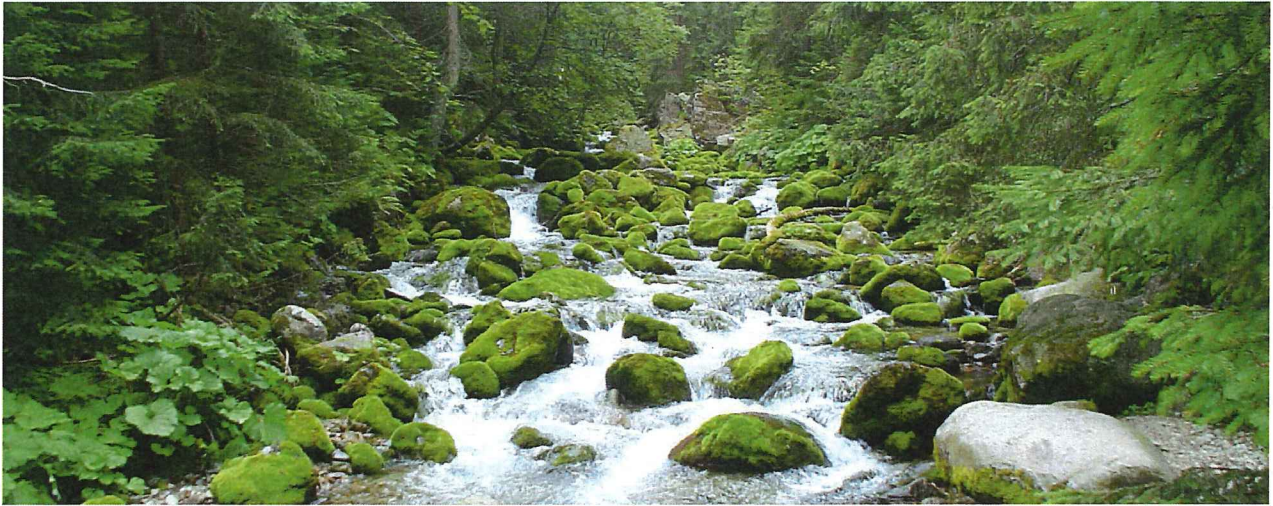


# Standards and Best Practices for Instream Works



## Culverts

Version 1.0

### Other Guides in this Series

- Guidebook Introduction
- Bank Stabilization
- Beaver Dam Removal
- Bridges
- Channel Maintenance
- Culverts**
- Habitat Enhancement & Restoration
- Miscellaneous Works
- Pipeline Crossings
- Public Utility Works
- Urban Stormwater Management
- Wharf, Pier, Dock, Boathouse & Mooring

### Supporting Documents

- General BMPs & Standard Project Considerations
- Regional Timing Windows
- Contact List  
B.C. Ministry of Environment Contacts  
Fisheries and Oceans Canada (DFO) Contacts
- Glossary
- MOE/DFO Notification, Approval & Authorization Instructions & Forms

You have selected this document because your project involves **Culvert** activities in or about a stream. Culvert activities include:

- culvert installation, removal, maintenance and/or clearing an obstruction from a culvert during a flood event.

Culvert activities can potentially have negative effects on fish and fish habitat. A clear-span bridge, whenever possible, is preferred to a culvert as no structures are placed on the stream bed and no alteration of natural channel processes occur. When planning your project, develop designs and select locations to minimize potential impacts to fish and fish habitat. If your works are outside the scope of this Guidebook then a MOE Approval application must be completed and DFO contacted to determine if a review and/or Authorization under the *Fisheries Act* is appropriate.

# Introduction

## About this document...

Before you proceed with your project you must ensure that you:

- understand and apply the appropriate [Water Act Standards](#) to your project;
- understand the federal [Fisheries Act](#) and ensure you are in compliance with Section 35 of the [Act](#) which prohibits the **Harmful Alteration, Disruption or Destruction (HADD)** of fish habitat and Section 36 of the [Act](#) which prohibits the release of **deleterious** substances to a watercourse;
- review the appropriate DFO Pacific Region Operational Statement(s) and determine if Operational Statement Notification and/or DFO review and/or Authorization is appropriate;
- incorporate the applicable [Best Management Practices](#) to comply with the Standards; and,
- complete and submit a [Notification, Approval and/or Authorization application](#) for MOE and DFO as required for your project.

### Glossary

Important words, denoted in **bold text**, are defined in the glossary, included as a separate document for download as part of this same series.

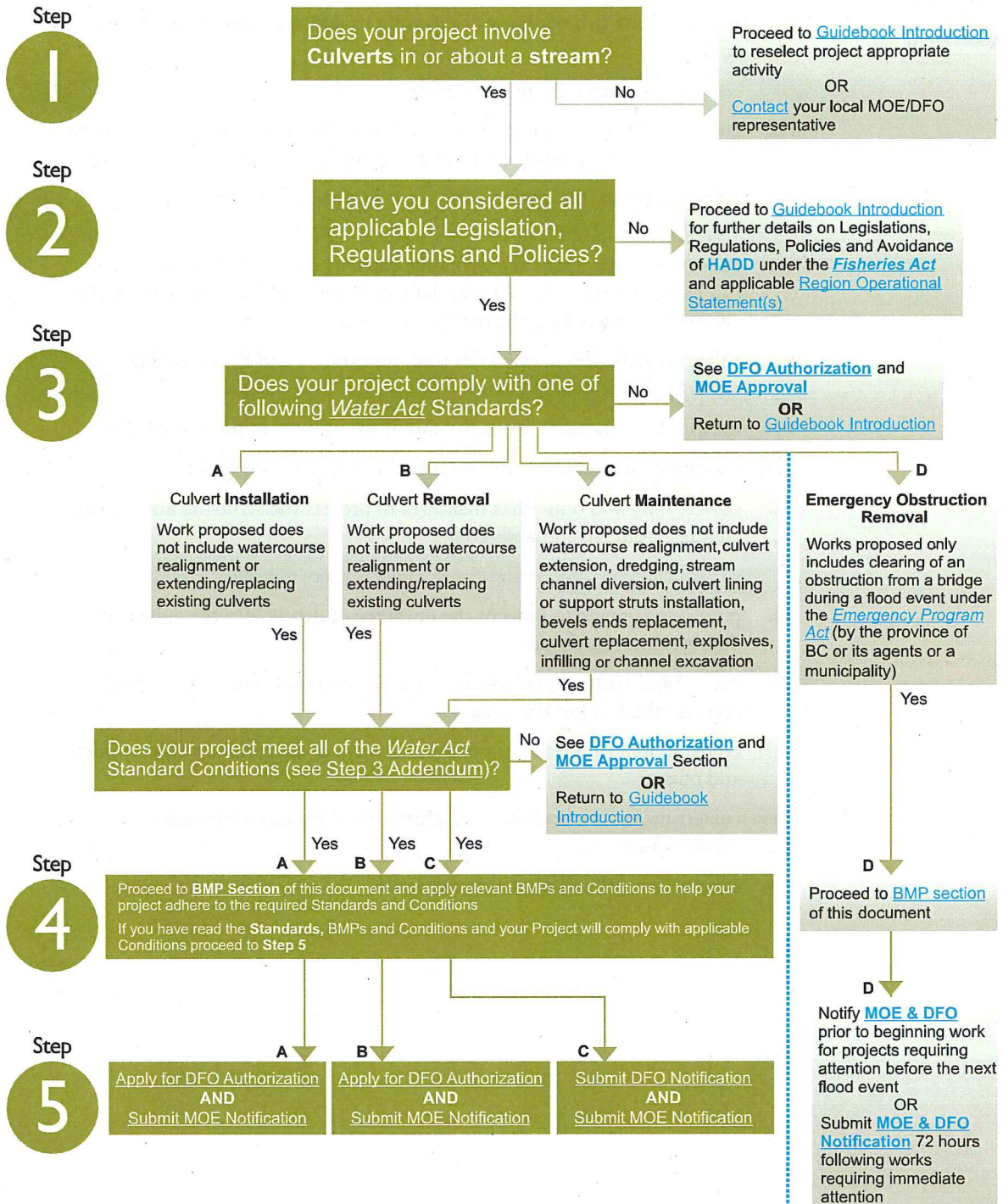
## Disclaimer

Information in this document is provided for guidance only. Users must apply appropriate legislation and regulations as applicable to the works in and about a stream that are being considered. It is strongly recommended that an appropriately [Qualified Professional\(s\) \(QP\)](#) be consulted as part of project development. Legislation and regulations should be consulted and applied as they pertain to your project. If a discrepancy arises between this document and legislation, the legislation takes precedence. Neither the Province of British Columbia nor Government of Canada guarantee the accuracy or completeness of the information referenced herein and in no event are liable or responsible for damages of any kind arising from its use. Note that other legislation and regulations (e.g., municipal) may also apply to such activities and should be consulted.



# How to proceed with your Culvert Project

The following **five (5) steps** will help guide you through the provincial and federal [Notification, Approval](#) and/or [Authorization](#) process for **Culvert Installation, Maintenance or Removal** works:



Step

3

Addendum

## Water Act Standard Conditions

### CULVERT DESIGN AND OPERATIONAL REQUIREMENTS

- i. culvert allows fish of all ages to pass up or down stream under all flow conditions
- ii. culvert diameter minimum of 0.6 m
- iii. culverts with  $\geq 2$  m diameter or  $>6$  cubic metres/sec flow design capacity was designed by a professional engineer and conforms with that design
- iv. culvert depth of fill cover is  $>0.3$  m or as required by the culvert manufacturer's specifications
- v. culvert capacity equals the hydraulic capacity of the stream channel or can pass the max 1-in-200 year daily flow without the water level at the culvert inlet exceeding the top of the culvert
- vi. culvert installation permits removal of obstacles and debris within the culvert and at the culvert ends
- vii. maximum fill heights above the top of the culvert do not exceed 2 m
- viii. equipment operates in a dry stream channel or top of bank
- ix. culvert inlet and outlet has measures to protect the structure and stream channel from erosion and scour
- x. stream channel outside the cleared width is not altered
- xi. provision is made to prevent the entrance of debris into the culvert if debris cannot safely pass
- xii. culvert and associated roads do not produce a backwater effect or increase the head of the stream
- xiii. embankment fill materials do not and will not encroach on culvert inlets and outlets
- xiv. culvert material meets the standards of the [Canadian Standards Association](#)
- xv. stream channel will not be destabilized

# Best Management Practices (BMPs)

Step  
**4**

The following Best Management Practices (BMPs) are methods, that if followed, will help ensure your project minimizes potential impacts to fish and fish habitat and will provide a standard level of protection to the aquatic and terrestrial environment potentially affected by your project.

It is the responsibility of the proponent/developer to ensure that they are in compliance with all applicable legislation.

There are three (3) types of BMPs you should consider:

- i. [General BMPs and Standard Project Considerations](#) applicable to any project;
- ii. Culvert Installation, Maintenance or Removal specific BMPs (below); and,
- iii. [Supportive information](#) applicable to project design, implementation and [Culvert Installation, Maintenance](#) or [Removal](#) techniques.

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## i. General Project BMPs and Standard Project Considerations

Please proceed to the [General BMPs and Standard Project Considerations](#) section to review considerations applicable to your project.

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## ii. Culvert Installation, Maintenance or Removal Specific BMPs

To achieve the required Standards and objectives that your activity must meet, apply the following BMPs as applicable to your works.

To reduce impacts on fish and wildlife habitats and populations, your culvert installation, removal or maintenance must consider:

### A. Culvert Installation

#### DESIGN

**CVT01** ensure [General BMPs and Standard Project Considerations](#) have been consulted and appropriately applied and the [Forest Practices Code: Fish-stream Crossing Guidebook](#) has been read and understood prior to commencement of work;

**CVT02** culvert installation must adhere to [Regional Timing Windows](#) to prevent disruption of fish and wildlife habitat;

## Best Management Practices (BMPs): continued...

- CVT03** utilize alternative crossing structures (e.g. clear span bridges, lock blocks and concrete decks) as a replacement for culverts, where possible (contact DFO to discuss culvert alternatives). Culverts, if required, should be designed and installed by a **Qualified Professional (QP)**;
- CVT04** utilize a single large culverts design over a multiple culverts design (i.e. several smaller culverts) to allow for reduced debris blockage and increased fish and wildlife passage, where hydrologically feasible (consult a **Qualified Professional**);
- CVT05** avoid **floodplains, meander bends, braided streams, alluvial fans**, and any other areas where bank stability may be a concern;
- CVT06** design culvert bottoms to be placed at least 15cm below the stream bed elevation to ensure culverts remain passable by fish and wildlife by preventing culverts from becoming perched. Ensure a **qualified professional (QP)** is consulted for proper culvert design;
- CVT07** ensure designs locate culvert structures in areas that minimize impacts to riparian vegetation and associated wildlife;

### OPERATIONAL

- CVT08** place adequate **rip rap** or **wing walls** (if required) at the upstream and downstream ends of the culvert to protect the road embankment and stream channel from erosion;
- CVT09** prevent eroding inlets and outlets by reinforcement/armouring them with **rip rap** or other appropriate measures. If utilizing reinforcement/armouring measures consider the following:
- place large, durable, clean, suitably graded and sized angular rocks (**rip rap**) into the eroding area at the culvert inlet/outlets only;
  - carefully unload rocks and key into place (if placing rocks along the embankment);
  - implement appropriate **erosion and sediment control measures** and maintain their functionality;
  - do not obtain rocks from below the **high water mark** (HWM) of any water body;
  - install **rip rap** at a similar slope as the stream bank to maintain a uniform stream bank slope and natural stream alignment;
  - avoid use of acid-containing rocks;
  - ensure **rip rap** does not constrict the channel width or flow; and,
  - ensure that the placement of **rip rap** does not infill instream fish habitat (e.g. outlet pools) and does not create a barrier to fish passage, particularly during low flow periods.
- CVT10** materials (e.g. **rip rap** or **gabion rock**) placed within the average **high water mark** (HWM) of the watercourse, must be free of **silt, overburden**, debris or other substances considered **deleterious** to aquatic life;
- CVT11** place and compact **backfill** around the culvert in accordance with accepted engineering procedures;

## Best Management Practices (BMPs): continued...

- CVT12** protect natural function and features by avoiding [fish and wildlife habitat areas](#);
- CVT13** avoid disturbing the bed and banks of the stream by using structures that will remain outside the [bankfull width](#) of the stream;
- CVT14** align stream crossings perpendicular to stream flow;
- CVT15** protect exposed areas of the [stream channel](#) and culvert from erosion by proper installation of [erosion and sediment control measures](#);

### B. Culvert Removal

#### DESIGN

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- CVT16** ensure [General BMPs and Standard Project Considerations](#) have been consulted and appropriately applied prior to commencement of work;
- CVT17** culvert removal must adhere to [Regional Timing Windows](#) to prevent disruption of fish and wildlife habitat;
- CVT18** design stream crossing removal to include opportunities to enhance the surrounding environment;
- CVT19** protect fish habitat surrounding culvert removal sites by ensuring no future crossings are planned for installation at that location;

#### OPERATIONAL

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- CVT20** wooden culvert removal involving [cribbing](#) structures must be left in place if it is stable and over time has integrated into the stream banks and channel and contributes to stream complexity. If the cribbing structures constrict the watercourse or the upper portion of the [cribbing](#) is or will decay overtime then it should be removed with the lower portion left in place;
- CVT21** isolate your work area, if required, from all flowing water in a manner that does not cut off flow to downstream portions of the stream at any time during construction (see [General BMPs and Standard Project Considerations: Temporary Diversion](#) section for further information);
- CVT22** if dewatering of the site is required, an [Environmental Monitor](#) holding all necessary permits required by fisheries agencies to collect and transport fish, should be on hand to make the final decision regarding the need for a [fish salvage](#) program. If a [fish salvage](#) is necessary, recovered fish must be relocated to a safe area outside of the influence of the worksite and transport containers must not be overloaded with fish (see [General BMPs and Standard Project Considerations: Fish and/or Wildlife Salvage](#) section for further information);

#### POST MITIGATION WORKS

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- CVT23** remove any old structures to a suitable upland disposal site away from the [riparian](#) area and floodplain to avoid waste material from re-entering the watercourse;

## Best Management Practices (BMPs): continued...

- CVT24** restore banks to original condition if any disturbance occurs;
- CVT25** maintain effective [erosion and sediment control](#) measures until complete re-vegetation of disturbed areas is achieved;

### C. Culvert Maintenance

#### DESIGN

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- CVT26** ensure [General BMPs and Standard Project Considerations](#) have been consulted and appropriately applied prior to commencement of work;
- CVT27** culvert maintenance must adhere to [Regional Timing Windows](#) to prevent disruption of fish and wildlife habitat;

#### OPERATIONAL

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- CVT28** remove debris accumulation gradually to prevent downstream erosion, flooding, habitat damage, property damage and mobilization of sediment;
- CVT29** utilize culvert maintenance techniques that result in the least amount of impacts to the watercourse and riparian area;
- CVT30** inspect [erosion and sediment control measures](#) regularly to ensure they are functioning properly. Make all necessary repairs if any damage occurs or to maintain functionality;
- CVT31** avoid culvert maintenance activities during wet and rainy periods;
- CVT32** remove accumulated material and debris slowly to allow clean water to pass, to reduce the amount of sediment-laden water going downstream and to reduce potential upstream fish strandings;
- CVT33** conduct maintenance work by hand, where possible;
- CVT34** operate machinery, if required, from the top of bank;
- CVT35** do not obtain rocks from below the [high water mark](#) (HWM) of any water body to conduct maintenance activities;
- CVT36** stabilize waste materials removed from the work site to prevent them from entering the watercourse. Storage of waste materials should be kept outside of riparian areas;
- CVT37** limit removal of accumulated debris (i.e., branches, stumps, other woody materials, garbage, ice build-up, etc.) to the area within the culvert, immediately upstream of the culvert and to that which is necessary to maintain culvert function and fish passage;



## Best Management Practices (BMPs): continued...

**CVT38** stabilize eroding inlets and outlets (if required) according to the following measures:

- place large, durable, clean, suitably graded and sized angular rocks (**rip rap**) into the eroding area at the culvert inlet/outlets only by hand or using machinery operating outside of the water;
- carefully unload rocks and key into place (if placing rocks along the embankment);
- implement appropriate **erosion and sediment control measures** and maintain their functionality;
- do not obtain rocks from below the **high water mark** of any water body;
- install rip rap at a similar slope as the stream bank to maintain a uniform stream bank slope and natural stream alignment;
- ensure **rip rap** does not constrict the channel width or flow; and,
- ensure that the placement of **rip rap** does not infill instream fish habitat (e.g. outlet pools) and does not create a barrier to fish passage, particularly during low flow periods; and,
- avoid use of acid-containing rocks.

### POST WORKS MITIGATION

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**CVT39** restore banks to original condition where any disturbance has occurred;

## D. Emergency Obstruction Removal

### DESIGN

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**CVT40** ensure **General BMPs and Standard Project Considerations** have been consulted and appropriately applied prior to, during and after commencement of work;

**CVT41** ensure an appropriately qualified professional confirms all emergency works and properly classifies works as Type 1 or Type 2 emergencies

Type 1: works requiring immediate attention during a flood event or as designated under the *Provincial Emergency Program*. These situations have caused or present an immediate (within 24 hours) high potential danger to human life, damage property or fish and wildlife populations or habitat; and,

Type 2: works requiring attention prior to the next flood event. These situations present a high potential danger to human life, damage property or fish and wildlife populations if not addressed prior to the next flood event.

## Best Management Practices (BMPs): continued...

**CVT42** ensure Type 1 emergencies use the following protocols:

- commence necessary works to alleviate the emergency and immediately advise appropriately qualified professional monitors (at any time of day or day of the week);
- incorporate the standards and Best Management Practices appropriate to culvert works being completed to ensure the protection of fish and wildlife populations and habitats;
- ensure monitoring professionals attend the site immediately to conduct salvages and 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;
- ensure only works necessary to mitigate the emergency are completed. Any remaining works should be deferred until the next work window or conducted through the regular process; and,
- ensure monitors notify MOE, DFO and any other appropriate agencies by fax and phone within 72 hours. The monitor should include technical rationale for justification of the proposed emergency works, information associated with the Notification and any special mitigating Best Management Practices used for completing the works outside the work window (agency staff may visit the site after receipt of the Notification).

**CVT43** ensure Type 2 emergencies use the following protocols:

- advise appropriately qualified professional monitors during the first available office hours;
- ensure only works necessary to mitigate the emergency are proposed. Any remaining works should be deferred until the next work window or conducted through regular processes;
- schedule works to be completed prior to the next flood event and ensure designs incorporate the recommended standards and Best Management Practices appropriate to the type of works proposed. If appropriate, special mitigative measures should be incorporated into the design to reduce the risks of working outside work windows;
- ensure monitoring professionals notify MOE, DFO and any other appropriate agencies by fax and phone and include all design, plans and mitigation documents. The professional should include in the communication the use of appropriate protocols, technical rationale for justification of the proposed emergency works, information associated with the Notification and any special mitigating best practices used for completing the works outside work windows (agency staff may visit the site after receipt of the Notification);

## Best Management Practices (BMPs): continued...

- ensure monitoring professionals meet onsite with agency staff, if available, to review designs, associated plans and proposed works. Any additional Best Management Practices should be discussed and agreed to during the site visit. Works should then be completed prior to the next flood event; and,
- ensure monitoring professionals attend the site prior to conducting any works to complete salvages and to ensure environmental protection measures are constructed, installed and maintained appropriately. Works should be monitored full-time until completion.

### OPERATIONAL

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**CVT44** remove all obstruction debris from the **active floodplain** to ensure it is not redeposited during the next flood event;

**CVT45** remove obstructions by hand, where possible;

**CVT46** remove debris accumulation gradually to prevent downstream erosion, flooding, habitat damage and mobilization of sediment;

**CVT47** any machinery, if required, must work from the top of the bank and not in the stream channel;

**CVT48** limit the removal of accumulated material (i.e. branches, stumps, other woody materials, garbage, etc.) to the area within the culvert, immediately upstream of the culvert and to that which is necessary to maintain culvert function and fish passage;

**CVT49** ensure the **Beaver Dam Removal** section is properly consulted for culvert activities involving beaver dams;

**CVT50** ensure an appropriately qualified professional monitors all emergency works full time and has extensive knowledge and experience in erosion and sediment control and fish and wildlife salvage.

### POST WORKS MITIGATION

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**CVT51** ensure monitors provide a report within 10 working days of completion of the majority of works to proponents and a final copy to MOE and any other agency(s) in the jurisdiction;

## Best Management Practices (BMPs): continued...

**CVT52** ensure monitoring reports contain:

- detailed accounts of the completion of works including 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 consistency of completed works with the submitted Notification;
- fish and wildlife protection mitigation difficulties encountered and how those difficulties were managed; and,
- outstanding issues with the Notification, and how and when those activities will be completed and confirmed and how and when they will be reported.

## Supportive Information

### iii. Supportive Information

The following sources provide you with additional planning, design, implementation and review advice for a variety of project-specific activities. Please follow the appropriate links to obtain further information on your project specific activity.

#### General Considerations

**Pacific Region Operational Statements**

[http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/operational\\_statements\\_e.htm](http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/operational_statements_e.htm)

**Best Management Practices for Highway Maintenance Activities, BC**

[http://www.th.gov.bc.ca/Publications/eng\\_publications/environment/MoT\\_Hwy\\_Maint\\_BMP.pdf](http://www.th.gov.bc.ca/Publications/eng_publications/environment/MoT_Hwy_Maint_BMP.pdf)

**Culverts and Fish Passage**

[http://www.th.gov.bc.ca/publications/eng\\_publications/environment/references/Culverts\\_and\\_Fish\\_Passage.pdf](http://www.th.gov.bc.ca/publications/eng_publications/environment/references/Culverts_and_Fish_Passage.pdf)

**Timing Windows and Measures to Adequately Manage and Conserve Aquatic Resources for the Cariboo Region Forest Districts**

[http://wlapwww.gov.bc.ca/car/env\\_stewardship/ecosystems/reports/timing\\_windows\\_measures\\_cariboo.pdf](http://wlapwww.gov.bc.ca/car/env_stewardship/ecosystems/reports/timing_windows_measures_cariboo.pdf)

**Riparian Areas and Revegetation, Pacific Region**

[http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/riparian-reveg\\_e.htm](http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/riparian-reveg_e.htm)

#### Culverts Design & Techniques

**Land Development Guidelines for the Protection of Aquatic Habitat, Section 6 Fish Passage and Culverts**

<http://www-heb.pac.dfo-mpo.gc.ca/publications/pdf/165353.pdf>

**Installation of an Embedded Pipe Culvert: Hotfish Creek**

[http://www.for.gov.bc.ca/hfd/LIBRARY/FFIP/Gillies\\_CT2002FericAdv.pdf](http://www.for.gov.bc.ca/hfd/LIBRARY/FFIP/Gillies_CT2002FericAdv.pdf)

**Aggregate Operators Best Management Practices Handbook for British Columbia (Volume II), Outlet Protection Best Management Practices**

<http://www.em.gov.bc.ca/Mining/MiningStats/Aggregate%20BMP%20Handbook/Vol-2-AOH-BMP.pdf>

**Fish-Stream Crossing Guidebook, Forest Practices Code**

<http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/FishStreamCrossing/FSCGdBk.pdf>

#### Rip Rap Design & Techniques

**Rip Rap as Bank Stabilization Above High Water Level**

[http://www.th.gov.bc.ca/publications/eng\\_publications/best\\_practices/bp.pdf](http://www.th.gov.bc.ca/publications/eng_publications/best_practices/bp.pdf)

**Rip Rap Design and Construction Guide**

[http://www.env.gov.bc.ca/wsd/public\\_safety/flood/pdfs\\_word/riprap\\_guide.pdf](http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/riprap_guide.pdf)

**Best Management Practices Guide for Stormwater, Appendix H: BMPECI 3 Rip Rap, Metro Vancouver**

<http://www.metrovancouver.org/about/publications/Publications/BMPV12c.pdf>

## MOE/DFO Notification, Approval & Authorization

Step

5

If you determine that your project requires notification and/or approval from MOE or DFO, please ensure that MOE and/or DFO application [instructions](#) are followed and [forms](#) completed and sent to the appropriate agency.

The latest application instructions and forms for MOE and DFO can be found at <http://www.env.gov.bc.ca/wld/BMP/>