid point of lap or as indicated.
- .7 Anchor the top edge of the filter fabric by digging a 300 mm deep trench, inserting the top edge of the fabric and backfilling with compacted soil.
- .8 Take care to prevent puncturing or tearing the geotextile. Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers. Repair all damage by use of patches that extend at least 1.0 m beyond the perimeter of the tear or puncture.

- .9 After installation, cover with overlying layer within sufficient time so that ultraviolet damage does not occur. In no case shall this time exceed 7 days for ultraviolet susceptible material and 14 days for ultraviolet protected and low ultraviolet susceptible polymer geotextiles.
 - .10 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
 - .11 Commence rip-rap placement at the base of the blanket area and proceed up the slope. Limit the height of drop of rip-rap to 1.0 m or less. Do not allow the rip-rap to roll down the slope.
- 3.2 Protection
- .1 No vehicles permitted directly on geotextile.

END OF SECTION

PART 1 - GENERAL

- 1.1 Measurement for Payment .1 The quantity of rock rip-rap to be paid for will be measured in place. The volume of rock paid for will be calculated from the thickness of the rip-rap as shown on the drawings, and the actual areas covered. Overages in thickness or area beyond the limits shown on the drawings will not be paid for unless these changes were requested by the Departmental Representative.
- .2 Existing riprap which is in the way of completing the Work of this Contract shall be removed by the Contractor during the Work.
- .3 Payment will be made at the unit price bid per cubic metre of rock rip-rap acceptably in place. Price shall include full compensation for all necessary materials, development of the quarry site including drilling and blasting, preparation of the rip-rap, sorting of rip-rap at quarry site, reclaiming of quarry site, loading, hauling of materials, equipment, tools, labour and incidentals necessary to complete the work, including the preparation of the subgrade for the rip-rap, geotextile filter fabric, bedding material, trimming, excavation, backfill as required and labour for measurement and any other related labour and materials.
- 1.2 Source of Riprap .1 Riprap for this project is available at km 650.0, Alaska Highway.
- .2 Coordinate extraction of riprap from this site with the work of other Contractors extracting riprap there.
- .3 Monitor and report sizes and amounts of riprap extracted from this site to the Departmental Representative.

PART 2 – PRODUCTS

- 2.1 Stone .1 Hard, dense, durable quarry stone, angular in shape, resistant to weathering and water action, free from overburden, spoil, shale or shale seams, and organic material, with all stones having maximum dimension not greater than three times its least dimension, to meet following size distribution:

Class of Riprap (kg)	Nominal Thickness of Riprap (mm)	Rock Gradation: Percentage Larger Than Given Rock Mass		
		85%	50%	15%
10	350	1 kg	10 kg	30 kg
25	450	2.5 kg	25 kg	75 kg
50	550	5 kg	50 kg	150 kg
500	1,200	50 kg	500 kg	1,500 kg

- .2 The minimum acceptable unit weight of the rock is 2.65 t/m³.

PART 3 - EXECUTION

- 3.1 Processing .1 Process riprap uniformly using methods that prevent contamination, segregation, and degradation.
- 3.2 Handling .1 Handle and transport riprap to avoid segregation, contamination, and degradation.
- 3.3 Excavation .1 Include protection procedures to minimize disturbance of the river bed in the Environmental Control of Operations (ECO) Plan as specified in Section 013543 – Environmental Protection.
- .2 At least 2 weeks prior to performing Riprap Work, Contractor to provide Departmental Representative with a Construction Sequence for the Work. Do not proceed with the Work until approval has been received from the Departmental Representative.
- 3.4 Placing .1 Where riprap is to be placed on slopes, excavate trench at toe of slope first, if and where instructed by the Departmental Representative.
- .2 Where riprap is to be placed, fine grade the area first to provide a uniform and even surface, if and where instructed by the Departmental Representative. Fill any depressions with suitable materials and compact to provide a firm bed.
- .3 Place stones to secure the surface of the slope and create a stable mass. Place larger stones at the bottom of the slopes.
- .4 Use larger stones for lower courses and as headers for subsequent courses.
- .5 Stagger vertical joints and fill voids with rock spalls or cobbles.
- .6 Finished surface to be reasonably uniform and even, free from bumps, depressions, underlying voids, large openings, or individual stones projecting out above apparent surface.
- .7 Place riprap prior to permitting water to pass through slope drains, as applicable.
- .8 Be careful not to damage the structure (new and existing components) in any way during riprap movement. Any damages shall be repaired at the expense of the Contractor.
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- .9 Place layers simultaneously at both ends of the bridge to equalize loadings on the structure as a whole. Difference not to exceed 0.3m from one abutment to the other.

- .10 Embankments to be sloped to Departmental Representative's requirements. Intent is that slopes be as gentle as possible within limitations of site geometry. Intent is that slopes to be reinforced with riprap to prevent future roadway embankment and river slope erosion, scour, migration, etc.

END OF SECTION

PART 1 - GENERAL

- 1.1 Measurement for Payment .1 No separate payment for Select Granular Sub-grade Fill work. Payments for such work to be included in unit prices of other items in this Contract.
- 1.2 References .1 ASTM C117, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- .4 ASTM D4718, Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
- .5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .6 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- 1.3 Definitions .1 Select Granular Sub-grade Fill: Material excavated from within right-of-way and from designated borrow locations that meets specified gradation and material requirements and will be incorporated into embankment.

PART 2 - PRODUCTS

- 2.1 Materials .1 Select Granular Sub-grade Fill: native material selected or blended to following requirements:
- .1 Gradations to be within limits specified when tested to ASTM C136-01 and ASTM C117-95 and to exhibit smooth curve when plotted on semi-log gradation chart. Sieve sizes to CAN/CGSB-8.1.

.1 Gradation to:

Sieve Designation	% Passing
100 mm	100
5.0 mm	20 – 65
0.075 mm	0 – 8

- .2 Material passing 0.425 mm sieve size to have:
 - .1 Liquid limit: to ASTM D4318-00, maximum 25.
 - .2 Plasticity index: to ASTM D4318-00, maximum 6.
- .3 Placed and compacted material will not rut when loaded tandem truck is passed over it.

PART 3 - EXECUTION

- 3.1 Inspection of Sub-grade Surface
 - .1 Place Select Granular Sub-grade Fill after underlying surface is inspected and accepted by Departmental Representative.
 - 3.2 Placing
 - .1 Place Select Granular Sub-grade Fill to depths and grades indicated.
 - .2 Begin spreading Select Granular Sub-grade Fill material on crown line or on high side of one-way slope.
 - .3 Place material in uniform layers not exceeding 200 mm compacted thickness. Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
 - .4 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .5 Remove and replace segregated material.
 - 3.3 Compacting
 - .1 Compact to 100% maximum dry density, to ASTM D698-00a and ASTM D4718.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted structure.
 - .3 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.
 - 3.4 Finish Tolerance
 - .1 Finished compacted surface to be plus or minus 25 mm of established grade and cross section.
 - .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
 - 3.5 Maintenance
 - .1 Maintain finished Select Granular Sub-grade Fill in condition conforming to this Section until acceptance by Departmental Representative and succeeding material is applied.
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**SELECT GRANULAR
SUB-GRADE FILL**

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- .2 Apply dust control measures as required.
- .3 Ensure that Select Granular Sub-grade Fill surface is in properly compacted state prior to application of succeeding material.

END OF SECTION

PART 1 - GENERAL

- 1.1 Measurement for Payment .1 No separate payment for Granular Sub-base work. Payments for such work to be included in Unit Prices of other items in this Contract.
- 1.2 References .1 ASTM C117, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- .4 ASTM D4718, Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
- .5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³)).
- .6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .7 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .8 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- 1.3 Stockpile Handling .1 Stockpile aggregates in accordance with Section 310516 - Aggregates: General.
- .2 Handle and transport aggregate to avoid segregation, contamination, and degradation.
- .3 Leave stockpile in tidy, well-drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles as directed.
- .5 Stockpile minimum 50% of total aggregate required prior to commencing placing.

PART 2 - PRODUCTS

2.1 Materials

- .1 Granular Sub-base: material to Section 310516 – Aggregates and following requirements:
 - .1 Crushed stone or gravel.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

- .1 Gradation to:

Sieve Designation	% Passing
50 mm	100
31.5 mm	63 – 100
12.5 mm	38 – 71
4.75 mm	22 – 54
2.00 mm	13 – 42
0.425 mm	5 – 24
0.075 mm	2 – 8

- .2 Liquid limit: to ASTM D4318, maximum 25.
 - .3 Plasticity index: to ASTM D4318, maximum 6.
 - .4 Crushed particles: at least 20% of particles by mass retained on 4.75 mm sieve to have at least one freshly fractured face.

PART 3 – EXECUTION

3.1 Sequence of Operation

- .1 Stockpile Granular Sub-base as specified under Section 310516 – Aggregates.
 - .2 Place Granular Sub-base after subgrade is inspected and accepted by Departmental Representative.
 - .3 Placing:
 - .1 Construct Granular Sub-base to depth and grade in areas indicated.
 - .2 Ensure no frozen material is placed.
 - .3 Place material only on clean unfrozen surface, properly shaped and compacted, and free from snow and ice.
 - .4 Begin spreading sub-base material on crown line or on high side of one-way slope.
-

- .5 Place material using methods which do not lead to segregation or degradation of aggregate.
 - .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
 - .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .8 Remove and replace that portion of layer in which material becomes segregated during spreading.
 - .4 Compaction Equipment:
 - .1 Compaction equipment to be capable of obtaining required material densities.
 - .5 Compacting:
 - .1 Compact to density not less than 100% maximum dry density in accordance with ASTM D698-00a and D4718.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 Dry gravel if granular sub-base is excessively moist.
 - .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.
 - .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
 - 3.2 Site Tolerances
 - .1 Finished sub-base surface to be within plus or minus 25 mm of established grade and cross section.
 - 3.3 Maintenance
 - .1 Maintain finished Granular Sub-base in condition conforming to this Section until acceptance by Departmental Representative and until succeeding material is applied.
 - .2 Apply dust control measures as required.
-

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**GRANULAR
SUB-BASE**

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- .3 Ensure that Granular Sub-base surface is in properly compacted state prior to application of succeeding material.

END OF SECTION

PART 1 - GENERAL

- 1.1 Measurement for Payment .1 No separate payment for Granular Base work. Payments for such work to be included in unit prices of other items in this Contract.
- 1.2 References .1 ASTM C117, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- .5 ASTM D4718, Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
- .6 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³)).
- .7 ASTM D1883, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .8 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .9 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .10 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- 1.3 Stockpile Handling .1 Stockpile aggregates in accordance with Section 310516 - Aggregates.
- .2 Handle and transport aggregate to avoid segregation, contamination, and degradation.
- .3 Deliver and leave stockpile in tidy, well-drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles as directed.
-

- .5 Stockpile minimum 50% of total aggregate required prior to commencing placing.

PART 2 - PRODUCTS**2.1 Materials**

- .1 Granular base: material to Section 310516 - Aggregates and following requirements:
 - .1 Crushed stone or gravel.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

- .1 Gradation to:

Sieve Designation	% Passing
19 mm	100
12.5 mm	70 – 100
9.5 mm	-
4.75 mm	40 – 70
2.00 mm	23 – 50
0.425 mm	7 – 25
0.180 mm	-
0.075 mm	3 – 8

- .2 Liquid limit: to ASTM D4318, maximum 25.
 - .3 Plasticity index: to ASTM D4318, maximum 6.
 - .4 Crushed particles: at least 60% of particles by mass retained on 4.75 mm sieve to have at least one freshly fractured face.

PART 3 - EXECUTION**3.1 Sequence of Operation**

- .1 Stockpile Granular Base as specified under Section 310516 – Aggregates.
 - .2 Place Granular Base after underlying surface has been placed to within tolerances.
 - .3 Placing:
 - .1 Construct Granular Base to depth and grade in areas indicated.
-

- .2 Ensure no frozen material is placed.
 - .3 Place material only on clean unfrozen surface, properly shaped and compacted, and free from snow and ice.
 - .4 Begin spreading base material on crown line or on high side of one-way slope.
 - .5 Place material using methods which do not lead to segregation or degradation of aggregate.
 - .6 Place material to full width in uniform layers not exceeding 300 mm compacted thickness.
 - .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .8 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .4 Compaction Equipment:
- .1 Compaction equipment to be capable of obtaining required material densities.
- .5 Compacting:
- .1 Compact to density not less than 100% maximum dry density in accordance with ASTM D698 and D4718.
 - .2 Shape and roll alternately to obtain smooth, even, and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 Dry gravel if Granular Base is excessively moist.
 - .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.
 - .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.2 Site Tolerances
- .1 Finished base surface to be within plus or minus 25 mm of established grade and cross section.
-

- 3.3 Maintenance
- .1 Maintain finished Granular Base in condition conforming to this section until acceptance by Departmental Representative and until succeeding material is applied.
 - .2 Apply dust control measures as required.
 - .3 Ensure that Granular Base surface is in properly compacted state prior to application of succeeding material.

END OF SECTION

PART 1 - GENERAL

- 1.1 Description
 - .1 This section specifies requirements for application of emulsified asphalt followed by applications of aggregate to roadway.
 - .2 Bituminous Surface Treatment aggregate will be supplied by Departmental Representative.
- 1.2 Measurement for Payment
 - .1 Payment for repaving required for the installation of the culverts included in the lump sum price for Repaving (BST) in the Schedule of Quantities and Unit Prices. Include repairing, replacing, or disposing of failed surface treatment associated with this Work.
- 1.3 Product Acceptance
 - .1 The completed Bituminous Surface Treatment shall be free of surface defects as described in paragraph 1.3.2 and may be rated by the Departmental Representative for satisfactory performance at any time within 30 days of completion.
 - .2 Performance rating will be in accordance with the criteria described in the following Tables, 1.3.2.1 – Surface Defect Parameters and 1.3.2.2 – Density of Surface Defects.

Table 1.3.2.1 – Surface Defect Parameters

Surface Defects	Severity	Rating Parameters
Loss of Cover Aggregate (Ravelling)	Very Good	No noticeable aggregate loss
	Good	A few pock marks, less than 5 per 0.09 m ²
	Fair	Frequent pock marks closely spaced, more than 6 per 0.09 m ²
	Poor	Extensive pock marks or few surface disintegrations
	Very Poor	Disintegration with potholes
Potholes	Very Good	Few minor potholes, only involves B.S.T.
	Good	Few deep potholes, involves granular base
	Fair	Intermittent sections with asphalt on surface
	Poor	Frequent sections with asphalt on surface, has wet look or asphalt on surface throughout
	Very Poor	Wet look with tire noise like a wet pavement
Total Failure	Any	Any condition where the asphalt material softens or disintegrates under traffic and aggregate is pick up or “kicked off” by traffic

Table 1.3.2.2 – Density of Surface Defects

Density of Surface Defects	Ravelling	Potholes	Flushing/Bleeding
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Units	(% Length)	(Numbers)	(% Length)
Few	<5%	<5	<5%
Intermittent	>5% <20%	>5 <15	>5% <20%
Frequent	>20% <50%	>15 <30	>20% <50%
Extensive	>50% <80%	>30 <50	>50% <80%
Throughout	>80%	>50	>80%

(based on % of surface area affected per 0.5 lane km length of Bituminous Surface Treatment application)

- .3 The Departmental Representative will notify the Contractor in writing of the requirement for repairs/replacement of failed Bituminous Surface Treatment.
- .4 At the sole cost of the Contractor, complete repair/replacement of failed surface treatments within 30 days of notification by the Departmental Representative in accordance with the requirements of Table 1.3.4.1. When surface condition is a safety concern, complete repair/replacement of failed surface treatments within 7 days of notification by the Departmental Representative. Any materials used in repair/replacement of failed surface treatments shall be consistent with those originally specified in the Contract or otherwise approved by the Departmental Representative.

Table 1.3.4.1 – Surface Treatment Repair/Replacement Criteria

Surface Defect	Severity	Repair/Replacement Method
Loss of Cover Aggregate (Ravelling)	Very Good/Good	None
	Fair/Poor/Very Poor	Reseal of affected area ***
Potholes	Very Good/Good	All potholes to be filled with asphaltic patching material and reseal
	Fair/Poor/Very Poor	Patch potholes and reseal affected area ***
Flushing/ Bleeding	Very good/Good	None
	Fair	Application of sand blotter.
	Poor/Very Poor	Reseal of affected area, removal of initial surface treatment at Contractor’s option.
Total Failure	Any	Remove and dispose of failed surface treatment in its entirety and apply new surface treatment.

Note: ***Reseal shall consist of a new bituminous surface treatment single application. Area of the Reseal repair/replacement shall not be less than one application width x 10 metres in length. If there is less than 10 metres between two sections in the application pass designated for repair/replacement,

the repair/replacement shall be continuous.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Supply asphalt material CAN 2-16.5-M84 Grade HF150S emulsified asphalt with anti-stripping agent added at manufacturer's suggested rate.
 - .2 Include removal and disposal of emulsion products received and stored that show signs of separation or that are not homogeneous.
 - .3 If Contractor elects to incorporate non-traditional material components such as, but not limited to, crude oil, waste products and industrial or manufacturing by-products in the High Float emulsified asphalt, the Departmental Representative must be advised in writing before any material is supplied.
 - .4 Submit to the Departmental Representative, prior to supplying any material, Material Safety Data Sheets for the finished product and all component products.
- 2.2 Application Rates
- .1 Apply asphaltic material at minimum rate of 1.8 litres per square metre on overlay and minimum 2.2 litres per square metre on granular base.
 - .2 Apply aggregates at rate to ensure coverage and minimize wastage (nominally 19 mm thick).
 - .3 Submit proposed job design application rates to the Departmental Representative one week prior to application of Bituminous Surface Treatment.

PART 3 - EXECUTION

- 3.1 Equipment
- .1 Pressure Distributor:
 - .1 Distributor to be designed, equipped, maintained, and operated so that asphalt material at even temperature may be applied uniformly on variable widths of surface up to 4.88 m at readily determined and controlled rates from (0.3 to 5.5) L/m³ The litres of asphalt emulsified loaded onto pressure distributor are to be metered for purposes of checking application rates.
 - .2 Capable of distributing asphalt material in uniform spray without atomization at rate and temperature required.
-

- .3 Equipped with easily read, accurate, and sensitive device that registers temperature of liquid in reservoir.
 - .4 Equipped with 4.88 metre minimum length spray bar capable of vertical adjustment and of instant full opening and positive cut-off complete with rotary adjustable spray nozzles, designed to ensure uniform fan shaped delivery overlapping to produce uniformly spread surface.
 - .2 Mechanical Aggregate Spreader:
 - .1 A self-propelled unit of approved design supported by at least four wheels equipped with pneumatic tires on two axles. Aggregate spreader to be equipped with positive controls in order that required amount of material will be deposited uniformly over full width of asphalt material.
 - .3 Rollers:
 - .1 Self-propelled pneumatic tired rollers.
 - 3.2 Preparation
 - .1 Obtain approval of existing surface of Granular Base before applying asphalt surface treatment material.
 - .2 Finish surface of Granular Base to specified grade and cross section in accordance with Section 312413 – Roadway Excavation, Embankment and Compaction. Immediately before asphalt binder is applied, broom or otherwise clean as necessary to remove foreign material.
 - 3.3 Application
 - .1 Schedule work to the approval of Departmental Representative.
 - .2 Apply asphalt material using approved pressure distributor at rate required. Apply aggregate at rate required following application of asphalt material. All asphalt material to be covered with aggregate. Roll surface after applying aggregate. Broom surface as required to minimize motor-vehicle damage from loose cover aggregate.
 - .3 Apply Bituminous Surface Treatment to cover full design width in a maximum of three passes.
 - 3.4 Workmanship
 - .1 Layout and construct edges parallel to centreline and true to designated design.
 - .2 Construct longitudinal and transverse joints so as to prevent surface irregularities that would impede moisture runoff or affect vehicle ride or steering.
-

- .3 Construct Bituminous Surface Treatment to prevent surface corrugations or rutting greater than 12 mm or that affect vehicle ride.
 - .4 Construct required repair/replacement patches to prevent surface irregularities that would impede moisture runoff or affect vehicle ride or steering.
 - .5 Begin sweeping no sooner than 36 hours after application of Bituminous Surface Treatment.
- 3.5 Traffic Control
- .1 Direct traffic through project using warning signs, flagpersons and pilot car in accordance with Section 013500 – Special Procedures for Traffic Control.
 - .2 Pilot traffic continually through applied Bituminous Surface Treatment sections until completion of first sweeping.
 - .3 Keep traffic off freshly sprayed asphalt.
 - .4 If necessary to route traffic over new treatment restrict speed to 10 km/hr or less, until rolling is completed and asphalt has taken initial set.

END OF SECTION

PART 1 - GENERAL

- 1.1 Measurement for Payment .1 No separate payment will be made for ongoing dust control. Include ongoing water dust control in all Work as part of Lump Sum amounts.
- .2 Supply and apply calcium chloride as part of dust control only if directed to do so by the Departmental Representative.
- 1.2 Definition .1 Flake equivalent tonne: Unit used to convert aqueous calcium chloride to its equivalent mass of Type S, Grade 1, regular 77% flake calcium chloride. It is calculated as follows:
- $$FE = M \times C / 77,000$$
- Where: FE = Number of flake equivalent tonnes.
M = mass of solution in kilograms.
C = percentage of calcium chloride in solution.
- 1.3 References .1 Canadian General Standards Board (CGSB):
- .1 CAN/CGSB-15.1, Calcium Chloride.
- 1.4 Delivery Storage and Handling .1 Supply calcium chloride in quantities and at times as directed by Departmental Representative.
- .2 Indicate name of manufacturer, name of product, net weight or mass, and percentage of calcium chloride guaranteed by manufacturer.
- .3 Store bags of calcium chloride in weather-proof enclosures.
- .4 Supply calcium chloride as 35% aqueous solution.
- 1.5 Waste Management and Disposal .1 Separate and recycle waste materials in accordance with Section 017419 - Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.

PART 2 - PRODUCTS

- 2.1 Materials .1 Calcium chloride flakes: to CAN/CGSB-15.1, Type S: Grade 1 (77%), Class A.
- .2 Aqueous calcium chloride: to CAN/CGSB-15.1, Class 1 or 2, 35% concentration by weight of anhydrous product.
-

- .3 Water: to Departmental Representative's approval.

PART 3 - EXECUTION

3.1 Application

- .1 Apply calcium chloride after final grading of Granular Base is accepted and directed by Departmental Representative.
- .2 Apply calcium chloride with equipment capable of an application rate of 5 flake equivalent tonnes/km unless otherwise directed.
- .3 Apply aqueous calcium chloride (or water) with distributors equipped with means of shut-off and with spray system to ensure uniform application.
- .4 Apply calcium chloride flakes uniformly over the centre 7 metres of highway at a rate of 5 flake equivalent tonnes/km unless otherwise directed.
- .5 Immediately after applying calcium chloride flakes, apply water at rate of 15 tonnes/km or until calcium chloride spreads to edge of highway.
- .6 Apply water with distributors equipped with means of shutoff and with spray systems to ensure uniform application.

END OF SECTION

PART 1 - GENERAL

- 1.1 Requirements for Working Within or Near Watercourses
- .1 Activities which involve Work within or near waterways should be first coordinated with the Departmental Representative and must always follow applicable legislation/regulations and the Contractor's Environmental Control of Operations (ECO) Plan which is outlined in Section 013543 – Environmental Protection.
 - .2 Comply with Department of Fisheries and Oceans' regulations (DFO) and Ministry of Environment's (MOE) regulations attached to these specifications (i.e.: 'DFO Bridge Maintenance Standard Operating Procedures' and 'MOE Standards and Best Practices for In-stream Work').
 - .3 Keep all Approved activities within wetted perimeters to an absolute minimum.
 - .4 Do not operate construction equipment in waterways unless required by Contract.
 - .5 Do not dump excavated fill, waste material, or debris in waterways.
 - .6 Abide by all conditions of permits obtained from Provincial and Federal Government environmental agencies.
 - .7 Do not skid logs or construction materials across waterways.
 - .8 Obtain a license from Ministry of Environment (British Columbia) Water Division Branch for any domestic water intakes.
 - .9 Provide a buffer area of at least 50 metres between the construction camp and the waterway.
 - .10 Provide a buffer area of at least 50 metres between the storage and handling of fuels, lubricants, or other deleterious substances and the waterway.
 - .11 Do not store construction materials, debris, waste, etc. within 50 metres of any waterbody.
 - .12 Nothing should drop into the creek.
- 1.2 Basis for Payment
- .1 No separate payment will be made for preservation of watercourses. Include watercourse protection in Lump Sum price for Water Management and Pumps in the Schedule of Quantities and Unit Prices.
-

PART 2 – PRODUCTS

- 2.1 Preparation .1 Obtain work permits from governing federal and provincial conservation authorities as applicable.

PART 3 - EXECUTION

- 3.1 Existing Conditions .1 Maintain existing flow patterns in natural watercourse systems during completion of this Work.
- .2 Only interrupt the natural watercourse system as direct by the Departmental Representative or the Contract Documents for new riprap locations.
- 3.2 Site Clearing and Plant Protection .1 Conduct Work to provide minimal disturbance to vegetated areas. Protect all trees and plants onsite.
- .2 Maintain temporary erosion and pollution control features installed under this Contract.
- 3.3 Drainage .1 Pumping water containing suspended materials into watercourse is prohibited.
- .2 Establish rock chute spillways to accommodate safe surface water entry into watercourses as instructed by Departmental Representative as applicable.
- 3.4 Site Restoration .1 Replant vegetation natural to area, suitable for application without requirement for fertilizers, pesticides, and/or other chemicals in order to restore site to its former condition (before the Work under this Contract began) as instructed by Departmental Representative.
- .2 Establish vegetated buffer zones with suitable native vegetation to a minimum of 3m from water level at time of planting, along edge of watercourse banks as determined by Departmental Representative.
- .3 Extents of embankment riprap to be placed around the bridge-culvert are as per the Departmental Representative.

END OF SECTION



BRIDGE MAINTENANCE

Fisheries and Oceans Canada
Pacific Region Operational Statement

Version 3.0

Bridge maintenance is undertaken to extend the life of the structure and to ensure that it functions as designed, thus ensuring public safety. This Operational Statement applies only to: deck sweeping and washing to remove traction material (e.g., sand and salt residue), cleaning of all bridge components (substructure, superstructure and deck), the removal and application of protective coatings, deck wearing surface replacement, the removal of debris to protect piers and abutments, and structural repairs involving no instream work. **Note any instream work involving rock armouring of the bridge structure or channel should be referred to the local DFO office for advice on appropriate mitigations to avoid potential negative impacts to fish and fish habitat.**

Bridge maintenance activities have the potential to negatively impact fish and fish habitat by introducing sand, sediments, deck surface materials such as concrete and asphalt, and other deleterious substances (e.g., salt, paint, solvents, oil and grease) into watercourses. Removal of woody debris and riparian vegetation may alter natural habitat features and flows that exist in the watercourse. Operation of machinery may impact habitat on the banks and bed, and result in erosion and sedimentation. Placement of rock to stabilize structures may alter natural habitat and flows, and block fish passage.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your bridge maintenance project without a DFO review when you meet the following conditions:

- the work does not include realigning the watercourse or replacing the existing bridge,
- the work does not involve instream works, dredging, placing fill (e.g., filling scour pools) or excavating the bed or bank of the watercourse,
- explosives are not used to remove debris,
- the withdrawal of any water will not result in reduction in the wetted width of a stream, and will not exceed 10% of the instantaneous flow, in order to maintain existing fish habitat, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Maintaining a Bridge* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case,

you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to comply with all municipal, provincial, territorial and/or federal legislation that applies to the work being carried out in relation to this Operational Statement. In British Columbia, please contact the Water Stewardship Division, Ministry of Environment (http://www.env.gov.bc.ca/wsd/water_rights/licence_application/section9/index.html) for information on the Provincial *Water Regulation* notification requirements when planning to conduct bridge maintenance in or around BC waters.

The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (<http://www.speciesatrisk.gc.ca>). For general information on aquatic SARA species visit the following web site: http://www.dfo-mpo.gc.ca/species-especes/actMeans/actMeans_criticalHabit_factsheet_e.asp and/or contact DFO by email at: SARA@pac.df-o-mpo.gc.ca.

If you have questions regarding this Operational Statement, please refer to the list of **Frequently Asked Questions** (http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/os-faq_e.htm) or contact DFO Regional Headquarters at 1-866-845-6776.

Please notify DFO 10 working days before starting your work by filling out and sending the Pacific Region Operational Statement **notification form** directly to DFO Regional Headquarters. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement. It is recommended that you keep a copy of the Operational Statement at the work site to demonstrate to Habitat and Fishery Officer staff that the conditions and measures, as outlined in the OS, are being followed.

Area of Application

This Operational Statement applies to the province of British Columbia and Yukon Territory freshwater systems only.

Measures to Protect Fish and Fish Habitat when Maintaining a Bridge

1. Deck Sweeping

- 1.1. Adequately seal drains and open joints before sweeping to prevent material from falling into the watercourse.
- 1.2. Clean and remove debris and sediment from drainage devices and dispose of the material in a way that will prevent it from entering the watercourse.

2. Deck Washing

- 2.1. Sweep decks, including curbs, sidewalks, medians and drainage devices to remove as much material as practical before washing.
- 2.2. Adequately seal drains and open joints before washing to prevent sediment-laden wash-water from entering the watercourse.
- 2.3. Direct wash-water past the ends of the bridge deck to a vegetated area to remove suspended solids, dissipate velocity and prevent sediment and other deleterious substances from entering the watercourse. If this cannot be achieved, use silt fences or other sediment and erosion control measures to prevent wash-water from entering the watercourse.
- 2.4. When extracting water from a watercourse, ensure the intakes of pumping hoses are equipped with an appropriate device to avoid entraining and impinging fish. Guidelines to determine the appropriate mesh size for intake screens may be obtained from DFO (Freshwater Intake End-of-Pipe Fish Screen Guidelines (1995), available at www.dfo-mpo.gc.ca/Library/223669.pdf).
- 2.5. Where possible, avoid using small streams as a source for water.

3. Removal and Application of Protective Coatings

- 3.1. Remove paint or protective coatings in a manner that prevents any paints, paint flakes, primers, blasting abrasives, rust, solvents, degreasers or other waste material from entering the watercourse.
- 3.2. Use measures such as barges or shrouding to trap and prevent blasting abrasives, protective coatings, rust and grease from entering the watercourse.
- 3.3. Contain paint flakes, abrasives, and other waste materials for safe disposal.
- 3.4. Store, mix and transfer paints and solvents on land and not on the bridge to prevent these materials from entering the watercourse in the event of a spill.
- 3.5. Do not clean equipment in the watercourse or where the wash-water can enter the watercourse.

4. Removal of Debris (e.g., including woody debris, garbage, etc.)

- 4.1. Unless the debris accumulation is an immediate threat to the integrity of the piers and abutments, time debris removal to avoid disruption to sensitive fish life stages by adhering to appropriate fisheries **timing windows** (http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/timing_e.htm).
- 4.2. Limit the removal of material to that which is necessary to protect piers and abutments.
- 4.3. Remove debris by hand or with machinery operating from shore or a floating barge.

5. Structural Repairs and Reinforcements

- 5.1. Use barges or shrouding to trap and prevent concrete and other bridge materials from entering the watercourse.
- 5.2. If minor replacement rock reinforcement/armouring is required to stabilize eroding areas around the immediate area of existing bridge structures (e.g., abutments and/or wing walls), the following measures should be incorporated:

- 5.2.1. Place appropriately-sized, clean rocks into the eroding area.
- 5.2.2. Do not obtain rocks from below the **high water mark** (HWM) (http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/definitions_e.htm) of any water body.

5.2.3. Avoid the use of rock that is acid-generating. Also avoid the use of rock that fractures and breaks down quickly when exposed to the elements.

5.2.4. Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment.

5.2.5. Ensure rock does not interfere with fish passage or constrict the channel width.

6. If working from land, install effective sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.
7. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be required. This removal should be kept to a minimum and limited to the right-of-way of the bridge.
8. Operate machinery on land (above the **HWM**) or on the water (i.e., from a barge or vessel) in a manner that minimizes disturbance to the banks or bed of the watercourse.
 - 8.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks, invasive species and noxious weeds.
 - 8.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
 - 8.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
 - 8.4. Restore banks to original condition if any disturbance occurs.
9. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
10. Vegetate any disturbed areas by planting and seeding with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. All seeding and/or planting trees should follow the DFO guidance on **Riparian Revegetation** (http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/riparian-reveg_e.htm). If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
 - 10.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

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Aussi disponible en français

http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_f.asp

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NOTIFICATION FORM

Fisheries and Oceans Canada
Pacific Region Operational Statement

Version 3.1

PROPONENT INFORMATION

NAME: _____ STREET ADDRESS: _____
 CITY/TOWN: _____ PROVINCE/TERRITORY: _____ POSTAL CODE: _____
 TEL. NO. (RESIDENCE): _____ TEL. NO. (WORK): _____
 FAX NO: _____ EMAIL ADDRESS: _____

CONTRACTOR INFORMATION (provide this information if a Contractor is working on behalf of the Proponent)

NAME: _____ STREET ADDRESS: _____
 CITY/TOWN: _____ PROVINCE/TERRITORY: _____ POSTAL CODE: _____
 TEL. NO. (RESIDENCE): _____ TEL. NO. (WORK): _____
 FAX NO: _____ EMAIL ADDRESS: _____

PROJECT INFORMATION

Select Operational Statements that are being used (check all applicable boxes):

- | | | |
|--|---|--|
| <input type="checkbox"/> Aquatic Vegetation Removal in Lakes | <input type="checkbox"/> Ice and Snow Fill Bridges | <input type="checkbox"/> Routine Maintenance Dredging for Navigation |
| <input type="checkbox"/> Bridge Maintenance | <input type="checkbox"/> Isolated Pond Construction | <input type="checkbox"/> Small Moorings |
| <input type="checkbox"/> Culvert Maintenance | <input type="checkbox"/> Maintenance of Riparian Vegetation | <input type="checkbox"/> Small Clear-Span Bridges |
| <input type="checkbox"/> Directional Drilling | <input type="checkbox"/> in Existing Rights-of-Way | <input type="checkbox"/> Temporary Ford Crossings |
| <input type="checkbox"/> Dock and Boathouse Construction
in Fresh Water Systems | <input type="checkbox"/> Overhead Line Construction | <input type="checkbox"/> Underwater Cables in Fresh Water Systems |
| <input type="checkbox"/> Dry Open-Cut Crossings | <input type="checkbox"/> Public Beach Maintenance | |
| | <input type="checkbox"/> Punch and Bore Crossings | |

Select the type of water body or watercourse at or near your project:

- | | | |
|---|--|---|
| <input type="checkbox"/> River, Stream, Creek | <input type="checkbox"/> Marine (Ocean or Sea) | <input type="checkbox"/> Pond or wetland (pond is less than 8 hectares) |
| <input type="checkbox"/> Lake (8 hectares or greater) | <input type="checkbox"/> Estuary | |

PROJECT LOCATION (S) (fill out this section if the project location is different from Proponent Information; append multiple project locations on an additional sheet if necessary)

Name of water body or watercourse	Coordinates of the Project (UTM co-ordinate or Degrees, Minutes, Seconds), if available	
Nearest Town to site	Easting:	Northing:
Legal Description (Plan, Block, Lot, Concession, Township, Section, Range)	Latitude:	Longitude:
Proposed Start Date (YYYY/MM/DD):	Directions to Access the Project Site (i.e., Route or highway number, etc.)	
	Proposed Completion Date (YYYY/MM/DD):	

Please notify DFO, preferably 10 working days before starting your work, by filling out and sending in, by mail, email or by fax, this notification form to the DFO Regional Headquarters. This information is requested in order to evaluate the effectiveness of the work carried out in relation to the Operational Statement.

I, _____ (print name) certify that the information given on this form is, to the best of my knowledge, correct and complete.

Signature _____ Date _____

Note: If you cannot meet all of the conditions and cannot incorporate all of the measures in the Operational Statement then your project may result in a violation of Subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

Information about the above-noted proposed work or undertaking is collected by DFO under the authority of the *Fisheries Act* for the purpose of administering the fish habitat protection provisions of the *Fisheries Act*. Personal information will be protected under the provisions of the *Privacy Act* and will be stored in the Personal Information Bank DFO-SCI-605. Under the *Privacy Act*, individuals have a right to, and on request shall be given access to, any personal information about them contained in a personal information bank. Instructions for obtaining personal information are contained in the Government of Canada's Info Source publications available at www.infosource.gc.ca or in Government of Canada offices. Information other than "personal" information may be accessible or protected as required by the provisions of the *Access to Information Act*.

This Notification Form (Version 3.1) may be updated as required by Fisheries and Oceans Canada. It is your responsibility to use the most recent version. Please refer to the Operational Statements web site at http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_e.asp to ensure that a more recent version has not been released.

DFO REGIONAL HEADQUARTERS

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Standards and Best Practices for Instream Works



March 2004



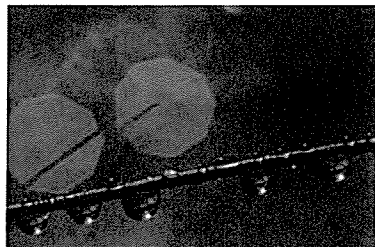
**BRITISH
COLUMBIA**

Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

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Preface

British Columbia is recognized globally for its exceptional wildlife, diversity of ecosystems, and rich natural resources. The Ministry of Water, Land and Air Protection (WLAP) works to maintain these valuable natural assets, which lie at the heart of many recreational and economic activities enjoyed by British Columbians in all regions of the province.



The Ministry has responsibility for the protection and stewardship of British Columbia's environment. To fulfil this responsibility, it develops policy and legislation, regulations, codes of practice, environmental contracts and covenants (legal agreements). It also monitors and reports on selected species and habitats, as well as acquires information on habitat and species health. It sets science- and results-based objectives and standards and provides best practices for activities that affect our environment.

Together, clear goals and objectives, meaningful performance measures and science-based tools guide Ministry actions in improving environmental management. Regulatory frameworks allow headquarters and regional staff to set and report on standards for and protecting environmental quality, limiting discharges and emissions to air, land and water. Regulatory compliance is addressed through policy development, enforcement and the public reporting of the results of compliance monitoring.

An Increasing Role for Stewardship

While the Ministry takes a leading role in the protection of British Columbia's natural resources, species, and habitats, environmental protection and stewardship are ultimately the responsibility of all British Columbians. Stewardship of natural resources is key to maintaining and restoring the province's natural diversity, and achieving the Ministry's important environmental mandate. A stewardship approach involves all British Columbians taking responsibility for the well being of the environment by acting to protect or restore a healthy environment.

The Ministry is actively pursuing opportunities for sharing the responsibility of protecting the environment. To this end, it is establishing partnerships with other governments, First Nations, communities, academic institutions, industries, volunteer organizations, and citizens. The involvement of these partners in the shared environmental protection and stewardship of the province's resources is essential because of their local knowledge, resources, and expertise. With the assistance of these partners, the Ministry can work to increase the awareness of ecosystem needs, to incorporate environmental stewardship ethics and to create immediate and long-term improvements to our environment.

A Changing Process

Over the next several years, the Ministry will be making strategic shifts in its business practices, moving towards:

- Developing shared stewardship between the Ministry and other stakeholders;
- Establishing clear roles for gathering environmental information and achieving environmental objectives;
- Designing an integrated system of program delivery that is based on the best available science and an ecosystem-based approach; and
- Setting clear, reasonable environmental outcomes, with discretion as to how to achieve these outcomes.

This document will be updated in the future as these strategic changes take place, and will move in delivery format towards greater Internet-based access.

What Will This Document Do For Me?

This document is designed to help you act as a steward of the environment. The information provided here will guide you in planning and carrying out your proposed development activities so that they:

- comply with applicable legislation, regulations, and policies; and
- meet provincial standards of performance.

Knowing what these legal obligations and standards are will assist you in choosing the “best practices” for conducting your activities.

Information about the Ministry’s Notification and Approval processes – key application forms through which the province (under the *Water Act*) administers permitting for instream works – is also presented here. For many types of proposed works, all the guidance you need to submit a notification or apply for a formal Approval is provided here. Both processes require you to review this document, incorporate the appropriate standards and best practices into your work plan, and submit the appropriate form and accompanying documents.

If you already have experience working in and around water and are familiar with this document and the Notification and Approval processes, you may opt to turn directly to Sections 6 and 7 for information about the standards and best practices that apply to your type of work. If your instream works are related to forest, range, oil and gas or mining practices, you are not required to submit a Notification or Approval under the *Water Act* Regulation.

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1 Introduction

The British Columbia Ministry of Water, Land and Air Protection (WLAP) is committed to protecting and enhancing the quality of British Columbia's environment. Over the years, the Ministry's staff have made significant progress in implementing strategic changes in the delivery of environmental protection responsibilities in the province. This document further supports the Ministry's objectives of promoting shared stewardship and establishing provincial standards and best practices that can serve as the basis for ongoing monitoring of environmental protection and management efforts.

The Ministry has developed this document through consultation with its staff from all regions of the province. Fisheries and Oceans Canada (DFO) staff in the Pacific Region and other stakeholders have also had the opportunity to review it and provide input.

User's Tip:

Select terms used throughout the text are defined in the glossary, which may be found in Section 11.

Information about the Ministry's Notification and Approval processes – key applications through which the province (under the *Water Act*) administers permitting for instream works – is presented here. For many types of proposed works, most or all the guidance you need to submit a Notification or apply for a formal Approval is provided here. Both processes require you to review this document, incorporate the appropriate standards and best practices into your work plan, and submit the appropriate form and accompanying documents.

If your instream works are related to forest, range, oil and gas, or mining practices, you are **not** required to submit a notification or seek an approval under the *Water Act* Regulation. Rather, works can be conducted under the authority of the *Forest and Ranges Practices Act*, *Forest Practices Code of British Columbia Act*, or the *Mines Act*, or a regulation made under any of those Acts.

2 Purpose and Scope

This document sets out provincial standards and recommended best practices for the planning, design and construction of instream projects in keeping with the British Columbia *Water Act*.

This document has been developed to assist you in appropriately addressing fish and wildlife populations and habitat protection in the proposal, design and implementation of your instream works. **Note that other legislation and regulations (e.g., federal, municipal) may also apply to such activities.**

Some of the information provided in this document is referenced from legislation. However, this document should not be considered an official copy of legislation. If a discrepancy arises between this document and legislation, the legislation takes precedence. The Province of British Columbia does not guarantee the accuracy or completeness of the information referenced here from legislation, and in no event is the Province liable or responsible for damages of any kind arising out of its use.

3 Background

The geography of British Columbia offers a great diversity of aquatic habitats that supports a rich variety of flora and fauna. Water flows from glaciers and mountaintops to small headwater streams, and from there into lakes, rivers, wetlands, estuaries, and finally the ocean. Each of these habitats plays a critical role in the survival of the many species that depend on the aquatic environment during their life cycles.

Over the past 150 years, aquatic ecosystems and habitats have been negatively affected by human activities such as urban, agricultural and industrial development. To ensure the health and sustainability of our aquatic resources, we need to balance the demand on critical habitats with conservation activities.

3.1 What Is a Stream?

Streams are complex ecosystems supporting a range of aquatic habitats and species. Streams often support rare and endangered species and may or may not support fish habitat. A “stream” as defined in the *Water Act* is “a natural watercourse or source of water supply, whether usually containing water or not, ground water, and a lake, river, creek, spring, ravine, swamp and gulch.”

Consistent with the definition in the *Act* and in support of the federal *Fisheries Act*, channelized streams and some constructed ditches, such as those in floodplain areas, which provide fish habitat would also be considered streams.

3.2 What Are Fish and Wildlife Habitats?

Any proposed works in or about a stream must protect fish and wildlife habitat. The *Water Act* Regulation defines “habitat” as “the areas in and about a stream, including (a) the quantity and quality of water on which fish or wildlife depend directly or indirectly in order to carry out their life processes, and (b) spawning grounds and the nursery, rearing, food supply, and migration areas.

Remember:

- Not only the watercourse itself but also the vegetated streamside areas that provide nutrients and shade to the stream are considered fish and wildlife habitat.
- Fish habitat includes watercourses, streams, ditches, ponds and wetlands that provide water, food, or nutrients into a fish-bearing stream even if they do not contain fish or if they only have temporary or seasonal flows.

Background

- The *Water Act* also applies to those streams that may have no fish habitat, yet still meet the definition of a stream. These streams are important for the complex ecosystem functions they provide, which could include the support of amphibians and rare and endangered species.

3.3 What Are Works In or About a Stream?

Works in or about a stream are defined under Section 9 of the *Water Act* as all works proposed in or about a stream, ravine or active floodplain of a stream or its riparian or streamside area.

Such works may include:

Stream Crossings

- installation, maintenance, or removal of stream culverts for the purpose of a road, trail, or footpath;
- construction, maintenance, or removal of clear-span bridges;
- construction or maintenance of pipeline crossings;
- construction, maintenance, or removal of ice bridges or winter fords; and
- construction, maintenance, or removal of temporary, seasonal fords.

Stream Channel Maintenance

- restoration or maintenance of stream channels by the provincial government or a municipality;
- cutting of annual vegetation; and
- control of Eurasian water milfoil and other aquatic vegetation.

Stream Bank and Lakeshore Stabilization

- repair or maintenance of existing dykes or erosion protection works.

Urban Stormwater Management

- construction or maintenance of storm sewer outfalls; and
- installation or repair of drainage tile outlets.

Habitat Enhancement and Restoration

- restoration or maintenance of fish habitat by the provincial or Canadian governments.

Beaver and Beaver Dam Management

- modification or removal of beaver dams.

For More Information:

The publication *Water Management - A Users Guide to Working In and Around Water* (referred to as the "Users Guide") will provide you with more information on the WLAP's and Land and Water British Columbia (LWBC) requirements for working in and about streams and will guide you through the Ministry's regulatory instream work requirements.

<http://www.lwbc.bc.ca/03water/licencing/index.html>

Miscellaneous Works

- repairs to bridge superstructures excluding foundations;
- construction, maintenance, or removal of temporary diversions;
- construction, maintenance, or removal of docks, wharves, or piers;
- routine maintenance of public utility works;
- construction, maintenance or removal of flow or water measuring devices;
- construction or removal of fish fences, screens, or fish or game guards; and
- installation, removal, or repair of fences outside the stream channel.

Emergency Works

- construction of emergency flood protection and erosion protection works as designated under the Emergency Program Act; and
- removal of bridge obstructions during flood conditions by the provincial government or municipal staff.

Other Types of Instream Works Requiring an Approval Application Under the *Water Act*

- culvert installation for reasons other than those listed under the “Stream Crossings” section above;
- watercourse or channel realignment;
- retaining wall or bank protection installation;
- dam construction;
- dredging;
- weir construction;
- construction of a sediment sump;
- pond or lake creation;
- permanent flow diversions; and
- other significant works.

4 Why Protect Fish and Wildlife Habitats and Water Quality?

4.1 Background

Remember:

The term “stream” is used here to refer to all watercourses including lakes, ponds, rivers, wetlands, creeks, springs, swamps, ravines, and some ditches.

Do you know what effects your proposed works may have on a stream ecosystem? This section addresses the range of potential impacts your proposed works may have on riparian and aquatic ecosystems. It provides additional context for the reasons why standards and best practices apply to your works, and for why you must consider those standards and best practices before you undertake works in or around water.

An ecosystem is the dynamic and interrelated complex of plant and animal communities and their non-living environment. All parts of an ecosystem, including physical, chemical, and biological components, are interconnected – that is, they affect and are affected by all other parts. Habitat refers to the natural home of a plant or animal within an ecosystem. Aquatic habitats are those areas associated with water that provide food and shelter and other elements critical to an organism’s health and survival.

4.2 Potential Impacts of Instream Works

Healthy aquatic ecosystems are dynamic – they are always changing. Instream work carries a high risk of affecting water quality and quantity, fish and wildlife species, and riparian and aquatic habitats by altering streams and streamside (i.e., riparian) areas (Figure 1). All instream works are potentially very intrusive to aquatic and riparian ecosystems. Such works can disrupt the continuity of riparian corridors, increase flows and stream power, cause temporary or permanent loss or alteration of aquatic habitats, and result in temporary or permanent loss of riparian vegetation.

With the potential for such significant impacts on fish and wildlife populations and habitats, instream works should be avoided.



Figure 1. Works near water can significantly impact aquatic and riparian species and habitats.

4.2.1 Physical Impacts: Impacts on Stream Processes

Streams are balanced dynamic systems in which the extent and frequency of change can be easily affected by human activities. Streams need space to move and good supporting structures (i.e., stable banks) to maintain their balance (Figure 2).

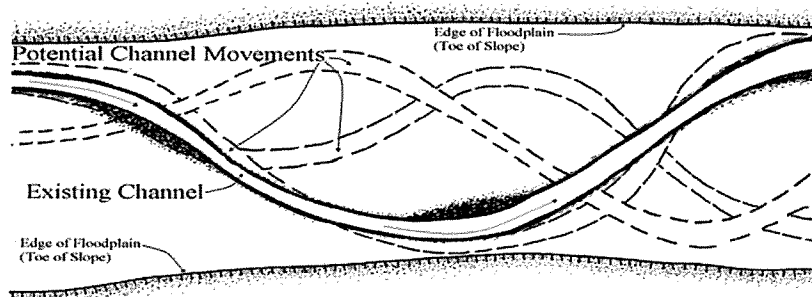


Figure 2: Natural channel migration within the active and historic floodplain of a stream

Works that damage or change the stream channel or encroach into the floodplain of a stream destroy habitats, reduce the stream capacity, and affect natural floodplain processes. Alterations made to a site's natural drainage pattern can have severe impacts on streams and nearby wetlands, causing destruction or dewatering of habitats. In addition, human development activities within the upper areas of watersheds can increase the flow and energy of surface runoff, further destroying in-channel habitats and increasing the need for erosion and flood protection works downstream.

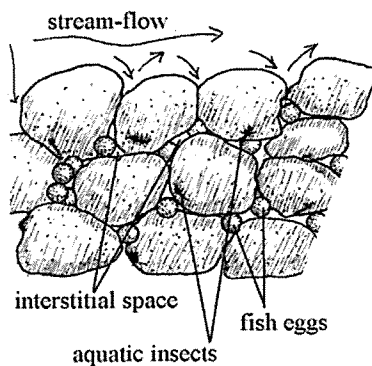
Why Protect Fish and Wildlife Habitats and Water Quality?

4.2.2 Physical and Chemical Impacts: Impacts to Habitats and Water Quality

Stream water quality can be impacted by changes made to the streambed. The porous streambed (the streambed's hyporheic zone) plays a critical role in:

- the exchange and cycling of stream waters;
- the maintenance of stream temperature regimes;
- the moderation of flow or temperature changes; and
- the provision of important habitat for stream invertebrates, juvenile fish and other aquatic life, especially during incubation, and periods of low summer or high flood flows.

Clean Streambed Gravels



Streambed Gravels In filled with Fine Sediments

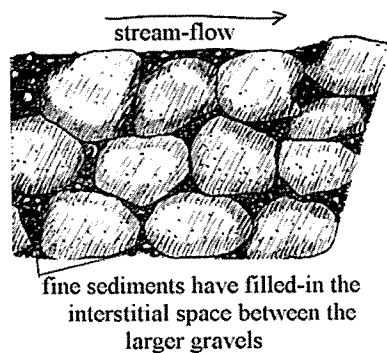


Figure 3. The impact of sediment deposition on stream flow through streambed materials.

Works within a stream often result in the release of fine sediments and other deleterious substances. Fish, aquatic wildlife, other aquatic organisms and the food they depend on, are very sensitive to habitat quality and environmental cues such as high turbidity (i.e., cloudiness in the water). They can be killed, seriously injured, or affected by changes to water chemistry and high suspended sediment levels; and, like most other animals, they prefer the most hospitable habitat available to them.

Studies have shown that the introduction of fine sediments directly from digging activity in the stream and indirectly from run-off from exposed soils has severe negative impacts on all life stages of fish and other aquatic life and their habitats. These effects include:

- Reduction of the availability and quality of aquatic habitats through the in-filling of critical types of habitats (e.g., pools and riffles, spawning habitats);
- Loss of the spaces between spawning gravels used to shelter eggs, alevin, juvenile fish, and other aquatic organisms (Figure 3);
- Impairment of the health of fish and other aquatic organisms through the clogging and abrasion of gills and smothering of eggs and juveniles;
- Reduction of water clarity and visibility which impairs the ability of aquatic life to find food, mate, and escape predators;
- Elimination of critical food items such as insects and aquatic invertebrates through smothering and loss of habitat; and
- Death of fish, amphibian, insect, and other aquatic organisms.

Discharges or spills to streams of toxic or deleterious substances like concrete or cement products, equipment oils and fuels, wood waste, chlorinated drinking water, herbicides, pesticides and even sediment can kill fish, frogs, salamanders, insects, and all other aquatic organisms outright, or alter the stream's water chemistry so severely that they eventually die. Spills in streams can be devastating. In some cases, entire

Why Protect Fish and Wildlife Habitats and Water Quality?

stream ecosystems are destroyed as organisms within the stream are killed and habitat altered so severely the area can no longer be inhabited. Several of the standards and best practices listed in this document are oriented towards the avoidance of spills.

4.2.3 Biological Impacts: Impacts to Riparian vegetation and Fish & Wildlife Populations

What does “riparian” mean?

Riparian = streamside

4.2.3.1 Riparian vegetation

Riparian vegetation is fundamental to the maintenance of healthy aquatic ecosystems. Vegetated riparian areas play critical roles in:

- providing woody debris that contributes to channel complexity and maintains microclimate conditions;
- buffering the effects on water quality of flow changes, such as increases in stream power and erosion, and changes in water temperature;
- buffering streams from sedimentation and pollution in surface runoff;
- contributing food and nutrients in the form of insects and organic litter fall;
- stabilizing soils through root matrices; and
- providing shade and cover to control temperature and manage predation.

Riparian areas also maintain critical aquatic and terrestrial wildlife habitats adjacent to the stream. Many of British Columbia’s animal species use riparian zones. These habitats provide higher complexity and structural diversity of vegetation and wildlife than any found in upland areas (Figure 4).

Why Protect Fish and Wildlife Habitats and Water Quality?

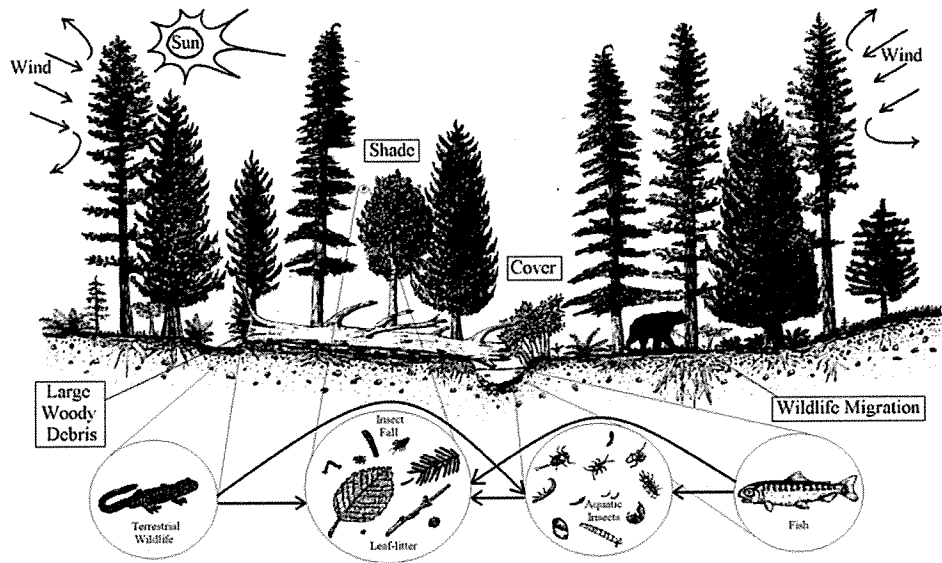


Figure 4: The primary riparian zone functions of a typical coastal stream in southwest British Columbia.



Figure 5. Changes in stream conditions can result in barriers to fish or wildlife passage

4.2.3.2 Fish and Wildlife Migration

An additional impact of instream works on aquatic habitat is the potential to form a total or partial barrier to fish or wildlife migration or movement. Instream structures or changes to the stream channel may alter flow velocities or depths. Fish migration occurs in response to a variety of needs including, but not limited to spawning, rearing, feeding, escaping too high or too low stream flow conditions, escaping poor quality or polluted waters, and escaping predators. Section 20(1) of the federal *Fisheries Act* requires fish passage to be maintained. Figure 5 illustrates one type of barrier to fish passage.

As well as providing valuable fish habitat, non-fragmented riparian areas provide critical migratory habitats for terrestrial wildlife, amphibians, and birds. Migratory bird abundance and diversity are generally greater in riparian areas, and small mammal communities tend to be more diverse along streams than other habitat types. Large mammals, such as deer and bears, use riparian areas as migratory corridors to search for food and mates, and to travel to breeding areas or between summer and winter ranges. Interruption of these migration corridors (Figure 6) reduces habitat function and value and may cause greater human-wildlife conflict and reduced wildlife survival.

Most amphibians and some reptiles migrate to specialized aquatic areas to reproduce and many spend much of their lives in riparian areas. Shoreline works in particular can have significant impacts on the habitats and migration routes used by these species. Lakeshore stabilization works can create vertical barriers to amphibian and reptile movement, and may disturb the foreshore habitats required for breeding.

Why Protect Fish and Wildlife Habitats and Water Quality?

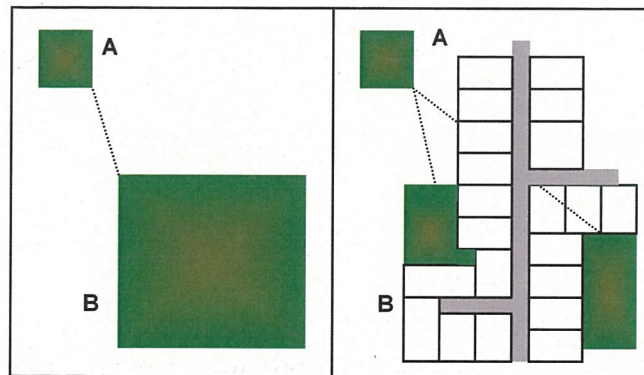


Figure 6. Patch A has become more isolated from the remnants of Patch B, after Patch B is fragmented by development and road construction. This limits movement between A and B for some species of wildlife.

4.2.3.3 Species at risk

Many of British Columbia's species at risk are supported by riparian and aquatic habitats. These include, but are not limited to:

- Painted Turtle (lakeshore habitat)
- Pacific Water Shrew (riparian forest habitat)
- Toothcup plant (lakeshore habitat)
- Behr's (Columbia) Hairstreak butterfly (dry riparian areas)
- Nooksack Dace (fast-flowing small streams)
- Arctic Grayling – (Williston Watershed Population)
- Bull Trout (streams and large rivers)
- Coastal Giant Salamander (streams and riparian habitat)
- Oregon Spotted Frog (shallow wetlands and marsh habitat)
- White Sturgeon (large river systems)
- Great Basin Spadefoot Toad (ponds within dry grassland habitat)

What is Critical habitat?

Critical habitat is defined under the *Species At Risk Act*. It includes high value spawning, rearing, or nesting habitat, as well as habitat critical to the maintenance of local populations of a species because of its rareness, productivity, or sensitivity. Impacts to critical habitat areas **must** be avoided.

Impacts of any degree on the habitat of threatened or endangered species can have catastrophic effects on species survival and should be avoided at all times. For some species at risk, there is no “window of least risk” during which instream works may be permitted. The risk of harm to the plant or animal remains high at all times.

Before planning any instream works, you should contact your local WLAP office for assessment and window information. You should also review the following website for further information on species at risk: <http://srmwww.gov.bc.ca/atrisk/>. In addition, the “Species Explorer” at <http://srmwww.gov.bc.ca/atrisk/toolintro.html> can help you identify which species at risk may be in your area. The legislation guiding the protection of species at risk, the federal *Species At Risk Act*, is detailed in the following section.

Mitigate =
To lessen or reduce

5 Legal Requirements: How Are My Works Regulated?

Under British Columbia's *Water Act*, anyone proposing to carry out instream works must submit either a Notification or application for Approval to WLAP, LWBC, or both.

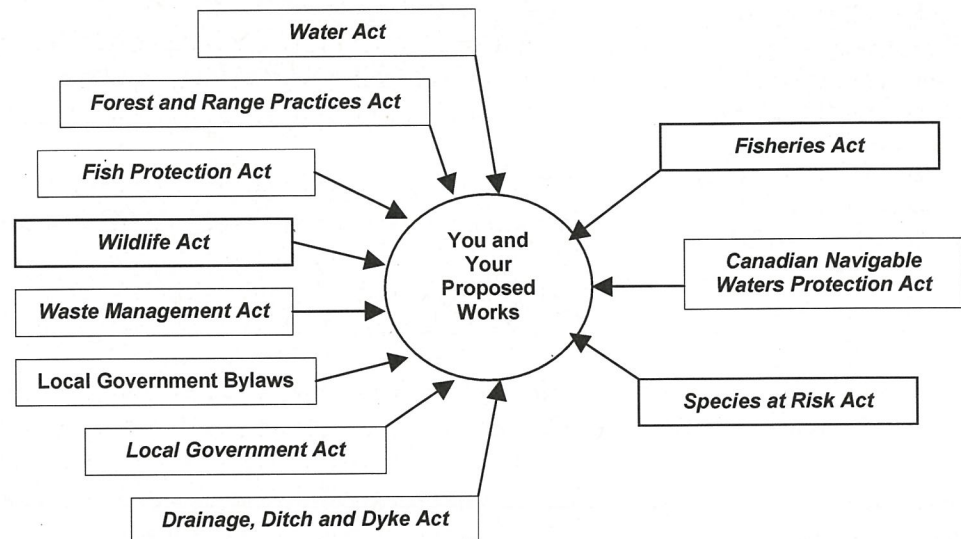
Important to note, however, is that works conducted under the authority of the *Forest and Ranges Practices Act*, *Forest Practices Code of British Columbia Act*, the *Mines Act*, or a regulation made under any of those Acts, **do not** require Notification or application for Approval under the *Water Act*.

5.1 Legal Requirements for Instream Works

Acts and regulations exist at the provincial and federal levels to protect fish and wildlife species and habitats, as well as water quality and quantity (Figure 7). Municipalities and regional districts may also have local bylaws that amplify provincial or federal legislation for working in or near water. What applies to your proposed instream works?

Several pieces of legislation are undergoing review. Information on any changes can be obtained from provincial and federal websites:

<http://www.gov.bc.ca/>
<http://canada.gc.ca/>



**Legal Requirements:
How Are My Works Regulated?**

This section summarizes the main pieces legislation you should know about. If you have a question or concern about these and how they affect your activity or project, contact your regional Ministry, DFO, or local government offices.

Due diligence

It is your responsibility when working in and around water to:

1. be familiar with the municipal, provincial, and federal legal requirements;
2. recognize and address the potential impacts to aquatic and riparian habitats, water quality and quantity, fish and wildlife populations, and public safety and property from your proposed works;
3. recognize and address the need to avoid, mitigate or lessen those impacts or risks;
4. ensure the protection of fish and wildlife populations and their habitats, including species at risk;
5. ensure the protection of properties and human health;
6. obtain the appropriate permits and authorizations from all regulatory agencies before proceeding with activities; and
7. conduct your works in a manner that complies with the law and avoids, mitigates or lessens potential impacts to aquatic and riparian habitats, water quality and quantity, fish and wildlife populations, and public safety and property.

5.1.1 Provincial Legislation

Various pieces of provincial legislation regulate activities related to instream works. The most pertinent Acts and regulations are described below.

5.1.1.1 Water Act

For full text of this legislation, visit:

http://www.qp.gov.bc.ca/statreg/stat/W/96483_01.htm

The *Water Act* is the main provincial statute regulating water resources in British Columbia. Under the Act, it is an offence to divert or use water, or alter a stream, without formal approval from the Province.

Section 9 of the *Water Act* regulates changes in or about a stream. Under this section, the “*Water Act* Regulation” ensures that water quality, riparian habitat, and the rights of licensed water users are not compromised. In 1998, the Regulation was amended to include certain

**Legal Requirements:
How Are My Works Regulated?**

activities that could be undertaken in compliance with the Regulation rather than under the authority of an Approval.

Under the original Regulation, many works could only be permitted if a proponent obtained a formal Approval or licence. Now, under the amended Regulation, you may carry out a number of routine works, provided that the general conditions and notification requirements are met.

**Key sections of the
Water Act:**

- **Section 1:** definitions and terms;
- **Sections 5&6:** lists the rights acquired under a water license;
- **Section 7:** lists who may acquire a water license;
- **Section 8:** allows short term approvals (water use less than 12 months);
- **Section 9:** allows approvals for changes in and about a stream; these must also meet with DFO approval under the federal *Fisheries Act*;
- **Sections 10-50:** outline license applications, rights, administrative concerns, rights of appeal, and offences.

Part 7 of the *Water Act* Regulation is entitled “Changes in and about a stream”. It includes sections that: permit the use of notifications rather than approvals for certain types of works; contain provisions for the protection of water quality, habitat, and other water users; and authorize changes to streams. Formal approvals are required in cases involving more complex works and for the short-term use, storage or diversion of water.

If your work involves making a change in and about a stream, your work cannot proceed unless it is:

- compliant with the requirements of the *Water Act*, and
- authorized by an approval, licence, or order under Section 9 of the *Water Act* from LWBC or
- authorized through a Notification to WLAP as permitted by Part 7 of the *Water Act* Regulation.

Activities That May Be Carried Out Under the Regulation

In general, works that do not involve any diversion of water, that may be completed within a short period of time, and that have little impact on the environment may be conducted in compliance with the Regulation, and without a permit, through the Notification process. Refer to the Regulation for a detailed list of such types of works. Some examples of works allowed under the Notification process include:

- installation of a clear-span bridge stream crossing;
- installation or repair of a pier or wharf;
- replacement and maintenance of culverts and outfalls;
- temporary stream diversions around a worksite; and
- minor maintenance of municipal utilities.

Keep in mind that all such activities must adhere to general standards and best practices and a Notification must still be submitted to WLAP. You must also follow any conditions set out by a Habitat Officer with regard to timing of the work, maintenance of minimum flow, salvage of fish or wildlife, protection of vegetation, and site restoration. Note that DFO may also have special requirements under Section 35 of the *Fisheries Act* (see Section 5.1.2 below).

Fines and Penalties Under the Water Act

A person who commits an offence under the *Water Act* may be liable on conviction to a fine of between \$200,000 per offence per day (up to \$1,000,000 per offence per day) or to imprisonment not exceeding 12 months, or to both. The *Water Act* also allows for creative sentencing: courts may require a convicted party to take action to remedy damage done, or to engage in an activity to prevent the repeat of the offence, such as paying for compensation, performing community service, or paying a bond to ensure compliance.

Streamside Protection Regulation

The Streamside Protection Regulation provides local governments with an improved planning approach to streamside protection. The science-based regulation attempts to find the best possible balance among fish protection, land development potential and other community values. Local governments will be given the flexibility to implement the directives in a manner that takes into account capacity issues, local values, settlement patterns and stream conditions. They will also be able to develop their own streamside protection measures, provided that these measures are comparable to the directives. The regulation is currently under review.

For more information, refer to the following website:
http://wlapwww.gov.bc.ca/habitat/fish_protection_act/streamside_protection/streamside_protection.html

5.1.1.2 Fish Protection Act

For full text of this legislation, visit:

http://wlapwww.gov.bc.ca/habitat/fish_protection_act/

The *Fish Protection Act* was passed in 1997 in British Columbia and is part of the provincial Fisheries Strategy. It focuses on four major objectives:

1. ensuring sufficient water for fish;
2. protecting and restoring fish habitat;
3. improving riparian protection and enhancement; and
4. strengthening local government powers in environmental planning.

The Act is not yet fully enforced, but several components could potentially affect your construction and maintenance activities if you live in an urban area. Those components include:

- the *Streamside Protection Regulation*, which protects riparian areas threatened by urban development;
- rules that prohibit the introduction into streams of debris that will be harmful to fish; and
- new water allocation rules for streams that are not designated as “sensitive streams” under the *Act*.

The *Fish Protection Act* provides protection to fish and fish habitat by:

- prohibiting stream-blocking dams on major rivers;
- mandating the consideration of fish habitat issues in dealing with applications under the *Water Act*;
- establishing special rules in relation to water licences on streams designated as being particularly sensitive to impact on fish and fish habitat and providing for the development of recovery plans for such streams, and
- allowing the provincial government to establish directives for local governments in preserving streamside areas (e.g., the Streamside Protection Regulation which is currently under review).

**Legal Requirements:
How Are My Works Regulated?**

How does the *Fish Protection Act* affect the *Water Act*?

The *Fish Protection Act*, passed in 1997, has made significant changes to the *Water Act*. Key sections include:

- **Section 22.1-22.4:** water management areas and plans;
- **Section 40.1:** prohibiting introducing debris into a stream or area adjacent to a stream that may harm or damage the stream, stream channel, property or riparian owners, fish or fish habitat; and
- **Section 40.2:** allows for remediation orders for mitigation of effects of introduced debris.

The *Fish Protection Act* also contains amendments to several other pieces of provincial legislation, including the *Water Act*, *Wildlife Act*, and *Waste Management Act*.

Those amendments related to the *Water Act* include:

- establishing a public process for the development of water management plans to guide future government decision making;
- providing additional water use regulation authority to provide greater flexibility in ensuring water in streams at the time it is required for fish;
- expanding the definition of materials constituting debris and allowing remediation if such deposit occurs; and
- providing additional enforcement authority, including allowing creative sentencing as under the proposed *Waste Management Act* amendments and establishing higher penalties for offences related to fish, and fish habit.

Those amendments related to the *Wildlife Act* (see below) allow endangered or threatened species protection to be provided regardless of whether the cause of the extinction threat is human in origin, and allow this protection to be extended to invertebrates and plants that are factors in fish habitat.

Those amendments related to the *Waste Management Act* (see below) provide additional enforcement authority, including allowing courts to use creative sentencing to establish additional penalties (such as remediation, mitigation, or community service) that the court considers appropriate to the nature of the offence.

Fines and Penalties Under the *Fish Protection Act*

There are no direct fines and penalties under the *Fish Protection Act*. However, by not complying with the Act and its associated regulations, you risk committing an offence under the *Waste Management Act*, the *Water Act*, the *Wildlife Act*, or other legislation.

5.1.1.3 *Wildlife Act*

For full text of this legislation, visit:

http://www.qp.gov.bc.ca/statreg/stat/W/96488_01.htm

The provincial *Wildlife Act* protects wildlife and wildlife habitat in British Columbia. The main legal tool that permits special privileges under the *Wildlife Act* is the Wildlife Permit Regulation, revised in 2000.

Under this new Wildlife Permit Regulation, two types of permits may be granted: authorization permits and exemption permits. An exemption permit is required by anyone wishing to destroy a beaver dam or muskrat

den. Some of the sections of the Act most applicable to instream works are detailed below:

**Wildlife Act
Definitions:**

- **Fish:** bony fishes, lampreys, crustaceans, or molluscs, from or in non-tidal waters of B.C., including their eggs and juvenile stages.

Section 9: Damaging beaver dams

- (1) A person commits an offence if the person disturbs, molests or destroys
 - (a) a muskrat house or den, except on dyked land, or
 - (b) a beaver house or den or beaver dam.
- (2) Subsection (1) does not apply
 - (a) to a licensed trapper,
 - (b) if the action is taken to provide irrigation or drainage under lawful authority for the protection of property, or
 - (c) if the action is authorized by regulation.

The Act also enforces the protection of bird nest sites. Section 34 of the Act states that it is an offence to destroy nests occupied by a bird, its eggs, or its young.

Section 34: Birds, nests and eggs

- A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys
- (a) a bird or its egg,
 - (b) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or
 - (c) the nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg.

Clearing should not occur during critical bird-nesting periods, which typically occur in spring and summer. Contact your local WLAP office to obtain the vegetation clearing timing windows for your region.

The Act also protects the nests of herons, owls, vultures, eagles, falcons, and hawks in perpetuity. Before you undertake any clearing work, Ministry staff may require you to obtain professional assistance in completing a field survey to determine that no nesting birds are present.

Section 6: Endangered and threatened species

- (1) If the Lieutenant Governor in Council considers that a species of wildlife is threatened with imminent extinction throughout all or a significant portion of its range in British Columbia because of the action of humans, the Lieutenant Governor in Council may, by regulation, designate the species as an **endangered species**.
- (2) If the Lieutenant Governor in Council considers that a species of wildlife is likely to become endangered in British Columbia if the factors affecting its vulnerability are not reversed, the Lieutenant Governor in Council may, by regulation, designate the species as a **threatened species**.

**Legal Requirements:
How Are My Works Regulated?**

Fines and Penalties Under the *Wildlife Act*

Convictions under the *Wildlife Act* may lead to a fine of between \$1,000 and \$100,000, or a term of imprisonment not exceeding one year, or both.

5.1.1.4 Drainage, Ditch and Dike Act & Dike Maintenance Act

For full text of these legislations, visit:

http://www.qp.gov.bc.ca/statreg/stat/D/96102_01.htm &

http://www.qp.gov.bc.ca/statreg/stat/D/96095_01.htm.

These provincial Acts establish a system for the regulation and authorization of ditches, watercourses, drainages, and dikes in British Columbia. If your work involves the diversion, storage, use or delivery of water, you must apply under the *Water Act* for Approval and a water licence. For further information, contact LWBC at <http://lwbc.bc.ca>.

For information on dike construction and maintenance visit :

<http://wlapwww.gov.bc.ca/wat/flood/> or

<http://wlapwww.gov.bc.ca/wat/flood/structural.html>., or contact your regional WLAP office.

5.1.1.5 Waste Management Act

For full text of this legislation, visit:

http://www.qp.gov.bc.ca/statreg/stat/W/96482_01.htm

This provincial Act protects the quality of air, land and water by regulating the discharge or emission of effluent, waste or contaminants. The Act includes restrictions regarding solid and toxic wastes and contains spill-reporting requirements for certain substances. The Agricultural Waste Management Regulation falls under this Act and regulates the storage, use, and disposal of agricultural wastes. All spills of reportable quantities of substances toxic, polluting or deleterious to aquatic life must be reported to the Provincial Emergency Program 24 hour phone line at 1-800-663-3456.

5.1.1.6 Forest Practices Code of British Columbia Act/Forest and Range Practices Act

For full text of this legislation, visit:

http://www.qp.gov.bc.ca/statreg/stat/F/96159_00.htm

The *Forest Practices Code of British Columbia Act* and its replacement, the *Forest and Range Practices Act* govern forestry-related activities. Guidance for working in or about water in compliance with these Acts is provided in the *Fish Stream Crossing Guidebook*, *Riparian Management Area Guidebook*, and other guidebooks. Instream works conducted under the authority of this Act or a regulation made under the Act, do not require *Water Act* referral or notification. For more information on the new *Forest and Range Practices Act*, visit: <http://www.for.gov.bc.ca/code/>

Important sections of the Fisheries Act that are relevant to instream works:

Subsection 34 (1): defines “deleterious substance” as *any substance that, if added to any water, would degrade or alter...the quality of that water so that it is rendered or is likely rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water.*

Section 35 (1): No person shall cause Harmful Alteration, Disruption or Destruction (HADD) of fish habitat, either by direct or indirect means.

Section 36(3): No person shall deposit deleterious substances in any type of water frequented by fish or in any place under any conditions where the deleterious substance may enter any such water.

Subsection 37(1): Requires approval for work that may impact fish habitat. If any work is carried out which is likely to result in HADD, you must submit development plans to DFO for approval or authorization

5.1.1.7 Oil and Gas Commission Act

For full text of this legislation, visit:

http://www.qp.gov.bc.ca/statreg/stat/O/98039_01.htm

This provincial Act governs activities related to the search, exploration, production, gathering, processing and storage of petroleum and natural gas. Under this Act, the Oil and Gas Commission takes on some of the responsibility normally vested in other Acts (e.g., the *Water Act*, the *Forest and Range Practices Act*) for works such as road and stream crossing construction for oil- and gas-related projects. For some works, the Oil and Gas Commission may issue a permit or Approval. To obtain more information, visit the commission’s website: <http://www.ogc.gov.bc.ca/>

5.1.1.8 Local Government Act (formerly the Municipal Act)

For full text of this legislation, visit:

http://www.qp.gov.bc.ca/statreg/stat/L/96323_00.htm

Under the *Local Government Act*, local governments may enact their own bylaws for such matters as sediment control, erosion protection, wastewater discharge, watercourse protection, drainage, and tree retention. Local bylaws may amplify federal or provincial legislation for working in or near water. Contact your local municipality or regional district to find out which bylaws may apply to your proposed works.

5.1.2 Federal Legislation

5.1.2.1 Fisheries Act

For full text of this legislation, visit: <http://laws.justice.gc.ca/en/F-14/>

The *Fisheries Act* is the main federal Act affecting all fish, fish habitat, and water quality. Anytime your activity has the potential to deposit a “deleterious substance” or if you are seeking a permit to destroy or alter fish habitat, the *Fisheries Act* is invoked.

Under this Act, the term fish refers to “all fish, shellfish, crustaceans and marine animals, and the eggs, spawn, spat and juvenile stages of fish, shellfish, crustaceans, and marine animals”. Fish habitat is defined as “spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.”

The Act is administered federally by the Fisheries and Oceans Canada (DFO) and Environment Canada and provincially by the Ministry of Water, Land, and Air Protection. Depending on the area of the province, water quality concerns may be addressed by either Environment Canada or DFO through Section 36 of the Act, or by WLAP through the *Waste Management Act*.

Some works require only that you inform DFO; others require a Section 35(2) Authorization from DFO. Contact DFO to determine whether

**Legal Requirements:
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The **Council on the Status of Endangered Wildlife in Canada (COSEWIC)** is given legal status under *SARA*. They have the responsibility to conduct the assessment of species and produce a list of threatened or endangered species. The federal government then formulates recovery strategies and action plans for the protection of these species.

Over the last 22 years, COSEWIC has classified 340 species in Canada as being at risk. This means they are extinct, extirpated (no longer in the wild in Canada but existing in the wild elsewhere), endangered, threatened or vulnerable.

Examples of a few of the federally designated species at risk found in BC:

Coastal Giant Salamander, Dun Skipper butterfly, Coast Basin Spadefoot Toad, and Pacific Water Shrew.

your works will require the latter. DFO may also require you to retain the services of an appropriately qualified professional to provide advice should your project have the potential to harm fish or fish habitat.

Fisheries Act approvals will include application of the Federal Policy for the Management of Fish Habitat's Guiding Principle of "no net loss of productive capacity of habitat" achieved through habitat protection, enhancement, and compensation. For more information, visit: http://www.ncr.dfo.ca/canwaters-eauxcan/infocentre/legislation-lois/policies/fhm-policy/index_e.asp

Fines and Penalties Under the Fisheries Act

Convictions under the *Fisheries Act* may be divided into Summary convictions and indictable offences. Summary convictions can result in fines up to \$100,000 per offence per day or up to one year of imprisonment. Indictable offences can result in fines up to \$500,000 per offence per day or up to two years of imprisonment, or both. Courts may also engage in what is known as "creative sentencing," whereby a convicted party could be required to take action to remedy damage done, or to engage in an activity to prevent the repeat of the offence, such as paying for compensation, performing community service, or payment of a bond to ensure compliance.

5.1.2.2 Species at Risk Act (SARA)

For full text of this legislation, visit:

http://www.ec.gc.ca/press/000411_b_e.htm

http://www.parl.gc.ca/37/2/parlbus/chambus/house/bills/government/C-5/C-5_3/C-5TOCE.html

The federal *Species At Risk Act* (SARA) was enacted on October 9, 2002 and aims to protect wildlife at risk from becoming extinct or lost from the wild. The ultimate objective of *SARA* is to help wildlife numbers to recover. *SARA* prohibits the killing, harming, harassing, capturing, or taking of species officially listed as threatened, endangered or extirpated, and the destruction of their residences or critical habitats. *SARA* covers birds, plants, fish, mammals, invertebrates, amphibians, and reptiles. *SARA* seeks to manage species of special concern to prevent them from becoming endangered or threatened. Compensation for loss of land use is also available in extraordinary circumstances.

This Act recognizes that the primary threat to species is the destruction or degradation of their habitat. The Act encourages the protection of habitat through conservation and voluntary measures.

The Act also contains what is referred to as the "safety net," which, through federal intervention, could protect individuals and critical habitats or regulate land use.

How Will the *Species At Risk Act* Affect My Instream Work?

SARA complements the work done by provincial and territorial governments under the Accord for the Protection of Species at Risk. This recognizes that species protection is a shared responsibility. Under *SARA*, you may need to apply for a permit to engage in an activity that will affect a species listed by COSEWIC, or the habitat of any species listed by COSEWIC.

For more information on species at risk in the Province of British Columbia, refer to the following provincial websites:

<http://srmwww.gov.bc.ca/atrisk/>, and
<http://srmwww.gov.bc.ca/cdc/>

If you determine, through doing an environmental assessment of your project, that a listed wildlife species will be negatively affected, the federal government may require that you notify them. In general, Environment Canada is responsible for overall administration of the Act, except when the Act gives responsibility to either Fisheries and Oceans Canada or Parks Canada.

A number of other laws and agreements currently in force stand beside this Act to assist with habitat protection and the protection of species at risk. These include the *Fisheries Act*, the *Migratory Birds Convention Act*, the *National Parks Act*, the *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act*, the *Convention on International Trade in Endangered Species* and the *Canada Wildlife Act*.

Fines and Penalties Under the *Species At Risk Act*

Convictions under *SARA* can result in fines up to a range of \$50,000 to \$1,000,000 and up to a five-year term of imprisonment.

5.1.2.3 *Navigable Waters Protection Act*

For full text of this legislation, visit:

<http://laws.justice.gc.ca/en/N-22/text.html>

The *Navigable Waters Protection Act* of Canada regulates any activity in, around, under, and over navigable waters, and is administered by the Canadian Coast Guard of the DFO. Navigable waters are defined as including any body of water capable of being navigated by any type of floating vessel for the purpose of transportation, recreation, or commerce.

Authorization under this Act is required for new and replacement stream crossing works on navigable waters, as well as for works on navigable waters that would occur below the high-water mark, such as dredging, channel maintenance, and streambank protection.

How Will the *Navigable Waters Protection Act* Affect My Instream Work?

The design of your works must not hinder appropriate navigation of navigable waters. Usually works that are regulated under the *Navigable Water Protection Act* are also those that may result in a HADD under the *Fisheries Act*. When planning such works, you are required to provide

**Legal Requirements:
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project information to DFO and enter into the DFO Review process as described in Section 5.6. For more information on the specific Approval process under the *Navigable Waters Protection Act*, visit: http://www.ccg-gcc.gc.ca/cen-arc/nwp-pen/client/index_e.htm

Fines and Penalties Under the Navigable Waters Protection Act

Convictions under the *Navigable Water Protection Act* can result in fines up to \$5,000 and/or a term of imprisonment of up to 6 months. If works are carried out without approval under the *Act*, you may also be responsible for the costs related to removal of the works and rehabilitation of the site.

5.1.3 Local Government Legislation

Local governments throughout the province have put in place various restrictions and bylaws for such things as sediment control, erosion protection, wastewater discharge, watercourse protection, drainage, and tree retention, which may also affect your proposed works. It is your responsibility to contact your local municipality or regional district to find out which local bylaws may apply to your proposed works.

**5.2 When Will I Need to Submit a
Water Act Notification?**

If your works are listed in the first eight categories itemized in Section 3.3 of this document, Part 7 of the *Water Act* Regulation authorizes you to construct your works and to complete other specified changes in and about a stream to an acceptable standard following the submission of a Notification to WLAP.

If your planned works fall into the category “Other Types of Instream Works,” you must obtain a formal Approval or license from LWBC, through the *Water Act* Approval process. This type of work, in addition to requiring an Approval under the *Water Act*, will likely require the involvement and approval of federal regulatory agencies such as DFO.

The Notification process requires that you give WLAP at least 45 days notification prior to starting your planned activities. Ministry staff may provide, within the 45-day period, information further to that contained in this document regarding timing windows and other conditions for work to protect aquatic resources, species, and habitats.

If the standards and best practices listed in this document are followed, the following changes in and about a stream may be carried out:

1. **With notification at least 45 days** prior to:
 - modification or installation of a stream culvert for the purpose of a road, trail, or footpath;

**Legal Requirements:
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- modification or installation of a clear-span bridge;
- modification or installation of a pipeline crossing;
- modification or installation of a pier or wharf;
- modification or installation of a flow or water measuring device by the British Columbia or Canadian governments;
- modification or installation of a fish fence, screen or game guard by the British Columbia or Canadian governments;
- restoration of a stream channel by the British Columbia Government or a municipality;
- cutting of annual vegetation;
- restoration of fish habitat by the British Columbia or Canadian governments;
- repair of an existing dyke or erosion control works;
- modification or installation of a storm sewer outfall;
- control of aquatic vegetation;
- modification or installation of an ice bridge or winter ford;
- minor and routine maintenance of public utility works; and
- modification or removal of a beaver dam.

2. **Without** pre-notification, but requires reporting/ notification within **72 hours** following works:

- erosion or flood protection works during an emergency flood event as designated under the *Emergency Protection Act*; and
- clearing of an obstruction from a bridge or culvert by the British Columbian government or municipality during an emergency flood event.

3. **Without** Notification:

- installation or cleaning of drain tile outlets;
- repair of bridge superstructure (excluding foundations); and
- repair, removal, or construction of fences not in the stream channel.

5.3 When Will I Need to Submit an Application for a *Water Act* Approval?

You are required to submit an Approval application to LWBC under Section 9 of the *Water Act* if you are planning any of the following works:

- changes or construction activities not listed above as being permitted under the Notification process

**Legal Requirements:
How Are My Works Regulated?**

- works that are listed above but are large or significant in scope
- works that have increased potential impacts due to habitat or species sensitivities or risks

It is important to note that LWBC manages the Approval application process. The Approval application process requires you to provide all habitat assessments, designs, and plans for the works needed to determine the affects of the proposal on the legal rights of downstream water licensees, channel stability, flood levels, and fish and wildlife

Remember:

Failure to obtain an Approval, provide Notification, meet the conditions in an Approval, or meet the standards or requirements under the *Water Act* Regulation would be considered non-compliance with the *Water Act* and could result in significant penalties including imprisonment, pursuant to the Act.

resource values.

Before you begin your proposed works, you must have received an Approval document from staff at LWBC.

5.4 How Do I Submit My Notification or Application for Approval?

To submit a Notification or and application for an Approval under the *Water Act*, follow the steps outline below (Figure 8).

Step 1:

Review the [Potential Impacts of Instream Works](#) section of this document to familiarize yourself with potential impacts that may arise from your proposed works;

Step 2:

Review your legal obligations in the [Legal Requirements](#) section of this document;

Step 3:

Plan your works to comply with the standards and recommended best practices detailed in the [Standards and Best Practices](#) section of this document; and

**Legal Requirements:
How Are My Works Regulated?**

Step 4:

Determine whether your works will require a Notification to WLAP or an application to LWBC for an Approval under the *Water Act*;

Step 5:

Submit a Notification to your regional WLAP Office using the outline provided in Section 10.2, at least 45 days prior to the start date of your proposed works; or contact your regional LWBC Service Centre for information on submitting an application for an Approval under the *Water Act*. LWBC Service Centre contact information is found in Section 10.1 of this document.

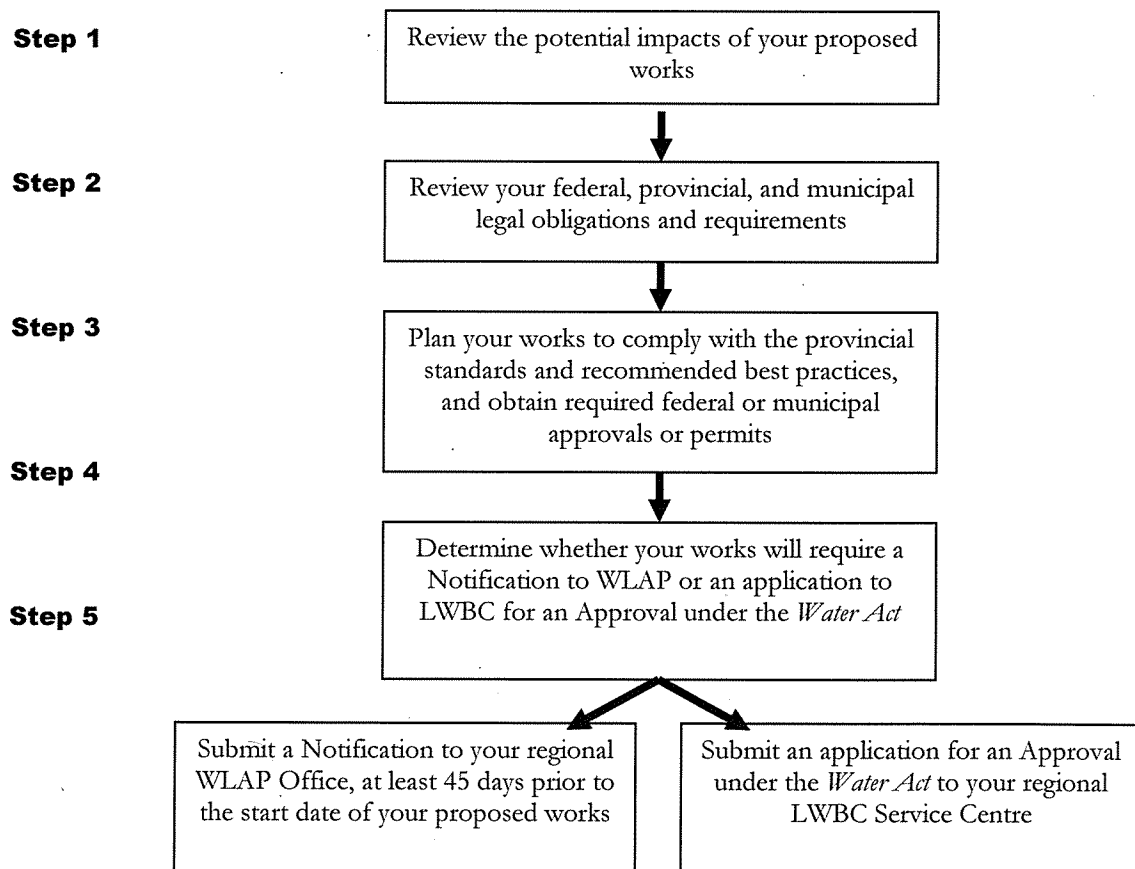


Figure 8. Provincial (WLAP and LWBC) review process.

5.5 What If My Works Are Related to Forestry, Range, Oil and Gas, or Mining Practices?

If your instream works are related to Forest, Range, Oil and Gas or Mining practices, you are **not** required to submit a Notification or apply for an Approval under the Water Act. Instream works conducted under the authority of the *Forest and Ranges Practices Act*, *Forest Practices Code of British Columbia Act*, the *Mines Act*, *Oil and Gas Commission Act* or a regulation made under any of those Acts, do not require *Water Act* referral or Notification.

If your proposed works in or about a stream are related to forestry or range practices, refer to the *Forest and Range Practices Act* and *Forest Practices Code Act of British Columbia* website for standards and best practices which apply to your works: <http://www.for.gov.bc.ca/code>

For guidance on stream crossing works for forestry and mineral or petroleum access roads, refer to the Forest Practices Code, *Fish-stream Crossing Guidebook*, March 2002, or its' equivalent. The document is available at the following website:
<http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/FishStreamCrossing/FSCGdBk.pdf>

Several other *Forest and Range Practices Act* and *Forest Practices Code* documents provide standards and best practices for works related to forestry, and the mining and oil and gas industries. Refer to the above website for links to these documents.

For more information on mining activities, refer to:
http://www.qp.gov.bc.ca/statreg/stat/M/96293_01.htm

The British Columbia Oil and Gas Commission may also issue permits and approvals for instream works related to the Oil and Gas industry. Refer to the following website for more information:
<http://www.ogc.gov.bc.ca/>

5.6 How Is Fisheries and Oceans Canada Involved?

As outlined in Section 5.1 of this document, Fisheries and Oceans Canada (DFO) has ultimate authority over fish habitat through the *Fisheries Act*. Section 35 of the Act protects fish habitat. Subsection 35(2) also contains provisions for DFO to authorize works where the harmful alteration, disruption or destruction (HADD) of fish habitat is expected. **Proposed works that result in a HADD can only proceed after an Authorization under Subsection 35(2) of the Fisheries Act**

has been issued in addition to a *Water Act* Notification or Approval.

How Can I Avoid a HADD?

The *Decision Framework for the Determination and Authorization of HADD of Fish habitat* (1998) describes DFO's approach to reviewing requests for Subsection 35(2) *Fisheries Act* Authorizations. These Authorizations are only required where harm to fish habitat is expected. Instream works can usually avoid a HADD of fish habitat if the work spans the stream or can be undertaken without:

- disturbing instream fish habitat;
- encroaching within the stream channel or active floodplain; or
- causing excessive, avoidable or irreplaceable loss of riparian vegetation.

DFO has outlined the following habitat management options that should be considered in the design of your works (Figure 9).

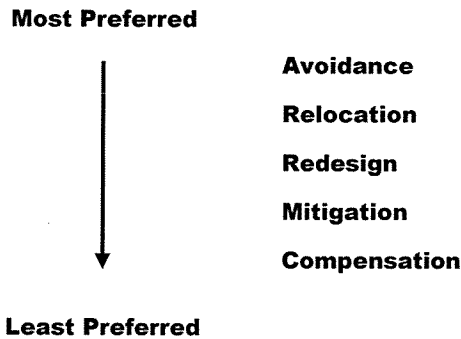


Figure 9. DFO habitat management options

DFO Contact Information

is provided in Section 10.1 at the end of this document.

From this figure it should be clear that your works should be planned and designed to avoid causing a HADD, if possible. Options, such as the relocation or redesign of your works to avoid a HADD, should be considered. In certain circumstances, harm to fish habitat may be unavoidable despite relocation, redesign or mitigation. In these circumstances, DFO will require compensation for loss of fish habitat consistent with the DFO Policy for the Management of Fish Habitat (“No-Net-Loss” Policy).

DFO Habitat Classifications

In the consideration of applications for Subsection 35(2) Authorizations, the DFO review will focus on the value and sensitivity of fish habitat potentially affected. All fish habitats contribute to the productivity of fish

**Legal Requirements:
How Are My Works Regulated?**

populations. Even in situations where fish cannot access a stream section because of a waterfall or other barrier, this section can still benefit fish production indirectly through food production and other factors. Therefore, any reduction in the quantity or quality of fish habitat may reduce fish productivity. Some habitat types make a greater contribution to fish productivity than others and are treated differently by DFO in their authorization of different types of works.

The following habitat classifications are used in the DFO review process. Please note that the indicators described in the habitat classifications are highly generalized and require regional interpretation. Those involved in conducting habitat assessments should contact their regional DFO office.

**What does
Appropriately
Qualified Professional
mean?**

Appropriately qualified professional means an applied scientist or technologist specializing in a relevant applied science or technology including, but not necessarily limited to, agronomy, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and

- a) who is registered in British Columbia with their appropriate professional organization, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and these links:
- b) who, through oy.bc.ca, demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.

- **Critical Fish habitat:** Habitat that is critical in sustaining a subsistence, commercial, or recreational fishery, or fish species at risk (provincially red- and blue-listed or listed by COSEWIC because of its relative rareness, productivity, or sensitivity). Indicators of critical fish habitat include the presence of high-value spawning and rearing habitat, which are critical to the fish population present (e.g., for salmon and some trout, locations with an abundance of suitably sized spawning gravels, deep pools, undercut banks, or stable debris).
- **Important fish habitat:** Habitat that is used by fish for feeding, growth, and migration, but is not deemed to be critical. This category of habitat usually contains a large amount of similar habitat that is readily available to the population. Indicators of important fish habitat include important migration corridors, or the presence of suitable spawning and rearing habitat for the fish species present.
- **Marginal fish habitat:** Habitat that has low productive capacity and contributes marginally to fish production. Indicators of marginal fish habitat include the absence of suitable spawning habitat or rearing habitat for the fish species present (e.g., for salmon and some trout, locations without suitable sized gravels, deep pools, undercut banks, or stable debris).

The HADD of **critical fish habitat** is generally unacceptable and it is unlikely that DFO will authorize your proposed works. Therefore works that will avoid impact to critical fish habitat are strongly recommended. In **important fish habitats** an Authorization will typically be required for any works that impact fish habitat. For **marginal fish habitats** works can often be conducted without the need for an Authorization through the use of design and operational standards and best practices.

If you are required to apply for a Subsection 35(2) *Fisheries Act* Authorization you should contact an appropriately qualified professional with adequate training or knowledge of fish habitat as this person can

**Legal Requirements:
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help you to identify, address and mitigate potential habitat or species concerns related to your proposed works. DFO will be reviewing your works in terms of their preferred management options and will need you to provide a clear rationale for moving from a more preferred to a less preferred option.

The DFO Review Process

The typical DFO review process for works that have the potential to result in a HADD is outlined in the following steps and is illustrated in Figure 10.

Step 1:

You submit an application package, including details of your proposed works, to your local DFO office (see Section 10 for a list of office locations and contact information). The information you will need to provide includes any information required by DFO to help them determine whether your works have the potential to cause a HADD and whether a Subsection 35(2) Authorization should be issued.

Applications for Authorizations should be developed and supported by appropriately qualified professionals (AQPs). Your application needs to address key information requirements including:

- justification for the proposed works and the management options applied;
- a detailed description of the fisheries resource and habitat values at your project location, including hydrological information and photographs of the site;
- details of your proposed works, including scaled drawings, schedule information, and types of equipment expected to be used;
- information regarding the type of impacts anticipated from your works and your application of mitigation measures to avoid or reduce those impacts; and
- details regarding planned habitat compensation and environmental monitoring, including costs.

Contact your local DFO office or consult the following website for more information:

http://www-heb.pac.dfo-mpo.gc.ca/publications/pdf/dfo_proj_review_info_e.pdf

Step 2:

DFO will review your information package, the value and sensitivity of the fish habitat involved, and the management options applied to

**Legal Requirements:
How Are My Works Regulated?**

determine whether an Authorization under Subsection 35(2) of the *Fisheries Act* may be issued.

One of three things will typically happen following this review:

- DFO determines that your application is incomplete and requests that you conduct additional design work and gather additional information before resubmitting your application; or
- DFO determines that your proposed work **will** result in a HADD; therefore you require Authorization under Subsection 35(2) of the *Fisheries Act* before you can submit a *Water Act* Notification or Approval application or undertake your work; or
- DFO determines that your proposed work **will not** result in a HADD. You should then submit a *Water Act* Notification to WLAP or an application for Approval to LWBC. All communications with or from DFO must be forwarded with your Notification or Approval application.

Step 3:

If DFO has determined that your works will result in a HADD, they must then decide whether to issue an Authorization.

If DFO authorizes a HADD, the Subsection 35(2) Authorization you will receive will include specific terms and conditions regarding standards and best practices for completing the works, habitat compensation, and monitoring. Prior to the issuance of the Authorization, DFO may require a letter of credit to cover the costs for repair, replacement, or maintenance of compensation or mitigation measures. An Authorization will also require an environmental screening under the *Canadian Environmental Assessment Act* (CEAA). There is a minimum 15-day requirement for the project to be posted to the public registry of the CEAA prior to commencement of the works. For more information on the federal CEAA, please visit the following website: http://www.ceaa-acee.gc.ca/index_e.htm

If DFO does not issue a Subsection 35(2) Authorization for the HADD associated with your works or requests additional information, you may choose either to address DFO's comments and resubmit your application (return to Step 2) or to abandon your project.

Step 4:

If DFO authorizes a HADD by issuing a Subsection 35(2) Authorization, you must then submit a *Water Act* Notification for the works to WLAP or an application for Approval to LWBC. All communications with or from DFO, including the signed HADD Authorization, must be forwarded with your notification or application.

**Legal Requirements:
How Are My Works Regulated?**

Step 1

You submit an application package for proposed works that may result in a HADD to your local DFO office.

Step 2

DFO reviews your information package and determines if there is a potential HADD.

DFO determines that your application is incomplete and requests additional design work and more information on your proposed works (**return to Step 2**).

DFO determines that your proposed work **will** result in a HADD; therefore, you require authorization under Subsection 35(2) of the *Fisheries Act* **before** you can undertake your work.

DFO determines that your proposed work will **not** result in a HADD. Works can proceed without an Authorization, providing Notification or application for Approval is made to WLAP or LWBC.

Step 3

DFO reviews your detailed application and determines whether or not will issue a Subsection 35(2) Authorization for the HADD.

DFO does **NOT** authorize a HADD, and requires you to address their comments and resubmit your application (**return to Step 2**) or **abandon** your project.

DFO **authorizes** a HADD with conditions regarding standards and best practices, habitat compensation measures and long term monitoring formalized in the terms and conditions of the Authorization.

Step 4

The user submits a Notification to WLAP or an application for Approval to LWBC. All communications with or from DFO, including any letters of Authorization, must be forwarded to WLAP or LWBC as part of your application.

**Legal Requirements:
How Are My Works Regulated?**

REMEMBER:

The DFO review process can take months to complete and considerably longer for complex projects. Ensure that you incorporate the time and resources required to seek all approvals into the proposed schedule and budget for your works.

While the *Fisheries Act* manages fish and their habitats, the *Water Act* manages both fish and wildlife and their habitats. Authorization under the *Fisheries Act* does not give you the authority to conduct works under the *Water Act*. You must still submit a Notification or application for Approval under the *Water Act*.

5.7 When Does Local Government Get Involved?

Many local or regional governments have bylaws in place relating to the protection of streams and riparian and aquatic habitats and may require you to submit other applications for the approval of instream works. Please contact your local government offices to inquire about required permits.

6 Standards and Best Practices

Instream Works = Works In and Around Water

The term stream includes lakes, wetlands, streams, ponds, marshes, swamps, gullies, ravines, springs, and some ditches.

Numerous instream works ranging from lakeshore stabilization in the Okanagan to urban stormwater connections on Vancouver Island, from stream crossings in the Skeena to fish habitat restoration in the Kootenays, are undertaken each year on private and public lands throughout the province of British Columbia. In the past, regional Ministry staff have been responsible for providing guidance to users through conditional letters, regionally developed documents that detail notification requirements, and standards and best practices for proposed instream works. These conditions and regional standards and best practices have been consolidated and used to create one provincially relevant document that consistently applies to proponents planning instream works throughout British Columbia.

What are “Standards” and “Best Practices”?

Standards and best practices are guiding statements that, when followed, will allow you to undertake instream works in a way that will avoid, limit or mitigate impacts to aquatic and riparian habitats, water quality and quantity, fish and wildlife species, and public safety and property. They exist to help you ensure your works are designed and carried out in compliance with applicable legislation and in a manner that will not cause harm to the natural environment.

Standards and best practices for instream works exist to avoid, limit or mitigate the impacts of instream works discussed in Section 4.2. These standards are developed from the legislation and regulations discussed in Section 5.

The best practices provided in this document represent some of the best-known current methods to avoid or mitigate impacts; however, the best practices recommended here do not represent an exhaustive list of available and appropriate best practices. Alternatives to and improvements on these best practices should not be overlooked when planning your proposed works, as long as the goals detailed in the applicable standards can be met.

Best practices only serve their purpose when they are properly applied. Because of this, it is important to ensure that all people participating in your works are aware of the applicable best practices, have the necessary materials available to them, and are properly trained in implementing the chosen best practices.

Standard: a regulatory requirement that must be followed or achieved in the design and completion of your works. This may also be referred to as a condition or requirement.

Best Practice: a recommended method or technique that should be followed to ensure the standards are met and impacts to riparian and aquatic habitats are mitigated.

Standards and Best Practices

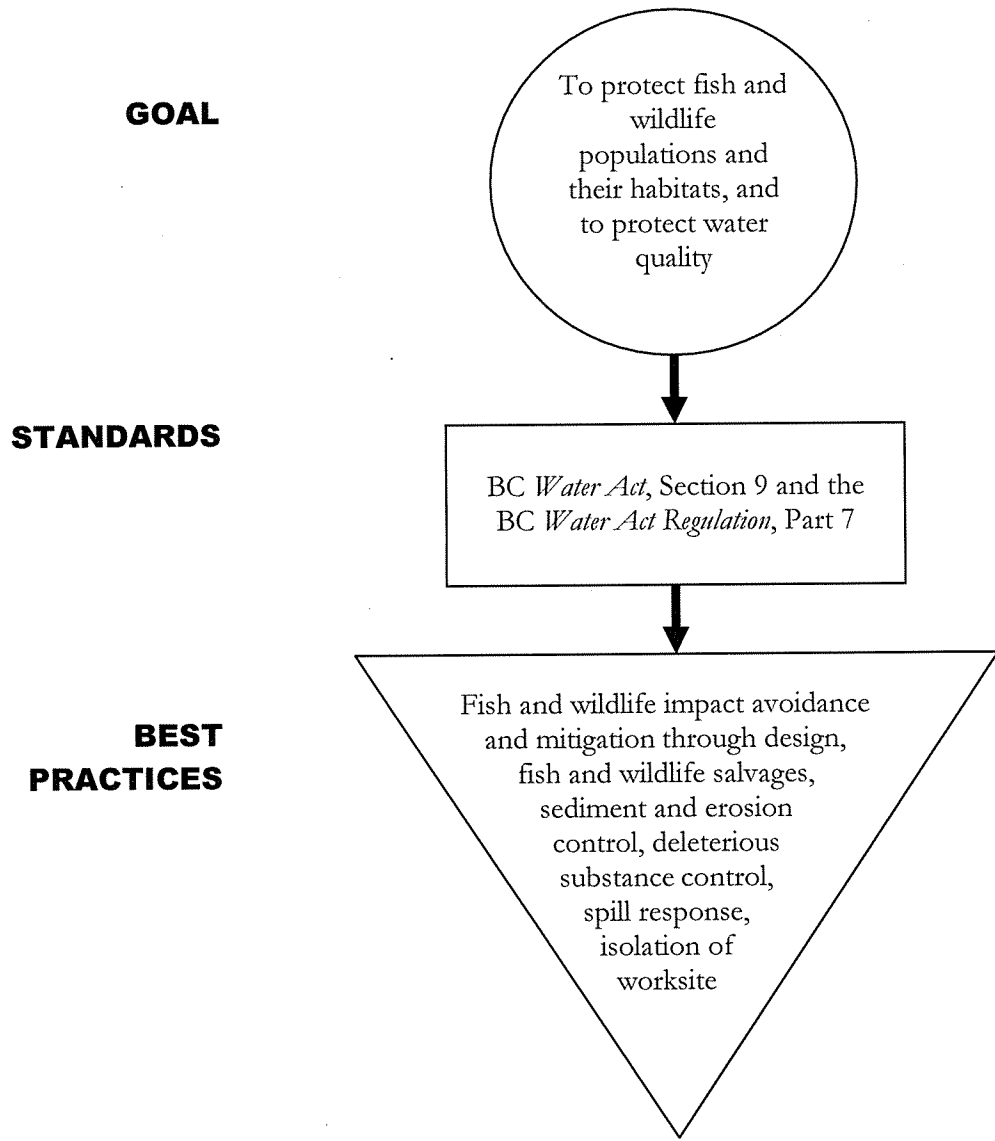


Figure 11: An example of how a provincial goal or objective leads to a standard and best practices for your works.

Engineer:

Under the *Water Act* an **engineer** means a professional engineer employed by the government or a government corporation and designated in writing by the comptroller as an engineer. It also includes a regional water manager.

If you are unfamiliar with the general standards of the *Water Act*, you can review the document *A Users Guide to Working in and Around Water, Regulation Under British Columbia's Water Act*. <http://www.lwbc.bc.ca/03water/licencing/index.html>

This document details responsibilities and requirements under the *Water Act*.

6.1 What Standards Do I Need to Meet?

Under Part 7 of the *Water Act* Regulation, your works must meet the following standards, regardless of the type of work you propose to undertake:

Works that may have significant detrimental impacts (Section 37 (3))

If the engineer is of the opinion that a proposed change in and about a stream may have a significant detrimental impact on the nature of the stream or stream channel, the engineer may require that an application for an approval or a license be made in connection with the proposed change in and about a stream.

Legal requirements of other legislation: (Subsection 37 (4) (a))

A person **will** comply with all applicable federal, provincial, or municipal enactments, such as the *Fisheries Act (Canada)*, *Workers Compensation Act*, local zoning and building requirements, and is responsible for obtaining the necessary permits.

Land ownership: (Subsection 37 (4) (b))

If a person does not own the land, the approval of the landowner **must** be obtained whether the land is private or Crown land.

Public safety: (Section 38 (2))

A person **must** design, construct and maintain the works so that life, property, and the environment are not endangered.

Completion of Work: (Subsection 38 (1) (b))

Once works are started, the changes **must** be completed without delay, unless necessary to preserve the nature of the stream.

Protection of water quality: (Subsection 41 (a) to (g))

A person making a change in and about a stream **must** ensure that:

- (a) no substance, sediment, debris or material that could adversely impact the stream is
 - (i) allowed or permitted to enter or leach or seep into the stream from an activity, construction, worksite, machinery or from components used in the construction of any works, or
 - (ii) placed, used or stored within the stream channel,
- (b) no standards or objectives published under Section 2(e) of the *Waste Management Act* for the protection of ambient water quality are exceeded or not attained now or in the future due to the change,
- (c) there is no disturbance or removal of stable natural materials and vegetation in and about a stream that contribute to

Standards and Best Practices

stream channel stability except as authorized under this regulation and in accordance with the terms and conditions specified by the habitat officer,

- (d) temporary material, fill, bridge, culvert, pump, pipe, conduit, ditch or other structure used to assist in the construction of any works are constructed and maintained only during the period of construction, and are removed on completion of the works,
- (e) all cast-in-place concrete and grouting is completely separated from fish bearing waters for a minimum of 48 hours,
- (f) rock from acid-generating rock formations is not used for construction, and
- (g) the stream is restored to its natural state on completion of the change in and about a stream.

Protection of Species and Habitat (Section 42 (1) & (2))

(1) To protect habitat, a person making a change in and about a stream under this regulation, other than under Subsection 44 (1)(o) to(s) or (2), **must** make that change in accordance with terms and conditions specified by the habitat officer with respect to:

- (a) the timing window or the period or periods of time in the year during which the change can proceed without causing harm to fish, wildlife or habitat (refer to the provincial *Timing Windows* document or Appendix 14.1 of this document),
- (b) the minimum instream flow or the minimum flow of water that must remain in the stream while the change is being made,
- (c) the removal of material from the stream or stream channel in connection with the change,
- (d) the addition of substance, sediment, debris or material to the stream or stream channel in connection with the change,
- (e) the salvage or protection of fish or wildlife while the change is being made or after the change has been made,
- (f) the protection of natural materials and vegetation that contribute to habitat or stream channel stability,
- (g) the restoration of the worksite after the change has been made, and
- (h) the requirement to obtain an approval from the federal Department of Fisheries and Oceans in connection with the change.

(2) In addition to other remedies or penalties that may be imposed on a person who makes a change in and about a stream that damages habitat, the person **must**:

- (a) within 72 hours report the damage to a habitat officer, and
- (b) restore and repair the habitat to its natural state or as directed by the habitat officer.

Protection of other water users: (Section 43 (1) & (2))

A person **must** ensure that existing water uses under the *Water Act* are protected and that the users are given three days prior notice and provided with a supply of water as required.

Specific Standards associated with certain types of instream works: (Section 44 (1))

For the purposes of Section 9 of the *Water Act*, changes in and about a stream listed in Section 44 of the *Water Act* Regulation may be made without the necessity of obtaining a Section 9 Approval or license for that change, provided that the change is made in accordance with the standards of the regulation and the terms and conditions, described in Section 42. Specific Standards and Best Practices relating to types of instream works can be found in the following sections of this document.

6.2 What Further Standards and Best Practices Apply to My Type of Instream Works?

The design standards and best practices your works are required to meet will vary depending on the type of instream work you are planning to complete. In most cases, it is recommended that you retain the services of an appropriately qualified professional with adequate training and knowledge of fish habitat to help determine which standards and best practices are appropriate for your proposed works.

6.2.1 Standards and Best Practices Specific to the Type of Instream Work

To determine what standards and best practices apply to your work, review the following sections for your type of instream work:

- **Stream Crossings** – including bridges, culverts, utility and pipeline crossings;
- **Stream Channel Maintenance by Government** – including sediment, vegetation, and debris removal;
- **Stream Bank and Lakeshore Stabilization** –including bank and shore stabilization;

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- **Urban Stormwater Management** – including stormwater management system design and stormwater outfall construction;
- **Habitat enhancement and Restoration** – including instream works to enhance aquatic and riparian areas for fish and wildlife species;
- **Beaver and Beaver Dam Management** – including activities to manage beavers and their dams;
- **Miscellaneous Instream Works (permitted under a Notification)** – including pier and wharf works, fish screen fence installation, flow monitoring devices, and public utility maintenance activities;
- **Emergency Works** – including urgent flood and erosion protection works; and
- **Other Types of Instream Works (requiring an Approval)** – including stream diversion, channelization, dredging and realignment activities, dam construction, weir installation, sediment pond or sump construction, lake or pond creation.

7 Standards and Best Practices for Specific Types of Works

Best practices are recommended techniques that have been demonstrated to be effective and practical means of preventing or limiting harmful impacts to the environment.

The best practices presented in this document provide you with a starting point for ensuring your works are planned and completed in compliance with environmental legislation. The practices outlined here should not be regarded as a complete and comprehensive set, however. New techniques and methods or professional advice from an appropriately qualified professional may provide you with a better means of ensuring your works meet the performance standards and legislated requirements.

Therefore the option is yours: you may follow the best practices recommended in this document, or you may follow different practices with or without the advice of an appropriately qualified professional. Either way, the key aim is to ensure that your works achieve the standards and objectives set. If your works do not, then you, your agents, and the professionals you hired will be responsible for demonstrating that the practices used were an appropriate choice and were applied correctly. If this cannot be demonstrated, then all parties will be liable and accountable for any impacts to the environment, danger to human health, or infringement on water or property rights.

7.1 Standards and Best Practices for Stream Crossings

7.1.1 Background

A stream crossing refers to a structure such as a clear-span bridge or culvert used for road, driveway, pedestrian, livestock, or utility service crossing of a watercourse.

Private stream crossings are usually smaller in scale than public stream crossings (e.g., a livestock or driveway crossing) and are often constructed by an individual landowner.

Public stream crossings are usually larger in scale than private stream crossings (e.g., major road crossings) and may result in larger potential impacts to riparian and aquatic habitats.

Utility crossings include service pipelines, pipes, cables, and wires (e.g., sanitary sewer, electricity, telephone, and gas services). In addition to the usual potential impacts associated with any stream crossing structure, utility crossings pose an increased risk of impact associated with the potential for discharge of a deleterious substance carried by the utility (e.g., raw sewage, natural gas).

Winter road crossings include ice bridges, winter fords, or snowfills constructed to provide temporary seasonal stream crossings.

Temporary fords are temporary stream crossings installed to allow transportation or material movement across a channel for a limited period of time. Temporary fords have limited applicability, and risk to habitat and water quality may increase if this crossing type is improperly located or constructed.

Stream crossing works are undertaken for a variety of reasons: to construct a crossing where none existed previously; to replace an existing crossing with one of equal size; or to replace an existing crossing with a larger one or a different type of structure. Because of the risks to riparian and aquatic habitat and species, stream crossing works should only be considered when the need for the works can be **justified**:

For a new crossing - The area the crossing will provide access to is currently isolated, and the increased use of the area will not result in the degradation of aquatic and riparian habitat.

For a replacement crossing - The replacement is required to maintain access and safety, and the maintained or increased use of the area will not result in the degradation of aquatic and riparian habitat.

For enlargement of a crossing – Current zoning permits the enlargement, and the maintained or increased use of the area will not result in the degradation of aquatic and riparian habitat.

7.1.2 Objectives

The Ministry's objectives for the management of stream crossings are to discourage unnecessary crossings, to prevent harmful impacts to riparian or aquatic habitats and fish and wildlife species, and to protect water quality and channel shapes and flows during crossing construction, modification, and deactivation activities.

7.1.3 Standards for Stream Crossings

All stream crossing works for which you are submitting instream works notifications or approvals must be compliant with the general standards listed in Section 7 of this document for:

- Compliance with Federal, Provincial, and Municipal Legislation
- Land Ownership
- Public Safety
- Completion of Work
- Protection of Water Quality
- Protection of Species and Habitat
- Protection of Other Water Users

Specific Standards associated with this type of work (*Water Act* Regulation Section 44(1)) permit stream crossing works completed as the following work types and under the following conditions:

Culvert installation, maintenance or removal on a road or trail stream crossing (Subsection 44(1)(a)) is permitted, providing that:

- (i) equipment used for site preparation, construction, maintenance, or removal of the culvert is situated in a dry stream channel or operated from the top of the bank;
- (ii) in fish bearing waters, the culvert allows fish in the stream to pass up or down stream under all flow conditions;
- (iii) the culvert inlet and outlet incorporate measures to protect the structure and the stream channel against erosion and scour;
- (iv) if debris cannot safely pass, provision is made to prevent the entrance of debris into the culvert;

FEDERAL STANDARDS:

The federal *Fisheries Act* regulates fish and fish habitat in Canada. Section 35 of the *Act* prohibits the "harmful alteration, disruption, or destruction of fish habitat" (HADD) unless authorized by DFO.

If your works may result in a HADD, you will need to contact DFO for an Authorization of your works.

If species at risk are present, the federal *Species At Risk Act* will also apply.

REMEMBER:

You **must** submit a Notification to the WLAP or an Approval application to LWBC for your proposed works.

**Standards and Best Practices:
Stream Crossings**

- (v) the installation, maintenance, or removal does not destabilize the stream channel;
- (vi) the culvert and its approach roads do not produce a backwater effect or increase the head of the stream;
- (vii) the culvert capacity is equivalent to the hydraulic capacity of the stream channel or is capable of passing the 1 in 200 year maximum daily flow without the water level at the culvert inlet exceeding the top of the culvert;
- (viii) the culvert has a minimum equivalent diameter of 600 mm;
- (ix) a culvert having an equivalent diameter of 2 m or greater, or having a design capacity to pass a flow of more than 6 cubic metres a second, is designed by a professional engineer and constructed in conformance with that design;
- (x) the culvert is installed in a manner which will permit the removal of obstacles and debris within the culvert and at the culvert ends;
- (xi) the stream channel, located outside the cleared width, is not altered;
- (xii) embankment fill materials do not and will not encroach on culvert inlets and outlets;
- (xiii) the culvert has a depth of fill cover which is at least 300 mm or as required by the culvert manufacturer's specifications;
- (xiv) the maximum fill heights above the top of the culvert do not exceed 2 m; and
- (xv) the culvert material meets the standards of the Canadian Standards Association.

Clear-span bridge construction, maintenance or removal
(Subsection 44(1)(b)) is permitted, providing that:

- (i) the bridge and its approach roads do not produce a back water effect or increase the head in the stream;
- (ii) the equipment used for construction, including site preparation, maintenance, or removal of the bridge, is situated in a dry stream channel or is operated from the top of the bank;

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Stream Crossings**

- (iii) the hydraulic capacity of the bridge is equivalent to the hydraulic capacity of the stream channel, or is capable of passing the 1 in 200 year maximum daily flow, and the height of the underside of the bridge is also adequate to provide free passage of flood debris and ice flows; and
- (iv) the bridge material meets the standards of the Canadian Standards Association, as applicable.

Pipeline crossing construction or maintenance (Subsection 44(1)(c)) is permitted, providing that:

- (i) the pipeline and associated works are installed in a dry stream channel at a depth so that the top of the pipe is at least 1 m below the lowest elevation of the bed of the stream; and
- (ii) in the case of an aerial crossing, the crossing is constructed in accordance with the requirements prescribed in paragraph (b) for clear span bridges.

Ice bridge, winter ford or snowfill construction or maintenance (Subsection 44(1)(n)) is permitted, providing that:

- (i) the materials used are removed from the stream channel before ice break-up and that only clean ice and snow are used; and
- (ii) in the case of ice bridges, any logs, timber, and other structural materials used can be removed in a safe manner.

Temporary ford construction (Subsection 44(1)(w)) is permitted, providing that:

- (i) the construction occurs at a time in the year during which the construction can occur without causing harm to fish, wildlife, or habitat;
- (ii) the 1 in 10 year maximum daily flow over the ford is accommodated without the loss of the ford and without scouring the stream;
- (iii) a stream culvert, if used, is designed and installed to pass the average low flow during the period of use;
- (iv) the channel is protected against any anticipated erosion:
 - (A) during the period of construction and use of the ford;and

**Standards and Best Practices:
Stream Crossings**

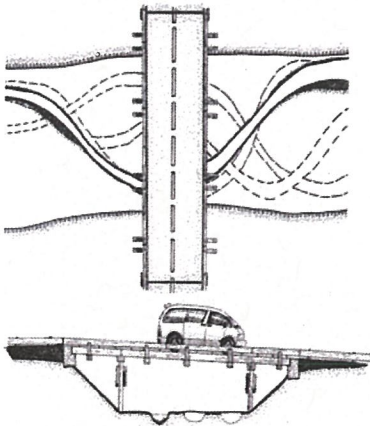
- (B) after the ford crossing is removed;
- (v) sediment from approach ditches does not enter the stream;
- (vi) the driveable running surface is erosion-free;
- (vii) the stream remains in its channel and cannot be diverted down the road;
- (viii) the ford will pass channel debris; and
- (ix) the ford is removed at the end of the period of use at a time, before the next freshet, when the removal can proceed without causing harm to fish, wildlife or habitat.

Note:

Temporary diversion construction around or through a worksite(Subsection 44(1)(x)) is permitted, providing that the worksite is no larger than the minimum area required and:

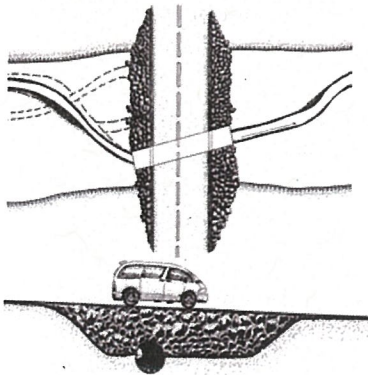
- (i) if pumps, pipes or conduits are used to divert water around or through the worksite:
 - (A) the pumps, pipes or conduits are sized to divert the 1 in 10 year maximum daily flow for the period of construction; and
 - (B) any pump or intake withdrawing water from fish bearing waters is screened in accordance with the Fish Screening Directive of the Department of Fisheries and Oceans (Canada).
- (ii) if cofferdams are used to isolate successive parts of the construction at the worksite:
 - (A) the cofferdams are designed by a professional engineer and constructed in accordance with that design; and
 - (B) the natural channel remaining outside of the cofferdams is adequate to pass the 1 in 10 year maximum daily flow during the period of construction; or
- (iii) if ditches are used to divert flow around the worksite:
 - (A) the flow of water diverted remains within the stream channel;

**Recommended:
Floodplain-span crossing
(clear-span bridge)**



- Stream pattern and channel migration are maintained.
- Width of crossing is narrow.
- Lies perpendicular to stream flow.
- No potential fish or wildlife migration barriers likely to result or mitigation of habitat impacts required.

**Not Recommended:
Channel-span structure
(round or box culvert)**



- Stream pattern is altered and channel migration is eliminated.
- Channel is eliminated under crossing and downstream.
- Width of the crossing and impacts to riparian habitat are excessive.
- Likely fish and wildlife migration barrier results, with impacts to the

(B) the ditches are designed and constructed to divert the 1 in 10 year maximum daily flow around or through the worksite and are protected from any anticipated erosion during the period of construction and use of the ditch; and

(C) the ditches are completely backfilled and the area returned as closely as possible to the natural state on completion of the works;

7.1.4 Best Practices

Following the best practices described here will ensure your proposed works comply with provincial standards. The practices are designed to help you plan and carry out your works in a way that protects species, habitats, and water quality and quantity.

7.1.4.1 Planning and Design Best Practices

Crossings should be designed by an appropriately qualified professional and constructed in accordance with that design. To ensure impacts to fish and wildlife habitats and populations are minimized, stream crossings should:

- Avoid floodplains, meander bends, braided streams, alluvial fans, and any other areas where bank stability may be a concern.
- Avoid critical fish and wildlife habitat areas.
- Avoid disturbing the bed and banks of the stream (this can be done by using structures that will remain outside the bankfull-width of the stream).
- Be aligned perpendicular to stream flow.
- Limit impacts to onsite and adjacent riparian areas (this can be done by minimizing the width of the right-of-way clearing).
- Involve “trench-less” technologies (i.e., directional drilling outside the channel and floodplain and below the streambed) for pipelines and other utilities crossings.
- Be designed to include opportunities to enhance the surrounding environment or to reduce the impact of the existing structure during replacement activities.

For further information on the design of stream-crossing structures, consult the following resources:

- *Access Near Aquatic Areas: A Guide to Sensitive Planning, Design, and Management*

http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp#

Figure 12. Channel crossings

Standards and Best Practices: Stream Crossings

- *Forest Practices Code Fish Stream Crossing Guidebook*
<http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/FishStreamCrossing/FSCGdBk.pdf>
- *Fish Habitat Rehabilitation Procedures, Watershed Restoration Technical Circular No.9* and other Watershed Restoration Program documents
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>

7.1.4.2 Operational Best Practices

All individuals carrying out instream works should be very familiar with the listed standards and best practices. To address or achieve the standards and comply with the *Water Act* Regulation's Protection of Habitat (Section 42(1)) and Protection of Water Quality (Section 41) standards, you should follow or implement these operational best practices:

Monitoring

- Construction activities should be monitored full-time during start-up and any instream works or sensitive activity, and on a daily basis during any other construction activity to the completion of the project. The environmental monitor must be an appropriately qualified professional and will be provided with written authority to modify or halt any construction activity if it is deemed necessary to do so for the protection of fish and wildlife populations or their habitats. A sign listing the monitor's company name and phone number should be posted at the entrance to the job site or in the immediate vicinity.
- Forward a copy of the section of this document listing the standards and best practices for your works and all appropriate plans, drawings, and documents to the contractor or crew supervisor, and keep this information readily available at the site while the work is proceeding.
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project.
- Within **60 days** of the project's completion have the environmental monitor complete and submit at least one copy of a monitoring report consistent with the recommended standard format (see Section 8.2 of this document) to both you and the Ministry.

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

Timing of Works – “Work Windows”

For further information on best practices for timing of works, see Appendix 14.1.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for streams where fish or species at risk are present, or if their presence in the stream is not known, complete in-channel or bank work during the

instream works reduced risk-timing window provided by Ministry for your region.

- Only clear vegetation for worksite access during the vegetation clearing timing window, to protect nesting birds.
- As species at risk typically have no window of least risk, avoid in-channel work wherever possible when the presence of species at risk is known or expected.
- Only undertake works during favourable weather and low water conditions.
- Complete the works as quickly as possible once they are started.

Spill Reporting

Report any spill of a reportable quantity of a listed substance to the Provincial Emergency Program (PEP) at **1-800-663-3456** and to your nearest DFO office at the contact numbers listed at the end of this document.

Deleterious Substance Control/Spill Management (Subsections 41(a)(b) & 42(1)(d))

- Prevent the release of silt, sediment, sediment-laden water, raw concrete, concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine, or storm sewer system. The recommendations for sediment and erosion control outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al.* 1992) can also be used for reference.
- Ensure equipment and machinery are in good operating condition (power washed), free of leaks, excess oil, and grease. No equipment refuelling or servicing should be undertaken within 30m of any watercourse or surface water drainage.
- Ensure all hydraulic machinery entering a stream uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. Train onsite staff in its use. Immediately report any spill of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities to the Provincial Emergency Program 24-hour phone line at **1-800-663-3456**.
- Do not use treated wood products in any construction below the high-water mark of the stream channel, to prevent the release of preservatives that are toxic to fish.

Wood Products

For more information on acceptable wood products to use in or near water, consult the document *Guidelines to Protect Fish and Fish habitat From Treated Wood Used in Aquatic Environments in the Pacific Region* (2000)
<http://www.wwpinstitute.org/pdffiles/treatedwoodguidelines.pdf>

Concrete Works (Subsections 41(e) & 42(d))

- Ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place must remain inside sealed formed structures.

**Standards and Best Practices:
Stream Crossings**

Concrete leachate is alkaline and highly toxic to fish and other aquatic life.

- A CO₂ tank with regulator, hose and gas diffuser must be readily available during concrete work to neutralize pH levels should a spill occur. Train staff in its use.
- Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- Report immediately any spills of sediments, debris, concrete fines, wash or contact water of reportable quantities to **1-800-663-3456**. Implement emergency mitigation and clean-up measures (such as use of CO₂ and immediate removal of the material).
- Completely isolate all concrete work from any water within or entering into any watercourse or stormwater system.
- Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until the works are completed. Emergency measures should be implemented if downstream pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level, or is recorded to be below 6.0 or above 9.0 pH units.
- Prevent any water that contacts uncured or partly cured concrete (during activities like exposed aggregate wash-off, wet curing, or equipment washing) from directly or indirectly entering any watercourse or stormwater system.
- Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0 pH units and the turbidity is less than 25 nephelometric turbidity units (NTU), measured to an accuracy of +/- 2 NTU.

Isolation of the Work Area (Subsections 42(b) & 44(x))

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.
- Temporarily divert, enclose, or pump the water around the worksite. Ensure the point of discharge to the creek is located immediately downstream of the worksite to minimize disturbance to downstream populations and habitats.

Salvage of Fish and/or Wildlife (Subsection 42(1)(e))

- Complete a fish and amphibian salvage before the start of works if any portion of the wetted channel will be isolated or dewatered. An appropriately qualified professional must complete the salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by British Columbia Fisheries Regulations or Canada *Fisheries Act* before conducting the salvage activities.

Standards and Best Practices: Stream Crossings

- Choose low impact salvage methods such as minnow trapping and seining before opting for higher impact electrofishing.
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

Sediment Control (Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f))

- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel or floodplain of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- Ensure machinery is operated from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Put sediment control measures into place before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars, or water diversions within the work area so they do not directly discharge sediment-laden surface flows into the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.
- Use mitigating measures to protect excavated material from eroded and reintroduced into the watercourse. Such measures include, but are not limited to, covering the material with erosion blankets or seeding and planting it with native vegetation.
- When material is moved offsite, dispose of it in a manner that prevents its entry into any watercourse, floodplain, ravine, or storm sewer system.

Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management activities that will affect trees used by all birds

New Land

Development BMPs

The Ministry is currently preparing a document entitled *Environmental Best Management Practices for Urban and Rural Land Development* that will contain additional information on best practices. Consult the Ministry websites for more information.

Tree Replacement Criteria

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:
http://srmwww.gov.bc.ca/sry/csd/downloads/fo rms/vegetation_riparian /treereplcrit.pdf

**Standards and Best Practices:
Stream Crossings**

and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.

- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.
- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.

**Standards and Best Practices:
Stream Crossings**

- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.
- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

Site Restoration (Subsections 41(a)(c) & 42(1)(c)(f)(g))

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.
- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.
- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

**No-net-loss of fish
and wildlife
habitat?**

Minimize impacts of your activities and leave the stream in better condition than how you found it!

REMEMBER:

Your project will not be considered to be in compliance with the Act or the Regulation if any of the standards have not been met. Ensure you implement appropriate best practices to avoid impacts and mitigate your works.

7.2 Standards and Best Practices for Stream Channel Maintenance

7.2.1 Background

Streams and channels sustain fish and wildlife values and are also relied upon as drainage pathways. As such, maintenance activities are periodically required to ensure the ability and capacity of the channel to carry adequate flow is maintained. **Please note that this section pertains only to works carried out by municipalities and the British Columbia government or its agents.**

Stream channel maintenance refers to any of the following activities:

- Removal of debris, waste or garbage including discarded building materials and household waste;
- Removal of sediment, vegetation, or woody debris;
- Stream channel and lake dredging; and
- Ditch maintenance.

Fish and other aquatic organisms need healthy places to live, feed and reproduce. For most species, these activities usually occur along stream banks and in nearshore areas of lakes. When you are proposing the removal of sediment, debris, or vegetation from a stream or lake, you should be confident that the works are necessary and will serve a legitimate purpose.

In your Notification to the WLAP, you will need to work with an appropriately qualified professional(s) to confirm that:

- The proposed works are necessary to alleviate actual or imminently potential flooding or other hazards that would result in the loss of life or property;
- The works will not result in the immediate or long term degradation of riparian or stream habitats, or fish and wildlife populations; and
- No alternative solutions such as strategically located sediment traps, off-line detention or retention ponds, or increased watershed drainage density are available.

7.2.2 Objectives

Stream channel maintenance activities can cause temporary or permanent loss or alteration of instream habitats, and can result in both temporary and permanent losses in riparian or streamside vegetation or channel stability. Extreme care must therefore be taken when conducting stream channel maintenance activities. The Ministry's objective for the management of stream and channel clean up and maintenance is to

Stream Clean-ups:

Clean-up activities, including the removal of man-made materials from streams, are typically conducted by local stewardship groups, schools, or local governments to enhance or help restore stream habitats.

If you are planning to undertake activities like these, no Notification is required. Contact all landowners whose properties your works might affect. Refer to stewardship guidelines such as those listed at <http://www.stewardshipcentre.org> to ensure your works result in a habitat gain.

prevent harmful impacts to riparian and aquatic habitats, fish and wildlife species, and water quality.

7.2.3 Standards for Stream Channel Maintenance

All stream channel maintenance works for which you are submitting instream works Notifications or Approvals must be compliant with the general standards listed in Section 7 of this document for:

- Compliance with Federal, Provincial, and Municipal Legislation
- Land Ownership
- Public Safety
- Completion of Work
- Protection of Water Quality
- Protection of Species and Habitat
- Protection of Other Water Users

Specific standards associated with this type of work (*Water Act* Regulation Section 44) permit stream channel maintenance works completed as the following work types and under the following conditions:

Restoration or maintenance of a stream channel by British Columbia or its agents (Subsection 44(1)(g));

Restoration or maintenance of a stream channel by a municipality (Subsection 44(1)(h));

Mechanical or manual cutting of annual vegetation within the stream channel (Subsection 44(1)(i)); and

Mechanical or manual control of Eurasian water milfoil and other aquatic vegetation (Subsection 44(1)(m)).

Note:

Temporary diversion construction around or through a worksite (Subsection 44(1)(x)) for works authorized under Section 44 is permitted providing that the worksite is no larger than the minimum area required; and

- (i) if pumps, pipes or conduits are used to divert water around or through the worksite;
- (A) the pumps, pipes or conduits are sized to divert the 1 in 10 year maximum daily flow for the period of construction; and

FEDERAL

STANDARDS:

The federal *Fisheries Act* regulates fish and fish habitat in Canada. Section 35 of the *Act* prohibits the “harmful alteration, disruption, or destruction of fish habitat” (HADD) unless authorized by DFO.

If your works may result in a HADD, you will need to contact DFO for an Authorization of your works.

If species at risk are present, the federal *Species At Risk Act* will also apply.

REMEMBER:

You **must** submit a Notification to the WLAP or an Approval application to LWBC for your proposed works.

**Standards and Best Practices:
Stream Channel Maintenance**

**LAKE
SEDIMENT/DEBRIS
REMOVAL:**

If you want to remove sediment or debris from a lake, you will require a Notification. Keep in mind the following:

- Salvage activities are to be restricted to areas well away from creek mouths or shallow water (< 4 meters deep) areas.
- Do not remove standing trees adjacent to the lake foreshore or snags within the lake, as they may provide important nesting habitat.
- Do not remove logs embedded within the substrate of the lake.
- If there is a community water intake nearby, you must consult with the water purveyor before starting work.
- Lakes are also fish habitat. Apply the listed operational best practices (e.g., timing of works, sediment control, worksite isolation) to your works.

(B) any pump or intake withdrawing water from fish bearing waters is screened in accordance with the Fish Screening Directive of the Department of Fisheries and Oceans (Canada);

(ii) if cofferdams are used to isolate successive parts of the construction at the worksite:

(A) the cofferdams are designed by a professional engineer and constructed in accordance with that design; and

(B) the natural channel remaining outside of the cofferdams is adequate to pass the 1 in 10 year maximum daily flow during the period of construction; or

(iii) if ditches are used to divert flow around the worksite:

(A) the flow of water diverted remains within the stream channel;

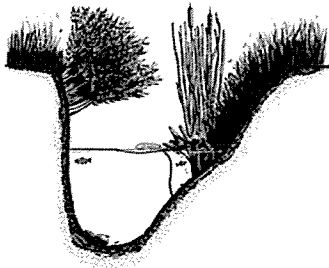
(B) the ditches are designed and constructed to divert the 1 in 10 year maximum daily flow around or through the worksite and are protected from any anticipated erosion during the period of construction and use of the ditch; and

(C) the ditches are completely backfilled and the area returned as closely as possible to the natural state on completion of the works.

7.2.4 Best Practices

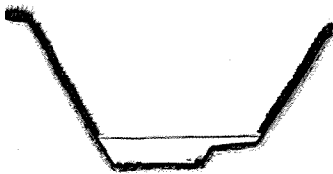
The best practices given here **should** be followed to ensure your proposed works comply with provincial standards. They are designed to help you protect species and habitats, maintain adequate water flows, and maintain or improve existing channel characteristics through the way you plan and carry out your works.

- Only remove material needed to alleviate flood or debris flow risk. Retain, where possible, existing instream and riparian vegetation and other features. These include trees, bushes, shrubs, weeds, or tall grasses along any stream bank; mats of floating vegetation; overhanging vegetation; natural, large woody debris that does not appear to be causing damage to the bottom; and large boulders.
- Maintain or improve the existing channel complexity by retaining or creating a diverse mix of instream structures and overhanging vegetation.



**Channelized Stream
Before Dredging**

- Channel is deep, low surface to volume ratio.
- Channel form provides good cover for fish and their food.
- Overhanging vegetation provides shade from sun.
- Some flow complexity.



**Dredged or "Maintained"
Channelized Stream**

- Decreases the biological productivity of fish habitat
- Channel is shallow; high surface to volume ratio
- Channel form provides little to no cover for fish or their food
- No overhanging vegetation; no shade
- No flow complexity; efficient drainage

Figure 13. Effects of stream maintenance activities

- Do not disturb stream banks that can expose underlying soils, cause silt to enter the stream, and result in loss of fish habitat.
- Adhere to instream work windows. Carry out instream clean-up activities during conditions of low flow, when eggs and alevins are not present in the gravel, and when there is the least risk to fish and wildlife populations and habitats.
- Consider whether removal of an object from the stream will cause more damage to fish and wildlife populations and habitats than would have resulted from leaving the object as it was. If the object is large (e.g., car or shopping cart), and is more than one-third buried in the stream substrates, its removal may result in a large amount of sediment being resuspended or discharged, or may result in significant changes to in-channel habitats. In these cases, such garbage, though unsightly, may actually enhance habitat by performing a function similar to large woody debris.

To address the need for stream channel maintenance, those planning works (i.e., municipalities or the British Columbia government or its agents) should consider the form and function of local watersheds to develop long-term solutions to flooding or debris flow risks that eliminate or reduce stream and channel maintenance. These may include:

- Appropriately constructed and licensed sediment traps in the stream (requires additional *Water Act* Approval);
- Control or reduction of up-stream sources of sediment;
- Increased drainage density in the watershed;
- Construction of off-line detention or retention facilities; and
- Shade trees and shrubs planted to shade out instream vegetation.

7.2.4.1 Operational Best Practices

All individuals carrying out instream works should be very familiar with the listed standards and best practices. To address or achieve the standards and comply with the *Water Act* Regulation's Protection of Habitat (Section 42(1)) and Protection of Water Quality (Section 41) standards, you should follow or implement these operational best practices:

Monitoring

- Construction activities should be monitored full-time during start-up and any instream works or sensitive activity, and on a daily basis during any other construction activity to the completion of the project. The environmental monitor must be an appropriately qualified professional and will be provided with written authority to modify or halt any construction activity if it is deemed necessary to do so for the protection of fish and wildlife populations or their habitats. A sign listing the monitor's company name and phone number

Standards and Best Practices: Stream Channel Maintenance

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

should be posted at the entrance to the job site or in the immediate vicinity.

- Forward a copy of the section of this document listing the standards and best practices for your works and all appropriate plans, drawings, and documents to the contractor or crew supervisor, and keep this information readily available at the site while the work is proceeding.
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project.
- Within **60 days** of the project's completion have the environmental monitor complete and submit at least one copy of a monitoring report consistent with the recommended standard format (see Section 8.2 of this document) to both you and the Ministry.

Timing of Works – “Work Windows”

For further information on best practices for timing of works, see Appendix 14.1.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for streams where fish or species at risk are present, or if their presence in the stream is not known, complete in-channel or bank work during the instream works reduced risk-timing window provided by Ministry for your region.
- Only clear vegetation for worksite access during the vegetation clearing timing window, to protect nesting birds.
- As species at risk typically have no window of least risk, avoid in-channel work wherever possible when the presence of species at risk is known or expected.
- Refer to Appendix 14.1 or contact the Ministry's regional office for information on timing window requirements for your area.
- Only undertake works during favourable weather and low water conditions.
- Complete the works as quickly as possible once they are started.

Spill Reporting

Report any spill of a reportable quantity of a listed substance to the Provincial Emergency Program (PEP) at **1-800-663-3456** and to your nearest DFO office at the contact numbers listed at the end of this document.

Deleterious Substance Control/Spill Management (Subsections 41(a)(b) & 42(1)(d))

- Prevent the release of silt, sediment, sediment-laden water, raw concrete, concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine, or storm sewer system. The recommendations for sediment and erosion control outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al.* 1992) can also be used for reference.
- Ensure equipment and machinery are in good operating condition (power washed), free of leaks, excess oil, and

**Standards and Best Practices:
Stream Channel Maintenance**

grease. No equipment refuelling or servicing should be undertaken within 30m of any watercourse or surface water drainage.

- Ensure all hydraulic machinery entering a stream uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. Train onsite staff in its use. Immediately report any spill of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities to the Provincial Emergency Program 24-hour phone line at 1-800-663-3456.

**New Land
Development BMPs**

The Ministry is currently preparing a document entitled *Environmental Best Management Practices for Urban and Rural Land Development* that will contain additional information on best practices. Consult the Ministry websites for more information.

Isolation of the Work Area (Subsections 42(b) & 44(x))

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.
- Temporarily divert, enclose, or pump the water around the worksite. Ensure the point of discharge to the creek is located immediately downstream of the worksite to minimize disturbance to downstream populations and habitats.
- If it is not possible for you to fully isolate and divert flowing water from your work area due to water depth and volume, isolate your works with a silt curtain to keep silty water from entering clean water.

Salvage of Fish and/or Wildlife (Subsection 42(1)(e))

- Complete a fish and amphibian salvage before the start of works if any portion of the wetted channel will be isolated or dewatered. An appropriately qualified professional must complete the salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by British Columbia Fisheries Regulations or Canada *Fisheries Act* before conducting the salvage activities.
- Choose low impact salvage methods such as minnow trapping and seining before opting for higher impact electrofishing.
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

Sediment Control (Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f))

- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel or

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floodplain of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.

- Ensure machinery is operated from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Put sediment control measures into place before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars, or water diversions within the work area so they do not directly discharge sediment-laden surface flows into the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.
- Use mitigating measures to protect excavated material from eroded and reintroduced into the watercourse. Such measures include, but are not limited to, covering the material with erosion blankets or seeding and planting it with native vegetation.
- When material is moved offsite, dispose of it in a manner that prevents its entry into any watercourse, floodplain, ravine, or storm sewer system.

Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management activities that will affect trees used by all birds and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.
- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing

**Tree Replacement
Criteria**

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:
http://srmwww.gov.bc.ca/sry/csd/downloads/forms/vegetation_riparian/treereplcrit.pdf

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Stream Channel Maintenance**

owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.

- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.
- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.
- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

Site Restoration (Subsections 41(a)(c) & 42(1)(c)(f)(g))

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.

**Standards and Best Practices:
Stream Channel Maintenance**

- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.
- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

**No-net-loss of fish
and wildlife
habitat?**

Minimize impacts of your activities and leave the stream in better condition than how you found it!

REMEMBER:

Your project will not be considered to be in compliance with the Act or the Regulation if any of the standards have not been met. Ensure you implement appropriate best practices to avoid impacts and mitigate your works.

7.3 Standards and Best Practices for Stream Bank and Lakeshore Stabilization

What is Erosion?

Erosion is a natural process of sediment movement as a consequence of water currents or rainfall runoff and may be considered beneficial or detrimental, depending upon the associated environmental concerns.

Potential Negative Impacts of Bank and Shore Stabilization:

- loss of riparian or streambank vegetation,
- loss of future LWD anchoring opportunities;
- decrease in aquatic and terrestrial habitat diversity;
- direct or indirect loss of in-channel habitat through infill, habitat feature blow out, or restrictions on lateral channel movement;
- loss of channel substrate recruitment such as sand, gravel, cobbles or boulders;
- loss of stream meanders and lateral migration ability; and
- loss of floodplain, high-water fish refuge habitat or access to high-water off-channel fish habitats.

7.3.1 Background

Stream bank and lakeshore stabilization refers to works undertaken to protect or armour a bank or shore from erosion.

Increased channel flow, surface water run-off from upland areas, groundwater seepage, and the loss of riparian vegetation can all contribute to stream bank erosion. Erosion processes along lakeshores are similar to streams. They can occur naturally from the ongoing action of waves dissipating their energy against erodable banks but may be worsened by increased water levels, riparian vegetation removal, wave action associated with boat use, or other human activities.

While protecting or armouring a small section of stream bank or lake shore may prevent erosion at one location and appear to have only minor impacts to the watercourse, the compound effects of all individual works within a drainage or watershed are significant.

The more a stream experiences hardening of its banks, the greater the potential for increased and ongoing erosion problems elsewhere within that stream. Bank hardening also has significant impacts on riparian and in-channel habitats as it eliminates or permanently alters riparian and bank vegetation and leads to channelization (the elimination of channel complexity). In some cases, physical or velocity barriers to fish and wildlife movement may be created. Along lakeshores, structures designed to stabilize banks may also act as barriers, limiting fish and wildlife use of the foreshore and blocking the migration of amphibians, reptiles, or other wildlife species.

Stream bank and lakeshore stabilization works are permitted under Section 44 of the *Water Act* Regulations **only**:

- if they are conducted as part of restoration and maintenance works undertaken by a municipality, the British Columbia government, or its agents; or
- if they are completed as works to repair or maintain to their original state existing dikes or existing erosion protection works.

Stream bank and lakeshore stabilization works must only be undertaken when the need for works can be **justified** by:

- the size, scale and location of proposed works;

**Standards and Best Practices:
Stream Bank and Lakeshore Stabilization**

**Benefits of Erosion to
Streams and Lakes:**

- Provides silt, sand, gravel, and boulders, to form more complex channel beds and foreshores.
- Provides large and small woody debris that can improve instream habitat complexity, provide cover, decrease flow energy, and armour banks.

**FEDERAL
STANDARDS:**

The federal *Fisheries Act* regulates fish and fish habitat in Canada. Section 35 of the *Act* prohibits the “harmful alteration, disruption, or destruction of fish habitat” (HADD) unless authorized by DFO.

If your works may result in a HADD, you will need to contact DFO for an Authorization of your works.

If species at risk are present, the federal *Species At Risk Act* will also apply.

REMEMBER:

You **must** submit a Notification to the WLAP or an Approval application to LWBC for your proposed works.

- the level of risk to existing buildings, roads, or services that are being threatened by the erosion; and
- a technical rationale specific to the design developed, signed and sealed by an appropriately qualified professional.

7.3.2 Objectives

The Ministry’s objective for the management of stream bank stabilization is to prevent harmful impacts to riparian and aquatic habitats, fish and wildlife species, and water quality related to the installation or repair of bank and shore stabilization works.

**7.3.3 Standards for Stream Bank and Lakeshore
Stabilization**

All stream bank and lakeshore stabilization works for which you are submitting instream works Notifications or Approvals must be compliant with the general standards as listed in Section 7 of this document for:

- Compliance with Federal, Provincial, and Municipal Legislation
- Land Ownership
- Public Safety
- Completion of Work
- Protection of Water Quality
- Protection of Species and Habitat
- Protection of Other Water Users

Specific Standards associated with this type of work (*Water Act* Regulation Section 44) permit stream bank and lakeshore stabilization works completed as the following work types and under the following conditions:

Restoration or maintenance of a stream channel by British Columbia or its agents (Subsection 44(1)(g));

Restoration or maintenance of a stream channel by a municipality (Subsection 44(1)(h));

Restoration or maintenance of fish habitat by the federal or provincial Crown, or their agents (Subsection 44(1)(j)); and

Repair or maintenance of existing dikes or existing erosion protection works to their original state, (Subsection 44(1)(k)) provided that the dikes or works were functional during the previous year.

**Standards and Best Practices:
Stream Bank and Lakeshore Stabilization**

Note:

Temporary diversion construction around or through a worksite (Subsection 44(1)(x)) is permitted for works providing that the worksite is no larger than the minimum area required, and

- (i) if pumps, pipes or conduits are used to divert water around or through the worksite:
 - (A) the pumps, pipes or conduits are sized to divert the 1 in 10 year maximum daily flow for the period of construction; and
 - (B) any pump or intake withdrawing water from fish bearing waters is screened in accordance with the Fish Screening Directive of the Department of Fisheries and Oceans (Canada).
- (ii) if cofferdams are used to isolate successive parts of the construction at the worksite:
 - (A) the cofferdams are designed by a professional engineer and constructed in accordance with that design; and
 - (B) the natural channel remaining outside of the cofferdams is adequate to pass the 1 in 10 year maximum daily flow during the period of construction; or
- (iii) if ditches are used to divert flow around the worksite:
 - (A) the flow of water diverted remains within the stream channel;
 - (B) the ditches are designed and constructed to divert the 1 in 10 year maximum daily flow around or through the worksite and are protected from any anticipated erosion during the period of construction and use of the ditch; and
 - (C) the ditches are completely backfilled and the area returned as closely as possible to the natural state on completion of the works.

Interested in lake information and resources?

Please visit the following website for further information:

British Columbia Lake Stewardship Society
<http://www.nalms.org/bclss/>

7.3.4 Best Practices

In order to assess and manage your bank erosion problem, it is advisable to work with an appropriately qualified professional, or team of professionals depending on the scale and scope of the problem. This

**Standards and Best Practices:
Stream Bank and Lakeshore Stabilization**

typically requires retaining the services of an appropriately qualified environmental professional, which could include a biologist, hydrologist, fluvial geomorphologist, engineer, agronomist or the combination of one or more. The following section outlines best practices for stream bank stabilization design and construction.

7.3.4.1 Design Best Practices

- Ensure the assessment and design your professional completes considers the following:
 - Erosion dynamics (i.e., what is causing the problem);
 - Location of stream within the watershed, stream type and stream order;
 - Seasonal variations in stream flow (perennial, intermittent or ephemeral stream);
 - Local soil characteristics;
 - Existing or potential fish and wildlife use, aquatic habitat, and riparian habitat;
 - Potential access-related disturbances from machinery or other equipment if required;
 - Potential erosion or sediment movement resulting from proposed works; and
 - Existing stream morphology and potential impacts or changes to the channel.
- Ensure impacts to fish and wildlife habitats and populations are minimized by designing your bank stabilization work to meet the following requirements:
 - Uses vegetated or integrated stream bank stabilization techniques:

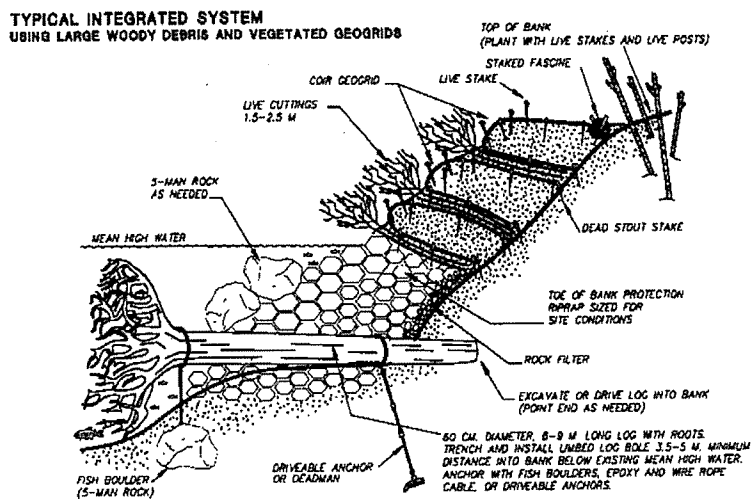


Figure 14: Example of integrated bank stabilization techniques

**Standards and Best Practices:
Stream Bank and Lakeshore Stabilization**

What are Habitat Features?

If no alternative to using “hard” engineering is possible, design consideration must address the need for fish and wildlife habitat features. These include, but are not limited to:

- boulder clusters in relief at the toe,
- oversized armor rock,
- anchored large woody debris,
- plants installed above the average high-water mark,
- native live stakes or cuttings incorporated into the rockwork with rooting soil.

- Incorporates appropriate habitat features;
- Uses natural materials, such as live vegetation and natural rock;
- Avoids the use of anthropogenic materials such as broken concrete, tires and other materials. These materials do not naturalize well and it is not clear the extent to which these materials could potentially introduce toxic substances into the stream;
- Minimizes impacts to the active floodplain and channel of the stream;
- Increases the active floodplain in the area or immediately adjacent areas to lessen erosive energy or stream power and mitigate channelization effects;
- Minimizes direct and indirect impacts to riparian vegetation, fish and wildlife individuals, populations, species, and habitats;
- Minimizes direct and indirect impacts on off-channel ponds, spawning, rearing or over-wintering areas for fish; and
- Minimizes direct and indirect impacts to other properties or services.

If your works are proposed for any of the following conditions, you may need to use “hard” engineering techniques (engineering involving hard structures like retention walls or rip rap) rather than integrated bank stabilization:

- Streams that are steep with high energy and power with high flows and high velocities,
- Banks that have extreme erosion potential,
- A specific utility or road crossing, or
- A site where vegetative or integrated bank stabilization techniques won't work.

For further information on the design of stream bank and lakeshore stabilization works, please consult:

- *Fish Habitat Rehabilitation Procedures, Watershed Restoration Technical Circular No. 9*
<http://www.elp.gov.bc.ca/frco/bookshop/tech.htm> or
http://www.usda.gov/stream_restoration/
- *Washington State Integrated Streambank Protection Guidelines*
<http://wdfw.wa.gov/hab/ahg/ispgdoc.htm>

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Stream Bank and Lakeshore Stabilization**

7.3.4.2 Operational Best Practices

All individuals carrying out instream works should be very familiar with the listed standards and best practices. To address or achieve the standards and comply with the *Water Act* Regulation's Protection of Habitat (Section 42(1)) and Protection of Water Quality (Section 41) standards, you should follow or implement these operational best practices:

Monitoring

- Construction activities should be monitored full-time during start-up and any instream works or sensitive activity, and on a daily basis during any other construction activity to the completion of the project. The environmental monitor must be an appropriately qualified professional and will be provided with written authority to modify or halt any construction activity if it is deemed necessary to do so for the protection of fish and wildlife populations or their habitats. A sign listing the monitor's company name and phone number should be posted at the entrance to the job site or in the immediate vicinity.
- Forward a copy of the section of this document listing the standards and best practices for your works and all appropriate plans, drawings, and documents to the contractor or crew supervisor, and keep this information readily available at the site while the work is proceeding.
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project.
- Within **60 days** of the project's completion have the environmental monitor complete and submit at least one copy of a monitoring report consistent with the recommended standard format (see Section 8.2 of this document) to both you and the Ministry.

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

**Timing of Works –
“Work Windows”**

For further information on best practices for timing of works, see Appendix 14.1.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for streams where fish or species at risk are present, or if their presence in the stream is not known, complete in-channel or bank work during the instream works reduced risk-timing window provided by Ministry for your region.
- Only clear vegetation for worksite access during the vegetation clearing timing window, to protect nesting birds.
- As species at risk typically have no window of least risk, avoid in-channel work wherever possible when the presence of species at risk is known or expected.

**Standards and Best Practices:
Stream Bank and Lakeshore Stabilization**

- Refer to Appendix 14.1 or contact the Ministry's regional office for information on timing window requirements for your area.
- Only undertake works during favourable weather and low water conditions.
- Complete the works as quickly as possible once they are started.

**Deleterious Substance Control/Spill Management
(Subsections 41(a)(b) & 42(1)(d))**

- Prevent the release of silt, sediment, sediment-laden water, raw concrete, concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine, or storm sewer system. The recommendations for sediment and erosion control outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al.* 1992) can also be used for reference.
- Ensure equipment and machinery are in good operating condition (power washed), free of leaks, excess oil, and grease. No equipment refuelling or servicing should be undertaken within 30m of any watercourse or surface water drainage.
- Ensure all hydraulic machinery entering a stream uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. Train onsite staff in its use. Immediately report any spill of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities to the Provincial Emergency Program 24-hour phone line at **1-800-663-3456**.
- Do not use treated wood products in any construction below the high-water mark of the stream channel, to prevent the release of preservatives that are toxic to fish.

Concrete Works (Subsections 41(e) & 42(d))

- Ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place must remain inside sealed formed structures. Concrete leachate is alkaline and highly toxic to fish and other aquatic life.
- A CO₂ tank with regulator, hose and gas diffuser must be readily available during concrete work to neutralize pH levels should a spill occur. Train staff in its use.

Spill Reporting

Report any spill of a reportable quantity of a listed substance to the Provincial Emergency Program (PEP) at **1-800-663-3456** and to your nearest DFO office at the contact numbers listed at the end of this document.

Wood Products

For more information on acceptable wood products to use in or near water, consult the document *Guidelines to Protect Fish and Fish habitat From Treated Wood Used in Aquatic Environments in the Pacific Region* (2000) <http://www.wwpinstitute.org/pdffiles/treatedwoodguidelines.pdf>

**Standards and Best Practices:
Stream Bank and Lakeshore Stabilization**

- Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- Report immediately any spills of sediments, debris, concrete fines, wash or contact water of reportable quantities to **1-800-663-3456**. Implement emergency mitigation and clean-up measures (such as use of CO₂ and immediate removal of the material).
- Completely isolate all concrete work from any water within or entering into any watercourse or stormwater system.
- Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until the works are completed. Emergency measures should be implemented if downstream pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level, or is recorded to be below 6.0 or above 9.0 pH units.
- Prevent any water that contacts uncured or partly cured concrete (during activities like exposed aggregate wash-off, wet curing, or equipment washing) from directly or indirectly entering any watercourse or stormwater system.
- Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0 pH units and the turbidity is less than 25 nephelometric turbidity units (NTU), measured to an accuracy of +/- 2 NTU.

Isolation of the Work Area (Subsections 42(b) & 44(x))

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.
- Temporarily divert, enclose, or pump the water around the worksite. Ensure the point of discharge to the creek is located immediately downstream of the worksite to minimize disturbance to downstream populations and habitats.
- If it is not possible for you to fully isolate and divert flowing water from your work area due to water depth and volume, isolate your works with a silt curtain to keep silty water from entering clean water.

Salvage of Fish and/or Wildlife (Subsection 42(1)(e))

- Complete a fish and amphibian salvage before the start of works if any portion of the wetted channel will be isolated or dewatered. An appropriately qualified professional must complete the salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by British Columbia Fisheries Regulations or Canada *Fisheries Act* before conducting the salvage activities.

**Standards and Best Practices:
Stream Bank and Lakeshore Stabilization**

- Choose low impact salvage methods such as minnow trapping and seining before opting for higher impact electrofishing.
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

Sediment Control (Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f))

- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel or floodplain of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- Ensure machinery is operated from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Put sediment control measures into place before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars, or water diversions within the work area so they do not directly discharge sediment-laden surface flows into the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.
- Use mitigating measures to protect excavated material from eroded and reintroduced into the watercourse. Such measures include, but are not limited to, covering the material with erosion blankets or seeding and planting it with native vegetation.
- When material is moved offsite, dispose of it in a manner that prevents its entry into any watercourse, floodplain, ravine, or storm sewer system.

Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management activities that will affect trees used by all birds

New Land

Development BMPs

The Ministry is currently preparing a document entitled *Environmental Best Management Practices for Urban and Rural Land Development* that will contain additional information on best practices. Consult the Ministry websites for more information.

**Standards and Best Practices:
Stream Bank and Lakeshore Stabilization**

and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.

- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.
- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.

**Tree Replacement
Criteria**

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:

http://srmwww.gov.bc.ca/sry/csd/downloads/forums/vegetation_riparian/treereplcrit.pdf

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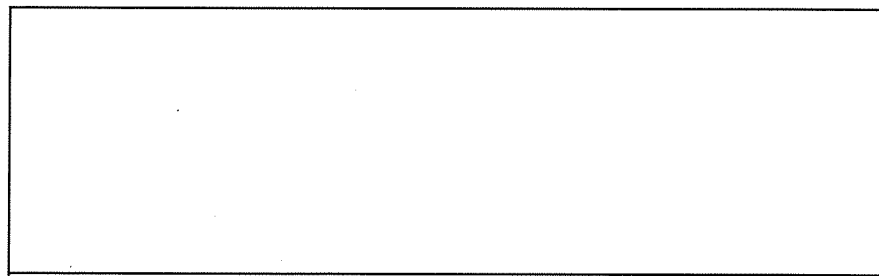
- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.
- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

Site Restoration (Subsections 41(a)(c) & 42(1)(c)(f)(g))

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.
- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.
- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

**No-net-loss of fish
and wildlife
habitat?**

Minimize impacts of your activities and leave the stream in better condition than how you found it!



7.4 Standards and Best Practices for Urban Stormwater Management

7.4.1 Background

**If you want to
install a new
perimeter drain for
your single family
house:**

To avoid the need to submit a Notification, you must ensure that:

- The discharge is necessary, as no opportunity exists to connect to an existing system or return to the ground discharge;
- Construction and long-term use will not result in degraded instream or riparian habitat or impacts to fish and wildlife; and
- The perimeter drain is permitted by local government legislation.

Urban and rural stormwater management refers to activities involving the connection of urban and rural drainage systems to streams. Streams are critical components of all municipal, urban and rural stormwater systems. As stormwater outfalls are the direct links between upland land use and streams, they can have significant impacts to aquatic species and habitats through the alteration of storm flow volume and timing within watercourses. Pool and riffle habitats may be destroyed, spawning gravels may be scoured out or covered with sediment, and critically low flows or base flows in streams may be reduced. Stormwater systems also impact a stream's water quality by introducing pollutants through spills and non-point source pollution.

Stormwater is typically managed only for flood control. However, recent studies, including a study conducted by the GVRD, have clearly shown that urbanization has had significant impacts on stream health and productivity in the absence of stormwater management systems that would protect fish and wildlife species and their habitats. This GVRD report can be found at the following website:

http://www.gvrd.bc.ca/sewerage/stormwater_reports.htm

Discharges from new multi-lot residential subdivisions, multi-family residential developments, as well as commercial, institutional or industrial sites are considered **stormwater system connections** and require a Notification. **Perimeter drain** discharges include proposed new discharges from independent single lot single-family residential properties only, and do not require a Notification.

7.4.2 Objectives

To prevent harmful impacts to water quality, riparian and aquatic habitats and fish and wildlife species through activities related to the connection of stormwater management systems to local streams, the following approach is provided:

Objective: Putting Water Back into the Ground - Volume Reduction

To reduce and mitigate the total runoff volume caused by increased urban development and the subsequent increase in impervious surface area, and to maximize the amount of runoff returned to shallow groundwater via recharge.

Objective: Preserving or Improving the Water - Water Quality

To mitigate water quality impacts to fish habitat by collecting and treating “first flush” events of smaller storms and more frequent runoff events from impervious areas.

Objective: Holding Back the Water – Rate Control/Detention

To restrict the post-development peak runoff flow rate to that of the pre-development peak runoff flow rate for selected design return periods.

The provincial document, *Stormwater Planning: A Guidebook for British Columbia*, helps to introduce and orient local governments towards addressing stormwater management in urban and rural developments.

The document is available at the following website:

<http://wlapwww.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html>

In the highly urbanized and fast-developing GVRD, much work has been conducted on stormwater management through the Liquid Waste Management Planning process. See the following website for additional information, as well as reports and publications:

<http://www.gvrd.bc.ca/sewerage>

**FEDERAL
STANDARDS:**

The federal *Fisheries Act* regulates fish and fish habitat in Canada. Section 35 of the *Act* prohibits the “harmful alteration, disruption, or destruction of fish habitat” (HADD) unless authorized by DFO.

If your works may result in a HADD, you will need to contact DFO for an Authorization of your works.

If species at risk are present, the federal *Species At Risk Act* will also apply.

REMEMBER:

You **must** submit a Notification to the WLAP or an Approval application to LWBC for your proposed works.

7.4.3 Standards for Stormwater Management

All proposals for the connection of a new stormwater system to a stream, or the connection of a new system to an existing stormwater system that is connected to a stream must address the protection of riparian and aquatic habitats and their supported fish and wildlife species through the design and implementation of a stormwater management system that will mitigate to the greatest extent the harmful impacts of stormwater to water quality, and aquatic and riparian habitats.

All stormwater management system designs and outfall constructions for which you are submitting instream works notifications or approvals must be compliant with the general standards as listed in Section 7 of this document for:

- Compliance with Federal, Provincial, and Municipal Legislation
- Land Ownership
- Public Safety
- Completion of Work
- Protection of Water Quality
- Protection of Species and Habitat
- Protection of Other Water Users

**Standards and Best Practices:
Urban Stormwater Management**

Specific standards associated with this type of work (*Water Act* Regulation Section 44(1)) permit works completed as the following work types and under the following conditions:

**Appropriately
Qualified
Professionals:**

Appropriately qualified professionals should **always** be consulted to provide technical rationale when determining the feasibility of these recommendations. For choices of structural best practices, it is recommended that options in stormwater best management practice (BMP) reference guides be considered, such as in the *GVS&DD Best Management Practices Guide for Stormwater, October 1999*, which is available at the following website:

http://www.gvrd.bc.ca/sewerage/management_guide.htm

Construction or maintenance of storm sewer outfalls

(Subsection 44(1)(l)), provided that the storm sewer outfall is designed by a professional engineer, and constructed, maintained and used so as not to obstruct the flow of water in the stream or to cause erosion or scour in the stream.

Note:

Temporary diversion construction around or through a

worksite (Subsection 44(1)(x)) is permitted for works providing that the worksite is no larger than the minimum area required, and

- (i) if pumps, pipes or conduits are used to divert water around or through the worksite,
 - (A) the pumps, pipes or conduits are sized to divert the 1 in 10 year maximum daily flow for the period of construction, and
 - (B) any pump or intake withdrawing water from fish bearing waters is screened in accordance with the Fish Screening Directive of the Department of Fisheries and Oceans (Canada),
- (ii) if cofferdams are used to isolate successive parts of the construction at the worksite,
 - (A) the cofferdams are designed by a professional engineer and constructed in accordance with that design, and
 - (B) the natural channel remaining outside of the cofferdams is adequate to pass the 1 in 10 year maximum daily flow during the period of construction, or
- (iii) if ditches are used to divert flow around the worksite,
 - (A) the flow of water diverted remains within the stream channel,
 - (B) the ditches are designed and constructed to divert the 1 in 10 year maximum daily flow around or through the worksite and are protected from any anticipated erosion during the period of construction and use of the ditch, and

- (C) the ditches are completely backfilled and the area returned as closely as possible to the natural state on completion of the works.

7.4.4 Best Practices

Integrated stormwater management planning at a watershed level, as committed to by the GVRD, should be conducted wherever possible and practical. Such plans should address fish and wildlife habitat and species protection as watersheds change from activities associated with urban and rural development. Stormwater management systems designed for urban rural developments should be consistent with these municipal plans where they exist. See the following website for the GVRD's stormwater planning template:

<http://www.gvrd.bc.ca/sewerage/pdf/ismptemplate.pdf>

The following section outlines recommended best practices to support the standards, which should be addressed in urban stormwater management systems and connection design and construction where an integrated stormwater management plan has not been completed:

7.4.4.1 Stormwater Management Systems

The design of a stormwater system and its connections will determine the extent to which impacts to fish and wildlife habitats and populations may be avoided or mitigated. When proposing a new stormwater outfall, you should have confirmation through a technical rationale that the outfall is necessary, and that alternatives such as draining the site to the ground or draining the site to a constructed drainage facility like a rock pit or drainage trench are not appropriate. The connection should be designed by an appropriately qualified professional, and constructed in accordance with that design.

To ensure impacts to fish and wildlife habitats and populations are minimized, stormwater systems should use the following design recommendations which have been adapted from the *Urban Stormwater Guidelines and Best Management Practices for Protection of Fish and Fish Habitat*, 2001 DFO draft discussion paper.

Putting Water Back Into the Ground – Volume Reduction (VR)

Design Best Practices

Volumes from smaller rain events from impervious areas should not be discharged but should be infiltrated to ground.

If your perimeter drain discharges to a non-ravine area:

- Construct a rock pit with a minimum storage area of 9m³ outside of the riparian area and online with your drain. This rock pit will allow some of the water collected to return to ground.
- Use a porous material for your overflow pipe, and trench the pipe from the rock pit to the stream bank.
- Locate the pipe discharge approximately 15cm from the streambank, above the active floodplain height.

If your perimeter drain discharges to a ravine area:

- Construct a rock pit and overflow pipe as above, but only trench the pipe to the top of the ravine.
- Use a flexible pipe to convey the drain from the top of bank to the toe of the slope.
- Stake the pipe in place and construct a rock splash pad at the discharge to dissipate flows.

**Standards and Best Practices:
Urban Stormwater Management**

Structural Best Practices

Ground infiltration systems, biofiltration swales or burrows, or long-term storage in constructed wetlands or ponds should be used.

**Preserving or Improving the Water –
Water Quality (WQ)**

Design Best Practices

The volume of the 24-hour event equaling the majority of the total rainfall from impervious areas should be collected and treated with suitable BPs.

Structural Best Practices

Biofiltration swales or burrows, constructed wetlands, or exfiltrating dry detention pond systems should be used.

**Holding Back the Water –
Rate Control/Detention (RC)**

Design Best Practices

The post-development flows should match the volume, shape and peak instantaneous rates of pre-development flows for larger flood events using appropriate best practices.

Structural Best Practices

Suitable best practices include dry detention ponds, constructed wetlands, wet detention ponds, or storage swales.

7.4.4.2 Hydrological Design

In order to accurately determine rates of runoff for stormwater management systems, sites should be monitored and flows modelled using analysis programs with continuous simulation. Site hydrological data should be collected for a minimum of 12 months unless there is acceptable regional data.

7.4.4.3 Storm Sewer Outfall Design

In addition to these best practices, the design for your stormwater outfall connection should also:

- be located where it will minimize impacts to the existing riparian vegetation and/or alterations to the channel and active floodplain and associated fish and wildlife habitats;
- be located to mimic natural site drainage patterns and not alter existing watershed boundaries;
- provide appropriate water energy dissipation;
- minimize erosion and discharge flow impacts to the channel by directing the discharge to a maximum 45 degree angle to downstream flow;

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- minimize impacts to the riparian corridor continuity by having a minimal footprint;
- minimize direct and Indirect impacts to onsite and adjacent fish and wildlife individuals, populations and species; and
- minimize direct and indirect impacts to other properties or services.

For further information on the design of stormwater connections and perimeter drains, please consult:

- *Greater Vancouver Sewage and Drainage District Best Management Practices Guide for Stormwater, Oct. 1999.*
http://www.gvrd.bc.ca/sewerage/managment_guide.htm

7.4.4.4 Operational Best Practices

All individuals carrying out instream works should be very familiar with the listed standards and best practices. To address or achieve the standards and comply with the Water Act Regulation's Protection of Habitat (Section 42(1)) and Protection of Water Quality (Section 41) standards, you should follow or implement these operational best practices:

Monitoring

- Construction activities should be monitored full-time during start-up and any instream works or sensitive activity, and on a daily basis during any other construction activity to the completion of the project. The environmental monitor must be an appropriately qualified professional and will be provided with written authority to modify or halt any construction activity if it is deemed necessary to do so for the protection of fish and wildlife populations or their habitats. A sign listing the monitor's company name and phone number should be posted at the entrance to the job site or in the immediate vicinity.
- Forward a copy of the section of this document listing the standards and best practices for your works and all appropriate plans, drawings, and documents to the contractor or crew supervisor, and keep this information readily available at the site while the work is proceeding.
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project.
- Within **60 days** of the project's completion have the environmental monitor complete and submit at least one copy of a monitoring report consistent with the recommended standard format (see Section 8.2 of this document) to both you and the Ministry.

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

**Standards and Best Practices:
Urban Stormwater Management**

**Timing of Works –
“Work Windows”**

For further information on best practices for timing of works, see Appendix 14.1.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for streams where fish or species at risk are present, or if their presence in the stream is not known, complete in-channel or bank work during the instream works reduced risk-timing window provided by Ministry for your region.
- Only clear vegetation for worksite access during the vegetation clearing timing window, to protect nesting birds.
- As species at risk typically have no window of least risk, avoid in-channel work wherever possible when the presence of species at risk is known or expected.
- Refer to Appendix 14.1 or contact the Ministry’s regional office for information on timing window requirements for your area.
- Only undertake works during favourable weather and low water conditions.
- Complete the works as quickly as possible once they are started.

**Deleterious Substance Control/Spill Management
(Subsections 41(a)(b) & 42(1)(d))**

Spill Reporting

Report any spill of a reportable quantity of a listed substance to the Provincial Emergency Program (PEP) at **1-800-663-3456** and to your nearest DFO office at the contact numbers listed at the end of this document.

- Prevent the release of silt, sediment, sediment-laden water, raw concrete, concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine, or storm sewer system. The recommendations for sediment and erosion control outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al.* 1992) can also be used for reference.
- Ensure equipment and machinery are in good operating condition (power washed), free of leaks, excess oil, and grease. No equipment refuelling or servicing should be undertaken within 30m of any watercourse or surface water drainage.
- Ensure all hydraulic machinery entering a stream uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. Train onsite staff in its use. Immediately report any spill of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities to the Provincial Emergency Program 24-hour phone line at **1-800-663-3456**.
- Do not use treated wood products in any construction below the high-water mark of the stream channel, to prevent the release of preservatives that are toxic to fish.

Concrete Works (Subsections 41(e) & 42(d))

- Ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place must remain inside sealed formed structures. Concrete leachate is alkaline and highly toxic to fish and other aquatic life.
- A CO₂ tank with regulator, hose and gas diffuser must be readily available during concrete work to neutralize pH levels should a spill occur. Train staff in its use.
- Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- Report immediately any spills of sediments, debris, concrete fines, wash or contact water of reportable quantities to **1-800-663-3456**. Implement emergency mitigation and clean-up measures (such as use of CO₂ and immediate removal of the material).
- Completely isolate all concrete work from any water within or entering into any watercourse or stormwater system.
- Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until the works are completed. Emergency measures should be implemented if downstream pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level, or is recorded to be below 6.0 or above 9.0 pH units.
- Prevent any water that contacts uncured or partly cured concrete (during activities like exposed aggregate wash-off, wet curing, or equipment washing) from directly or indirectly entering any watercourse or stormwater system.
- Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0 pH units and the turbidity is less than 25 nephelometric turbidity units (NTU), measured to an accuracy of +/- 2 NTU.

Isolation of the Work Area (Subsections 42(b) & 44(x))

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.
- Temporarily divert, enclose, or pump the water around the worksite. Ensure the point of discharge to the creek is located immediately downstream of the worksite to minimize disturbance to downstream populations and habitats.

Wood Products

For more information on acceptable wood products to use in or near water, consult the document *Guidelines to Protect Fish and Fish habitat From Treated Wood Used in Aquatic Environments in the Pacific Region (2000)*
<http://www.wwpinstitute.org/pdffiles/treatedwoodguidelines.pdf>

**Standards and Best Practices:
Urban Stormwater Management**

Salvage of Fish and/or Wildlife (Subsection 42(1)(e))

- Complete a fish and amphibian salvage before the start of works if any portion of the wetted channel will be isolated or dewatered. An appropriately qualified professional must complete the salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by British Columbia Fisheries Regulations or Canada *Fisheries Act* before conducting the salvage activities.
- Choose low impact salvage methods such as minnow trapping and seining before opting for higher impact electrofishing.
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

Sediment Control (Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f))

- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel or floodplain of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- Ensure machinery is operated from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Put sediment control measures into place before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars, or water diversions within the work area so they do not directly discharge sediment-laden surface flows into the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.
- Use mitigating measures to protect excavated material from eroded and reintroduced into the watercourse. Such measures include, but are not limited to, covering the material with erosion blankets or seeding and planting it with native vegetation.
- When material is moved offsite, dispose of it in a manner that prevents its entry into any watercourse, floodplain, ravine, or storm sewer system.

**New Land
Development BMPs**

The Ministry is currently preparing a document entitled *Environmental Best Management Practices for Urban and Rural Land Development* that will contain additional information on best practices. Consult the Ministry websites for more information.

Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management activities that will affect trees used by all birds and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.
- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.
- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must

**Tree Replacement
Criteria**

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:
http://srmwww.gov.bc.ca/sry/csd/downloads/fo rms/vegetation_riparian/treereplcrit.pdf

**Standards and Best Practices:
Urban Stormwater Management**

be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.

- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.
- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.
- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

Site Restoration (Subsections 41(a)(c) & 42(1)(c)(f)(g))

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.
- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.
- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

**No-net-loss of fish
and wildlife
habitat?**

Minimize impacts of your activities and leave the stream in better condition than how you found it!

REMEMBER:

Your project will not be considered to be in compliance with the Act or the Regulation if any of the standards have not been met. Ensure you implement appropriate best practices to avoid impacts and mitigate your works.

7.5 Standards and Best Practices for Habitat Enhancement and Restoration

7.5.1 Background

Habitat enhancement and restoration works include any works in or about a stream designed to restore or increase the productive capacity of aquatic or riparian habitat. The types of work include, but are not limited to: rehabilitating aquatic habitats, restoring fish access, rehabilitating stream banks, rehabilitating off-channel habitat, introducing channel complexity (placement of large-woody debris, boulder clusters), restoring mainstem rearing habitat, introducing pool and riffle sequences, and augmenting minimum stream flows. They do not include works associated with beaver dams. Please refer to the following section of this document for information on beaver and beaver dam management.

FEDERAL STANDARDS:

The federal *Fisheries Act* regulates fish and fish habitat in Canada. Section 35 of the *Act* prohibits the “harmful alteration, disruption, or destruction of fish habitat” (HADD) unless authorized by DFO.

If your works may result in a HADD, you will need to contact DFO for an Authorization of your works.

If species at risk are present, the federal *Species At Risk Act* will also apply.

REMEMBER:

You **must** submit a Notification to the WLAP or an Approval application to LWBC for your proposed works.

7.5.2 Objectives

The Ministry’s objective for the management of habitat enhancement and restoration is to prevent harmful impacts to water quality, riparian and aquatic habitats, and fish and wildlife species arising from the habitat enhancement works and restoration activities.

7.5.3 Standards for Habitat Enhancement and Restoration

All habitat enhancement and restoration works for which you are submitting instream works Notifications or Approvals must be compliant with the general standards listed in Section 7 of this document for:

- Compliance with Federal, Provincial, and Municipal Legislation
- Land Ownership
- Public Safety
- Completion of Work
- Protection of Water Quality
- Protection of Species and Habitat
- Protection of Other Water Users

Specific standards associated with this type of work (*Water Act* Regulation Section 44(1)) permit habitat enhancement and restoration works completed as the following work type and under the following conditions:

**Standards and Best Practices:
Habitat Enhancement and Restoration**

Restoration or maintenance of a fish habitat by the Crown in the right of either Canada or British Columbia, or their agents (Subsection 44(1)(j))

Note:

Temporary diversion construction around or through a worksite (Subsection 44(1)(x)) is permitted for works providing that the worksite is no larger than the minimum area required, and

- (i) if pumps, pipes or conduits are used to divert water around or through the worksite;
 - (A) the pumps, pipes or conduits are sized to divert the 1 in 10 year maximum daily flow for the period of construction; and
 - (B) any pump or intake withdrawing water from fish bearing waters is screened in accordance with the Fish Screening Directive of the Department of Fisheries and Oceans (Canada);
- (ii) if cofferdams are used to isolate successive parts of the construction at the worksite:
 - (A) the cofferdams are designed by a professional engineer and constructed in accordance with that design; and
 - (B) the natural channel remaining outside of the cofferdams is adequate to pass the 1 in 10 year maximum daily flow during the period of construction; or
- (iii) if ditches are used to divert flow around the worksite:
 - (A) the flow of water diverted remains within the stream channel;
 - (B) the ditches are designed and constructed to divert the 1 in 10 year maximum daily flow around or through the worksite and are protected from any anticipated erosion during the period of construction and use of the ditch; and
 - (C) the ditches are completely backfilled and the area returned as closely as possible to the natural state on completion of the works.

7.5.4 Best Practices

The following section outlines recommended best practices for habitat enhancement and restoration design and construction.

7.5.4.1 Design Best Practices

As the long-term objective of habitat enhancement and restoration works is to improve available instream and riparian habitats for fish and wildlife species, the impacts resulting from the works should be limited to short-term, construction-related impacts. However, care must be taken in the planning and design of enhancement and restoration structures. Changes to instream structures can have unexpected impacts to stream hydraulics and may cause unintentional habitat disruption or destruction. If you would like assistance in planning your works, consider hiring an appropriately qualified professional for assistance. Information is also available from the following documents:

- *Fish Habitat Rehabilitation Procedures, Watershed Restoration Technical Circular No. 9*, available from:
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>
- *Fish Habitat Enhancement: A Manual for Freshwater, Estuarine, and Marine Habitats*, available from:
http://www-heb.pac.dfo-mpo.gc.ca/english/pubn_order.pdf

Examples of a Few Types of Habitat Enhancement and Restoration Works:

- Restoring fish access
- Creating bank cover
- Rehabilitating off-channel habitats
- Complexing the stream channel with large woody debris or boulder clusters
- Creating pool-riffle sequences with small rock weirs

You should include the following best practices when planning your enhancement or restoration works, or use alternatives recommended in a technical rationale prepared, signed, and sealed by an appropriately qualified professional. To ensure impacts to fish and wildlife habitats and populations are minimized, the design for your proposed works should:

- Prevent the creation of a barrier to fish migration;
- Consider impacts to all species or habitat-types within the area of your worksite;
- Enhance existing or restore historical biological diversity;
- Use a design created by an appropriately qualified professional, and construct the works in accordance with that design;
- Maintain the active floodplain in its existing condition;
- Protect the streambed;
- Minimize direct and indirect impacts to onsite and adjacent riparian areas, fish and wildlife individuals, populations, species, and habitats; and
- Minimize direct and indirect impacts to other properties, roads, services or utilities.

**Standards and Best Practices:
Habitat Enhancement and Restoration**

Because of these risks to riparian and aquatic habitats and species, habitat enhancement works must only be undertaken when the need for works can be **justified**:

- The works will not negatively impact existing fish habitat;
- The works will avoid critical habitat areas;
- The works will minimize disturbances to riparian vegetation, active floodplains, ravines, and instream habitat;
- The works will not negatively impact any native fish and wildlife populations or their habitats;
- The works will result in an immediate and long-term net gain of aquatic habitat; and
- The works are designed to benefit as many of the native fish and wildlife species that use the stream as possible.

When you have ensured that your chosen design meets the listed design best practices, plan your habitat enhancement works to comply with the following construction or operational best practices.

7.5.4.2 Operational Best Practices

All individuals carrying out instream works should be very familiar with the listed standards and best practices. To address or achieve the standards and comply with the *Water Act* Regulation's Protection of Habitat (Section 42(1)) and Protection of Water Quality (Section 41) standards, you should follow or implement these operational best practices:

Monitoring

- Construction activities should be monitored full-time during start-up and any instream works or sensitive activity, and on a daily basis during any other construction activity to the completion of the project. The environmental monitor must be an appropriately qualified professional and will be provided with written authority to modify or halt any construction activity if it is deemed necessary to do so for the protection of fish and wildlife populations or their habitats. A sign listing the monitor's company name and phone number should be posted at the entrance to the job site or in the immediate vicinity.
- Forward a copy of the section of this document listing the standards and best practices for your works and all appropriate plans, drawings, and documents to the contractor or crew supervisor, and keep this information readily available at the site while the work is proceeding.
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

to ensure a common understanding of the mitigative best practices for the project.

- Within **60 days** of the project's completion have the environmental monitor complete and submit at least one copy of a monitoring report consistent with the recommended standard format (see Section 8.2 of this document) to both you and the Ministry.

Timing of Works – “Work Windows”

For further information on best practices for timing of works, see Appendix 14.1.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for streams where fish or species at risk are present, or if their presence in the stream is not known, complete in-channel or bank work during the instream works reduced risk-timing window provided by Ministry for your region.
- Only clear vegetation for worksite access during the vegetation clearing timing window, to protect nesting birds.
- As species at risk typically have no window of least risk, avoid in-channel work wherever possible when the presence of species at risk is known or expected.
- Refer to Appendix 14.1 or contact the Ministry's regional office for information on timing window requirements for your area.
- Only undertake works during favourable weather and low water conditions.
- Complete the works as quickly as possible once they are started.

Spill Reporting

Report any spill of a reportable quantity of a listed substance to the Provincial Emergency Program (PEP) at **1-800-663-3456** and to your nearest DFO office at the contact numbers listed at the end of this document.

Deleterious Substance Control/Spill Management (Subsections 41(a)(b) & 42(1)(d))

- Prevent the release of silt, sediment, sediment-laden water, raw concrete, concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine, or storm sewer system. The recommendations for sediment and erosion control outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al.* 1992) can also be used for reference.
- Ensure equipment and machinery are in good operating condition (power washed), free of leaks, excess oil, and grease. No equipment refuelling or servicing should be undertaken within 30m of any watercourse or surface water drainage.
- Ensure all hydraulic machinery entering a stream uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. Train onsite staff in its use. Immediately

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report any spill of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities to the Provincial Emergency Program 24-hour phone line at **1-800-663-3456**.

- Do not use treated wood products in any construction below the high-water mark of the stream channel, to prevent the release of preservatives that are toxic to fish.

Concrete Works (Subsections 41(e) & 42(d))

- Ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place must remain inside sealed formed structures. Concrete leachate is alkaline and highly toxic to fish and other aquatic life.
- A CO₂ tank with regulator, hose and gas diffuser must be readily available during concrete work to neutralize pH levels should a spill occur. Train staff in its use.
- Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- Report immediately any spills of sediments, debris, concrete fines, wash or contact water of reportable quantities to **1-800-663-3456**. Implement emergency mitigation and clean-up measures (such as use of CO₂ and immediate removal of the material).
- Completely isolate all concrete work from any water within or entering into any watercourse or stormwater system.
- Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until the works are completed. Emergency measures should be implemented if downstream pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level, or is recorded to be below 6.0 or above 9.0 pH units.
- Prevent any water that contacts uncured or partly cured concrete (during activities like exposed aggregate wash-off, wet curing, or equipment washing) from directly or indirectly entering any watercourse or stormwater system.
- Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0 pH units and the turbidity is less than 25 nephelometric turbidity units (NTU), measured to an accuracy of +/- 2 NTU.

Wood Products

For more information on acceptable wood products to use in or near water, consult the document *Guidelines to Protect Fish and Fish habitat From Treated Wood Used in Aquatic Environments in the Pacific Region (2000)*
<http://www.wwpinstitute.org/pdffiles/treatedwoodguidelines.pdf>

Isolation of the Work Area (Subsections 42(b) & 44(x))

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.
- Temporarily divert, enclose, or pump the water around the worksite. Ensure the point of discharge to the creek is located immediately downstream of the worksite to minimize disturbance to downstream populations and habitats.

Salvage of Fish and/or Wildlife (Subsection 42(1)(e))

- Complete a fish and amphibian salvage before the start of works if any portion of the wetted channel will be isolated or dewatered. An appropriately qualified professional must complete the salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by British Columbia Fisheries Regulations or Canada *Fisheries Act* before conducting the salvage activities.
- Choose low impact salvage methods such as minnow trapping and seining before opting for higher impact electrofishing.
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

New Land

Development BMPs

The Ministry is currently preparing a document entitled *Environmental Best Management Practices for Urban and Rural Land Development* that will contain additional information on best practices. Consult the Ministry websites for more information.

Sediment Control (Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f))

- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel or floodplain of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- Ensure machinery is operated from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Put sediment control measures into place before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars, or water diversions within the work area so they do not directly discharge sediment-laden surface flows into the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.

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- Use mitigating measures to protect excavated material from eroded and reintroduced into the watercourse. Such measures include, but are not limited to, covering the material with erosion blankets or seeding and planting it with native vegetation.
- When material is moved offsite, dispose of it in a manner that prevents its entry into any watercourse, floodplain, ravine, or storm sewer system.

Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management activities that will affect trees used by all birds and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.
- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.
- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.

**Standards and Best Practices:
Habitat Enhancement and Restoration**

**Tree Replacement
Criteria**

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:
http://srmwww.gov.bc.ca/sry/csd/downloads/fo rms/vegetation_riparian /treereplcrit.pdf

**No-net-loss of fish
and wildlife
habitat?**

Minimize impacts of your activities and leave the stream in better condition than how you found it!

- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.
- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.
- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

Site Restoration (Subsections 41(a)(c) & 42(1)(c)(f)(g))

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.
- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.
- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

**Standards and Best Practices:
Habitat Enhancement and Restoration**

REMEMBER:

Your project will not be considered to be in compliance with the Act or the Regulation if any of the standards have not been met. Ensure you implement appropriate best practices to avoid impacts and mitigate your works.

7.6 Standards and Best Practices for Beaver and Beaver Dam Management

7.6.1 Background

Beaver biology

- Beavers live in colonies of between 3-9 individuals.
- The colony uses one or more lodges or burrows and will build one or more dams.
- Beavers are thought to forage as far as 800m upstream and within 50m inland of their dams.
- Active beaver systems are not permanent, as they typically run out of available food sources within easy reach of the pond within 2-3 years.
- Beavers prefer low gradient watercourses (<6%) and need ample access to herbaceous and woody materials

Beaver impoundments often create flooding and other drainage related problems on adjacent lands, especially during fall, winter, and spring. This can be a cause for concern, particularly at road and rail stream crossings and on agricultural and forest resource lands.

Beaver impoundments may also severely restrict fish passage. Juvenile fish are often able to migrate downstream through dams by making use of small rivulets around the dam, but adult migration can be impaired especially during low water conditions when the stream flows do not overtop the dam.

While the flooding cause by beaver dams can be problematic, beavers play an important role in creating off-channel ponds through their damming activities. Beaver ponds can be critical in supporting ecological diversity and successional changes within streams. Flooding and renewal of riparian vegetation by beavers, followed by the collapse of the dam and renewal of stream cover, all serve to provide rich organic soils to the aquatic ecosystem. In that respect, beaver dams contribute to watershed health and biodiversity. Through their damming activities, these “natural engineers” can supply up to 25% of the low summer water reserves required for viable fish and aquatic wildlife habitat. Amphibian species thrive in created ponds, and salmonids found in habitats with beaver ponds have been shown to have higher growth rates (Bergstrom, 1985).

To disturb, molest or destroy a beaver house, den or dam is an offence under Section 9 of the *Wildlife Act* unless you are a trapper, licensed under that *Act*. Alteration or removal of a dam is permitted under the *Wildlife Act* “to provide irrigation or drainage under lawful authority for the protection of property” and under the *Water Act* for drainage purposes with specific restrictions. To remove a beaver dam, you must have the permission of the landowner and notify the Ministry at least 45 days in advance of your removal project. Be prepared to supply supporting documentation and justification for the works with respect to the size, scale, and location of your proposed works and the level of risk to existing buildings, roads, or services being threatened with flooding.

7.6.2 Objectives

The Ministry’s objectives for the management of beavers and beaver dams are to encourage our coexistence with beavers, to allow beavers to remain where appropriate, and to manage beaver populations in areas where beaver presence is not appropriate. For beaver dam removal activities, the Ministry’s objective is to prevent harmful impacts to beaver populations, fish

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Beaver and Beaver Dam Management**

and wildlife species, water quality and quantity, and riparian and aquatic habitats.

7.6.3 Standards for Beaver and Beaver Dam Management

All beaver dam removal works for which you are submitting instream works Notifications or Approvals must be compliant with the general standards listed in Section 7 of this document for:

**FEDERAL
STANDARDS:**

The federal *Fisheries Act* regulates fish and fish habitat in Canada. Section 35 of the *Act* prohibits the “harmful alteration, disruption, or destruction of fish habitat” (HADD) unless authorized by DFO.

If your works may result in a HADD, you will need to contact DFO for an Authorization of your works.

If species at risk are present, the federal *Species At Risk Act* will also apply.

REMEMBER:

You **must** submit a Notification to the WLAP or an Approval application to LWBC for your proposed works.

- Compliance with Federal, Provincial, and Municipal Legislation
- Land Ownership
- Public Safety
- Completion of Work
- Protection of Water Quality
- Protection of Species and Habitat
- Protection of Other Water Users

Specific standards associated with this type of work (*Water Act* Regulation Section 44(1)) and *Wildlife Act* Regulation Section 9) authorize beaver dam removal works completed as the following work type and under the following conditions:

Removal of a beaver dam under Section 9 of the Wildlife Act, provided that the removal is carried out in such a manner that downstream flooding and erosion do not occur (Subsection 44(1)(v), *Water Act* Regulation)

A person commits an offence if the person disturbs, molests or destroys a beaver house or den or beaver dam (Subsection 9(1)(b), *Wildlife Act*).

As the *Wildlife Act* section quoted above indicates, removal of a beaver dam requires a permit under the *Wildlife Act* Regulation. Contact your regional WLAP office for additional information on permit application requirements.

7.6.4 Best Practices

Long-term planning for beaver dam management is important. Planning should ensure that any activities undertaken would be effective in both the short and long terms. A beaver management plan should consider and include all of the following:

- Dam modification and debris management options;
- Population management strategies; and
- Dam removal only where absolutely necessary.

Remember:

Beaver impoundments can be critical in supporting the ecological diversity and successional changes within streams. Beaver dam removal works can result in very intrusive impacts to streams and stream corridors and are often only short-term solutions.

**Disadvantages of
Beaver Dams
Removal**

- Beaver removal works can result in very intrusive impact to streams and stream corridors;
- A flush of silty water can smother downstream fish spawning and rearing habitat;
- A rapid reduction of pond depth that can result in stranding and mortality of fish and other animals;
- Scouring and erosion of the downstream channel and banks, which can impact private property and infrastructure;
- Potential contamination of downstream wells; and
- The beaver, if left on site, will usually repair the breach immediately.

It is also important to consider that not all beaver problems can or should be handled in the same way. Dam removal is most effective as a tool when used in concert with other management techniques. There are a number of design strategies that can address these circumstances and provide effective alternatives to repeated removal of these barriers. Effective planning and monitoring of beaver dam management techniques can reduce operational and liability costs.

7.6.4.1 Examples of Dam Replacement and Isolation Techniques

Information on several techniques recommended for beaver dam management is provided below. Note that all of these techniques may require some form of maintenance.

Dam Removal

Complete beaver dam removal should only be considered in the following circumstances:

- After all other management tools have been exhausted;
- Where an emergency situation has arisen; and
- Where measures can be taken to ensure that no harmful alteration to fish habitat will occur.

Dam removal is generally ineffective when not used together with other management techniques, as beavers will usually repair the breach immediately, often within hours. There are a number of alternate design strategies that can address these circumstances and provide effective alternatives to repeated removal of dams. A few of these are listed below.

Replacement of Road Culverts with Clean-span Bridges

Beavers prefer to construct their dams in low gradient locations where there are natural constrictions in the stream flow and a ready source of food and building materials. This often means that road crossing culverts become prime targets for dam building activities. Where fish habitat and adjacent land values require free flowing stream conditions, it is recommended that these crossings be prioritized for eventual replacement with clean span bridges, wherever feasible. Replacement of a culvert with a free span bridge requires submission of a notification and compliance with Section 9 of the Water Act.

Culvert Screening Devices

Culvert design conversions, including upstream screening methods, should be considered on small, low gradient systems where protection of fish access is desirable and frequent maintenance can be undertaken. Where fish are present, the structure should be designed and installed to promote fish migration patterns. These structures are typically affixed to the inlet end of a culvert. There is at least one proprietary design known as the "Beaver Stop" which includes a double-walled wire cage assembly that is fastened to the upstream end of the culvert.

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Perforated Culverts

A PVC pipe may be installed through the dam to form a one-piece screen and culvert. The pipe will have as many holes as possible drilled in the upstream end.

Log or Rock Fish Ladders adjacent to Beaver Dams

Log or rock fish ladders adjacent to beaver dams can be workable alternatives, used to promote fish access over beaver dams. These structures, however, may not adequately address flooding.

Fencing Techniques

Fencing should be designed to safely and effectively exclude the beaver from accessing upland vegetation while maintaining unrestricted stream flows. In order to ensure safe and effective beaver exclusion fencing, the following guidelines should be adhered to:

- Fence mesh openings should be small enough to prevent entry by beaver kits (<15 cm); and
- Fencing should be placed above the winter high-water mark of the watercourse.

7.6.4.2 Operational Best Practices

All individuals carrying out instream works should be very familiar with the listed standards and best practices. To address or achieve the standards and comply with the *Water Act* Regulation's Protection of Habitat (Section 42(1)) and Protection of Water Quality (Section 41) standards, you should follow or implement these operational best practices:

Monitoring

- Dam modification activities should be monitored full-time during any instream works or sensitive activity. The environmental monitor must be an appropriately qualified professional and will be provided with written authority to modify or halt any construction activity if it is deemed necessary to do so for the protection of fish and wildlife populations or their habitats. A sign listing the monitor's company name and phone number should be posted at the entrance to the job site or in the immediate vicinity.
- Forward a copy of the section of this document listing the standards and best practices for your works and all appropriate plans, drawings, and documents to the contractor or crew supervisor, and keep this information readily available at the site while the work is proceeding.
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project.
- Within **60 days** of the project's completion have the environmental monitor complete and submit at least one copy of

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

a monitoring report consistent with the recommended standard format (see Section 8.2 of this document) to both you and the Ministry.

Timing of Works – “Work Windows”

For further information on best practices for timing of works, see Appendix 14.1.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for streams where fish or species at risk are present, or if their presence in the stream is not known, complete in-channel or bank work during the instream works reduced risk-timing window provided by Ministry for your region.
- Only clear vegetation for worksite access during the vegetation clearing timing window, to protect nesting birds.
- As species at risk typically have no window of least risk, avoid in-channel work wherever possible when the presence of species at risk is known or expected.
- Refer to Appendix 14.1 or contact the Ministry’s regional office for information on timing window requirements for your area.
- Only undertake works during favourable weather and low water conditions.
- Complete the works as quickly as possible once they are started.

Deleterious Substance Control/Spill Management (Subsections 41(a)(b) & 42(1)(d))

- Prevent the release of silt, sediment, sediment-laden water, raw concrete, concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine, or storm sewer system. The recommendations for sediment and erosion control outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al.* 1992) can also be used for reference.
- Ensure any equipment and machinery used is in good operating condition (power washed), free of leaks, excess oil, and grease. No equipment refuelling or servicing should be undertaken within 30m of any watercourse or surface water drainage.
- Ensure all hydraulic machinery entering a stream uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. Train onsite staff in its use. Immediately report any spill of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities to the Provincial Emergency Program 24-hour phone line at 1-800-663-3456.

Spill Reporting

Report any spill of a reportable quantity of a listed substance to the Provincial Emergency Program (PEP) at 1-800-663-3456 and to your nearest DFO office at the contact numbers listed at the end of this document.

Isolation of the Work Area (Subsections 42(b) & 44(x))

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.

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- Temporarily divert, enclose, or pump the water around the worksite. Ensure the point of discharge to the creek is located immediately downstream of the worksite to minimize disturbance to downstream populations and habitats.
- If it is not possible for you to fully isolate and divert flowing water from your work area due to water depth and volume, isolate your works with a silt curtain to keep silty water from entering clean water.

Salvage of Fish and/or Wildlife (Subsection 42(1)(e))

- Complete a fish and amphibian salvage before the start of works if any portion of the wetted channel will be isolated or dewatered. An appropriately qualified professional must complete the salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by British Columbia Fisheries Regulations or Canada *Fisheries Act* before conducting the salvage activities.
- Choose low impact salvage methods such as minnow trapping and seining before opting for higher impact electrofishing.
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

Sediment Control (Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f))

- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel or floodplain of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- Ensure any machinery used is operated from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Put sediment control measures into place before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars, or water diversions within the work area so they do not directly discharge sediment-laden surface flows into the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.
- Use mitigating measures to protect excavated material from eroded and reintroduced into the watercourse. Such measures

**New Land
Development BMPs**

The Ministry is currently preparing a document entitled *Environmental Best Management Practices for Urban and Rural Land Development* that will contain additional information on best practices. Consult the Ministry websites for more information.

include, but are not limited to, covering the material with erosion blankets or seeding and planting it with native vegetation.

- When material is moved offsite, dispose of it in a manner that prevents its entry into any watercourse, floodplain, ravine, or storm sewer system.

Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management activities that will affect trees used by all birds and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.
- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.
- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel

Tree Replacement Criteria

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:

http://srmwww.gov.bc.ca/sry/csd/downloads/fo rms/vegetation_riparian /treereplcrit.pdf

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must be completed in a manner that will not disturb aquatic organisms.

- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.
- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.
- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

Site Restoration (Subsections 41(a)(c) & 42(1)(c)(f)(g))

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.
- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.
- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

**No-net-loss of fish
and wildlife
habitat?**

Minimize impacts of your activities and leave the stream in better condition than how you found it!

**Standards and Best Practices:
Beaver and Beaver Dam Management**

REMEMBER:

Your project will not be considered to be in compliance with the Act or the Regulation if any of the standards have not been met. Ensure you implement appropriate best practices to avoid impacts and mitigate your works.

7.7 Standards and Best Practices for Miscellaneous Instream Works

7.7.1 Background

Several types of instream works less commonly undertaken are also permitted under the Notification process. If your work type is listed in Section 3.3 as being permitted under the Notification process but a specific type document is not provided, please apply the following standards and best practices to your document.

FEDERAL STANDARDS:

The federal *Fisheries Act* regulates fish and fish habitat in Canada. Section 35 of the *Act* prohibits the “harmful alteration, disruption, or destruction of fish habitat” (HADD) unless authorized by DFO.

If your works may result in a HADD, you will need to contact DFO for an Authorization of your works.

If species at risk are present, the federal *Species At Risk Act* will also apply.

REMEMBER:

You **must** submit a Notification to the WLAP or an Approval application to LWBC for your proposed works.

7.7.2 Objectives

The Ministry’s objective for the management of instream works is to prevent harmful impacts to water quality, riparian and aquatic habitats, and fish and wildlife species during instream activities.

7.7.3 Standards for Other Types of Instream Works

All instream works for which you are submitting instream works notifications or approvals must be compliant with the general standards listed in Section 7 of this document for:

- Compliance with Federal, Provincial, and Municipal Legislation
- Land Ownership
- Public Safety
- Completion of Work
- Protection of Water Quality
- Protection of Species and Habitat
- Protection of Other Water Users

Specific standards associated with these types of work (*Water Act* Regulation Section 44(1)) permit works completed as the following work types and under the following conditions:

Piers and Wharfs (Subsection 44(1)(d)):

The construction, maintenance or removal of a pier or wharf in a stream, provided that the ebb and flow of water and movement of material under the influence of waves or currents is not obstructed;

Flow Monitoring Devices (Subsection 44(1)(e)):

The construction, maintenance or removal of a flow or water level measuring device in a stream by the Crown in right of either Canada or British Columbia, or their agents;

Fish Screen Fences (Subsection 44(1)(f)):

The construction or removal of a fish fence, screen or fish or game guard across a stream by the Crown in right of either Canada or British Columbia, or their agents, provided that it is designed, constructed, maintained or used so as not to obstruct the flow of water in the stream; and

**Minor and Routine Maintenance of Public Utility Works
(Subsection 44(1)(u)):**

The maintenance of a minor and routine nature by a public utility of its works.

7.7.4 Best Practices

The following section outlines recommended best practices for the design and construction of miscellaneous instream works.

7.7.4.1 Design Best Practices

The following best practices should be used in the design of piers, wharves, and related structures:

- Time construction to periods when use of the site by aquatic species is minimal (instream window).
- Construct docks so as to maintain a free flow of water currents beneath them to prevent erosion and sediment deposition along the shore, wherever possible.
- Reduce the width of approach trestles in shallow water.
- Locate structures so that future dredging will not be required.
- Use pre-cast concrete, steel or plastic construction material rather than treated wood, where possible, and especially in poorly flushed areas.
- If treated wood must be used, use wood treated with water-based preservatives. Pre-order wood timbers cut to size first then treated, where this is possible. Avoid the use of creosote treated wood in fresh water.
- Construct as much of the structure as possible in an upland area rather than in place and over the water.
- Provide an impermeable deck, spill containment, and a collection system for surface runoff where piers or trestles support mechanical or refueling equipment.
- Orient marina floats with currents or prevailing winds to prevent trapping surface debris and oily residue.
- Avoid the placement of floats or pile structures over significant areas of marine vegetation.
- Elevate piers well above the water, and orient floats in a north-south direction so that they do not shade bottom vegetation beds.
- Locate floats so that they remain afloat even at the lowest tides.

**Standards and Best Practices:
Miscellaneous Instream Works**

7.7.4.2 Operational Best Practices

All individuals carrying out instream works should be very familiar with the listed standards and best practices. To address or achieve the standards and comply with the *Water Act* Regulation's Protection of Habitat (Section 42(1)) and Protection of Water Quality (Section 41) standards, you should follow or implement these operational best practices:

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

Monitoring

- Construction activities should be monitored full-time during start-up and any instream works or sensitive activity, and on a daily basis during any other construction activity to the completion of the project. The environmental monitor must be an appropriately qualified professional and will be provided with written authority to modify or halt any construction activity if it is deemed necessary to do so for the protection of fish and wildlife populations or their habitats. A sign listing the monitor's company name and phone number should be posted at the entrance to the job site or in the immediate vicinity.
- Forward a copy of the section of this document listing the standards and best practices for your works and all appropriate plans, drawings, and documents to the contractor or crew supervisor, and keep this information readily available at the site while the work is proceeding.
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project.
- Within **60 days** of the project's completion have the environmental monitor complete and submit at least one copy of a monitoring report consistent with the recommended standard format (see Section 8.2 of this document) to both you and the Ministry.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for streams where fish or species at risk are present, or if their presence in the stream is not known, complete in-channel or bank work during the instream works reduced risk-timing window provided by Ministry for your region.
- Only clear vegetation for worksite access during the vegetation clearing timing window, to protect nesting birds.
- As species at risk typically have no window of least risk, avoid in-channel work wherever possible when the presence of species at risk is known or expected.
- Refer to Appendix 14.1 or contact the Ministry's regional office for information on timing window requirements for your area.
- Only undertake works during favourable weather and low water conditions.

**Timing of Works –
“Work Windows”**

For further information on best practices for timing of works, see Appendix 14.1.

- Complete the works as quickly as possible once they are started.

Deleterious Substance Control/Spill Management (Subsections 41(a)(b) & 42(1)(d))

- Prevent the release of silt, sediment, sediment-laden water, raw concrete, concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine, or storm sewer system. The recommendations for sediment and erosion control outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al.* 1992) can also be used for reference.
- Ensure equipment and machinery are in good operating condition (power washed), free of leaks, excess oil, and grease. No equipment refuelling or servicing should be undertaken within 30m of any watercourse or surface water drainage.
- Ensure all hydraulic machinery entering a stream uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. Train onsite staff in its use. Immediately report any spill of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities to the Provincial Emergency Program 24-hour phone line at **1-800-663-3456**.
- Do not use treated wood products in any construction below the high-water mark of the stream channel, to prevent the release of preservatives that are toxic to fish.

Concrete Works (Subsections 41(e) & 42(d))

- Ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place must remain inside sealed formed structures. Concrete leachate is alkaline and highly toxic to fish and other aquatic life.
- A CO₂ tank with regulator, hose and gas diffuser must be readily available during concrete work to neutralize pH levels should a spill occur. Train staff in its use.
- Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- Report immediately any spills of sediments, debris, concrete fines, wash or contact water of reportable quantities to **1-800-663-3456**. Implement emergency mitigation and clean-up measures (such as use of CO₂ and immediate removal of the material).
- Completely isolate all concrete work from any water within or entering into any watercourse or stormwater system.

Spill Reporting

Report any spill of a reportable quantity of a listed substance to the Provincial Emergency Program (PEP) at **1-800-663-3456** and to your nearest DFO office at the contact numbers listed at the end of this document.

Wood Products

For more information on acceptable wood products to use in or near water, consult the document *Guidelines to Protect Fish and Fish habitat From Treated Wood Used in Aquatic Environments in the Pacific Region (2000)*
<http://www.wwpinstitute.org/pdffiles/treatedwoodguidelines.pdf>

**Standards and Best Practices:
Miscellaneous Instream Works**

- Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until the works are completed. Emergency measures should be implemented if downstream pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level, or is recorded to be below 6.0 or above 9.0 pH units.
- Prevent any water that contacts uncured or partly cured concrete (during activities like exposed aggregate wash-off, wet curing, or equipment washing) from directly or indirectly entering any watercourse or stormwater system.
- Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0 pH units and the turbidity is less than 25 nephelometric turbidity units (NTU), measured to an accuracy of +/- 2 NTU.

**New Land
Development BMPs**

The Ministry is currently preparing a document entitled *Environmental Best Management Practices for Urban and Rural Land Development* that will contain additional information on best practices. Consult the Ministry websites for more information.

Isolation of the Work Area (Subsections 42(b) & 44(x))

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.
- Temporarily divert, enclose, or pump the water around the worksite. Ensure the point of discharge to the creek is located immediately downstream of the worksite to minimize disturbance to downstream populations and habitats.
- If it is not possible for you to fully isolate and divert flowing water from your work area due to water depth and volume, isolate your works with a silt curtain to keep silty water from entering clean water.

Salvage of Fish and/or Wildlife (Subsection 42(1)(e))

- Complete a fish and amphibian salvage before the start of works if any portion of the wetted channel will be isolated or dewatered. An appropriately qualified professional must complete the salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by British Columbia Fisheries Regulations or Canada *Fisheries Act* before conducting the salvage activities.
- Choose low impact salvage methods such as minnow trapping and seining before opting for higher impact electrofishing.
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

Sediment Control (Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f))

- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel or floodplain of

Standards and Best Practices: Miscellaneous Instream Works

the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.

- Ensure machinery is operated from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Put sediment control measures into place before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars, or water diversions within the work area so they do not directly discharge sediment-laden surface flows into the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.
- Use mitigating measures to protect excavated material from eroded and reintroduced into the watercourse. Such measures include, but are not limited to, covering the material with erosion blankets or seeding and planting it with native vegetation.
- When material is moved offsite, dispose of it in a manner that prevents its entry into any watercourse, floodplain, ravine, or storm sewer system.

Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management activities that will affect trees used by all birds and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.
- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.

Tree Replacement Criteria

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:
http://srmwww.gov.bc.ca/sry/csd/downloads/fo rms/vegetation_riparian /treereplcrit.pdf

**Standards and Best Practices:
Miscellaneous Instream Works**

- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.
- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.
- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

Site Restoration (Subsections 41(a)(c) & 42(1)(c)(f)(g))

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.
- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.

**Standards and Best Practices:
Miscellaneous Instream Works**

**No-net-loss of fish
and wildlife
habitat?**

Minimize impacts of your activities and leave the stream in better condition than how you found it!

- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

REMEMBER:

Your project will not be considered to be in compliance with the Act or the Regulation if any of the standards have not been met. Ensure you implement appropriate best practices to avoid impacts and mitigate your works.

7.8 Standards and Best Practices for Emergency Works

7.8.1 Background

Emergency instream works are specifically defined in the British Columbia *Water Act* Regulation (Subsections 44 (o) and (p)). Emergency works include erosion or flood protection works required during a flood emergency declared under the British Columbia *Emergency Program Act*, or works required to clear an obstruction from a bridge or culvert during a flood event when there exists a potential danger to life or property. The British Columbia government, its agents, or a municipality are permitted to undertake both types of work.

Unfortunately the Regulations do not address all high-risk emergency situations or those works that require attention prior to the next flood event to ensure that they do not become high risk. A protocol to manage these other emergency situations is proposed in the following best practices section.

FEDERAL

STANDARDS:

The federal *Fisheries Act* regulates fish and fish habitat in Canada. Section 35 of the *Act* prohibits the “harmful alteration, disruption, or destruction of fish habitat” (HADD) unless authorized by DFO.

If your works may result in a HADD, you will need to contact DFO for an Authorization of your works.

If species at risk are present, the federal *Species At Risk Act* will also apply.

REMEMBER:

You **must** submit a Notification to the WLAP or an Approval application to LWBC for your proposed works.

7.8.2 Objectives

To ensure that emergency works are conducted without further damage or risk to human life or property while avoiding or mitigating potential risks to fish and wildlife populations and habitats.

7.8.3 Standards for Emergency Works

All emergency instream works must be compliant with the general standards listed in Section 7 of this document for:

- Compliance with Federal, Provincial, and Municipal Legislation
- Land Ownership
- Public Safety
- Completion of Work
- Protection of Water Quality
- Protection of Species and Habitat
- Protection of Other Water Users

Specific standards associated with this type of work (*Water Act* Regulation Section 44(1)) permit works completed as the following work types and under the following conditions:

Emergency Flood and Erosion Protection Works (Subsection 44(1)(o)):

The construction or placement of erosion protection works or flood protection works during a flood emergency, but not including restoration works, declared under the *Emergency Program Act*, under the direction of

the Crown in right of British Columbia, or its agents, or by a municipality.

Flood Event Debris Removal (Subsection 44(1)(p):

The clearing of an obstruction from a bridge or culvert by the Crown in right of British Columbia, or its agents, or by a municipality during a flood event when there exists a potential danger to life or property.

**7.8.4 Best Practices Protocol to Manage Emergency Works
and to Mitigate Impacts During Their Construction**

The following protocol is recommended to manage all potential emergency works that require either immediate (Type 1) or imminent (Type 2) completion of works, either outside or within the recommended instream work window:

Type 1 emergencies are situations that require immediate attention **during a flood event or as designated under the Provincial Emergency Program**. These situations have caused, or present in the immediate future (**i.e., within 24 hours**), a high potential danger to human life, significant damage to property, or significant adverse impacts to fish or wildlife populations or their habitats.

Type 2 emergencies are situations that require attention in the near future, **immediately prior to the next flood event**. These situations would present a high potential danger to human life, significant damage to property, or significant adverse impacts to fish or wildlife populations or their habitats if not addressed immediately prior to the next flood event.

An appropriately qualified professional should confirm all emergency works. Once confirmed, all emergency works should follow the protocols for the type of emergency as outlined below:

Type 1 Emergency Protocol

- Local government, crown agency operations staff, or their agents should commence necessary works to alleviate the emergency and immediately advise their appropriately qualified professional monitor at any time of day and any day of the week.
- During the completion of works, operations staff or their agents should incorporate the standards and best practices appropriate to the type of instream works being completed to ensure the protection of fish and wildlife populations and habitats.
- The monitoring professional should attend the site immediately to conduct salvages and to ensure environmental protection measures are designed, constructed or installed, and maintained appropriately. The monitor should remain at the site full-time to monitor the works until completion.
- **Only works necessary to mitigate the emergency should be completed.** Any remaining works should be deferred until the next instream work window or conducted through the regular process.

**Standards and Best Practices:
Emergency Works**

- The monitoring professional must notify WLAP, DFO, and any other appropriate agencies by fax and phone within 72 hours. The monitor should include in his or her communication the use of this protocol, the technical rationale for justification of the proposed emergency works, the information associated with the Notification, and any special mitigating best practices used for completing the works outside the instream work window. Agency staff may visit the site, after receipt of the Notification.

Type 2 Emergency Protocol

- Local government, or crown agency operations staff, or their agents should advise their appropriately qualified professional monitor during the first available office hours:
 - **Only works necessary to mitigate the emergency should be proposed.** Any remaining works should be deferred until the next instream work window, or conducted through the regular process;
 - The proposed works should be scheduled to be completed prior to the next flood event, and should be designed to incorporate the recommended standards and best practices appropriate to the type of instream works proposed. If appropriate, special mitigative measures should be incorporated into the design to reduce the risks of working outside the instream work window.
 - The monitoring professional must notify WLAP, DFO, and any other appropriate agencies by fax and phone and include all design, plans, and mitigation documents. The professional should include in their communication the use of this protocol, the technical rationale for justification of the proposed emergency works, the information associated with the Notification, and any special mitigating best practices used for completing the works outside the instream work window. Agency staff may visit the site, after receipt of the Notification;
 - The monitoring professional should meet onsite with agency staff if available to review the design, associated plans, and proposed works. Any additional best practices should be discussed and agreed to during the site visit. Works should then be completed prior to the next flood event.
 - The monitoring professional should attend the site prior to conducting any instream works to complete salvages, and to ensure environmental protection measures are constructed, installed and maintained appropriately. Works should then be monitored full-time until completion.

7.8.4.1 Operational Best Practices

Emergency works carry a higher potential risk to fish and wildlife populations and habitats. The following operational best practices should be addressed in the planning, design and completion of all proposed emergency instream works.

Monitoring

- An appropriately qualified professional knowledgeable and experienced in monitoring the particular type of works should monitor all emergency works full-time. **Due to the sensitivity of conducting works during potentially high-risk periods to fish and wildlife populations and habitats, an appropriately qualified professional with extensive related experience in sediment, erosion and run-off control techniques, as well as fish and wildlife salvage should conduct the monitoring of works.**
- The monitor should complete a written report for the proponent within **10 working days** of completion of the majority of works. The report should include the following:
 - Detailed accounts of the completion of works with milestone events;
 - Confirmation of the use of standards and recommended best practices, or supported alternatives through an appropriate professionals' supported signed, and sealed technical rationale;
 - Confirmation of the consistency of the completed works with the Notification submitted;
 - Fish and wildlife protection mitigation difficulties encountered, and how those difficulties were managed; and
 - Outstanding issues with the Notification, how and when those activities will be completed and confirmed, and how and when they will be reported.
- A final copy of the report(s) should be provided to the proponent, a copy retained by the environmental monitor, a copy forwarded to WLAP to be filed with the Notification, and a copy provided to any other agency(s) with jurisdiction.

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for streams where fish or species at risk are present, or if their presence in the stream is not known, complete in-channel or bank work during the instream works reduced risk-timing window provided by Ministry for your region, if possible. As species at risk typically have no window of least risk, avoid in-channel work wherever possible when the presence of species at risk is known or expected;
- Only clear vegetation for worksite access during the vegetation clearing timing window, to protect nesting birds, if possible;
- If possible, undertake works during favourable weather and low water conditions; and
- Complete the works as quickly as possible once started.

Timing of Works – “Work Windows”

For further information on best practices for timing of works, see Appendix 14.1.

Salvage of Fish and/or Wildlife (Subsection 42(1)(e))

- Complete a fish and amphibian salvage before the start of works if any portion of the wetted channel will be isolated or dewatered. An appropriately qualified professional must complete the

Standards and Best Practices: Emergency Works

salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by British Columbia Fisheries Regulations or Canada *Fisheries Act* before conducting the salvage activities.

- Choose low impact salvage methods such as minnow trapping and seining before opting for higher impact electrofishing.
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

New Land

Development BMPs

The Ministry is currently preparing a document entitled *Environmental Best Management Practices for Urban and Rural Land Development* that will contain additional information on best practices. Consult the Ministry websites for more information.

Tree Replacement Criteria

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:
http://srmwww.gov.bc.ca/sry/csd/downloads/fo rms/vegetation_riparian/treereplcrit.pdf

Sediment Control (Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f))

- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel or floodplain of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- Ensure machinery is operated from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Put sediment control measures into place before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars, or water diversions within the work area so they do not directly discharge sediment-laden surface flows into the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.
- Use mitigating measures to protect excavated material from eroded and reintroduced into the watercourse. Such measures include, but are not limited to, covering the material with erosion blankets or seeding and planting it with native vegetation.
- When material is moved offsite, dispose of it in a manner that prevents its entry into any watercourse, floodplain, ravine, or storm sewer system.

Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management

activities that will affect trees used by all birds and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.

- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.
- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.
- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.

**Standards and Best Practices:
Emergency Works**

- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

Site Restoration (Subsections 41(a)(c) & 42(1)(c)(f)(g))

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.
- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.
- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

**No-net-loss of fish
and wildlife
habitat?**

Minimize impacts of your activities and leave the stream in better condition than how you found it!

REMEMBER:

Your project will not be considered to be in compliance with the Act or the Regulation if any of the standards have not been met. Ensure you implement appropriate best practices to avoid impacts and mitigate your works.

7.9 Standards and Best Practices for Other Types of Works Requiring *Water Act* Approvals

Consult with DFO to determine if your works will result in a HADD.

You will likely need to contact DFO for an Authorization of works under Subsection 35(2) of the Fisheries Act.

In addition to obtaining a DFO Authorization, you **must** apply for an Approval of the works under Section 9 of the *Water Act*.

Review this document and contact LWBC for information on the Approval application process.

7.9.1 Background

Instream works such as stream realignment or diversion; dam, weir, or sediment sump construction; pond or lake creation; permanent flow diversions; or any other works not permitted under the *Water Act* Regulation require an Approval under Section 9 of the *Water Act*. These are typically significant works that permanently alter the direction, pattern or flow of a stream's path. Significant habitat alteration is almost always required for these types of works and as a result, federal and provincial regulatory processes are invoked. These types of works typically result in a HADD of fish habitat.

Generally, the direction or capacity of a stream's natural channel should never be altered. There are many consequences that can be devastating to the stream and its aquatic life over the long term. Stream diversion, sediment pond or lake creation are just a few examples of works of this type that require very complex proposals as part of an application for Approval. Planning and designing these works typically requires the involvement of many specialized qualified professionals. Many complex issues involving, physical, biological and social constraints must also be addressed.

The following should be considered when proposing this type of works:

- The **location of the stream** and its' effects on adjacent properties and services before and after the proposed alteration. The value of adjacent properties can be greatly affected by changing the streams' proximity to them. The risk of flooding and erosion to properties and roads, services, and utilities can also be greatly affected.
- **Cost.** An altered stream should result in a net gain of fish habitat for the stream immediately after construction and in the long term. The costs for reproducing a natural fully productive stream are substantial, and costs typically continue for years after the initial construction. Depending on the stream, the habitats supported, and the conditions in the area, habitat creation associated with stream alterations can cost upwards of \$10,000 per linear metre.
- **The long-term viability and maintenance of the stream.** Streams are stable, dynamic organisms that support hundreds of different balanced aquatic and terrestrial life cycles. The path that streams follow is the most preferred and will need to change over time within its active floodplain depending on the topography of the area. Altering, restricting

**Standards and Best Practices:
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or fixing its path affects the ability of the stream to change or react to change and will limit its ability to support fish and wildlife habitats and populations. Works that restrict a stream's channel or floodplain also increase stream power and erosive forces in channel bends, resulting in a need for substantial bank protection to keep the channel position fixed and the water moving in a direction that it doesn't prefer to go. This hardening of the banks increases stream power more and results in increased costly channel maintenance needs that continue forever.

7.9.2 Objectives

Along with LWBC, WLAP's objective for the management of *Water Act* Section 9 Approvals is to prevent immediate and long-term harmful impacts to riparian and aquatic fish and wildlife habitats, fish and wildlife populations, and water quality and quantity.

7.9.3 Standards for Works Requiring Approvals

All activities **not** permitted under the *Water Act* Regulation require an Approval pursuant to Section 9 of the *Water Act*. A Section 9 Approval provides the conditions or standards that must be met when completing works. As works under Section 9 typically result in a HADD, application should **always** be made to DFO. Section 35 of the *Fisheries Act* prohibits a HADD unless authorized by DFO.

7.9.4 Best Practices

You should retain an appropriately qualified professional to assist with your proposal for works. Any application for an Approval under Section 9 should consider the following best practices.

7.9.4.1 Design Best Practices

An application for a Section 9 Approval should provide justification that:

- The works cannot be avoided;
- All alternatives to conducting the works have been considered;
- The works have been designed such that there would be no significant immediate or long-term impacts to upstream or downstream riparian or aquatic fish and wildlife habitats;
- The works have been designed such that there would be no significant immediate or long-term impacts to adjacent, upstream, or downstream properties, roads, services, or utilities.
- Permission can be obtained for any actual or potential impacts to property rights;
- There would no impacts to upstream or downstream water rights;
- The works are designed, constructed, monitored, and maintained by a team of appropriately qualified professionals, machine operators and other skilled construction staff that are specialized in the design,

A Consequence of Change

Even without tight turns and steep banks, altered watercourses can typically take 20 to 30 years to achieve dynamic stability and 30 years or more to reach the level of productivity that they had prior to being changed.

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construction and maintenance of such works and of fish and wildlife habitat streams; and

- The works would result in significant immediate and long-term net gain in fish and wildlife habitat.

Please note...

Should you be successful in the application for an Approval, the Section 9 Approval document you receive may provide more specific conditions, requirements or best practices than those listed below

7.9.4.2 Operational Best Practices

All individuals carrying out instream works should be very familiar with the listed standards and best practices. To address or achieve the listed standards and comply with the *Water Act*, you should apply the following operational best practices:

Monitoring

- As these types of works can result in significant impacts to fish and wildlife habitats, construction activities should be monitored **full-time** to the completion of the project. The environmental monitor should be an appropriately qualified professional and should have been provided with written authority to modify or halt any construction activity if deemed necessary for the protection of fish and wildlife populations or their habitats. A sign should be posted at the entrance to the job site or in the immediate vicinity listing the monitor's company name and phone number;
- A copy of this section of the document listing standards and best practices for your works, all appropriate plans and drawings, your *Water Act* Section 9 Approval, your DFO *Fisheries Act* Subsection 35(2) Authorization (if appropriate), and any other permits should be forwarded to the contractor or crew supervisor. Keep them readily available at all times at the site while the work is proceeding;
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project; and
- Have the environmental monitor complete and submit at least one copy of a monitoring report consistent with the recommended standard format (see Section 8.2 of this document for a suggested template) to agencies identified in the Approval document.

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

Timing of Works (Subsection 42(1)(a))

- If works are scheduled for streams where fish or species at risk are present, or if their presence in the stream is not known, complete in-channel or bank work during the instream works reduced risk-timing window provided by Ministry for your region.
- Only clear vegetation for worksite access during the vegetation clearing timing window, to protect nesting birds.

**Timing of Works –
“Work Windows”**

For further information on best practices for timing of works, see Appendix 14.1.

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- As species at risk typically have no window of least risk, avoid in-channel work wherever possible when the presence of species at risk is known or expected.
- Refer to Appendix 14.1 or contact the Ministry's regional office for information on timing window requirements for your area.
- Only undertake works during favourable weather and low water conditions.
- Complete the works as quickly as possible once they are started.

Spill Reporting

Report any spill of a reportable quantity of a listed substance to the Provincial Emergency Program (PEP) at **1-800-663-3456** and to your nearest DFO office at the contact numbers listed at the end of this document.

Deleterious Substance Control/Spill Management (Subsections 41(a)(b) & 42(1)(d))

- Prevent the release of silt, sediment, sediment-laden water, raw concrete, concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine, or storm sewer system. The recommendations for sediment and erosion control outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck *et al.* 1992) can also be used for reference.
- Ensure equipment and machinery are in good operating condition (power washed), free of leaks, excess oil, and grease. No equipment refuelling or servicing should be undertaken within 30m of any watercourse or surface water drainage.
- Ensure all hydraulic machinery entering a stream uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. Train onsite staff in its use. Immediately report any spill of a substance that is toxic, polluting, or deleterious to aquatic life of reportable quantities to the Provincial Emergency Program 24-hour phone line at **1-800-663-3456**.
- Do not use treated wood products in any construction below the high-water mark of the stream channel, to prevent the release of preservatives that are toxic to fish.

Wood Products

For more information on acceptable wood products to use in or near water, consult the document *Guidelines to Protect Fish and Fish habitat From Treated Wood Used in Aquatic Environments in the Pacific Region (2000)*

Concrete Works (Subsections 41(e) & 42(d))

- Ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place must remain inside sealed formed structures. Concrete leachate is alkaline and highly toxic to fish and other aquatic life.
- A CO₂ tank with regulator, hose and gas diffuser must be readily available during concrete work to neutralize pH levels should a spill occur. Train staff in its use.

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- Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- Report immediately any spills of sediments, debris, concrete fines, wash or contact water of reportable quantities to **1-800-663-3456**. Implement emergency mitigation and clean-up measures (such as use of CO₂ and immediate removal of the material).
- Completely isolate all concrete work from any water within or entering into any watercourse or stormwater system.
- Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until the works are completed. Emergency measures should be implemented if downstream pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level, or is recorded to be below 6.0 or above 9.0 pH units.
- Prevent any water that contacts uncured or partly cured concrete (during activities like exposed aggregate wash-off, wet curing, or equipment washing) from directly or indirectly entering any watercourse or stormwater system.
- Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0 pH units and the turbidity is less than 25 nephelometric turbidity units (NTU), measured to an accuracy of +/- 2 NTU.

Isolation of the Work Area (Subsections 42(b) & 44(x))

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.
- Temporarily divert, enclose, or pump the water around the worksite. Ensure the point of discharge to the creek is located immediately downstream of the worksite to minimize disturbance to downstream populations and habitats.

Salvage of Fish and/or Wildlife (Subsection 42(1)(e))

- Complete a fish and amphibian salvage before the start of works if any portion of the wetted channel will be isolated or dewatered. An appropriately qualified professional must complete the salvage. It is the responsibility of the salvage crew to obtain the necessary permits required by British Columbia Fisheries Regulations or Canada *Fisheries Act* before conducting the salvage activities.
- Choose low impact salvage methods such as minnow trapping and seining before opting for higher impact electrofishing.
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

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New Land

Development BMPs

The Ministry is currently preparing a document entitled *Environmental Best Management Practices for Urban and Rural Land Development* that will contain additional information on best practices. Consult the Ministry websites for more information.

**Tree Replacement
Criteria**

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:

Sediment Control (Subsections 41(a)(b)(c) & 42 (1)(c)(d)(f))

- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel or floodplain of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- Ensure machinery is operated from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Put sediment control measures into place before starting any works that may result in sediment mobilization.
- Construct any ditches, water bars, or water diversions within the work area so they do not directly discharge sediment-laden surface flows into the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.
- Use mitigating measures to protect excavated material from eroded and reintroduced into the watercourse. Such measures include, but are not limited to, covering the material with erosion blankets or seeding and planting it with native vegetation.
- When material is moved offsite, dispose of it in a manner that prevents its entry into any watercourse, floodplain, ravine, or storm sewer system.

Vegetation Management (Subsections 41(c) & 42 (f)(g))

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management activities that will affect trees used by all birds and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.

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- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.
- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.
- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.
- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

Site Restoration (Subsections 41(a)(c) & 42(1)(c)(f)(g))

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.

**Standards and Best Practices:
Other Types of Works Requiring *Water Act* Approvals**

**No-net-loss of fish
and wildlife
habitat?**

Minimize impacts of your activities and leave the stream in better condition than how you found it!

- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.
- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival.

For further information regarding an application for a *Water Act* Section 9 Approval your proposed works, contact the LWBC Service Centre in your region (see the Contact List provided in Section 10.1) or visit: <http://lwbc.bc.ca/>

REMEMBER:

Your project will not be considered to be in compliance with the Act or the Regulation if any of the standards have not been met. Ensure you implement appropriate best practices to avoid impacts and mitigate your works.

7.10 Alternatives to Best Practices

Procedures other than those outlined in the Standards and Best Practices sections may be used provided that all standards, legislative and regulatory requirements are met as well as short and long term objectives.

For larger or more complex works, or works where habitats or species may be more sensitive to impacts, the use of an appropriately qualified professional should be considered. Appropriately qualified professionals can assist with designing and planning works that will meet the required standards and can provide advice on the selection of appropriate best practices. For works requiring an application for *Water Act* Approval, the use of an appropriately qualified professional is very strongly recommended.

8 Monitoring and Reporting

Monitoring and reporting activities are actions you are required to carry out as a demonstration of your compliance with standards and best practices for your activity. For example, these activities may involve recording and reporting on your works to demonstrate that you have appropriate sediment and erosion controls in place, that you have completed your works within the appropriate timing windows of least risk, or that you have completed required aquatic species salvages.

8.1 Monitoring

The independent environmental monitoring of works is undertaken to ensure that works are completed in compliance with the required standards, best practices, and conditions. Depending on the nature of the works and the sensitivity of the site, the environmental monitor may be on site continually or may make periodic site visits.

To ensure your works meet the requirements of applicable legislation:

- Ensure that construction activities are to be monitored full-time during start-up and any instream works or sensitive activity. During other phases of your instream works monitoring may be on a daily basis to the completion of the project. The environmental monitor must be an appropriately qualified professional and will be provided with written authority to modify or halt any construction activity if deemed necessary for the protection of fish and wildlife populations or their habitats. A sign must be posted at the entrance to the job site or in the immediate vicinity that lists the monitor's company name and phone number.
- Forward a copy of this document listing standards and best practices for your works, and all appropriate plans, drawings and documents to the contractor or crew supervisor. This package should be at the site and readily available at all times while the work is proceeding.
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project.
- Ensure that a monitoring report using the recommended format is completed and submitted by the environmental monitor to the client and applicable agencies within 60 days of project completion.

8.2 Reporting

The following information should be provided to your local WLAP Ministry office as part of an environmental monitoring report completed by your environmental monitor.

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.

8.3 Spill Reporting

Spills in streams can be devastating. In some cases, entire stream ecosystems are destroyed as organisms within the stream are killed and habitat altered so severely the area can no longer be inhabited. A toxic or deleterious substance is any substance that, if discharged to the environment (air, land, or water) would kill fish, wildlife, vegetation or their food, or would degrade or alter the quality of air, land or water so that it becomes toxic or harmful to organisms or their habitats. This could include but is not limited to substances such as sediment, concrete wash, fuel, lubricants, pesticides or herbicides.

The *Waste Management Act* prohibits the discharge of toxic or deleterious substances to air, land or water. The *Fisheries Act* also prohibits the discharge of a toxic or deleterious substance to any stream that directly or indirectly supports fish or fish habitat. The penalties for the discharge of a toxic or deleterious substance can be significant and could include imprisonment. All efforts should be taken to avoid such spills. Several of the standards and best practices listed in this document are oriented towards spill avoidance.

By law, you are required to immediately report any spill of a reportable quantity of any toxic or deleterious substance into air, land or air.

Contact:

Provincial Emergency Program (PEP)

(24 hour phone line):

1-800-663-3456.

You must also report any discharge of a toxic or deleterious substance to a stream to the nearest DFO office or to 1-800-465-4336.

9 Compliance and Enforcement

As part of the change in the management of the province's environmental resources, WLAP or other agency staff will be visiting and inspecting instream worksites through a program of compliance monitoring.

Failure to provide Notification, obtain Approval, to address or achieve the standards or requirements under the *Water Act* Regulations or to meet the conditions in an Approval would be considered non-compliance with the *Water Act* and could result in significant penalties including imprisonment.

10 Your Next Steps

After review of this document you should be in a position to know whether you are ready to move forward with your proposed instream works.

If you have determined that a *Water Act* Notification is appropriate, you should:

- Seek professional advice regarding the design and plan for your proposed work;
- Plan your works to incorporate best practices to protect aquatic resources and ensure compliance with existing standards;
- Complete a Notification package (see the following section) for your works; and
- Send the Notification package to your regional WLAP representative.

If you have determined that a *Water Act* Approval is appropriate, you should:

- Seek professional advice regarding the design and plan for your proposed work;
- Plan your works to incorporate best practices to protect aquatic resources and ensure compliance with existing standards; and
- Contact LWBC for information on completing an Approval application package for your works. Forward it to the Land and Water Management Division of your regional LWBC Service Centre.

If you have determined that, *in addition* to your provincial requirements, a federal *Fisheries Act* Authorization is required, or if you are unsure as to whether your project will require a DFO Authorization, you should:

- Contact your local DFO office. Contact information is provided in the following section.
- An example of the information required by DFO (Lower Fraser) is available at the following website: http://www-heb.pac.dfo-mpo.gc.ca/publications/publications_e.htm

10.1 Agency Contact Information

BC WLAP – Regional Ecosystem Section Contacts		
Office	Mailing Address	Phone/Fax/Email
Region 1 Vancouver Island	Ministry of Water, Land and Air Protection 2080 A Labieux Road, Nanaimo BC V9T 6J9	Phone: (250) 751-3100 Fax: (250) 751-3103 sharon.erickson@gems3.gov.bc.ca
Region 2 Lower Mainland	Ministry of Water, Land and Air Protection 2 nd Floor – 10470-152 nd St., Surrey, BC V3R 0Y3	Phone: (604) 582-5235 Fax: (604) 930-7119 LMRworks@victoria1.gov.bc.ca
Region 3/8 Thompson/Okanagan	Ministry of Water, Land and Air Protection 1259 Dalhousie Drive, Kamloops, BC V2C 5Z5	Allison.Cebuliak@gems5.gov.bc.ca
Region 4 Kootenay	Ministry of Water, Land and Air Protection #401 - 333 Victoria Street, Nelson, BC V1L 4K3	Phone: (250) 354-6333 Fax: (250) 354-6332
Region 5 Cariboo	Ministry of Water, Land and Air Protection #400 - 640 Borland Street, Williams Lake, BC V2G 4T1	Phone: (250) 398-4530 Fax: (250) 398-4214
Region 6 Skeena	Ministry of Water, Land and Air Protection PO Box #5000 - 3726 Alfred Avenue, Smithers, BC V0J 2N0	Fax: (250) 847-7728
Region 7 Omineca	Ministry of Water, Land and Air Protection 4051-18 th Ave. Prince George, BC V2N 1B3	Phone: (250) 565-6135 Fax: (250) 565-6940
Region 9 Peace	Ministry of Water, Land and Air Protection 10003-110 th Ave. Rm. 400, Fort St. John, BC V1J 6M7	Phone: (250) 787-3567



Figure 15. WLAP Regions

Agency Contact Information

LWBC Service Centres		
Office	Mailing Address	Phone/Fax/Email
Lower Mainland Service Region Service Centre - Surrey	Suite 200-10428 153rd St Surrey BC V3R 1E1	Tel: (604) 586-4400 Fax: (604) 586-4434
Northern Service Region Service Centre - Prince George	Suite 455-1011 4th Ave Prince George BC V2L 3H9	Tel: (250) 565-6779 Fax: (250) 565-6941
Southern Service Region Service Centre - Kamloops	3rd Floor 145 3rd Ave Kamloops BC V2C 3M1	Tel: (250) 377-7000 Fax: (250) 377-7036
Vancouver Island Service Region Service Centre - Nanaimo	501-345 Wallace St Nanaimo BC V9R 5B6	Tel: (250) 741-5650 Fax: (250) 741-5686

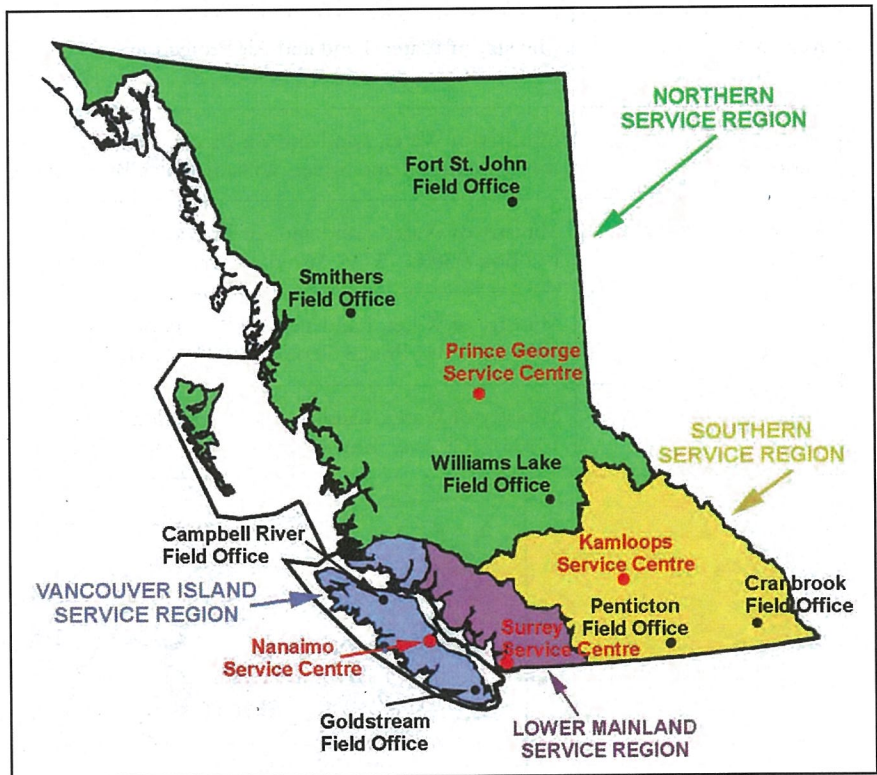


Figure 16. LWBC Service Regions

Agency Contact Information

Fisheries and Oceans Canada (DFO) BC Offices			
Office	Address	Contact Information	Hours of Operation
Bella Bella	Box 38, Bella Bella, BC V0T 1B0	Tel: (250) 957-2363 Fax:(250) 957-2767	Call Ahead: No Admin. Staff
Bella Coola	Box 130 (Hwy 20) Bella Coola, BC V0T 1C0	Tel: (250) 799-5345 Fax:(250) 799-5540	M to F: 8 AM to 4 PM
Campbell River	315-940 Alder Street, Campbell River, BC V9W 2P8	Tel: (250) 850-5701 Fax:(250) 286-5852	M to F: 8 AM to 4 PM
Chilliwack	45742 A Yale Road West, Chilliwack, BC V2P 2N4	Tel: 604-702-2278 Fax:604-702-2280	M to F: 10 AM to 2 PM
Clearwater	Box 610-1121 E. Hwy,16 Clearwater, BC V0E 1N0	Tel: (250) 674-2633 Fax:(250) 674-3553	Call Ahead: Open one day a week
Comox	148 Port Augusta Street, Comox, BC V9M 3N6	Tel: (250) 339-2031 Fax:(250) 339-4612	M to F: 9 AM to 3:30 PM
Cranbrook	P.O. Box 676 #201-101, 10th Ave., Cranbrook, BC V1C 4J2	Tel. (250) 417-2360 Fax. (250) 417-2361	M to F: 8 AM to 4 PM
Delta	100 Annacis Parkway, Unit 3 Delta, B.C. V3M 6A2	Tel: 604-666-8266 Fax:604-666-7112	M to F: 8 AM to 4 PM
Duncan	Box 241, 5653 Club Road, Duncan, BC V9L 3X3	Tel: (250) 746-6221 Fax:(250) 746-8397	M to F: 8 AM to 4 PM
Gold River	499 Muchalaht Drive (Box 130) Gold River BC, V0P 1G0	Tel: (250) 283-9075 Fax: (250) 283-9058	Call Ahead: No Admin Staff
Hazelton	Box 490 4351-11th Avenue, New Hazelton, BC V0J 2J0	Tel: (250) 842-6327 Fax:(250) 842-6283	Call Ahead: No Admin. Staff
Kamloops	985 McGill Place, Kamloops, BC V2C 6X6	Tel: (250) 851-4950 Fax:(250) 851-4951	M to F: 8 AM to 4 PM
Langley	5550 - 268th Street, Langley, BC V4W 3X4	Tel: 604-607-4150	M to F: 8 AM to 4 PM
Lillooet	Box 315 - 654 Industrial Place, Lillooet, BC V0K 1V0	Tel: (250) 256-2650 Fax:(250) 256-2660	M to F: 8 AM to 4 PM
Masset	Box 99, 1590 Old Beach Road, Masset, BC V0T 1M0	Tel: (250) 626-3316 Fax:(250) 626-3253	M to F: 8-12 AM and 1-4 PM
Mission	32873 London Avenue, Mission, BC V2V 6M7	Tel: 604-814-1055 Fax:604-826-1064	M to F: 8 AM to 4 PM

Agency Contact Information

Fisheries and Oceans Canada (DFO) BC Offices			
Office	Address	Contact Information	Hours of Operation
Nanaimo (Front Street)	60 Front Street, Nanaimo, BC V9R 5H7	Tel: (250) 754-0230 Fax:(250) 754-0309	M to F: 8 AM to 4 PM
Nanaimo (SCD)	3225 Stephenson Point Road, Nanaimo, BC V9T 1K3	Tel: (250) 756-7270 Fax:(250) 756-7162	M to F: 8 AM to 4 PM
Nelson	112 McDonald Drive, Nelson, BC V1L 6B9	Tel. (250) 352-0891 or (250) 352-0892 Fax. (250) 352-0916	M to F: 8 AM to 4 PM
Parksville	457 East Stanford Avenue, Parksville, BC V9P 1V7	Tel: (250) 954-2675 Fax:(260) 248-6776	Call Ahead: No Admin. Staff
Parksville	1100 Lee Rd. Parksville, BC V0R 2S0	Tel: (250) 954-1354 Fax:(250) 954-0173	M to F: 8 AM to 4 PM
Pender Harbour	Box 10 12841 Madeira Park Rd, Madeira Park, BC V0N 2H0	Tel: (604) 883-2313 Fax: (604) 883-2152	M to F: 8 AM to 12 PM
Penticton	201-3547 Skaha Lake Road, Penticton, BC V2A 7K2	Tel: (250) 770-4486 or (250) 770-4487 Fax: (250) 492-1314	M TO F: 8AM - 4PM
Port Alberni	250 - 4877 Argyle Street Port Alberni, BC V9Y 1V9	Tel: (250) 724-0195 Fax:(250) 724-2555	M to F: 8 AM to 4 PM
Port Hardy	Box 10, 8585 Wolloson Road, Port Hardy, BC V0N 2P0	Tel: (250) 949-6422 Fax:(250) 949-6755	M to F: 8 AM to 4 PM
Powell River	7255 Duncan Street, Powell River, BC V8A 5N6	Tel: (604) 485-7963 Fax:(604) 485-7439	M to F: 8:30 AM to 12:30 PM
Prince George	3690 Massey Drive, Prince George, BC V2N 2S8	Tel: (250) 561-5366 Fax:(250) 561-5534	M to F: 8 AM to 4 PM
Prince Rupert	417-2nd Avenue West, Prince Rupert, BC V8J 1G8	Tel: (250) 627-3499 Fax:(250) 627-3427	M to F: 8 AM to 4 PM
Queen Charlotte City	PO Box 99, 137 Bay Street, QCC, BC V0T 1S0	Tel: (250) 559-4413 Fax:(250) 559-4678	M/W/F: 8 AM to 4 PM T/R: 8 AM to 12 PM
Quesnel	1205 North Cariboo Hwy, #97, Quesnel, BC V2J 2Y3	Tel: (250) 992-2434 Fax:(250) 992-7232	M to F: 8 AM to 1 PM
Salmon Arm	Box 1160, 1751-10th Ave SW, Salmon Arm, BC V1E 4P3	Tel: (250) 804-7000 Fax:(250) 804-7010	M to F: 8 AM to 4 PM
Smithers	Box 578, 3177 Tatlow Road, Smithers, BC V0J 2N0	Tel: (250) 847-2312 Fax:(250) 847-4723	M to F: 8 AM to 4 PM
Squamish	1120 Hunter Place, Box 2360, Squamish, BC V0N 3G0	Tel: 604-892-3230 Fax:604-892-2378	Call Ahead: No Admin. Staff
Steveston	12551 No. 1 Road, Richmond, BC V7E 1T7	Tel: 604-664-9250 Fax:604-664-9255	M to F: 8 AM to 4 PM
Terrace	5235 A Keith Avenue, Terrace, BC V8G 1L2	Tel: (250) 615-5350 Fax:(250) 615-5364	M to F: 8 AM to 4:30 PM
Tofino	Box 48, 161 1st Street 2nd Fl, Tofino, BC V0R 2Z0	Tel: (250) 725-3468 Fax:(250) 725-3944	M to F: 8 AM to 12 PM

Agency Contact Information

Fisheries and Oceans Canada (DFO) BC Offices			
Office	Address	Contact Information	Hours of Operation
Upper Nass (New Aiyansh)	Box 29, Nass Camp, BC V0J 3J0	Tel: (250) 633-2408 Fax:(250) 633-2439	Call Ahead: No Admin. Staff
Vancouver RHQ	Suite 200 - 401 Burrard Street, Vancouver, BC V6C 3S4	Tel: 604-666-0384 Fax: 604-666-1847	M to F: 8 AM to 4 PM
Victoria	4250 Commerce Circle, Victoria, BC V8Z 4M2	Tel: (250) 363-3252 Fax:(250) 363-0191	M to F: 8 AM to 4 PM
Victoria - CCG	25 Huron Street, Victoria BC V8V 4V9	Tel: (250) 480-2600 Fax: (250) 480-2702	M to F: 8 AM to 4 PM
Whitehorse	100 - 419 Range Road, Whitehorse, Yukon Y1A 3V1	Tel: (867) 393-6722 Fax:(867) 393-6738	M to F: 8:00 AM to 4:30 PM
Williams Lake	310A North Broadway, Williams Lake, BC V2G 2Y7	Tel: (250) 305-4002 Fax:(250) 305-3017	M to F: 8 AM to 4 PM: No admin staff after 12.

10.2 Notification Form

Notification Form (pursuant to Section 44 of the Water Act Regulation)

1. Type of Instream Works:

- | | |
|---|--|
| <input type="checkbox"/> Stream Crossing | <input type="checkbox"/> Urban Stormwater Management |
| <input type="checkbox"/> Culvert | <input type="checkbox"/> Stormwater outfalls |
| <input type="checkbox"/> Clear-span bridge | <input type="checkbox"/> Habitat enhancement and Restoration |
| <input type="checkbox"/> Pipeline crossing | <input type="checkbox"/> Beaver and Beaver Dam Management |
| <input type="checkbox"/> Winter roads | <input type="checkbox"/> Other Types of Instream Work |
| <input type="checkbox"/> Temporary fords | <input type="checkbox"/> Pier/Wharf |
| <input type="checkbox"/> Stream Channel Maintenance | <input type="checkbox"/> Flow Monitoring Device |
| <input type="checkbox"/> Sediment removal | <input type="checkbox"/> Fish Fence |
| <input type="checkbox"/> Vegetation removal | <input type="checkbox"/> Routine Maintenance of a Public Utility |
| <input type="checkbox"/> Debris removal | <input type="checkbox"/> Emergency Works |
| <input type="checkbox"/> Stream Bank and Lakeshore Stabilization | |
| <input type="checkbox"/> Bank stabilization | |
| <input type="checkbox"/> Shore stabilization | |
| <input type="checkbox"/> Maintenance or repair of existing dyke or erosion protection works | |

2. Project title: _____

3. Applicant name: _____

Address: _____

Phone: _____ Fax: _____

Email: _____

4. Location of works:

Site location (UTM, or Latitude and Longitude): _____

Regional District: _____

City/Municipality: _____

Street address or nearest landmark: _____

Stream name: _____

Location on stream: _____

What stream / river / lake does it flow into? : _____

Street address of affected properties: _____

5. Agent(s) name: _____

Address: _____

Phone: _____ Fax: _____

Email: _____

6. List of Appropriately Qualified Professionals; names; contact information; designations and project responsibilities:

7. Who is monitoring the work? : _____

Address: _____

Phone: _____ Fax: _____

Email: _____

Yes, s/he is an appropriately qualified professional.

8. Who is doing the work? :

Address: _____

Phone: _____ Fax: _____

Email: _____

9. When are the works scheduled? :

Start (yy/mm/dd): _____

End (yy/mm/dd): _____

10. Have you referred this to DFO? :

- No, N/A. The works would not result in a "harmful alteration, disruption or destruction of fish habitat", or
- Yes. The works may result in a "harmful alteration, disruption or destruction of fish habitat". An application has been forwarded to Fisheries and Oceans Canada (DFO), and all future communications with DFO will be submitted referencing this project;

11. Have you included in your Notification...?

- Detailed photographs of the site prior to the proposed works, taken from a variety of perspectives to clearly record:
 - The proposed location of works including any riparian vegetation or in-channel habitat to be disturbed;
 - The cross-section of the stream at the proposed crossing location;
 - The extent of potential disturbance from the works and access requirements, and
 - The proposed area of mitigation or compensation for habitat alteration associated with the work.

12. Have you provided in your Notification...?

- Detailed plans and supporting documentation of the proposed crossing design that address the appropriate standards and best practices, and
- Approvals or permits from other agencies.

Notification Form

13. I have read the "Standards and Best Practices for Instream Works, March 2004" document and have incorporated the standards and best practices which apply to my works into this notification. I am the landowner, proponent or authorized agent working on behalf of the landowner or proponent, and take full responsibility for the completion and accuracy of the Notification Form and accompanying documents.

Name (please print): _____

Signature: _____

Date: _____

Submit this Notification form and accompanying documents to your regional WLAP office **at least 45 days prior to the proposed start date for your works.** To ensure that your Notification is complete, contact your regional office regarding any special requirements they may have for your Notification.

11 Glossary

Alevin: Another name for juvenile fish that have recently hatched from the egg. This is an intermediate life stage during which the fish feed off an attached yolk sac and remain within gravels and cobbles in the streambed.

Annual vegetation: Vegetation that completes its growth cycle in one year (e.g., grasses).

“Appropriately qualified professional”: An applied scientist or technologist specializing in a relevant applied science or technology including, but not necessarily limited to, agronomy, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and who is registered in British Columbia with their appropriate professional organization, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.

Aquatic habitats: Areas associated with water that provide food and cover and other elements critical to the completion of an organism's life cycle (e.g., wetlands, rivers, riparian areas and streams).

Avoidance: Minimizing the effects of an undertaking on fish habitat through identifying and bypassing areas of concern to fisheries.

Bedload: Particulate (e.g., gravels, cobbles and boulders) that is transported by rolling and bouncing along the channel bottom in the lower layers of stream flow.

Benthic invertebrates: Animals lacking backbones that live in the substrates of aquatic systems (e.g., aquatic worms, larval flies and midges, molluscs).

Best Management Practice: A recommended technique that has been demonstrated to be an effective and practical means of preventing or limiting harmful impacts to the environment. Best Management Practices include any program, technology, process, siting criteria, operating method, measure, or device that controls, prevents, removes, or reduces pollution.

Best Practice (see Best Management Practice): A method or technique that **should** be followed to ensure the standards are met and impacts to riparian and aquatic habitats are mitigated.

Bioengineering: The use of living plant materials to perform some engineering function (e.g., enhanced soil stability).

Glossary

For provincial and COSEWIC species at risk lists see these links:

<http://www.gov.bc.ca/WLAP>

<http://www.cosewic.gc.ca/cosewic>

Check dam: A small dam constructed in a ditch or similar place to decrease water velocity and promote the deposition of sediment.

Clear-span bridge: A stream crossing structure that spans the stream's bankfull channel and does not involve the construction or installation of any structure within the stream's banks.

Coffer dam: A watertight enclosure built in a shallow river or creek, which is pumped dry to allow construction activities in the isolation of flowing water.

Compensation: "The placement of natural habitat, increase in the productivity of existing habitat or maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada's fisheries resources" (DFO, 1986).

Critical habitat: Habitat used by species at risk or habitat critical to sustaining local populations of a species, because of its rareness, productivity, and sensitivity. This includes high value spawning/rearing or nesting habitat.

Critical fish habitat: Habitat that is critical in sustaining a subsistence, commercial, or recreational fishery, or fish species at risk (provincially red- and blue-listed or listed by COSEWIC because of its relative rareness, productivity, and sensitivity). Indicators of critical fish habitat include the presence of high-value spawning and rearing habitat, which are critical to the fish population present (e.g., for salmon and some trout, locations with an abundance of suitably sized spawning gravels, deep pools, undercut banks, or stable debris).

DFO: Federal Department of Fisheries and Oceans

Deleterious Substance: Any substance that, if added to any water, would degrade or alter the quality of that water so that it becomes toxic or harmful to aquatic organisms or habitat.

Diversion dam: A barrier built within the active channel of a watercourse in order to divert water along a different flow path.

Diversion ditch: A ditch that directs water and silt into stabilized areas away from a watercourse.

Due diligence: A legal term that requires individuals on the job to maintain a reasonable standard of care. This term applies to environmental precautions but also to other areas such as safety, for example.

Dyke: An impervious elongated mound of earth constructed to confine water or another liquid from entering or leaving an area of land.

Ecosystem: The dynamic and interrelated complex of plant and animal communities and their non-living environment. All parts of an ecosystem,

including physical, chemical, and biological components, are interconnected; that is, they affect and are affected by all other parts.

Erosion: A natural process of sediment movement as a consequence of water currents, rainfall runoff, or wind, which may be considered beneficial or detrimental, depending upon the associated environmental concerns.

Fish: All fish, shellfish, crustaceans and marine animals, and the eggs, spawn, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.

Fish habitat: The areas in and about a stream, such as spawning grounds and nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes. This includes streamside habitat.

Floodplain: A level, low-lying area adjacent to streams that is periodically flooded by stream water. It includes lands at the same elevation as areas with evidence of moving water, such as active or inactive flood channels, recent fluvial soils, sediment on the ground surface or in tree bark, rafted debris, and tree scarring.

Grade: The slope of road, channel, or natural ground.

Geotextile filter fabric: A synthetic material placed under erosion control material (i.e., riprap), with the primary functions of layer separation, aggregate confinement and distribution of load.

Harmful alteration, disruption or destruction of fish habitat (HADD): The DFO define HADD of fish habitat as “any change in fish habitat that reduces its capacity to support one or more life processes of fish”.

Habitat: The natural home of a plant or animal within an ecosystem, which provides food and shelter and other elements critical to an organism’s health and survival.

Habitat enhancement: Any manipulation of habitat that improves its value and ability to meet the specified requirements of one or more species.

Hyporheic zone: The porous layer of the streambed where the intermixing of ground and surface waters occurs.

Important fish habitat: Habitat that is used by fish for feeding, growth, and migration, but is not deemed to be critical. This category of habitat usually contains a large amount of similar habitat that is readily available to the population. Indicators of important fish habitat include important migration corridors, or the presence of suitable spawning and rearing habitat for the fish species present.

Instream window: See **Timing window**. Also referred to as the “instream work window” and “instream reduced risk work window”. When works are

Glossary

timed to occur during the instream window, there is a reduced risk of damage to spawning habitat, fish eggs, and juvenile fish and reduced impacts to adult and juvenile aquatic organisms that may be migrating, over-wintering or rearing.

LWBC: Land and Water British Columbia.

Marginal fish habitat: Habitat that has low productive capacity and contributes marginally to fish production. Indicators of marginal fish habitat include the absence of suitable spawning habitat or rearing habitat for the fish species present. (e.g., for salmon and some trout, locations no suitable sized gravels, deep pools, undercut banks, or stable debris).

Migration: Animal movements between two or more separate habitats (e.g., from over-wintering habitat to spawning habitat).

Mitigation: Actions taken during the planning, design, construction, and operation of a project to alleviate or reduce potential adverse effects on aquatic habitat, such as culvert design modifications to allow fish passage, timing constraints for instream work, and erosion control measures.

No-net-loss: A working principle of the Federal DFO which strives to balance unavoidable habitat losses through avoidance, mitigation, and habitat replacement on a project-by-project basis. (DFO, 1986).

Revegetation: The re-establishment of vegetation in disturbed areas.

Riparian vegetation: Vegetation adjacent to a watercourse, lake, swamp, or spring, that is generally critical for wildlife cover, fish food organisms, stream nutrients and large organic debris, and for stream bank stability.

Riprap: Rock or stone placed on earth surfaces for protection of the soil against the erosive action of flowing water or precipitation.

SARA: Federal *Species At Risk Act*

Sediment: Particulate matter that is entrained within, or settled out from, water.

Silt: The fine-particulate fraction of sediment.

Silt fence: A synthetic barrier erected to restrict the movement of unconsolidated material from a disturbed area to any sensitive areas.

Spawning habitat: Fish habitat associated with the breeding of fish.

Species at risk: A species designated as a species at risk by provincial or federal legislation or policy due to its vulnerable, threatened, or endangered status.

Standard: A regulatory requirement that must be followed in the design and implementation of your works. This may also be referred to as a condition or requirement.

Stream: A natural watercourse or source of water supply, whether usually containing water or not, ground water, and a lake, river, creek, spring, ravine, swamp and gulch.

Substrate: The bottom or bed materials of a water body or watercourse in which plants and organisms live and grow.

Suspended solids: Particulate matter, such as silt or clay, that is entrained within a water column (i.e., has not settled to the substrate)

Timing window: A period of reduced risk during which a particular type of works (i.e., instream works or vegetation clearing) are permitted. Referred to by various terms including “reduced risk window” and “window of least risk”. Timing windows vary depending on a site-specific basis, depending on which species may be present and the sensitivity of habitat.

Vegetation clearing window: See **Timing window**. A period of least risk for vegetation disturbance when there will be a reduced risk of impacting bird eggs, nests, and young.

WLAP: BC Ministry of Water, Land and Air Protection

Woody debris: Sound and rotting logs and stumps that provide cover for small animals and their predators (both fish and wildlife).

12 References

- A User Guide to Working in and Around Water: Regulation under British Columbia's Water Act.* 1998. Prepared by BC Environment Water Management Branch.
<http://www.lwbc.bc.ca/03water/licencing/index.html>
- Access Near Aquatic Areas, A Guide to Sensitive Planning, Design and Management.* 1996. Prepared by SharP and Diamond Landscape Architecture, DFO, MELP (WLAP).
http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp#access
- Agricultural Watercourse Maintenance Policy Guidelines for Lower Fraser Valley and Vancouver Island.* Valid until September 30, 2000. Prepared by Partnership Committee on Agriculture and the Environment.
- Beaver Damage Control in Agricultural Areas of BC,* BC Environment Stream Restoration Technical Bulletin QP#98358.
- Beaver Management Guidelines in British Columbia,* Province of British Columbia, Wildlife Branch QP#92195.
- Beavers: Biologists Rediscover a Natural Resource.* 1985. Bergstrom, D., Forestry Research West. United States Department of Agriculture, Forest Service.
- Code of Agriculture Practice for Waste Management* (BC Reg 131/192), under the *Waste Management Act.*
- Community Stewardship, A Guide to Establishing Your Own Group.* 1995. Prepared by Canadian Wildlife Service (CWS), DFO, Fraser Basin Management Program, Forest Renewal BC's Watershed Restoration Program.
http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp#access
- Construction and Mitigation Handbook for Ministry of Natural Resource Class EA Projects.* 1983. Prepared by Government of Ontario Ministry of Natural Resources.
- DFO Policy for Management of Fish Habitat.* 1986 Prepared by Fisheries and Oceans Canada.

References

- Draft Fish and Fish Habitat Protection Best Management Practices for the Ministry of Water, Land, and Air Protection – Kootenay Region*" a supporting document for Water Act User Guide. 2002. WLAP – Kootenay Region.
- Environmental Best Management Practices and Requirements for Land Developments*. March 2001. Ministry of Environment, Lands and Parks, Vancouver Island Region.
http://WLAPwww.gov.bc.ca/vir/pa/bmp_dev.pdf
- Environmental Construction Guidelines for Hydroelectric Facilities*. 1994. Prepared by Ontario Hydro.
- Environmental Objectives and Best Management Practices for Aggregate Extraction*. 2002. Prepared by BC Ministry of Water, Land and Air Protection, Vancouver Island Region. Environmental Stewardship Division.
- Environmental Stewardship in the Municipal Act: A Synopsis of Local Governments' Power*. 1996. Prepared by DFO, FRAP.
- Fish Habitat Conservation and Protection: Guidelines for Attaining No Net Loss*. 1999. Prepared by DFO.
- Fish Habitat Enhancement: A Manual for Freshwater, Estuarine and Marine Habitats*. 1990. Prepared by DFO, Envirowest Environment Consultants.
- Fish Habitat Rehabilitation Procedures. Watershed Restoration Technical Circular No.9*. 1997. Prepared by Watershed Restoration Program, MELP and MOF.
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>
- Fisheries Habitat Protection Guidelines Concerning the Use of Explosives in Water*. 1999. Prepared by Alberta Environment Natural Resource Service.
- Forest Practices Code: Fish Stream Crossing Guidebook*. 2002. Prepared by MOF and WLAP.
<http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/FishStreamCrossing/FSCGdBk.pdf>
- Forest Practices Code: Fish-Stream Identification Guidebook*. 1995. Prepared by MOF and WLAP.
- Forest Practices Code: Forest Road Engineering Guidebook*. 1995. Prepared by MOF and WLAP.
- Forest Practices Code: Riparian Management Guidebook*. 1995. Prepared by MOF and WLAP.

References

- Forest Practices Codes: Channel Assessment Procedure Guidebook.* 1996. Prepared by MOF and WLAP.
- Freshwater Intake End-of-Pipe Fish Screen Guideline.* 1995. Prepared by Department of Fisheries and Oceans.
<http://www.agf.gov.bc.ca/resmgmt/publist/500series/512100-1.pdf>
- Greening your BC Golf Course: a Guide to Environmental Management.* 1996. Prepared by Fraser River Action Plan (FRAP).
- Guidelines on Storage, Use and Disposal of Wood Residue for Protection of Fish and Fish Habitat in British Columbia.* 1996. Prepared by DFO, DOE, Fraser River Action Plan.
- Guidelines to Protect Fish and Fish Habitat From Treated Wood Used in Aquatic Environments in the Pacific Region.* 2000. Prepared by DFO.
- GVRD LWMP Stormwater Documents '97 - '02 (CD-Rom).* 1997-2002.
http://www.gvrd.bc.ca/sewerage/stormwater_reports.htm
- Habitat Conservation and Protection Guidelines.* Developed from the Policy for the Management of Fish Habitat. 1994. Prepared by DFO.
- WLAP Region 2 Instream Works Notification Forms and Guidance Documents.* 2001. Prepared by BC Ministry of Environment, Lands, and Parks.
- Land Development Guidelines for the Protection of Aquatic Habitat.* 1992. Prepared by Fisheries and Oceans Canada and BC Ministry of Environment, Lands and Parks.
http://www-heb.pac.dfo-mpo.gc.ca/publications/pdf/guidelines/ldg_e.pdf
- Managing Beaver Habitat for Salmonids: Working With Beavers.* 1987. Finnigan and Marshall. Watershed Restoration Technical Circular No. 9.
- Marina Development Guidelines for the Protection of Fish and Fish Habitat.* 1995. Prepared by DFO, Habitat Management; MELP.
- Nuisance Furbearer Damage Control in Urban and Suburban Areas.* 1987. De Almeida, Maria H. Wildlife Branch, Ontario Ministry of Natural Resources.
- Planning for Agriculture.* 1998. Prepared by BC Provincial Agricultural Land Commission.
- The Return of the Beaver.* Kwon, Hye Yeong. 1998. Center for Watershed Protection.

References

- Site Planning for Urban Stream Protection.* 1995. Prepared by Tom Schueler, Center for Watershed Protection.
- Stewardship Bylaws, A Guide for Local Government.* 1996. Prepared by Lanarc Consultants Ltd., with DFO, ELP (WLAP), CWS, Ministry of Municipal Affairs and Housing.
http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp#
- Stormwater Management in Washington State. Volume I Minimum Technical Requirements; Vol II Construction Stormwater Pollution Prevention.* August 1999 (draft). Prepared by Washington State Department of Ecology.
- Stream Stewardship, A Guide for Planners and Developers.* 1993. Prepared by Lanarc Consultants Ltd., with DFO, MELP (WLAP), Ministry of Municipal Affairs
http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp#
- Water Management – A User's Guide to Working in and About Water. Watercourse Crossing, 2nd ed.* 1999. Prepared by Pipeline Water Crossing Committee (CPWCC).
- Watershed Restoration Technical Circular No. 3 Resource Road Rehabilitation Handbook: Planning and Implementation Guidelines (Interim Methods).* 1994. Prepared by BC Ministry of Environment, Lands and Parks; BC Ministry of Forests.
<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>
- Watershed Stewardship, A Guide for Agriculture.* 1996. Prepared by DFO, Environment Canada (DOE), MELP (WLAP).

13 Additional Information Sources

A number of other resource documents and information sources may help you to plan your instream works. The links listed here (accurate at the time of printing, March 2004) are just a sample of the type of information you can access.

The following British Columbia government search engines and libraries are recommended for queries related to provincial documents:

Government of British Columbia Search Engine

<http://datafind.gov.bc.ca/>

Ministry of Forests, Ministry of Sustainable Resource Management and Ministry of Water, Land, and Air Protection Library

<http://www.for.gov.bc.ca/hfd/library/>

To access the full text of applicable federal and provincial legislation, try the following links:

Canadian Department of Justice – provides alphabetized links to federal statutes and regulations, including the *Fisheries Act*, *Migratory Birds Convention Act*, and *Navigable Waters Protection Act*.

<http://laws.justice.gc.ca/en/>

The Revised Statutes and Consolidated Regulations of British Columbia – provides links to provincial legislation including the *Water Act* Regulations, *Forest and Range Practices Act*, and *Wildlife Act*.

<http://www.qp.gov.bc.ca/statreg/>

For further information regarding the *Water Act* Regulation, refer to the following Provincial websites:

Users Guide to Working in and Around Water, Regulation Under British Columbia's *Water Act*

<http://www.lwbc.bc.ca/03water/licencing/index.html>

Water Act Regulations

<http://srmwww.gov.bc.ca/wat/wrs/waterreg/consolidatedreg.pdf>

The federal Department of Fisheries and Oceans websites contain information on responsibilities pertaining to the *Fisheries Act*:

The Canada *Fisheries Act*

<http://laws.justice.gc.ca/en/F-14/>

DFO Habitat Protection and Conservation Guidelines (1998)

http://www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/guides/fhmguide/index_e.asp

DFO Policy for Management of Fish habitat

http://www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/legislation-lois/policies/fhm-policy/index_e.asp

DFO Guidelines for Attaining No net loss

http://www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/guides/fhmcons/index_e.asp

“What the Law Requires” information

http://www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/guides/law-lois/index_e.asp

“Working Around Water?” Fact Sheet Series

http://www.dfo-mpo.gc.ca/canwaters-eauxcan/water-eau/index_e.asp

For further standards and best practices documents, refer to the following websites:

Land Development Guidelines for the Protection of Aquatic Habitat. 1992. Chilibeck, B. *et al.*

http://www-heb.pac.dfo-mpo.gc.ca/publications/pdf/guidelines/l dg_e.pdf

Best Management Practices to Protect Water Quality from Non-Point Source Pollution, March 2000.

<http://www.nalms.org/bclss/bmphome.html>

Stormwater Planning: A Guidebook for British Columbia

<http://WLAPwww.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html>

Forest Practices Code of BC: Guidebook on Fish Stream Crossings

<http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/FishStreamCrossing/FSCGdBk.pdf>

Environmental Best Management Practices and Requirements for Land Developments, March 2001. Ministry of Environment, Lands and Parks, Vancouver Island Region.

http://WLAPwww.gov.bc.ca/vir/pa/bmp_dev.pdf

Additional Information Sources

Washington State Integrated Streambank Protection Guidelines

<http://wdfw.wa.gov/hab/ahg/ispgdoc.htm>

Cement and Concrete: Environmental Considerations

<http://www.buildinggreen.com/features/cem/cementconc.html>

Carbon Dioxide for Concrete Wash Water Treatment

<http://www.praxair.com/Praxair.nsf/d63afe71c771b0d785256519006c5ea1/78b5b272ccfbcd8885256550069e32d?OpenDocument>

For information on British Columbia's fish and wildlife species, including species at risk, that may help you to plan your works, refer to the following websites:

FishInfo BC – a Ministry of Sustainable Resources site providing on-line access to the BC Fisheries Data Warehouse and containing links to fish distribution data searchable with a mapping tool called Fish Wizard.

<http://www.bcfisheries.gov.bc.ca/fishinfobc.html>

BC Conservation Data Centre – a site including links to information on species at risk including red and blue listed plant and animal species.

<http://srmwww.gov.bc.ca/cdc/>

British Columbia Stewardship Centre - Lists information ranging from sensitive habitat inventories and habitat maps to stewardship and land development guidelines. This site has a wide variety of links to other online documents and resources.

http://www.stewardshipcentre.bc.ca/sc_bc/main/index.asp?sProv=bcB

British Columbia Lake Stewardship Society.

<http://www.nalms.org/bclss/>

Biodiversity and Wildlife in BC, WLAP.

<http://WLAPwww.gov.bc.ca/wld/>

The Wildlife Act Permit Regulation, An Introduction and *Wildlife Act: New Requirements* pamphlets. Printed Sept 1, 2000, revised Aug 6, 2002.

<http://WLAPwww.gov.bc.ca/wld/pub/permreg/permreg.htm>

For maps, atlases, and habitat inventories relating to your project area, try the following links:

Community Mapping Network: Maps and Data Entry websites, including habitat mapping from regions across the province.

<http://www.shim.bc.ca/maps2.html>

Additional Information Sources

Sensitive Ecosystem Inventories of British Columbia, prepared by WLAP and the Canadian Wildlife Service.

<http://srmwww.gov.bc.ca/sei/index.html>

Fraser River Estuary Management Program/Burrard Inlet Environmental Action Program.

<http://www.bicapfrempp.org>

Natural Areas Atlas for the Capital Regional District (CRD) covering southern Vancouver Island.

<http://www.crd.bc.ca/es/natatlas/>

Sunshine Coast Habitat Atlas, prepared by Sunshine Coast Regional District and Fisheries and Oceans Canada.

<http://habitat.scrd.bc.ca/>

Habitat Atlas for Wildlife at Risk – South Okanagan and Similkameen, WLAP.

<http://WLAPwww.gov.bc.ca/sir/fwh/wld/atlas/index.html>

For information on fish habitat restoration techniques, refer to the following websites and documents:

Fish Habitat Rehabilitation Procedures, Watershed Restoration Technical Circular No.9 and other Watershed Restoration Program documents.

<http://srmwww.gov.bc.ca/frco/bookshop/tech.html>

Fish Habitat Enhancement: A Manual for Freshwater, Estuarine, and Marine Habitats, available from:

http://www-heb.pac.dfo-mpo.gc.ca/english/pubn_order.pdf

General Best Practices Documents and Publication.

<http://srmwww.gov.bc.ca/sry/csd/forms/>

Instream Works Best Practices Information Documents and Checklists.

http://srmwww.gov.bc.ca/sry/csd/forms/index.htm#hpur_frm

Stewardship Series Documents

http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp#

Access Near Aquatic Areas

http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp#

14 Appendices

Appended to this document are several short sections containing further information on the following operational best practices for instream works:

- Reduced risk timing windows
- Work area isolation
- Fish and wildlife Salvage
- Monitoring of works
 - Environmental monitoring report template
- Deleterious substance control/spill management
- Concrete works
- Sediment control
- Vegetation management
- Site restoration

14.1 Reduced Risk Timing Windows For Fish and Wildlife

14.1.1 Background

All works in and about a watercourse are high-risk activities, and fish or wildlife populations and their habitats can be significantly impacted at **any** time. As a result, all instream works require strict mitigative best practices to ensure that fish and wildlife populations and habitats are protected. By controlling the timing of works changes in and about a stream can be limited to periods of least risk.

Timing windows ensure that instream works avoid causing harm to spawning habitat, fish eggs, and juvenile fish while also preventing impacts to adults and juveniles that may be migrating, over-wintering, or rearing.

Timing windows for the clearing of vegetation help to reduce the risk of impacting bird eggs, nests, and young. Timing windows vary depending on a site-specific basis, depending on which species may be present and the sensitivity of habitat. Please be advised that for certain species at risk there may be no period of least risk.

14.1.2 Objectives

To reduce the risk of impacts to fish and wildlife populations and their habitats, instream works and vegetation clearing are limited to non-critical periods of the year.

14.1.3 Operational Best Practices

These recommended timing requirements apply to **all** proposed instream work types.

- Only undertake works during favourable weather and low water conditions.
- During periods of heavy and persistent precipitation, stop works if there is a risk of sediment delivery to the watercourse. Ensure sediment control measures are in place.
- Complete the works as quickly as possible once started.

If your works involve fish bearing streams...

- If works are scheduled for **fish-bearing streams** or if fish presence in the watercourse is not known, complete in-channel or bank work during the *reduced risk timing window* provided for your region. Contact your regional WLAP office for specific timing window information.

What if the stream channel is dry or has no visible water?

Fish, invertebrates and wildlife may live within wetted spaces between gravels, cobbles and boulders, even though there may be no visible water.

Works may proceed **outside** of the instream timing window, provided there is no water flowing through stream substrates, and that there are no species at risk present. This should be confirmed in a technical rationale by an appropriately qualified professional.

Stringent sediment, erosion and run-off controls and other preventative measures would still be required to ensure downstream fish and wildlife populations and habitats are protected.

Appendices:
Reduced Risk Timing Windows

If your works involve species at risk

- Species at risk typically have **no window** of least risk; so in-channel work should be avoided wherever possible when their presence is known or expected. For information on timing window requirements for your area, contact your regional WLAP office.

If your works involve vegetation clearing...

- Only clear vegetation for the worksite or access within the *vegetation clearing timing window for the protection of nesting birds* provided for your region. Contact your regional WLAP office for specific timing window information.
- Ensure that your activities will not result in the disturbance of bird nests, young, or eggs.

Works **outside** of the instream window may only be completed if a technical rationale completed by an appropriately qualified professional is provided. This rationale should demonstrate that there would be **no increased risk** to fish and wildlife populations and habitats as a result of the proposed works and should provide details regarding the proposed works including confirmation that they:

- **Are** in a section of stream with confirmed absence of fish or species at risk;
- **Are not** in a stream or section of a stream immediately upstream of a section or stream with fish or species at risk;
- Would **not** adversely impact any individual, species, or population of fish or species at risk;
- Do **not** include the use of concrete pours;
- Would **not** result in the discharge of sediment to downstream sections or streams with fish or species at risk; and
- Would **not** impact benthic macro-invertebrate production.

14.2 Work Area Isolation

14.2.1 Background

Protection of water quality within your project area is one of the primary foci of all instream works standards and best practices. By ensuring complete and thorough isolation of your work area, you can help to protect water and habitat quality for aquatic life within adjacent and downstream waters.

Isolation of your worksite can be completed by:

- installing a dam structure around the instream portion of your work area,
- creating a temporary diversion of flow, and
- dewatering the isolated area

14.2.2 Objectives

The objective of this set of best practices is to ensure that the water quality standards are met and aquatic species and habitats protected during instream works through the isolation of the work area from flow.

14.2.3 Standards

The following specific standards for worksite isolation are provided in Subsection 44(1)(x) of the *Water Act* Regulations:

Temporary diversion construction around or through a worksite

(Subsection 44(1)(x)) is permitted for works providing that the worksite is no larger than the minimum area required, and

- (i) if pumps, pipes or conduits are used to divert water around or through the worksite,
 - (A) the pumps, pipes or conduits are sized to divert the 1 in 10 year maximum daily flow for the period of construction, and
 - (B) any pump or intake withdrawing water from fish bearing waters is screened in accordance with the Fish Screening Directive of the Department of Fisheries and Oceans (Canada),
- (ii) if cofferdams are used to isolate successive parts of the construction at the worksite,
 - (A) the cofferdams are designed by a professional engineer and constructed in accordance with that design, and

Appendices:
Work Area Isolation

- (B) the natural channel remaining outside of the cofferdams is adequate to pass the 1 in 10 year maximum daily flow during the period of construction, or
- (iii) if ditches are used to divert flow around the worksite,
- (A) the flow of water diverted remains within the stream channel,
- (B) the ditches are designed and constructed to divert the 1 in 10 year maximum daily flow around or through the worksite and are protected from any anticipated erosion during the period of construction and use of the ditch, and
- (C) the ditches are completely backfilled and the area returned as closely as possible to the natural state on completion of the works.

14.2.4 Operational Best Practices

To ensure your works meet the requirements of applicable legislation:

- Isolate your work area from all flowing water, but do not cut off flow to downstream portions of the stream at any time during construction.
- Temporarily divert, enclose or pump the water around the worksite. Ensure the point of discharge to the creek is located immediately downstream of the worksite to minimize disturbance to downstream populations and habitats.
- For works near or in lakes or larger water bodies, if it is not possible for you to fully isolate and divert flowing water from your work area due to water depth and volume, isolate your works with a silt curtain to keep silty water from entering clean water.

14.3 Fish and Wildlife Salvage

14.3.1 Background

Protection of aquatic fish and wildlife species within your project area is one of the primary focuses of all instream works standards and best practices. By ensuring any fish or wildlife found within your isolated work area are transferred to adjacent non-impacted areas, you can help to protect aquatic life.

14.3.2 Objectives

The objective of this set of best practices is to ensure that habitat and species protection standards are met during instream works involving the isolation of the work area from flow, or disturbance of habitat.

14.3.3 Standards

Subsection 42(1)(e) of the *Water Act* Regulations provides for the salvage or protection of fish or wildlife during the course of your proposed works.

14.3.4 Operational Best Practices

- Complete a fish and amphibian salvage for works prior to the start of works if any portion of the wetted channel will be isolated and/or dewatered. A certified appropriately qualified professional should complete the salvage;
- It is the responsibility of the salvage crew to obtain the necessary permits required by the British Columbia Fisheries Regulations or Canada *Fisheries Act* prior to conducting the salvage activities. Contact your regional WLAP office for additional information;
- Opt for low impact salvage methods such as minnow trapping and seining, before using higher impact electrofishing, where possible; and
- Use special techniques and take extra caution when completing salvages that might involve species at risk. If species at risk are expected to be present, contact the regional Ministry office in your area for information regarding assessment and salvage requirements for species at risk.

14.4 Monitoring of Works

14.4.1 Background

The independent environmental monitoring of works is an activity undertaken to ensure that works are completed in compliance with the required standards, best practices, and conditions. Depending on the nature of the works and the sensitivity of the site, the environmental monitor may be onsite continually or may make periodic site visits.

14.4.2 Objectives

The set of best practices relating to environmental monitoring will ensure that a high level of environmental protection is in place during your activities in or about a watercourse.

14.4.3 Operational or Construction-related Best Practices

To ensure your works meet the requirements of applicable legislation:

- Construction activities should be monitored full-time during start-up and any instream works or sensitive activity, and on a daily basis during any other construction activity to the completion of the project. The environmental monitor must be an appropriately qualified professional and will be provided with written authority to modify or halt any construction activity if it is deemed necessary to do so for the protection of fish and wildlife populations or their habitats. A sign listing the monitor's company name and phone number should be posted at the entrance to the job site or in the immediate vicinity.
- Forward a copy of the section of this document listing the standards and best practices for your works and all appropriate plans, drawings, and documents to the contractor or crew supervisor, and keep this information readily available at the site while the work is proceeding.
- Hold a pre-construction meeting between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project.
- Within **60 days** of the project's completion have the environmental monitor complete and submit at least one copy of a monitoring report consistent with the recommended standard format (see Section 8.2 of this document) to both you and the Ministry.

Monitoring Reports

A suggested Environmental Monitoring Report outline is available in Section 8.2 of this document.

14.4.4 Environmental Monitoring Report Template

The following information should be provided to your local WLAP office as part of an environmental monitoring report completed by your environmental monitor.

Project Description

- Project name;
- Site location;
- Type of works; and
- Person or organization undertaking the works.

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.

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.

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.

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.

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.

Photographs

- Representative date stamped photographs should be taken during each site inspection, and during and after all incidents.

14.5 Deleterious Substance and Spill Management

14.5.1 Background

The introduction to a stream of any substance that may cause harm to fish or fish habitat is prevented under the federal *Fisheries Act*. The British Columbia *Waste Management Act* also lists substances that may not be discharged into the environment.

What is a deleterious substance?

A deleterious substance is any substance that, if added to any water, would degrade or alter the quality of that water so that it becomes toxic or harmful to aquatic organisms and habitat.

14.5.2 Objectives

The objective of this set of best management practices is to prevent the release of any deleterious substance to a watercourse as a result of instream works.

14.5.3 Standards

Section 41 of the *Water Act* Regulations provides for the protection of water quality for your proposed works.

14.5.4 Operational or Construction-related Best Practices

To ensure your works meet the requirements of applicable legislation:

- Prevent the release of silt, sediment or sediment-laden water, raw concrete or concrete leachate, or any other deleterious substances into any ditch, watercourse, ravine or storm sewer system. The recommendations for sediment and erosion control outlined in the "*Land Development Guidelines for the Protection of Aquatic Habitat*" can also be used for reference
- Ensure equipment and machinery is in good operating condition (power washed), free of leaks or excess oil and grease. No equipment refueling or servicing should be undertaken within **thirty (30.0) metres** of any watercourse or surface water drainage
- Ensure all hydraulic machinery to be used instream uses **environmentally sensitive hydraulic fluids** which are non-toxic to aquatic life, and which are readily or inherently biodegradable

Appendices:
Deleterious Substance and Spill Management

- Do not use treated wood products in any construction below the high-water mark of the stream channel to prevent the release of preservatives toxic to fish.
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment.
- Immediately report any spill of a substance toxic to aquatic life of reportable quantities to the **Provincial Emergency Program 24 hour phone line at 1-800-663-3456.**

14.6 Concrete Materials Use

14.6.1 Background

Concrete, cement, mortars, grouts and other Portland cement or lime-containing construction materials are basic or alkaline materials. They are highly toxic to fish and must only be used near water with extreme care.

What are acceptable pH ranges?

A pH level around 7 is typical for most watercourses, and this neutral pH is required for the survival of aquatic organisms. Should the pH rise or drop out of this range, fish and other aquatic organisms will become stressed and may die. Complete isolation of the work area is needed to ensure that pH value in the surrounding waterbody does not rise (become more alkaline) during works. WLAP's *British Columbia Approved Water Quality Criteria for pH* sets the range for acceptable pH change with respect to fresh water aquatic life between 6.5 and 9.0. However, any increase in pH noted in conjunction with concrete works should be monitored and emergency protection measures implemented in accordance with the best practices below.

14.6.2 Objectives

The objective of this set of best practices is to ensure no concrete materials or leachate enters any watercourses.

14.6.3 Standards

Subsections 41(a)(b)(e)(f) of the Water Act Regulations provide for the protection of water quality during your proposed works.

14.6.4 Operational or Construction-related Best Practices

To ensure your works meet the requirements of applicable legislation:

- Use pre-cast concrete structures whenever possible.
- As concrete leachate is alkaline and highly toxic to fish and other aquatic life, ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials (concrete) will **not** deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place must remain inside formed structures.
- Keep a carbon dioxide (CO₂) tank with regulator, hose and gas diffuser readily available during concrete work. Use it to release carbon dioxide gas into the affected area to neutralize pH levels should a spill occur. Train workers to use the tank.

**Appendices:
Concrete Materials Use**

- Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- Report immediately any spills of sediments, debris, concrete fines, wash or contact water to **1-800-663-3456**. If possible, immediately remove the materials from the water and implement emergency mitigation and clean-up measures.
- Completely isolate all concrete work from **any** water within or entering into **any** watercourse or stormwater system.
- Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until completion of the works. Emergency measures will be implemented if downstream pH has changed **more than 1.0 pH unit**, measured to an accuracy of +/- 0.2 pH units from the background level, or is recorded to be **below 6.0 or above 9.0 pH units**.
- Prevent any water that contacts uncured or partly cured concrete during activities like exposed aggregate wash-off, wet curing, or equipment washing from directly or indirectly entering any watercourse or stormwater system.
- Maintain complete isolation of all cast-in-place concrete and grouting from fish-bearing waters for a minimum of 48 hours if ambient air temperature is above 0°C and for a minimum of 72 hours if ambient air temperature is below 0°C.
- Isolate and hold any water that contacts uncured or partly cured concrete until the pH is **between 6.5 and 8.0 pH units**, and the turbidity is **less than 25 nephelometric turbidity units (NTU)**, measured to an accuracy of +/- 2 NTU.

For further information regarding the safe use of concrete materials, refer to the following websites:

Cement and Concrete: Environmental Considerations

<http://www.buildinggreen.com/features/cem/cementconc.html>

Carbon Dioxide for Concrete Wash Water Treatment

<http://www.praxair.com/Praxair.nsf/d63afe71c771b0d785256519006c5ea1/78b5b272ccfbcd88852565550069e32d?OpenDocument>

14.7 Sediment, Runoff and Erosion Control

14.7.1 Background

In addition to the natural sediment, runoff and erosion control function that vegetated buffer strips provide, a number of best practices are commonly used to reduce sedimentation, runoff and erosion associated with construction in and around watercourses.

An Appropriately Qualified Professional (AQP) can include someone certified as an Erosion Control Specialist by the International Erosion Control Association.

14.7.2 Objectives

Sediment, runoff and erosion control best practices will help to meet the standards of the *Water Act* with respect to water quality and protection of instream species and habitat.

14.7.3 Operational or Construction-related Best Practices

To ensure your works meet the requirements of applicable legislation:

- Ensure fill or other materials used for this project on areas adjacent to the stream are inert, free of contaminants and will be placed so that they will not gain entry into the watercourse.
- Ensure material, such as rock, riprap, or other materials that are to be placed on the banks or within the active channel or floodplain of the watercourse are inert and free of silt, overburden, debris or other substances deleterious to aquatic life.
- Ensure machinery works from the bank of the stream and not in the stream channel to minimize impacts and to better enable mitigation of sedimentation.
- Install sediment, runoff and erosion control measures before starting any works.
- Construct any ditches, water bars or water diversions within the work area so they do not directly discharge sediment-laden surface flows to the stream. Divert such flows to a vegetated area where flows can slowly infiltrate.
- Minimize the disturbance to existing vegetation on and adjacent to the stream banks.
- Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the stream, as far as possible from the channel.

Appendices:
Sediment, Runoff, and Erosion Control

- Protect this material from erosion and reintroduction to the watercourse by using mitigating measures including, but not limited to covering the material with erosion blankets or seeding/planting with native vegetation.
- When material is moved offsite, dispose of it in such a manner as to prevent its entry into any watercourse, floodplain, ravine, or storm sewer system.

Sediment, Erosion and Run-off Control Plans

In addition to these best practices, each project should have in place a written contingency plan to deal with sediment control during instream projects in the event there is:

- An increase in stream flow due to increased precipitation, or
- An increase in local overland runoff, or
- Saturation of the work area.

Information on various sediment control techniques and their applicability to your project can be found in many documents, including the following documents and websites:

Land Development Guidelines for the Protection of Aquatic Habitat, Barry Chilibeck et al, 1992.

http://www-heb.pac.dfo-mpo.gc.ca/publications/pdf/guidelines/ldg_e.pdf

Water Quality Best Management Practices Best Management Practices to Protect Water Quality from Non-Point Source Pollution, March 2000.

<http://www.nalms.org/bclss/>

International Erosion Control Association

<http://www.ieca.org/>

14.8 Vegetation Management

14.8.1 Background

Vegetation management refers to best practices regarding the maintenance and protection of riparian vegetation during works in and about a watercourse. This included replacement criteria for impacted vegetation and hazard tree removal best practices.

14.8.2 Objectives

The vegetation set of best practices is intended to meet the standards requiring that no-net-loss or a gain in habitat be realized as a result of the works. In addition to this goal, vegetation management best practices will ensure activities like hazard tree removal may be completed with minimized impacts to surrounding riparian vegetation.

14.8.3 Operational Best Practices

Large-scale modification and removal of riparian vegetation is not considered a best management practice for the proper functioning of streams. However, especially in urban settings, where development has occurred in and around riparian areas, conflicts between riparian vegetation and safety of property and human life may occur. Considerations should be given to finding a long-term solution to address safety issues while maintaining proper riparian function.

To ensure your works meet the requirements of applicable legislation:

- Limit the extent of vegetation clearing done for access to your site and at your work area.
- Consider other options when contemplating the need to remove vegetation. It is very often not the best choice for fish and wildlife habitat and species.
- Wildlife trees are important for many wildlife, bird, and amphibian species. Avoid vegetation removal or management activities that will affect trees used by all birds and other wildlife while they are breeding, nesting, roosting or rearing young. Section 34 (a) of the *Wildlife Act* protects all birds and their eggs, and Section 34 (c) protects their nests while they are occupied by a bird or egg. Different areas of the province have different breeding periods for birds, and therefore have different vegetation removal or management periods of least risk to nesting birds. To find out what the vegetation removal and management period of least risk is for the protection of breeding birds in your area, contact the regional Ministry office.

Tree Replacement Criteria

For information on the Replacement Tree Criteria required by provincial and federal agencies, visit:
http://srmwww.gov.bc.ca/sry/csd/downloads/forms/vegetation_riparian/treereplcrit.pdf

- Section 34(b) of the *Wildlife Act* protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons and burrowing owls year-round. This means that a tree or other structure containing such a nest must not be felled, even outside of the breeding season.
- If you are proposing to top or remove trees, have the trees within the riparian area assessed by an appropriately qualified professional biologist to determine the presence and status of bird nests. If trees are suspected of being hazardous, then also have them assessed by a qualified professional arborist who is also a Wildlife Danger Tree Assessor, to determine the presence and nature of the hazard.
- Where topping or removing the dead limb can remove the danger, opt for doing this rather than removing the entire tree.
- Where the entire tree must be removed then the tree replacement criteria should be applied.
- Retain large woody debris and the stubs of large diameter trees where it is safe to do so. These are important for preserving fish habitat and wildlife populations.
- Fall or top all trees so that the branches do not enter the stream channel. If any branches do inadvertently end up in the channel, remove them from the site to where they will not enter the channel during high flows. Removal of limbs from the channel must be completed in a manner that will not disturb aquatic organisms.
- Fall the tree across the stream only when no other method of tree removal is possible because of safety reasons (e.g., to protect fallers or buildings). Removal of the felled tree must be completed in a manner that does not damage the banks and the bed of the stream. If possible, leave and anchor the trunk, letting it remain as large woody debris within the riparian zone.
- Fall the tree away from the channel unless there is an immediate threat to the public, and remove the material within the instream work window.
- Ensure that equipment used for vegetation removal complies with this document's listed best practices for deleterious substance control.
- Schedule vegetation removal and the management or removal of hazard trees or limbs within the window of least risk for breeding birds and before the instream window, wherever possible. This will help to prevent work delays and allow your works to be scheduled within the instream work window.

14.9 Site Restoration

14.9.1 Background

Site restoration refers to activities used to return the work area to a stable state resembling the site's original instream and riparian habitat characteristics.

14.9.2 Objectives

The site restoration set of best practices is intended to meet the standards requiring that no-net-loss or a gain in habitat be realized as a result of the works. In addition to this goal, site restoration activities will help to minimize the risk of potential post-construction impacts such as slope erosion.

14.9.3 Operational or Construction-related Best Practices

To ensure your works meet the requirements of applicable legislation:

- Grade disturbed areas to a stable angle of repose after work is completed. As well, revegetate these areas to prevent surface erosion and subsequent siltation of the watercourse.
- Protect disturbed soil areas on the banks and areas adjacent to the stream from surface erosion by hydroseeding with a heavy mulch, tackifier, and seed mix; by installing erosion blankets; or by heavily revegetating.
- Plant a diverse mix of native trees, shrubs, and herbaceous plants appropriate to the site conditions, to revegetate and replace impacted riparian vegetation.
- Restore all in-channel or active floodplain habitats that have been disturbed during the completion of works to a condition that is enhanced from their original state. This meets the Ministry goal of no-net-loss of fish and wildlife habitat.
- Remove any remaining sediment and erosion control measures (i.e., silt fence). Ensure all equipment, supplies, and non-biodegradable materials have been removed from the site.
- Complete post-construction multiyear monitoring to ensure your revegetation meets full survival

No-net-loss of fish and wildlife habitat?

Minimize impacts of your activities and leave the stream in better condition than how you found it!

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 Effects Evaluation (EEE) and/or the Fish and Fish Habitat Report as supporting documents in the completion of the site Environmental Protection Plan (EPP). Applicable provincial and federal guidelines and regulations should be reviewed prior to submission of the EPP.

EPP Framework	Content Requirements	Yes	No	N/A
Project Setting and Site Activities				
<i>Project Description</i>	A brief description of the project and its location is provided.			
<i>Environmental Sensitivities</i>	Sensitive or protected features that could be impacted as a result of the Contractor's activities are described.			
<i>Site Activities</i>	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				
<i>Project Schedule</i>	A project schedule is provided, including scheduled shut-downs and restricted work periods due to environmental requirements.			
<i>Site Drawing</i>	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				
<i>Potential Environmental Issues and Impacts</i>	The potential environmental issues and impacts that may result from the construction activities are described. Environmental Reports (Environmental Effects Evaluation, Environmental Assessments; Fish and Fish Habitat and Compensation Reports, Aquatics Effects Evaluations 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 and potentially upstream and downstream of proposed works. 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).			
<i>Permits, Approvals, and Authorizations</i>	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 water body as part of construction activities is part of the Contractor's responsibility. Scientific Collection Permits such as licences for Fish Salvage Permits are also the responsibility of the Contractor and are obtained by the Contractor's environmental monitor/consultant* who will be completing the salvage.			

Mitigation Strategies	Procedures, controls or best management practices (BMPs) to prevent or reduce adverse impacts on the environment are provided. For example, all work in BC must adhere to the BC MOE "Standards and Best Practices for Instream Works" for those works that are completed below the high water mark. DFO mitigation techniques under the Fisheries Act must also be followed. One useful document that contains information on Ministry of Environment's ecosystems, guidelines and mitigation techniques is from the MOE Ecosystems Branch – Develop With Care 2014 – Environmental Guidelines for Urban and Rural Land Development in BC.			
Erosion and Sediment Control	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, re-fuelling of equipment will be conducted at least 30m 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.			

***Environmental Monitor/Qualified Professional as recognized by the province:** an applied scientist or technologist specializing in a relevant applied science or technology including, but not necessarily limited to, agronomy, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and who is registered in British Columbia with their appropriate professional organization, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.



PRELIMINARY HAZARD ASSESSMENT FORM

Project Number:	
Location:	
Date:	
Name of Departmental Representative:	
Name of Client:	
Name of Client Project Co-ordinator	PH: ()- -

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
	PWGSC, OGD's, or tenants		General Public or other contractors		
Examples: Chemical, Biological, Natural, Physical, and Ergonomic					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.
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.	Yes	No	Yes	No	

Typical Construction Hazards					
Concealed/Buried Services (electrical, gas, water, sewer etc)					
Slip Hazards or Unsound Footing					
Working at Heights					
Working Over or Around Water					
Heavy overhead lifting operations, mobile cranes etc.					
Marine and/or Vehicular Traffic (site vehicles, public vehicles, etc.					



Fire and Explosion Hazards					
High Noise Levels					
Excavations					
Blasting					
Construction Equipment					
Pedestrian Traffic (site personnel, tenants, visitors, public)					
Multiple Employer Worksite					Example : Contractor working in a occupied Federal Employee space.

Electrical Hazards					Comments
Contact With Overhead Wires					
Live Electrical Systems or Equipment					
Other:					
Physical Hazards					
Equipment Slippage Due To Slopes/Ground Conditions					
Earthquake					
Tsunami					
Avalanche					
Forest Fires					
Fire and Explosion Hazards					
Working in Isolation					
Working Alone					
Violence in the Workplace					
High Noise Levels					
Inclement weather					
High Pressure Systems					
Other:					
Hazardous Work Environments					
Confined Spaces / Restricted Spaces					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					
Other:					
Biological Hazards					
Mould Proliferations					
Accumulation of Bird or Bat Guano					
Bacteria / Legionella in Cooling Towers / Process Water					
Rodent / Insect Infestation					
Poisonous Plants					
Sharp or Potentially Infectious Objects in Wastes					



Wildlife					
Chemical Hazards					
Asbestos Materials on Site					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					If "yes" a pre-project designated substance survey report is required.
Chemicals Used in work					
Lead in paint					If "yes" a pre-project lead survey report is required.
Mercury in Thermostats or Switches					If "yes" a pre-project mercury survey report is required.
Application of Chemicals or Pesticides					
PCB Liquids in Electrical Equipment					
Radioactive Materials in Equipment					
Other:					
Contaminated Sites Hazards					
Hazardous Waste					
Hydrocarbons					
Metals					
Other:					

Security Hazards					Comments
Risk of Assault					
Other:					
Other Hazards					

Other Compliance and Permit Requirements ¹	YES	NO	Notes / Comments ²
Is a Building Permit required?			
Is a Electrical permit required?			
Is a Plumbing Permit required?			
Is a Sewage Permit required?			
Is a Dumping Permit required?			
Is a Hot Work Permit required?			
Is a Permit to Work required?			Mandatory for ALL AFD managed work sites.
Is a Confined Space Entry Permit required?			Mandatory
Is a Confined Space Entry Log required?			Mandatory for all Confined Spaces
Discharge Approval for treated water required?			



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			