Appendix: Scope-specific Best Management Practices for Changes In and About a Stream under the WSA

This document is the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia guidance (Requirements document). **It is recommended that you read the Requirements Document and its companion *A User's Guide for Changes in and About a Stream* before reading this Appendix.**

You are expected to follow the General BMPs for all changes in and about a stream (CIAS) projects under the *Water Sustainability Act* (WSA) in addition to any Scope-specific BMPs that pertain to your project. This Appendix contains all Scope-specific BMPs-refer to the Requirements document for all General BMPs.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

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Limitations and Use

Using this Document

The approaches described in this document are not exhaustive and projects may require different methods tailored to site-specific characteristics. This document is not intended to take the place of professional judgment or experience and cannot be relied upon exclusively to satisfy investigations into environmental requirements of a specific site.

The government of B.C. (the Province) recommends that proponents consider these BMPs when planning CIAS work and to refer to them when preparing reports (e.g., an environmental management plan) as part of a CIAS submission, such as a change approval application or notice of authorized change. These BMPs consider issues that are relevant to decisions that are made under the WSA.

Nature of BMPs

Depending on the circumstances of the project proposal, clients may choose not to adopt these BMPs or may choose to modify BMPs to suit site-specific characteristics/needs. These included BMPs are not legislated requirements specified by a statute. However, these **BMPs may be given legal effect** by incorporation as **terms and conditions** of an authorizing instrument like a water licence or change approval. If a BMP is not incorporated through legislation or an authorizing instrument, then it is best understood as non-mandatory guidance.

IMPORTANT: Terms and Conditions
The statutory decision maker has the discretion to include terms and conditions in a legal instrument such as a change approval, water licence, use approval or order. This document does not mandate how that discretion is to be exercised, whether BMPs should be specified, or how BMPs might be reflected or incorporated in the terms and conditions.

This document **supports, and does not replace, the requirements of the WSA** and its associated regulations. Individuals must ensure they are in accordance with **all applicable sections of WSA legislation** and must follow specific terms and conditions included in any authorizing instrument or order issued to them. Where a discrepancy occurs between what is described in legislation and what is described in this document, legislation takes precedence.

While this guidance document relates primarily to the WSA, instream works are also regulated by a number of other federal, provincial and municipal acts, regulations and bylaws. Some of these are referenced within this document. **It is an individual's responsibility to ensure they are compliant with all applicable legislation.**

To determine what sections of this document are applicable to their CIAS work, individuals may find it useful to retain the services of a qualified professional (QP) (e.g., with adequate training and knowledge of hydrology, biology, engineering and/or environmental policies in B.C.).

IMPORTANT: Minimizing BMP Content Overlap
The BMPs avoid repeating provisions as much as possible, e.g., practices related to erosion and sediment control may be recommended for every CIAS project, however the best management practices are only provided within the BMP for Erosion and Sediment Control. It is recommended that you **carefully consider and read all BMPs before determining which apply to your project**.

Alternatives to Best Management Practices

While alternative practices may be explored, adherence to any cited BMPs becomes mandatory if you are issued a change approval, water licence, use approval or order with terms and conditions that require you to follow one or more of the BMPs, such as by incorporating them by reference. Following these BMPs can help a proponent meet the statutory requirements under the WSA and WSR, and help avoid impacts to stream values. However, given the diversity of CIAS activities and works, the following BMPs will not always be suitable. Alternatives to the BMPs may be explored if they meet the mandatory requirements within the legislation and do not contravene the terms and conditions of a change approval, water licence, use approval or order.

Contact Us and More Information

More information on working around water in B.C. is available on the Province's water webpage or by contacting the FrontCounter BC office or regional offices. Regional offices may have additional region-specific guidance on making CIAS.

FrontCounter BC Contact Centre
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Web: www.frontcounterbc.gov.bc.ca

Report an error: Contact livingwatersmart@gov.bc.ca to report an error.

Updates Over Time

New information and technologies will continue to shape BMPs and expectations for working around water. The Province will aim to update this document periodically to incorporate any new practices and requirements that may arise.

Amendments or updates to this document since release:

New Version #	Date Amended	Amendment Description
NA		
NA		

Checklist: Best Management Practices for CIAS under WSA

The checklist below is intended as a planning tool to help you determine what best management practices (BMPs) can apply to your changes in and about a stream (CIAS) project under the WSA. You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project.

General BMPs		
Common practices that can generally be incorporated into all CIAS activities and works. Available in: Section 5 of the Requirements and Best Management Practices for Making CIAS in B.C. document.		
5.1	☐	Environmental Monitoring of Activities or Works
5.2	☐	Reduced Risk Timing Windows
5.3	☐	Riparian Vegetation Protection
5.4	☐	Deleterious Substances and Spill Management
5.5	☐	Erosion and Sediment Control
5.6	☐	Site Restoration or Maintenance

Scope-Specific BMPs		
Practices for specific types of CIAS activities and works unique to given project types. Refer to the BMPs that may apply to your project (in addition to the General BMPs listed above).		
A1	☐	Concrete Use
A2	☐	Beaver and Beaver Dam Management
A3	☐	Piers, Docks and Wharves Construction, Maintenance or Removal
A4	☐	Fish and Wildlife Salvage
A5	☐	Boat Launches
A6	☐	Construction, Maintenance or Removal of Bridges
A7	☐	Culvert Installation, Maintenance and Removal
A8	☐	Fording
A9	☐	Pipeline Crossings
A10	☐	Storm Sewer Outfalls
A11	☐	Streambank Erosion Protection
A12	☐	Instream Work Area Isolation

A1. Best Management Practices for Concrete Use

This section describes best management practices (BMPs) for preventing concrete materials or concrete leachate from entering watercourses during the use of concrete in and about a stream. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These Scope-specific BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Concrete, cement, mortars, grouts and other Portland cement or lime-containing construction materials are basic (alkaline) materials. They are highly toxic to fish and other aquatic life and must only be used near water with extreme care.

Authorized Changes under WSR Part 3

It may be possible to complete certain CIAS activities as a notice of authorized change if the work is done in accordance with Part 3 of the Water Sustainability Regulation (WSR). For example, a person making an authorized change in accordance with this Part must ensure that all cast-in-place concrete and grouting is completely separated from fish-bearing waters for a minimum of 48 hours (WSR s. 43(1)(d)). If the specifications **do not meet** the requirements, and the work is not authorized under another section of WSR Part 3, the work will require a change approval, water licence, use approval or order.

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs
You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for using concrete in CIAS activities under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

a) Pre-cast concrete structures are used.

b) All works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials (concrete) must not deposit, directly or indirectly,

sediments, debris, concrete, concrete fines, wash or contact water into or about any stream. Concrete materials cast-in-place must remain inside formed structures.

c) A carbon dioxide (CO_2) tank with regulator, hose and gas diffuser must be readily available during any work involving the mixing or pouring of concrete. Operators must have appropriate training to operate such equipment and to release carbon dioxide gas and neutralize pH levels should a concrete (and/or derivative) spill occur.

d) Wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment must be contained in a manner that prevents wash-down water from entering a stream, stormwater runoff or aquifer.

e) Concrete work must be isolated from any water within any watercourse or stormwater system and/or be prevented from entering into any watercourse or stormwater system.

f) Where concrete work occurs within the stream or stream channel, a location immediately downstream of the work must be monitored regularly for pH.

g) Concrete work must stop if downstream pH:
   i. has changed by **more than 1.0 pH unit**, measured to an accuracy of +/- 0.2 pH units from the background level; or,
   ii. where applicable, is recorded to be **below 6.0 or above 9.0 pH units** and may only resume when pH levels have returned to levels within this range.

h) Water that contacts uncured or partly cured concrete during activities, such as exposed aggregate wash-off, wet curing, or equipment washing, must be prevented from directly or indirectly entering any stream, stormwater system, or aquifer if it will adversely alter the water quality as compared to the pre-disturbed state.

i) All cast-in-place concrete and grouting must be isolated 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.

Amendments

New Version #	Date Amended	Amendment Description
NA	NA	NA

Recommended Citation

For the use by WSA statutory decision makers during the water authorization process:
"Best Management Practices for Concrete Use". Appendix, Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia. Version 2022.01. Government of British Columbia.

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https://portal.nrs.gov.bc.ca/web/client/locations

A2. Best Management Practices for Beaver and Beaver Dam Management

This section describes best management practices (BMPs) to help land managers address seasonal flooding caused by beavers and their dams while minimizing impacts to fish, wildlife and the aquatic habitat. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These Scope-specific BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Beavers support water reserves for fish and aquatic wildlife habitat and play an important role in creating off-channel habitat which support ecological diversity. Despite being "natural engineers", their dams can also cause significant problems related to flooding and drainage, and in some instances fish passage and adult fish migration (especially during low water conditions when stream flows do not overtop the dam). Beavers, if left on site, will usually repair any breach to their dams in the short-term.

Coexistence solutions and allowing beaver dams to remain where appropriate are strongly encouraged. Beaver dam removal can result in significant damage to streams and stream corridors, such as:

- a sudden release of water and sediment/debris, such as a flush of silty water, that can impact downstream fish spawning and rearing habitat;
- rapid reduction of pond depth which can strand or kill fish, amphibians, and other animals;
- erosion of downstream channels and banks which may affect property and infrastructure; and
- potential contamination of downstream wells.

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 or otherwise exempt under the Act, the Wildlife Regulation, or possess a permit under the *Wildlife Act*. Dam alteration or removal is permitted under the *Wildlife Act* "to provide irrigation or drainage under lawful authority for the protection of property" and under the *Water Sustainability Act* (WSA) and Water Sustainability Regulation (WSR) for drainage purposes with specific restrictions.

Authorized Change under WSR Part 3

It may be possible to complete certain beaver and beaver dam management activities involving CIAS, such as the removal of a beaver dam as a notice of authorized change if the work is done in accordance with Part 3 of the WSR and is carried out in such a manner that downstream flooding and erosion do not occur. For example, WSR s.39(1)(u) specifically outlines the criteria to be met for beaver dam removal to be considered as an authorized change under WSR. If the specifications **do not meet** the requirements, and the work is not authorized under another section of WSR Part 3, the work will require a change approval, water licence, use approval or order.

- WSRs.39(1)(u): the removal of a beaver dam under section 9 of the *Wildlife Act*, if the removal is carried out in such a manner that downstream flooding and erosion do not occur

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for beaver and beaver dam management as it relates to CIAS under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

Preventing Beaver Dam Construction on Streams

a) Wire fencing to exclude beavers from upland vegetation must be used. Fence mesh openings must be small enough to prevent entry by beaver kits (<15 cm).

b) Culvert inlets must be installed with double-walled wire cages with mesh size large enough to pass adult salmonids.

Removing Beaver Dams

c) Beaver dam removal may only occur during the time-period specified in the *Wildlife Act* permit or authorization.

d) Where fish passage is not an issue, alternatives to fully removing a beaver dam must be employed. For example, the insertion of a perforated PVC culvert with an end cap through the dam to act as a pond leveler on streams (Figure 1).

e) Beavers must be removed before the removal of a beaver dam. Where beaver removal is necessary, a licensed nuisance trapper or registered trapline holder must be hired to effect removal of the beaver.

f) Beaver dam removal must be performed using non-mechanized approaches where applicable and performed gradually to prevent sudden water flows and sediment release.

g) Lactating female beavers must be released as soon as possible if live-trapped during the summer.

h) Relocation of beavers must be avoided unless relocation is recommended by an appropriately qualified professional.

i) Explosives must not be used in beaver dam removal.

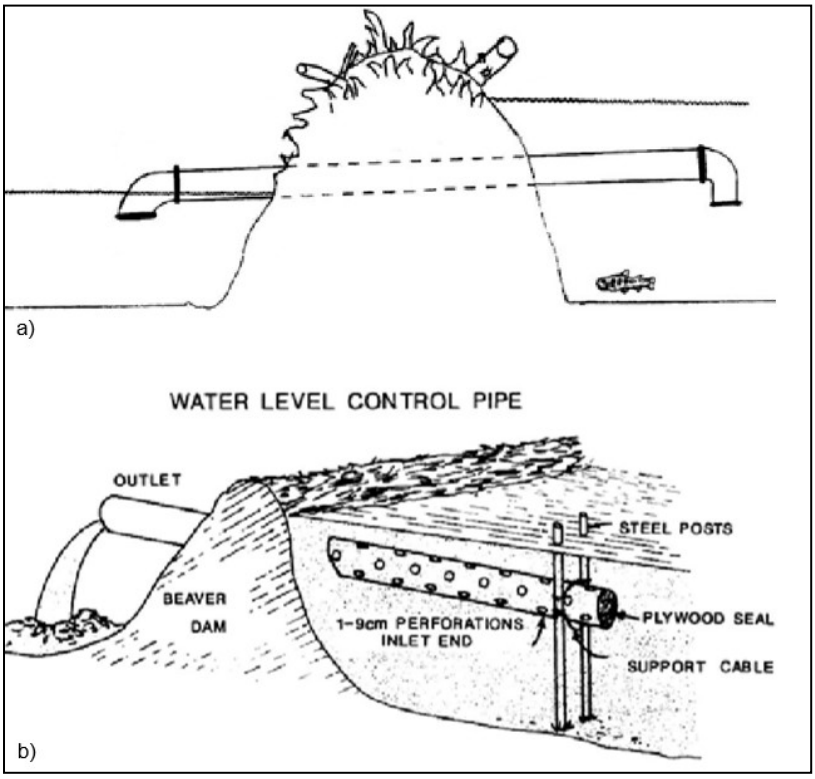

Figure 1: Examples of pond levelling structures: a) beaver siphon and b) perforated culvert. Constructed ditch factsheet. 2005. Drainage Management Guide – No. 16. British Columbia Ministry of Agriculture, Food and Fisheries. p.2.

Additional Resources

- Projects Near Water, Fisheries and Oceans Canada (DFO)

Amendments

New Version #	Date Amended	Amendment Description
NA	NA	NA

Recommended Citation

For the use by WSA statutory decision makers during the water authorization process:
"Best Management Practices for Beaver and Beaver Dam Management". Appendix, Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia. Version 2022.01. Government of British Columbia.

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A3. Best Management Practices for Piers, Docks and Wharves Construction, Maintenance or Removal

This section describes best management practices (BMPs) that aim to prevent harmful impacts to water quality, riparian and aquatic habitats, and fish and wildlife species during the construction, maintenance or removal of piers, docks and wharves. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

The installation of piers, docks and wharves can impact aquatic and riparian habitat by shading riparian vegetation, removing riparian/foreshore vegetation, covering spawning habitat, removing rocks and logs that provide shelter, causing erosion and sedimentation from bank disturbance, introducing deleterious substances if improper building materials are used, and disrupting sensitive fish life stages. Considering potential impacts when developing designs and selecting locations for your project can help minimize potential impacts to fish, wildlife, and associated habitats. Note that piers and wharves generally include docks.

Authorized Change under WSR Part 3

It may be possible to complete certain pier or wharf activities involving CIAS, such as construction, maintenance or removal of a pier or wharf in a stream, as a notice of authorized change if the work is done in accordance with Part 3 of the Water Sustainability Regulation (WSR). For example, WSR s.39(1)(d) and (w) specifically outline the criteria to be met for these activities to be considered as an authorized change under WSR. If the specifications **do not meet** the requirements, and the work is not authorized under another section of WSR Part 3, or will occur in an environmentally sensitive area, the work will require a change approval, water licence, use approval or order.

- WSR s.39(1)(d): the construction, maintenance or removal of a pier or wharf in a stream, if the ebb and flow of water and the movement of material under the influence of waves or currents is not obstructed;
- WSR s.39(1)(w): the construction of a temporary diversion around or through a worksite for the purposes of constructing or maintaining bridge abutments, constructing or maintaining piers other than bridge piers, maintaining bridge piers or constructing works authorized under this section, if … (see WSR for specifications)

Additional Permissions

Additional requirements may also apply under federal, provincial, or local government enactments. For example, additional permission may be required when seeking to construct within areas with red or blue conservation status listed species (Conservation Data Centre). Additionally, the construction, maintenance or removal of piers, docks and wharves must occur in accordance with local government zoning bylaws, which may have specific restrictions.

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for the construction, maintenance or removal of piers, docks or wharves under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

a) The width of approach ramps is minimized.
b) Light permeable gratings are used to avoid shading of any riparian vegetation.
c) Works are designed to minimize the need for future dredging.
d) If old creosote-treated pilings are to be removed, they must be cut flush with the lake bottom leaving the buried portion of the piling in place.
e) If treated wood must be used, the wood is treated with water-based preservatives. To avoid the subsequent deposition of sawdust from treated wood into the aquatic environment, construction and fitting of treated wood must be cut to size on an upland area (dry area) rather than in place and over the water.
f) Where piers or trestles support mechanical or refueling equipment, an impermeable deck, a spill containment system, and a collection system for surface runoff must be constructed.
g) Marina floats constructed in areas with currents or prevailing winds must be constructed in a manner that prevents trapping surface debris and oily residue.
h) Floats or pile structures must not be placed over a bed of freshwater mussels.
i) Docks must be constructed to maintain a free flow of water currents beneath them and to prevent erosion and sediment deposition along the shore.
j) Docks must be constructed so they remain afloat at lowest expected flow.
k) Dock size does not exceed what is reasonably needed for the enjoyment of the benefit property or population.

Amendments

New Version #	Date Amended	Amendment Description
NA	NA	NA

Recommended Citation

For the use by WSA statutory decision makers during the water authorization process:
"Best Management Practices for Piers, Docks and Wharves Construction, Maintenance or Removal". Appendix, Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia. Version 2022.01. Government of British Columbia.

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A4. Best Management Practices for Fish and Wildlife Salvage

This section describes best management practices (BMPs) that aim to ensure that fish and wildlife species are protected during applicable changes in and about a stream (CIAS) work through salvage activities under the WSA. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Altering, destroying or damaging wildlife habitat is an offence under the *Wildlife Act*. On some projects, certain wildlife species must be removed before work begins to avoid contravening the *Wildlife Act*. 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 and terrestrial life.

Some CIAS activities require a fish or wildlife salvage permit under the *Wildlife Act*. These BMPs are designed to assist individual holders of fish or wildlife permits who are making CIAS.

Permits and Responsibilities

Fish or wildlife salvage requires a permit or other legal authorization and is typically carried out by a Qualified Professional (QP) in accordance with the terms and conditions of a permit issued under the *Wildlife Act.* Applications for such permits are submitted through FrontCounter BC:

- general wildlife permits require completion of an Animal Care Application form to ensure safe capture, handling, and relocation of species encountered, and
- anyone intending to collect freshwater fish from non-tidal B.C. inland waters is also required to have a scientific Fish Collection Permit (*Wildlife Act*). The permit is not valid for species listed as threatened or endangered under the *Species at Risk Act* (SARA) or for eulachon or salmon other than kokanee.

Note: Contact the Department of Fisheries and Oceans for fish collecting permits for salmon, eulachon or SARA listed species.

A person who was required to obtain a wildlife permit before conducting a CIAS, and does not do so, risks contravening the *Wildlife Act* and the WSA if aquatic habitat is adversely affected. If the person completing a fish or wildlife salvage is different than the person completing the CIAS, then the persons should ensure that the work is properly coordinated.

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for fish and wildlife salvage CIAS activities under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

Capture and Release

Salvage activities and sampling methods must be conducted to the Resources Information Standards Committee (RISC) standards and guidelines for capture, data collection, handling and release (see resources below).

a) All fish are to be removed from the isolated area. Death or harm to fish without prior authorization is prohibited under the federal *Fisheries Act*. Achieving total removal can often include but not limited to:
   i) At least three collection methods on a risk hierarchy of passive (e.g., minnow traps, fyke nets) and active techniques (e.g., beach and pole seines, electrofishing, angling) and low risk to higher risk to fish health are used in fish salvage.
   ii) For active collection methods a minimum of two consecutive passes that produces a zero catch must be completed, as per total population removal methodology (95% or greater fish removal to be achieved).

b) All aquatic species must be released into the same stream they were removed from and downstream of the work areas or with enough distance upstream into waters of equivalent baseline quality and habitat type (e.g., pool, riffle, run) (distance is recommended as five channel widths to a maximum of 100 metres).

c) Caution must be applied when completing salvages that might involve species at risk (SAR). If species at risk are expected to be present, contact the Ministry office in your area for more information regarding assessment and salvage requirements.

Sampling and Data

d) All data fields (reference and location, fish collection methods, individual fish, stream site) under scientific Fish Collection Permits are to be completed in full.

e) Data entered into a Fish Data Submission Template must be submitted to the appropriate agency following the completion of a fish salvage within 90 days of permit expiry.

f) Sampling fish species under a Fish Collection Permit for fish salvage must follow the best practices outlined in Table A for the minimum individual fish data information to be included when conducting fish salvages.

Table A. Best practices for sampling fish species under a Fish Collection Permit for fish salvage.

Fish Species	Age Class	Size Range	Recommended specimens sampled and data fields to be populated[1]					
			Measuring and counting the fish caught	Species	Length (mm)	Weight (g)	Sex[3]	Maturity[3]
Salmonids[2] (RB, CT(CCT), DV, BT, EBT, GR, LT, KO)	Fry	20-80 mm	First 30 fish: measure After 30 fish: count	✓	✓			
	Juvenile	81-250 mm	Measure all fish caught	✓	✓	✓		
	Adult	>250 mm	Measure all fish caught	✓	✓	✓	✓	✓
Listed Species (Salish sucker, sturgeon, etc.)	All	All	Refer to SAR permit specifications for requirements					
Coarse Fish (shiner, dace, stickleback, carp, cyprinids, pikeminnow)	All	<200 mm	First 30 fish: measure After 30 fish: count	✓	✓			
		>200 mm	Measure all fish caught	✓	✓	✓	✓	
Sport/other (perch, bass, sunfish, northern pike, walleye)	All	All	First 30 fish: measure After 30 fish: count	✓	✓	✓		
Sculpin species	All	0-150 mm	First 30 fish: measure After 30 fish: count	✓	✓			
		>150 mm	Measure all fish caught	✓	✓	✓		
Burbot, Lamprey	All	All	Measure all fish caught	✓	✓	✓		✓
All fishes not listed above	All	All	First 10 fish: measure After 10 fish: count	✓	✓	✓		

[1]More information on Fish Data Submission form.
[2]RB-Rainbow, CT(CCT)-Cutthroat, DV-Dolly Varden, BT- Bull Trout, EBT- Eastern Brook Trout, GR- Arctic Grayling, LT- Lake Trout, KO- Kokanee.
[3]Sex and Maturity only if possible through visual observation.

Additional Resources

- Projects Near Water, Fisheries and Oceans Canada (DFO)
- Resources Information Standards Committee (RISC): Inventory standards and background, including but not limited to aquatic and terrestrial ecosystems.
- Natural Resource Best Management Practices, including but not limited to regions-specific guidelines and timing windows.
- Fish Stream Identification Guidebook (for guidance on identifying fish bearing streams)
- BMPs for Amphibian and Reptile Salvages in British Columbia (FLNRORD, 2016)
- Fish Stream Crossing Guidebook (FLNRORD, 2012)
- Federal *Species at Risk Act*: Recovery Strategies
- Submitting Fish Data: Questions regarding the fish data submission process can be made to: fishdatasub@gov.bc.ca.

Amendments

New Version #	Date Amended	Amendment Description
NA	NA	NA

Recommended Citation

For the use by WSA statutory decision makers during the water authorization process:
"Best Management Practices for Fish and Wildlife Salvage". Appendix, Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia. Version 2022.01. Government of British Columbia.

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A5. Best Management Practices for Boat Launches

This section describes best management practices (BMPs) for constructing, maintaining, and removing boat launches under the WSA. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Boat launches are a common fixture of lakes and rivers so watercraft can be safely loaded into and out of water for fishing, recreation and other activities. Constructing boat launches typically involves instream activities including the removal of riparian vegetation and modifications to the shoreline and stream bed. The placement of fill or the construction of hardened launch surfaces in shallow waters can smother bottom-dwelling organisms, displace plants and animals, and alter local water currents and other important conditions of the aquatic environment. Launching watercraft can also introduce sediment, harmful chemicals, and invasive species into the aquatic environment, which can have long-term detrimental impacts.

Construction of new public and private boat launches often leads to environmental disturbance. For this reason, the construction of boat launches is typically discouraged unless no other boat launches, such as public boat launches, are reasonably accessible.

Additional Permissions

In addition to requiring permission to make a change in and about a stream (CIAS) under the *Water Sustainability Act* (such as a change approval, water licence or order), boat launch construction, maintenance or removal usually require a *Land Act* tenure if activities are to occur in Crown land, particularly if you do not own the immediate upland riparian property. Note that it is an offence for a person to construct on Crown land a building, structure, enclosure or other works, or do or perform any dredging, excavation or filling, without authorization of the minister (*Land Act* s.60(e)).

Additional requirements may also apply under the Riparian Areas Protection Regulation (in the regions of the province designated in the regulation), federal *Fisheries Act*, *Canadian Navigable Waters Act* and *Species at Risk Act*. Local government permitting may also be required.

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for considering reduced risk timing windows when planning for CIAS activities under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

Boat Launch Planning and Design

a) A Qualified Professional with expertise in boat launch impacts and design must be engaged early in the design process.

b) The boat launch must be designed to avoid sensitive areas, such as within the stream and stream channel, which include but are not limited to: lake inlet/outlet streams, spring and aquifer discharge zones, fish habitat (e.g., spawning, holding and rearing areas), habitat for species at risk, unstable/easily erodible areas, areas of unstable stream banks, and other geomorphically sensitive areas.

c) The location and layout of the boat launch must consider the seasonal and long-term changes in water levels, prevailing wind direction, water current, potential for ice, and avoid unstable areas such as eroding banks. Additional protection measures such as riprap and breakwaters may be needed, particularly for launches in rivers.

d) The boat launch design must consider requirements for future maintenance and include monitoring recommendations specific to dredging and instream vegetation removal. The boat launch design must allow for site access for future maintenance and repairs for long-term use.

e) Associated infrastructure must be located as far back from the edge of water as possible, ideally located a minimum of thirty (30.0) metres from the high-water mark. This includes but is not limited to parking areas, vehicle turn around space for typical trailers and tow vehicles, and signage.

Boat Launch Construction and Maintenance

f) The construction area and access routes should be marked onsite prior to starting work and existing vegetation left in place, as much as possible.

g) Natural materials such as rocks or logs located within the water removed to facilitate construction must be carefully relocated to an area with similar habitat conditions.

h) Ongoing maintenance activities must be minimized, including dredging and the cutting or removal of instream and riparian vegetation.

Boat Launch Removal

i) The removal of a boat launch must have the same level of planning as launch construction.

j) Actions are taken to avoid causing depressions in the river or lakebed that could strand fish.

Additional Resources

- B.C. HabitatWizard tool
- Approved Work Practices for Boat Launch Construction and Maintenance in BC Hydro Managed Freshwater Systems, BC Hydro
- Treated Wood in Aquatic Environments, Western Wood Preservers Institute

Amendments

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A6. Best Management Practices for the Construction, Maintenance or Removal of Bridges

This section describes best management practices (BMPs) for installing, maintaining or removing bridges under the WSA. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Non-Mandatory vs. Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Bridges in B.C. range from small crossings on remote roads to large spans across lake and river systems. They provide critical infrastructure that link communities together and provide routes for industry, tourism, recreation, and other services. Bridge activities, such as their construction, maintenance, or removal may negatively impact water quality, fish and wildlife populations and habitat, and riparian areas.

Bridges consist of a superstructure and a substructure. The superstructure includes the upper portions of the bridge that rest on the substructure and consists of the girders (e.g., steel, log stringers or concrete), the decking or driving surface (e.g., concrete, wood or steel), and rails. The substructure is the portion of the bridge that bears and supports the superstructure. The substructure may consist of caps (e.g., concrete or steel), log cribs, piles, concrete blocks, timbers, spread footings or steel towers, and associated riprap and fill material.

Authorized Change under WSR Part 3

It may be possible to complete certain bridge activities involving CIAS, such as construction, maintenance or removal of clear span bridges as a notice of authorized change if the work is done in accordance with Part 3 of the Water Sustainability Regulation (WSR). For example, the following sections of the WSR provide design specifications for bridge-related activities that must be followed. If the design specifications do not meet the requirements, and the work is not authorized under another section of WSR Part 3, then the work must be legally authorized by a change approval, water licence, use approval, or order under the *Water Sustainability Act*.

- WSR s. 36: "clear span bridge" means a single span structure without piers that spans a stream channel from top of bank to top of bank with the bridge abutments outside the stream channel;
- WSR s.39(1)(b): the construction, maintenance or removal of a clear span bridge
- WSR s.39(1)(n): the construction or maintenance of ice bridges, winter fords or snowfills
- WSR s.39(1)(p): the clearing of an obstruction from a bridge or culvert
- WSR s.39(1)(r): the repair or maintenance of the superstructure of a bridge, other than the bridge's foundation

Examples of bridges that **do not** meet the criteria in WSR s.39(1) include but are not limited to: structures with piers, pilings, riprap, dolphins, or other works within the high water of the stream. Arches and similar open bottom crossings may look like a culvert, but they are treated as a bridge because they maintain the natural stream bottom.

Additional Permissions

Additional requirements may also apply under other enactments including but not limited to the *Oil and Gas Activities Act*, Oil and Gas Road Regulation, Environmental Protection and Management Regulation; the federal *Fisheries Act* and *Canadian Navigable Waters Act*; and local government authority.

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for CIAS for installing, maintaining or removing a bridge within a stream under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

Design

a) All bridges must be designed and have the installation overseen by a Qualified Professional.

b) The location of the bridge crossing must be perpendicular to the flow and avoid braided sections of streams, floodplains, alluvial fans, and locations of bank instability.

c) The bridge must be designed to pass the 1 in 200-year maximum daily flow and consider passage of flood debris and ice. Climate change impacts must also be considered in the design process.

d) Every effort must be made to design a clear span bridge and avoid placing bridge components (e.g., piers, piles etc.) in the water. Where this is unavoidable, instream structures must avoid spawning areas and other important fish habitat features.

e) To be considered a clear span bridge, the superstructure, substructure (including riprap) and road approaches must be located outside of the stream channel, including excavations required to support construction.

f) The bridge must be designed so that stormwater from the deck, fill slopes, approaches, and ditches is directed to the surrounding vegetated areas to prevent sediment and other deleterious substances from entering the stream. Splash guards can prevent water from the deck entering the stream.

g) Cross drains must be planned back from the bridge approaches to minimize the amount of water directed into the approach ditches. Cross drain outlets and approach ditches near the bridge must be protected from erosion using riprap or vegetation.

h) Turnouts must be designed to prevent debris such as road materials from entering the stream and to minimize the amount of vegetation clearing required.

Construction

i) The construction area and access routes must be marked onsite prior to starting work and vegetation removal must be limited to only the areas required for construction.

j) One piece of equipment may cross the stream and return once to support bridge construction where alternative crossings are not available. If minor rutting is anticipated, stream bank and bed protection must be used (e.g., swamp mats or logs). Areas of steep or erodible banks must be avoided.

k) If piles are being driven in or near fish-bearing water, additional exclusion measures (such as bubble curtains) must be taken to protect fish from vibrations and shock waves.

Maintenance

l) Drains and open joints must be adequately sealed prior to cleaning the bridge deck.

m) Decks, including curbs, sidewalks, medians, and drainage devices are to be swept prior to power washing to remove as much material as possible. Debris and sediment cleaned from the bridge deck and drainage devices must be properly disposed, not swept into the stream.

n) Wash water should be directed past the ends of the deck towards vegetated areas to help sediment settle out before wash water reaches the stream. Cleaning agents must not be added to the water. Silt fences or other sediment control measures may be required to help slow the water and allow sediment to settle out.

o) Measures such as ground covers or vertical drapes (e.g., sheets of plastic or air-permeable cloth such as burlap or canvas) must be used prior to removal activities such as sand blasting to retain falling debris, blasting abrasives, rust, grease, and other deleterious substances.

p) Machinery used for bridge maintenance or repair must be operated from land.

Removal

q) Removed material must be placed outside the active floodplain. Material must be removed slowly to prevent a rush of water and sediment downstream.

r) During removal activities, bridge structures, materials or equipment must be lifted over the stream rather than dragged through.

s) Bridge timbers must be removed in one piece as practicable. If that is not possible, a containment system such as tarps should be installed to catch woody debris while the timbers are cut into manageable pieces.

t) Water bars or other similar measures must be installed across the deactivated road to direct water away from the stream.

Additional Resources

- Fish-stream Crossing Guidebook (Revised Edition), FLNRO, MoE and DFO, 2012
- Guidelines for Professional Services in the Forest Sector–Crossings V.2, Professional Engineers and Geoscientists of BC, Association of BC Forest Professionals, 2014
- Forest Service Bridge Design and Construction Manual, FLNRORD
- Resource Road Engineering Publications and Permits, FLNRORD
- Treated Wood in Aquatic Environments, Western Wood Preservers Institute
- Projects Near Water, Fisheries and Oceans Canada (DFO)
- DFO and Port of Vancouver pile Driving Guidelines
- Forest Road Engineering Guidebook
- Best Management Practices for Pile Driving and Related Operations, BC Marine and Pile Driving Contractors Association, 2003

Amendments

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For the use by WSA statutory decision makers during the water authorization process:
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A7. Best Management Practices for Culvert Installation, Maintenance and Removal

This section describes best management practices (BMPs) for installing, maintaining, or removing culverts. It is a component of the Appendix to the Requirements and best practices for making Changes In and About a Stream in British Columbia (Requirements document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Non-Mandatory vs. Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Culverts are usually made of concrete, plastic, or metal, and allow water to flow under infrastructure such as roads, railways, or trails. Improper sizing, construction, and installation can constrict or otherwise alter the flow of water within a stream, potentially leading to adverse impacts on fish passage (e.g., velocity barriers, backwatering, erosion, etc.) and fish and wildlife habitats and connectivity. For example, blocked culverts can obstruct fish passage for years or can cause water to overtop infrastructure which can result in a washout that could deposit material downstream and alter valuable habitat. Culvert design, installation, maintenance, and removal need to be carefully considered especially in situations where sensitive aquatic species are present or there are increased risks from flooding.

There are two general types of culvert installations: culverts for drainages and culverts for streams. Drainage culverts typically maintain natural drainage patterns across an area, whereas stream culverts are installed in a stream. Culverts installed in a wetland area (defined stream feature in *Water Sustainability Act* (WSA)) to maintain hydraulic balance are considered stream culverts. This BMP refers specifically to stream culverts; however, many of the same BMPs can be applied to drainage culverts. There are two general types of stream culverts that have specific design and construction requirements: stream culverts in a fish bearing stream and stream culverts in non-fish bearing stream.

Authorized Changes under WSR Part 3

It may be possible to complete the installation, maintenance, or removal of a culvert as an authorized change if the design and work can be done in accordance with Part 3 of the Water Sustainability Regulation (WSR). Specifically, WSR s.39(1)(a) requires that certain criteria be met, including design specifications that must be followed, for the work to be considered an authorized change. The following sections of the WSR provide design specifications for culvert-related activities that must be followed. If the culvert design specifications **do not meet** the requirements, and the work is not authorized under another section of WSR Part 3, then the work must be legally authorized by a change approval, water licence, use approval, or order under the WSA.

- WSR s.39(1)(a): the installation, maintenance or removal of a culvert for crossing a stream for the purposes of a road, trail or footpath,
- WSR s.39(1)(p): the clearing of an obstruction from a bridge or culvert by the Crown in right of British Columbia, a municipality or a regional district during a flood
- WSR s.39(1)(v): the construction of a temporary ford for vehicular traffic across a stream (includes design of culvert)

Additional Permissions

Culvert projects that are completed for forestry activities, oil and gas, or mining and are regulated under another enactment are exempt from the WSR, if carried out in accordance with that other enactment, and should be referred to the agencies that review and administer the applicable legislation. Additional requirements may also apply under other enactments including but not limited to the *Oil and Gas Activities Act* and Oil and Gas Road Regulation; the federal *Fisheries Act* and *Canadian Navigable Waters Act*; and local governments.

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for CIAS for installing, maintaining, or removing a culvert within a stream under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

Design

a) Culverts must only be planned where alternative crossing structures (e.g., clear span bridges or other open bottom structures) are not practical.

b) Culverts must be planned to avoid sensitive areas such as floodplains, meander bends, high quality fish habitat, braided streams, unstable areas and alluvial fans.

c) Culverts must be designed by a Qualified Professional.

d) Climate change impacts must be considered in the design process.

e) Culverts must be sized such that the high-water width of the stream is not reduced by the culvert.

f) Culverts must be sized and installed to safely convey stream flows and to pass expected debris. Multiple culverts with a combined equivalent capacity of one larger culvert are not considered best practice as several small culverts increase risk of debris blockage.

g) Culvert inlets and outlets must be protected from scouring by armouring erodible surfaces against erosive water forces (e.g., by using riprap or concrete headwalls).

h) Culvert design must specify the culvert fill material compaction requirements (by the manufacturer or Qualified Professional) for the structural integrity of the culvert and to prevent piping (water flowing on the outside of the culvert).

i) Fish stream culverts must be designed to minimize and mitigate negative impacts to fish and wildlife passage during variable water levels. Fish stream culverts must be designed to

provide fish passage at all water levels. The culvert outlet in reaches with fish must be submerged in all flow conditions.

j) Gradients must be designed such that embedded materials do not wash out of the culvert, excessive forces are not created at the culvert outlet, and fish passage is not negatively affected.

k) Alternatives to installing culverts in fish bearing streams with gradients over 6% must be considered and rationale provided.

l) Cross drain culverts must be installed near the stream crossing to direct any water from drainage ditches away from the stream as practicable.

Construction

m) The construction area and access routes must be marked onsite prior to starting work and vegetation removal must be minimized and limited to only the areas to which the CIAS applies.

n) One piece of equipment may cross the stream and return once to support culvert construction where alternative crossings are not available. If minor rutting is anticipated, stream bank and bed protection must be used (e.g., swamp mats or logs). Areas of steep or erodible banks must be avoided.

o) For embedded culverts, a depression must be made within the structure down the center of the substrate to help confine flows and promote fish passage during low water conditions.

p) Backfill around the culvert must be placed and compacted in accordance with accepted engineering procedures.

Maintenance

q) Debris must be removed from culvert inlets to maintain the design capacity of the culvert and must use the least invasive and least sediment generating method possible.

r) If additional riprap reinforcement/armouring is required, placement must be limited to stabilize eroding areas around the inlet and outlet.

s) Minimize vegetation clearing around culverts to only what is necessary for sight lines.

Removal

t) After the culvert is removed, fill slopes must be pulled back to a suitable slope.

u) Water bars or other similar measures must be installed across the deactivated road to direct water away from the stream.

Additional Resources

- Fish-stream Crossing Guidebook (Revised Edition), FLNRO, MoE and DFO, 2012
- B.C. HabitatWizard tool
- Projects Near Water, Fisheries and Oceans Canada (DFO)
- Guidelines for Professional Services in the Forest Sector–Crossings V.2, Professional Engineers and Geoscientists of BC, Association of BC Forest Professionals, 2014
- Forest Service Bridge Design and Construction Manual, FLNRORD
- Stream Simulation: Planning and Design for Closed-Bottom Structures for Fish Streams, FLNRO, MoE, FP Innovations, 2017
- Streambed Simulation: Streambed Construction, Infill Methods, and Rewatering for Closed-Bottom Stream Crossings, FLNRO, MoE, FP Innovations, 2018
- Chapter 3.6: Culvert Design, Engineering Manual - Province of British Columbia

- Chapter 4: Design & Construction of Bridges & Major Culverts, Engineering Manual - Province of British Columbia
- Forest Road Engineering Guidebook (Second Edition), Province of British Columbia, 2002

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A8. Best Management Practices for Fording

This section describes best management practices (BMPs) for minimizing potential impacts to aquatic resources through the proper construction and use of ford stream crossings. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Non-Mandatory vs. Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Fording is when streams are crossed, without altering the stream bed or stream banks, by vehicles or equipment, without the use of bridges or similar structures. In some cases, fords may be necessary when no other practical options exist for one-time or limited access routes. Three typical scenarios where fording can occur are for temporary access across a dry stream channel, a frozen stream channel, and across flowing water. Authorizing agencies do not encourage fords to be established as structures to facilitate regular and high frequency crossings. Preference should be given to using bridges, culverts, or dry fording rather than fording in streams with flowing water. Construction of fords on fish-bearing streams is strongly discouraged.

Inappropriate uses of fords can significantly impact water quality and aquatic ecosystems. Risks of using ford stream crossings include but are not limited to: destabilization of stream banks and beds, compaction of stream beds and damage to spawning habitat, the introduction of deleterious substances (sediment, hydrocarbons, etc.), loss of riparian habitat, alteration to channel shape and water flow resulting in barriers to fish migration, and direct harm or disruption to sensitive fish life stages.

Authorized Changes under Part 3 WSR

It may be possible to carry out fording as an authorized change if it can occur in accordance with Part 3 of the Water Sustainability Regulation (WSR). Specifically, WSR s.39(1)(n) and (v) of the WSR outline the types of fording that are generally considered as authorized changes. If the design specifications **do not meet** the requirements, and the work is not authorized under another section of WSR Part 3, the work will require a change approval, water licence, use approval or order. Additional requirements may also apply under other enactments including the federal *Fisheries Act*.

- WSR s.39(1)(n): the construction or maintenance of ice bridges, winter fords or snowfills
- WSR s.39(1)(v): the construction of a temporary ford for vehicular traffic across a stream

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for CIAS for fording a stream under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

Design

a) Fords must only be considered for short-term access with low frequency crossings where an existing crossing is not available. Fords must not be installed for use by the public and public exclusion measures may need to be considered.

b) Dry or frozen fording must be chosen as the preferred approach over fording in flowing water where practicable.

c) Existing crossings must be used wherever possible to reduce the number of fords.

d) Fords created during frozen conditions must maintain natural water flow levels and avoid freezing to the bottom of the channel, to maintain fish passage.

e) Fords created during frozen conditions must use clean snow, clean ice, logs, or timbers to create a driveable surface. Logs or timbers can be used to protect stream banks as required.

f) The location of the ford crossing must exclude sites that require realigning, dredging, infilling, grading, or excavating the channel or stream bank, diverting the stream, or sites that are susceptible to erosion.

g) The location of the ford must be perpendicular to the stream, at a narrow section of the stream, at a shallow location with preference being given to sites that require the least amount of vegetation removal within the riparian area. Plans must allow for a maximum width of one lane within the riparian area.

h) Ford crossings must be avoided wherever possible on: fish-bearing streams, meander bends, braided streams, alluvial fans, or any other area that is inherently unstable; areas near sensitive habitat; and locations that may result in the erosion and scouring of the stream bed.

i) Protective material must be used to prevent disturbance of channel bed and banks (e.g., rig matting or logs). The protective material must be installed immediately prior to use and removed immediately afterwards.

j) The bed and banks of the stream at the fording site must be stable and non-erodible with preference given to natural bedrock or coarse rock to avoid areas of fine sediment.

k) Fording sites must not contain gravel bars or deep channel sections requiring the manipulation or excavation of channel materials.

l) For fords in flowing water, an area must be selected with a natural water depth that is sufficiently shallow to allow passage of vehicles/equipment and to maintain a water depth that allows fish passage.

m) Fords must be removed at the earliest opportunity prior to breakup as to not pose a risk to fish, wildlife, or habitat.

Construction

n) Water from approach ditches must be directed away from the stream as practicable.

o) Construction fords used for installing bridges or culverts are to be limited to one crossing over and one crossing back across the stream by one single piece of equipment.

Use and Decommissioning

p) Where a ford is installed, a program of short-term monitoring and maintenance must be developed and implemented.

q) A very slow and steady pace must be maintained when crossing and rapid acceleration must be avoided while on the approaches or in the water.

r) Decommissioning and restoring fording sites must be performed immediately after use is completed and prior to heavy rains or the onset of thawing conditions.

s) When the ford is no longer in use, any material that was used to accommodate fording activities must be removed manually where possible.

Additional Resources

- Fish-stream Crossing Guidebook (Revised Edition), FLNRO, MoE and DFO, 2012
- Projects Near Water, Fisheries and Oceans Canada (DFO)
- B.C. HabitatWizard tool
- Engineering Manual: Ford Design & Construction on Non-Fish Streams, FLNRORD

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A9. Best Management Practices for Pipeline Crossings

This section describes best management practices (BMPs) for the construction or maintenance of pipeline crossings of streams and the different types of construction methods for CIAS under the WSA. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Pipelines are used to carry products such as oil, natural gas, water, sewage, and stormwater, either below or above ground and can range from short to long distances. Pipeline crossings have the potential to cause significant impacts on streams, including impacts to fish and wildlife populations, aquatic and riparian habitat, and water quality.

This document provides BMPs for three common methods used to construct pipeline stream crossings. These methods are described below and listed in order of general risk of impacting the aquatic environment (1 being the least risk, 3 being the highest risk), acknowledging that practical aspects and risk of each site must be considered on a case-by-case basis.

1. **Punch and bore method**: Excavation of a vertical bell hole or depression on either side of the stream and horizontal punching or boring under the stream channel to connect the two sides. It is typically used for smaller pipelines.
2. **Horizontal drilling method:** Similar to the punch and bore method, except a pressurized system is used to create a pilot hole from one side to the other and then the pipe pulled through.
3. **Open cut method:** Involves an open cut across a dry channel or isolated stream during construction.

Authorized Changes under WSR Part 3

It may be possible to carry out the construction or maintenance of a pipeline crossing as an authorized change if the work can be done in accordance with Part 3 of the Water Sustainability Regulation (WSR). WSR s.39(1)(c) outlines the criteria to be met for pipeline crossings to be considered authorized changes under WSA, including design specifications for the construction or maintenance of a pipeline crossing of a stream. If the design specifications for the proposed crossing **would not meet** these requirements and the work is not authorized under another section of WSR Part 3, then the work will require a change approval, water licence, order or use approval in order to be authorized to proceed.

> WSR s.39(1)(c): the construction or maintenance of a pipeline crossing of a stream, if either of the following conditions is met:

(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;
(ii) in the case of an aerial crossing, the crossing is constructed in accordance with the conditions of paragraph (b) for clear span bridges;

Additionally, under WSR s.39(5) CIAS can be an authorized change if the related CIAS activities are authorized by a permit issued under the *Oil and Gas Activities Act* (OGAA), and the CIAS is made in accordance with applicable OGAA regulations and the conditions respecting CIAS stream included in the permit.

Oil and Gas Pipelines

Oil and gas pipelines must be constructed in adherence to the OGAA, the Pipeline Regulation, the Environmental Protection and Management Regulation, the Pipeline Crossing Regulation, the Emergency Management Regulation, and in regards to an interprovincial pipeline, the *Canadian Energy Regulator Act*.

Reminder that the B.C. Oil and Gas Commission is the single window regulator for all oil and gas activities in B.C. As such, **all oil and gas related CIAS must be processed by the Commission.** Contact the Oil and Gas Commission for more information:

- Fort St. John: 250-794-5200
- Toll free: 1-800-663-7867
  Fax: 250-794-5390

Under WSR s.39(6) if a person making CIAS under WSR s.39(5) causes damage to an aquatic ecosystem, which damage is not authorized under OGAA or the permit referred to in that subsection, the person **must** report the damage to the Oil and Gas Commission within 72 hours after the damage is caused, and take any action ordered under OGAA by an official, as defined in that Act, to repair the damage and restore the aquatic ecosystem.

Note: B.C. Oil and Gas Commission incident and spill reporting guidelines and instructions require the oil and gas permit holder to report incidents to the Commission within 24 hours. More information is available in B.C. Oil and Gas Commission Incident Reporting Instructions and Guidelines.

Additional Permissions

Additional approvals or reviews may be required for pipelines (e.g., B.C. Oil and Gas Commission, BC Utilities Commission, Technical Safety BC, Department of Fisheries and Oceans, and local governments). Projects on public land (e.g., Crown land) can require tenure or an authorization from the province to construct and maintain a pipeline.

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for CIAS for installing or maintaining a pipeline crossing under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

General

a) An emergency response plan must be developed prior to construction, detailing the measures to be taken in the event of a sediment release or spill of a deleterious substance. Staff must be trained on the requirements and implementation of the plan. The plan must include a list of spill response materials to be on-site prior to the start of construction and a list of emergency contacts. The plan must include a step-by-step process, including:
   i. stop work to contain sediment-laden water and other deleterious substances, and prevent further migration into the stream;
   ii. notify all applicable authorities;
   iii. promptly clean up and appropriately dispose of the sediment-laden water and deleterious substances;
   iv. ensure clean up measures do not result in further alteration of the stream bed and/or banks; and,
   v. provide a report to the applicable agencies describing the incident and measures taken to clean up the site.

b) The location of the pipeline crossing must be perpendicular to the flow and must avoid sensitive areas such as braided sections of streams, fish habitat, floodplains, meander bends, alluvial fans, and locations of bank instability.

c) If directional drilling or punch and bore methods are selected, a geotechnical review must be completed in addition to an assessment of potential groundwater impacts for high risk sites.

d) The construction area and access routes must be marked onsite prior to starting work and vegetation removal must be minimized and limited to only the areas required for construction.

e) One piece of equipment may cross the stream once, there and back, to support construction where alternative crossings are not available. If minor rutting is anticipated, stream bank and bed protection must be used (e.g., swamp mats or logs). Areas of steep or erodible banks must be avoided.

f) Equipment must be operated from land.

Punch and Bore Stream Crossing

g) Punch and bore construction can be performed at any time of the year provided that the risk of failure (i.e., risk of the punch or bore hole collapsing under the stream) is low and no instream works are required such as an equipment crossing.

h) The punch and bore path must be designed at an appropriate depth (minimum 1.2 metres) below the lowest elevation of the bed of the stream to prevent exposure due to natural scouring of the stream bed.

i) Bell holes must be excavated a minimum of thirty (30.0) metres back from the edge of the stream channel.

j) Riparian vegetation between the borehole entry and exit points must be left in place to the extent possible.

k) The stream must be monitored during punch and bore activities for signs of activity or equipment malfunction. If a concern is identified, work must stop immediately, and the emergency response plan must be activated immediately.

l) Sediment-laden water must be diverted to a vegetated area or settling basin when dewatering the bell holes.

m) Upon completion, bell holes must be backfilled to the natural grade.

Directional Drilling Stream Crossing

n) The drill path must be designed to an appropriate depth below the stream to minimize the risk of frac-out (i.e., excessive drilling pressure results in drilling mud propagating toward the surface) and prevent the pipeline from exposure due to natural scouring of the stream bed.

o) The fluid pressure and the stream must be monitored during all phases of construction to identify signs of a frac-out. If a frac-out is identified, work must stop immediately, and the emergency response plan must be activated immediately.

p) Drill entry and exit points must be far enough away from the banks of the streams to minimize impacts to these areas.

q) Riparian vegetation must be retained between the entry/exit points and the stream bank to the extent possible.

r) Drilling mud must be composed of materials that do not pose a risk to aquatic life. A list of all materials must be kept on site for inspection.

s) A dugout/settling basin must be constructed at the drilling exit site to contain drilling mud and prevent sediment and other deleterious substances from entering the stream. If this cannot be achieved, silt fences or other erosion and sediment control measures must be installed.

Open Cut Stream Crossing

t) Open cut stream crossings must be installed only in completely dry or frozen stream channels (i.e., no water flow present to the bottom of the site) or in isolation of any stream flow to prevent downstream sedimentation.

u) The pipeline must be buried to a depth greater than 1.2 metres below the lowest level of the original channel bottom.

v) If pumps are used to divert stream flow, they must be sized to accommodate the anticipated water volumes and contingency pumps must be available in case of break downs or precipitation events.

w) Pumps must be set in spill trays while working within thirty (30.0) metres of the water and monitored regularly to ensure they are operating continuously.

x) All pump intakes used for diverting water in a fish bearing stream must be screened.

y) When backfilling the trench, it must be done in the reverse order that the material was removed (e.g., material removed last is placed first). The trench must be covered and contoured with a layer of substrate similar to the surrounding stream bed substrate (with gravel-sized material or greater) to prevent scour or deposition around the pipeline.

Additional Resources

- Incident Reporting Instructions and Guidelines, BC Oil and Gas Commission
- Environmental Protection and Management Guide, version 2.7, BC Oil and Gas Commission, 2018
- Projects Near Water, Fisheries and Oceans Canada (DFO)

- Pipeline Associated Watercourse Crossings, 5th Edition, CEPA, 2017
- Pipeline components and pipelines, CSA Group

Amendments

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A10. Best Management Practices for Storm Sewer Outfalls

This section describes best management practices (BMPs) to mitigate impacts to streams associated with storm sewer outfall construction and maintenance under the WSA. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

This BMP is specific to storm sewer outfalls and does not address broader storm sewer management approaches. Typically, storm sewer outfalls are the outlets of urban or rural storm sewer systems that flow into streams. Storm sewer outfalls are the direct links between upland land use (e.g., industry, development, or agriculture) and streams. Consequently, they can have significant impacts to aquatic species and the aquatic environment by altering the amount of water and/or the water quality entering the stream. Water quality can be impacted by the introduction of deleterious substances.

It is highly recommended that proponents undertaking storm sewer projects consult with a Qualified Professional to incorporate BMPs into the design of the entire storm system with the goal to reduce the volume and rate of water discharged to a stream and avoid impacts to water quality. Efforts should be made to manage as much storm water on-site as possible (e.g., infiltration, retention ponds) to avoid the need to construct a new storm sewer outfall. The owner of the storm sewer outfall is ultimately responsible for the storm sewer discharge, including any deleterious substances, and any damage caused to the stream and stream channel (e.g., erosion).

Authorized Changes under WSR Part 3

It may be possible to carry out the construction or maintenance of storm sewer outfalls can be completed as an authorized change if the work can be done in accordance with Part 3 of the Water Sustainability Regulation (WSR). WSR s.39(1)(l) outlines the criteria to be met for storm sewer outfalls to be considered authorized changes under WSR, including design specifications for the construction, maintenance, and usage of storm sewer outfalls. If the design specifications for the proposed storm sewer outfall would not meet these WSR requirements, and the work is not authorized under another section of WSR Part 3, then the work will require a change approval, water licence, order, or use approval in order to be authorized to proceed.

> WSR s.39(1)(l): (l)the construction or maintenance of storm sewer outfalls, if both the following conditions are met:
>
> (i) the storm sewer outfall is designed by an engineering professional;

(ii) the storm sewer outfall is constructed, maintained and used in a manner that does not obstruct the flow of water in the stream or cause erosion of the stream channel

Additional Permissions

Additional approvals from other enactments or local governments may be required. Projects on public land (e.g., Crown land) typically require tenure or an authorization from the province to construct and maintain a stormwater pipe and outfall. In addition, the project may require a review or approval under other pieces of legislation, e.g., the *Environmental Management Act* and the federal *Fisheries Act*.

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for designing, installing, and maintaining a storm sewer outfall under the WSA pertaining to CIAS. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

Design

a) Storm sewer outfalls must be designed by an engineering professional.

b) The outfall must be located where it will minimize impacts to stream water quality, riparian vegetation, stream channel, and fish and wildlife habitat. It must avoid areas of unstable banks, steep slopes, alluvial fans, and meander bends and be designed so that it does not constrict the flow of the stream.

c) The storm sewer outfall design must include appropriate water energy dissipation for the anticipated peak and minimum flows. The footprint of the headwall, riprap apron and other energy dissipators must be minimized and avoid encroachment into the stream and onto the stream channel. The stormwater pipe and outfall must be designed to discharge to the stream at a maximum angle of 45 degrees to the downstream flow.

d) The outlet must be designed to retain and hold as much sediment and debris as practicable.

e) Access for monitoring and maintenance must be considered during the design process.

f) A maintenance plan must be developed that includes a procedure to remove sediment and other debris from the headwall apron and/or energy dissipator on a regular basis to prevent material washing into the stream and stream channel.

g) The stormwater pipe outlet must be protected (e.g., screened) to prevent animals or people from gaining access to the pipe.

h) The outfall must be located where it minimizes direct and indirect impacts to other properties or services downstream.

Construction and Maintenance

i) The construction area and access routes should be marked onsite prior to starting work and vegetation removal must be minimized and limited to only the areas required for construction.

j) Equipment must be operated from land.

k) If the outfall drains an urban area, it is recommended that the sediment be sampled for metals, chlorides, hydrocarbons, and other contaminants to determine appropriate action.

l) If additional riprap reinforcement/armouring is required, placement must be limited to stabilize eroding areas around the headwall and aprons.

Additional Resources

- Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development, ENV
- Stormwater Planning – A Guidebook for British Columbia, MWLAP, 2002
- Best Management Practices Guide for Stormwater, Greater Vancouver Sewerage and Drainage District, 1999

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A11. Best Management Practices for Streambank Erosion Protection

This section describes best management practices (BMPs) for bank erosion protection of streams and lakes for CIAS activities under the WSA. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirements document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Streambanks can be eroded by natural or human-caused sources. Natural sources of streambank erosion include wave and wind action, ice, non-cohesive soils, flood events, and groundwater; whereas human-caused erosion can result from activities such as land clearing near streams, vehicle use fording into streambanks and disturbing lakeshores, discharging concentrated flows without adequate scour protection, and wave action from boats.

Natural events such as forest fires can change the hydrology of an area and lead to increased streamflow including peaks, debris flows, erosion and sediment deposition, and a loss of riparian vegetation, all of which can cause unstable banks and increase erosion. Erosion and the deposition of sediment into streams can have negative impacts such as infilling of spawning habitat, burial of redds, filling of interstitial streambed space where aquatic invertebrates live, and smothering of aquatic plants, to name a few.

Methods to protect streambanks from erosion generally fall into these three categories:

1. **“Hard” engineering methods:** not limited to the placement of riprap, articulated concrete mats, geosynthetic reinforced soil (GRS) walls, groynes, and gabions;
2. “**Soft” engineering methods:** not limited to the placement of large woody debris, brush layers, tree revetments, live crib walls, tree/shrub planting, wattles, hydroseeding and rolled erosion control products (RECPs); and
3. A **combination** of hard and soft engineering techniques.

Riprap is a commonly used hard engineering bank protection material in B.C. The advantages of riprap are that it is typically durable, has a history of use, and is available in most of B.C. Challenges with riprap are that it changes the hydrology and geomorphology of water bodies, it “hardens” the stream channel bank and prevents natural stream flow and channel movement, alters the riparian vegetation, and may result in erosion concerns elsewhere on the stream by deflecting the water’s energy to other locations on the stream channel. In some cases, depending on the stream, stream channel, and its aquatic ecosystem habitat values, mitigation for significant

adverse impacts and, if not possible to address them, compensation for habitat loss may be required when hard engineering methods are used.

Soft engineering techniques are often encouraged because they promote riparian vegetation growth and the creation of fish habitat. The vegetation covers the soil and the roots help bind it together to prevent erosion, but soft engineering methods are often not suitable for steeper stream banks or high energy streams. A combination of hard and soft engineering techniques can be used and, depending on the approach, objectives, and lifespan, this can result in longer term streambank erosion protection with the addition of vegetation enhancements and the creation of fish habitat.

It is strongly recommended that anyone planning to undertake a streambank erosion protection project retain Qualified Professionals to oversee the design and construction of the project. The physical, hydrological, and biological properties of the stream and stream channel must be considered when planning these projects.

Authorized Changes under WSR Part 3

It may be possible to carry out streambank erosion protection measures as an authorized change if it can occur in accordance with Part 3 of the Water Sustainability Regulation (WSR). For example, WSR s.39(1)(g), (h), (j), (k) and (o) of the WSR (listed below). If the design specifications **do not meet** these requirements, and the work is not authorized under another section of WSR Part 3, the work will require a change approval, water licence, use approval or order.

- WSR s.39(1)(g): the restoration or maintenance of a stream channel by the government;
- WSR s.39(1)(h): the restoration or maintenance of a stream channel by a municipality or regional district;
- WSR s.39(1)(j): the restoration or maintenance of fish habitat by the Crown in right of either Canada or British Columbia;
- WSR s.39(1)(k): the repair or maintenance of existing dikes or existing erosion protection works to their original state, if the dikes or works were functional during the previous year;
- WSR s.39(1)(o): the construction or placement, under the direction of the Crown in right of British Columbia, a municipality or a regional district, or an agent of any of them, of erosion protection works or flood protection works during an emergency declared under the Emergency Program Act that involves flooding

Additional Permissions

Approvals under the federal *Fisheries Act* may also be required. If the work is in association with a dike, refer to the *Dike Maintenance Act*.

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for CIAS activities for streambank erosion protection projects under the WSA. If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

Planning and Design

a) A qualified engineering professional licensed by the regulatory body, Engineers and Geoscientists BC (egbc.ca), must be retained where streambank erosion protection works are used to safeguard homes or critical infrastructure, to develop a design which specifies the type, size, and placement of the erosion protection works. The Qualified Professional designing the streambank erosion protection project must also have sufficient hydrological training and experience to be able to predict flows and to specify correctly selected and sized project materials and features (such as adequate for anticipated flows, wave action and/or ice).

b) The project area must be limited to streambank areas that are actively eroding or at high risk of eroding.

c) Impacts to other areas of the stream from the hard or soft engineering of streambanks must be considered to avoid causing concerns elsewhere on the stream channel.

d) Riprap and other hard engineering methods must be suitably designed for the anticipated flows, wave action and/or ice.

e) Riprap used must be hard, angular, resistant to weathering and be comprised of a variety of sizes to prevent any gaps.

f) Riprap must be placed over a permeable non-woven geotextile.

g) Soft engineering techniques must be incorporated into hard engineering plans to the extent possible, such as the incorporation of root wads, large woody debris, live stakes, pocket planting, or brush layers.

h) Installation of riprap must occur at a similar slope as the stream bank to maintain a uniform bank slope and stream channel. Geosynthetic reinforced soil (GRS) walls, gabion baskets and similar engineered structures may be better suited for steeper slopes.

i) Streambank erosion protection measures must be designed to avoid constricting the channel width or flow, infill fish habitat (e.g., outlet pools), or create a barrier to fish passage.

j) Rolled erosion control products must be considered to provide immediate erosion protection and bank stability where easily mobilized soils are exposed, until the vegetation is established.

Construction and Maintenance

k) The construction area and access routes must be marked onsite prior to starting work and any vegetation removal must be minimized and limited to only the areas required for construction.

l) Equipment must be operated from land.

m) Riprap must be placed by an excavator and not end dumped.

Additional Resources

- B.C. Water Quality Guidelines
- Fish Habitat Rehabilitation Procedures, Watershed Technical Circular No. 9, B.C. Government, 1997
- Rehabilitation and Enhancement of Aquatic Habitat Guide v1.0, DFO
- Riprap Design and Construction Guide, MELP, 2000
- Soil Bioengineering Techniques for Riparian Restoration, Polster Environmental Services Ltd., 2002
- Society for Ecological Restoration
- Bioengineering for Streambank Erosion Control, US Army Corps of Engineers, 1997

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A12. Best Management Practices for Instream Work Area Isolation

This section describes best management practices (BMPs) to protect aquatic ecosystem habitats when instream work temporarily requires dry or isolated conditions to install or repair infrastructure under the WSA. It is a component of the Appendix to the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Requirement document). These BMPs are intended to be used with the General BMPs in the Requirements document and any other Scope-specific BMP(s) applicable to the project.

IMPORTANT: Mandatory vs. Non-Mandatory
BMPs are widely accepted and recognized approaches that, when adopted and implemented, help individuals to avoid and mitigate potential adverse impacts. It is recommended that you use provincial BMPs for your work planning as applicable.

BMPs should be interpreted as **non-mandatory guidance if they are NOT made mandatory by being required in a legal instrument** (term or condition in an authorization, change approval or order). If, however, they ARE referenced as a term or condition, then you **must adhere to any BMPs required in the legal instrument.**

Background

Temporarily isolating work areas from streams is a mitigation strategy to reduce potential impacts to the stream, stream channel and its aquatic ecosystem environment. Work area isolation techniques maintain the flow of the stream while stopping water from flowing through an active work area or contain water within an active work area. Isolation measures can significantly affect water quality and aquatic species, so a robust plan to avoid or mitigate environmental impacts must be developed in advance of construction.

A Qualified Professional should be retained to determine the most appropriate design, construction method, operational approach, and removal method, based on the site-specific conditions and circumstances.

Authorized Changes under Part 3 WSR

It may be possible that the construction of a temporary diversion around or through a worksite can be completed as an authorized change if the work can be done in accordance with Part 3 of the Water Sustainability Regulation (WSR). WSR s.39(1)(w) specifically outlines the criteria to be met for the construction of a temporary diversion around or through a worksite to be considered authorized changes under WSR, including design specifications. If the design specifications would not meet these WSR requirements, and the work is not authorized under another section of WSR Part 3, then the work will require a change approval, water licence, order, or use approval in order to be authorized to proceed.

> WSR s.39(1)(w): the construction of a temporary diversion around or through a worksite for the purposes of constructing or maintaining bridge abutments, constructing or maintaining piers other than bridge piers, maintaining bridge piers or constructing works authorized under this section, if … (see WSR s.39(1)(w) for specifications)

Additional Permissions

Additional approvals from other enactments or local governments may be required., such as the federal *Fisheries Act.*

Worksite Isolation Methods

Isolation of the worksite is typically accomplished by one of the following methods. A summary of the common uses and advantages/disadvantages for each is summarized in Table 1.

Cofferdam Method

This method involves isolating the work area in the stream by installing a temporary dam (e.g., aqua-dam, sheet piling, sandbags, plywood, etc.) which is placed to enclose a portion of the stream channel, including bed and banks (such as of watercourses and lakes) where the work is taking place. Cofferdams can also be constructed to completely encircle a work area that is in the middle of a stream/stream channel (e.g., bridge pile).

Dam and Flume Method

This method involves isolating the work area in the stream by installing a temporary upstream dam (e.g., aqua-dam, sheet piling, sandbags, plywood, etc.) placed perpendicularly across the entire stream, upstream of the work area. Where necessary, a temporary dam on the downstream side of the work area is also used to prevent the work area from back flooding. The stream's natural flow of water is conveyed passively across the isolated area by flume or temporary pipe (plastic or metal), discharging the water back into the stream channel below the downstream dam, mirroring the quantity and rate of water inherent to the stream.

Dam and Pump Method

This method involves isolating the work area in the stream by installing a temporary upstream dam (e.g., aqua-dam, sandbags, etc.), placed perpendicularly across the entire stream and upstream of the work area. Where necessary, a temporary dam on the downstream side of the work area is also used to prevent the work area from back flooding. The water is pumped, using one or more pumps, to move water around the isolated area and discharge it back into the stream below the downstream dam.

Stream Diversion Method

This method involves isolating the work area in the stream by installing a temporary upstream dam (e.g., aqua-dam, sandbags, plastic sheeting, etc.) which diverts the flow of water in the stream into an existing off-channel or a newly excavated diversion channel. Where necessary, a temporary dam on the downstream side of the work area is also constructed to prevent the work area from back flooding. The natural flow of water present in the stream is conveyed passively around the isolated area through the diversion channel, discharging the water where the diversion channel rejoins the stream channel below the downstream dam.

Sediment Curtain Method

This method involves the isolation of the worksite in a lake or stream (including features, such as watercourses and lakes) with slow moving water by temporarily installing a heavy non-permeable "curtain" that's suspended at the top with buoyant floats and weighted at the bottom to seal sediment within a work area.

Table B: Work area isolation method summary.

Method	Common Applications	Advantages	Disadvantages
Cofferdam	• Instream bridge piers • Boat launches • Large pipeline crossings	• Works well for larger bodies of water • Can be used for long term projects • Can be used to dam off a portion of a stream of lake • Fish passage may continue around the site	• Tend to be more expensive to install, particularly if using sheet piles • Additional measures may be required if pile driving to prevent vibrations causing death to fish • Can be difficult to get a good seal if substrate is cobbles and/or boulders
Dam and Flume	• Culverts • Bridges • Pipeline crossings	• Can be left in place for longer term projects • May support fish passage with careful design	• Requires sufficient gradient for passive flow around the site • Requires careful design and installation to support fish passage • Could result in fish stranding during installation; salvage is required
Dam and Pump	• Small stream crossing replacements (culvert to culvert or culvert to bridge) • Small pipeline crossings	• Easy to install • Works well for smaller streams	• Not ideal for projects longer than a day (i.e., require overnight pumping) • Not recommended for freezing temperatures • Pumping requires continuous monitoring to ensure there is no downstream fish stranding • Possible fuel and oil spills from pumps or generators • Fish passage is blocked and could result in fish stranding during installation; fish salvage is required • Large streams require excessive pump sizing and could cause excessive erosion if discharge is not controlled
Stream Diversion	• Bridges • Larger culverts	• Works well for diversions over multiple days • Can be used during freezing conditions • Works well for streams of all sizes • Typically maintains fish passage	• Requires additional area to be allocated to excavation and restoration activities • Area required for diversion may infringe on construction site activities
Sediment Curtain	• Bank Protection projects • Stream channel maintenance • Boat launches	• Allows projects to work “in the wet” • Curtains can often be reused • Typically maintains fish passage around the work area	• Care must be taken when removing the curtain to avoid sediment flush • May not work well with all substrates

IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs

You are expected to follow the General BMPs for all CIAS projects in addition to any Scope-specific BMPs that pertain to your project. Refer to the General BMPs in the Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia document, and the other Scope-specific BMPs in the Appendix.

Best Management Practices

The following provisions represent BMPs for five commonly used work area isolation techniques: cofferdams, dam and flume method, dam and pump method, stream diversion, and sediment curtain as CIAS under the WSA. Best management practices relevant to all methods are described first, followed by practices specific to each of the five techniques.

If a legal instrument, such as a change approval or licence, requires that you follow any of these BMPs, **the corresponding terms listed below are the mandatory conditions of that requirement and must be followed unless otherwise specified in the instrument.**

Planning and Set-up

a) Determine the diversion method that will work best for your site and duration of project. If the site is dry at the time of construction, groundwater can be encountered that must be managed.

b) The diversion must be sized to account for additional flows and water levels that can result from precipitation events, snow melt, or wave action in the case of lakes.

c) Determine the best area to set up the diversion to avoid high quality habitat (e.g., spawning grounds) and natural occurring areas of instability (e.g., braided channels, steep eroding banks, alluvial fans, etc.).

d) When diverting water around a site, the natural rate and quality of water flow must be maintained at all times.

e) The isolated work area must be defined and marked, with sufficient space to complete all of the required construction work, the placement of pumps and hoses, and for equipment to move around.

f) All materials and equipment must be on site prior to commencing work to minimize the amount of time the diversion is in place; this includes contingencies such as extra pumps.

Dewatering the Isolated Area

g) If the area is in a fish-bearing stream, a fish and wildlife salvage must be completed first.

h) Pumps must be set in spill trays while working within thirty (30.0) metres of the water and monitored regularly to ensure they are operating continuously, particularly for dam and pump sites.

i) Sumps must be installed to allow pumps to capture sediment laden water and pump it to a vegetated area to allow for sediment to settle or filter out prior to re-entering the stream.

j) The outlet of any diversion (hose outlet, flume, pipe, diversion channel etc.) must include energy dissipation measures to protect against erosion where the water rejoins the stream. This can include energy dissipaters such as diffusers, sandbags, plastic, and riprap.

k) Downstream water flow levels must be sufficient at all times to support the aquatic life present.

Work Completion/Site Remediations

l) Water must be returned to the stream channel slowly to avoid flushes of sediment. A pump can be used downstream to temporarily direct sediment-laden water away from the stream until it clears.

m) The work area must be deactivated and recontoured to the original ground as best as possible (e.g., restore sumps, rutting and depressions if present).

Installation and Removal

Cofferdam

n) If sheet piles are being driven in fish-bearing water, additional exclusion measures such as bubble curtains must be used as required to protect fish from vibrations and shock waves.

o) When installing a cofferdam in a flowing stream, work must start at the upstream end and progress downstream until the work area has been isolated from the stream. The upstream face must be installed at an angle to the flow rather than perpendicular to deflect flow from the site.

p) Dam installation in flowing streams must not constrict the channel such that it unsafely impedes the flow of water or restricts fish passage.

q) When installing a dam from the shore in still water (e.g., lakes) systems, work must take place from the shore in an outward direction until the work area has been isolated from the water.

r) The ends of the cofferdam must be stable prior to working in the isolated work area.

s) When removing the dam in flowing systems, work must be done from the downstream side of the work area in an upstream direction until the cofferdam is completely removed.

t) When removing the dam in non-flowing systems, work must be done towards the bank in an inward direction until the until the cofferdam is completely removed.

Dam and Flume Method

u) The flume must be installed parallel to the steam. Depending on the volume of water, multiple flumes/pipes can be used.

v) An upstream dam must be built perpendicular to the stream at the upstream end of the flume to direct water towards it.

w) A downstream dam must be installed, perpendicular to the stream, when necessary to prevent backwatering; and it must be constructed upstream of the flume outlet.

x) The dam(s), flume, and associated works must be removed once the water is returned to the stream channel.

Dam and Pump Method

y) The pump intake(s) must be located upstream of the dam, preferably in a natural pool or depression in the streambed.

z) The hoses must be placed where they will not be in the travel path of equipment.

aa) The dams must be constructed upstream and downstream of the worksite isolation area once the pumps and hoses are set up and ready.

bb) The pumps must be monitored full time during diversion to ensure they are fuelled and maintain flow downstream at all times.

Stream Diversion Method

cc) Existing off-channels or ditches must be used as a diversion channel as practicable. If no existing off-channel or ditch is available, a new diversion channel may be excavated that ties into the existing stream channel and is sized for the flows with contingency capacity. For bridge projects, the trench excavated for riprap placement must be used prior to riprap placement if it is of sufficient size. The channel must be excavated starting from the downstream end and working upstream.

dd) The diversion channel must be lined (e.g., with rock, geotextile, plastic) and weighted down with rock or sandbags to prevent erosion.

ee) A dam to help divert water to the diversion channel must be installed upstream prior to moving the water to the diversion channel. A dam must be installed downstream to prevent water back flooding the work area if necessary.

ff) After the work is completed, water must be allowed to flow slowly into the stream channel. A pump must be used at the downstream end to collect sediment-laden water and pump it away from the stream. Once the water clears, the full flow must be returned to the stream and the dams and diversion channel deactivated.

Sediment Curtain Method

gg) If installing a sediment curtain in moving water, installation must begin at the upstream end by attaching it securely to a fixed anchor on shore.

hh) The sediment curtain must encircle the entire work site allowing enough room for works to occur such that the curtain does not need to be moved during the project.

ii) The top of the sediment curtain must not be allowed to become submerged during any anticipated water levels. The bottom of the sediment curtain must be 'fit' to the substrate as well as practicable to contain all sediment within the worksite.

jj) The sediment curtain must not be physically impacted by equipment or flows that could allow turbid water from inside of the worksite to escape into the stream (e.g., watercourse or lake).

kk) Prior to removing the sediment curtain, as much sediment as possible must be removed and the site to must be stabilized as much as possible.

ll) The sediment curtain must be removed slowly, starting at the downstream end while constantly maintaining control of it.

Additional Resources

- Projects Near Water, Fisheries and Oceans Canada (DFO)
- Fish Stream Crossing Guidebook, Revised Edition, FLNRO, MoE, 2012
- B.C. HabitatWizard tool
- Best Management Practices for Pile Driving and Related Operations, BC Marine and Pile Driving Contractors Association, 2003

Amendments

New Version #	Date Amended	Amendment Description
NA	NA	NA

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For the use by WSA statutory decision makers during the water authorization process:
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