

# Best Management Practices for Highway Maintenance Activities



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# Acknowledgements

This document has been prepared with the assistance of many individuals. An inter-agency Steering Committee, with regional representation from the BC Ministry of Transportation (MoT) and the BC Ministry of Water, Land and Air Protection (WLAP), guided the initial direction of the document. A much larger group of MoT and WLAP staff having broader geographic representation within the province commented on earlier drafts. And finally, through regional presentations completed in Kamloops, Langley, Nanaimo and Prince George, comments on the general and specific aspects of the Best Management Practices included in this document were provided by regional MoT and WLAP staff, as well as representatives from Fisheries and Oceans Canada and the MoT's Highway Maintenance Contractors. The contribution of all participants is acknowledged and appreciated.



# Preface

British Columbia's highways create a transportation web across a diverse landscape, permitting the movement of people and materials through the many regions of the province. The Ministry of Transportation (MoT) works with Highways Maintenance Contractors to ensure this transportation network is maintained and safe for the driving public. In fulfilling this responsibility, the Ministry is also working to demonstrate responsible environmental stewardship of the public lands under their jurisdiction.

The development of a provincially-applicable guide to best management practices (BMPs) for highway maintenance is a challenging task given the wide range of topographic and climatic conditions Maintenance Contractors face in their work throughout the province's regions. In addition to the broad spectrum of site conditions found across the province, regional practices have already been developed in some areas, and many relationships and work-related protocols have been established with local environmental regulatory staff.

This document is intended to be a living document – one that will grow and change through implementation of the BMPs and user comment. As part of this design for growth, the Ministry is will introduce a feedback mechanism that will allow Maintenance Contractors to provide review comments to improve future versions of this document. Case studies are also planned for future versions of this document as a means to demonstrate the successful application of environmental BMPs for highway maintenance works.

**Preface**

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# 1 Introduction

Highway maintenance involves routine maintenance activities completed on highway surfaces, rights-of-way, bridges, culverts and other highway-related structures. Mowing, bridge cleaning, ditching and snow ploughing are just a few examples of routine highway maintenance activities. On behalf of the Ministry of Transportation (MoT), Maintenance Contractors undertake these routine maintenance activities on roads and highways across British Columbia. They play an essential role in meeting the Ministry's mandate to provide safe transportation routes to the travelling public.

Highway maintenance activities have the potential to impact water quality, fish and wildlife habitats and species, both through their use of potentially harmful materials and their proximity to sensitive environments such as riparian areas, streams, wetlands, lakes and marine foreshores. Because of this potential, Maintenance Contractors must undertake their works in a manner that complies with environmental regulation and avoids and mitigates environmental impacts.

The Ministry is committed to demonstrating environmental stewardship and providing its Maintenance Contractors, the public and regulatory agencies with the assurance that routine highway maintenance is undertaken in an environmentally responsible manner. To aid Maintenance Contractors in streamlining their process of applying for environmental approvals, MoT staff in some Ministry Districts have worked to develop local BMPs for specific maintenance activities in cooperation with local regulators. In some districts, local informal protocols provide additional guidance.

To build on this work, the Ministry has developed a set of provincially-applicable operational BMPs for highway maintenance works. These standardized practices and protocols are designed to be a practical and cost-effective means for Maintenance Contractors to meet public and regulatory agency requirements and expectations for environmental protection and stewardship.

## **2 Purpose and Scope**

This document has been developed as an integral component of an existing Memorandum of Understanding between the MoT and WLAP regarding highways maintenance activities. It has been developed primarily for implementation by the Ministry's Maintenance Contractors – for use both in the office, as a resource guide, and in the field, for direction and as a source of information. As almost every work site will require site-specific tailoring of BMPs, the direction provided within this document is not prescriptive; rather, the BMPs are designed to provide guidance and recommended measures to achieve environmental protection.

The objective of this document and the BMP process is to standardize and streamline the application of practical, cost-effective environmental protection measures for the Ministry's Maintenance Contractors. It is meant to make the Maintenance Contractor's job easier, not more difficult. Through the use of the BMPs contained in this document it is expected that maintenance-related communications with both federal and provincial environmental regulatory staff will be more efficient and less time-consuming. Further, it is hoped that regional protocols and site-specific best management practices can be developed.

The scope of this document is limited to routine maintenance activities regularly undertaken throughout the province on the highway network. It presents provincially applicable best management practices (BMPs) for 15 types of highway maintenance activities corresponding to maintenance activities outlined in MoT's Highway Maintenance Contracts Maintenance Specifications document. The document and BMPs do not address capital projects such as new construction and large infrastructure developments or upgrades. Many other maintenance activities may involve works similar to those described in this document and readers are invited to review the matrix on the following page to identify BMPs applicable to their works.

Table 1. Maintenance Activity/BMP Reference Matrix

CATEGORY	MoT MAINTENANCE ACTIVITY	MAINTENANCE SPECIFICATION NUMBER	BMP SHEET
<b>Surface Maintenance</b>	Highway Pavement Patching and Crack Sealing	1-100	Highway Surface Management
	Highway Surface Treatment	1-110	Highway Surface Management
	Gravel Surface Grading and Re-shaping	1-130	Gravel Surface Management
	Dust Control and Base Stabilization	1-140	Dust Management
	Highway Surface and Shoulder Gravelling	1-150	Gravel Surface Management
	Highway Shoulder Maintenance	1-160	Gravel Surface Management
	Road Base Maintenance	1-170	Gravel Surface Management
	Pavement Surface Cleaning	1-180	Highway Surface Management
	Debris Removal	1-190	Debris Removal
<b>Drainage Maintenance</b>	Ditch and Watercourse Maintenance	2-250	Ditch and Watercourse Management
	Drainage Appliance Maintenance	2-260	Drainage Appliance Management
	Shore, Bank and Watercourse Maintenance	2-270	Shore, Bank and Watercourse Maintenance
	Engineered Wetland and Water Quality Pond Maintenance	2-280	Engineered Wetland and Water Quality Pond Maintenance
<b>Winter Maintenance</b>	Highway Snow Removal	3-300	Winter Road Maintenance
	Winter Abrasive and Chemical Snow and Ice Control	3-310	Winter Road Maintenance
	Roadside Snow and Ice Control	3-320	Winter Road Maintenance
	Highway Condition Reporting	3-330	No BMP available <sup>1</sup>
<b>Roadside Maintenance</b>	Roadside Vegetation Control	4-350	Roadside Vegetation Management
	Litter Collection and Graffiti Removal	4-370	No BMP available <sup>1</sup>
	Rest Area and Roadside Facilities Maintenance	4-380	Rest Area and Roadside Facilities Management
	Roadside Fence Maintenance	4-400	No BMP available <sup>1</sup>
<b>Traffic Maintenance</b>	Sign System Maintenance	5-440	No BMP available <sup>1</sup>
	Temporary Line Marking and Eradication	5-450	No BMP available <sup>1</sup>
	Highway Traffic Control	5-470	No BMP available <sup>1</sup>

**Purpose and Scope**

CATEGORY	MoT MAINTENANCE ACTIVITY	MAINTENANCE SPECIFICATION NUMBER	BMP SHEET
<b>Structure Maintenance</b>	Bridge Deck Maintenance	6-500	Bridge Structure Management
	Bridge and Structure Cleaning	6-510	Bridge Structure Management
	Bridge Drain and Flume Maintenance	6-520	Bridge Structure Management
	Bridge Joint Maintenance	6-530	Bridge Structure Management
	Bridge Bearing Maintenance	6-540	Bridge Structure Management
	Bailey and Acrow Bridge Maintenance	6-560	Bridge Structure Management
	Minor Painting of Bridge Structures	6-570	Bridge Structure Management
	Concrete Structure Maintenance	6-600	Bridge Structure Management
	Steel and Aluminum Structure Maintenance	6-605	Bridge Structure Management
	Timber Truss Bridge Maintenance	6-620	Bridge Structure Management
	Bridge Piling Maintenance	6-640	Bridge Structure Management
	Timber and Log Structure Maintenance	6-650	Bridge Structure Management
	Retaining Structure Maintenance	6-660	Retaining Structure Management
	Multiplate Structure Maintenance	6-680	Multiplate Structure Management
	Bridge Railing Maintenance	6-690	Bridge Structure Management
Debris Torrent Structure Maintenance	6-740	No BMP available <sup>1</sup>	
<b>Emergency Maintenance</b>	Flood Control and Washout Response	7-760	No BMP available <sup>1</sup>
	Mud, Earth and Rock Slide Response	7-770	No BMP available <sup>1</sup>
	Highway Incident and Vandalism Response	7-780	Highway Incident and Vandalism Response
	Snow Avalanche Response	7-790	No BMP available <sup>1</sup>
	Structural Damage Response	7-800	No BMP available <sup>1</sup>
	Bailey and Acrow Emergency Installation	7-810	No BMP available <sup>1</sup>
<b>Inspection</b>	Highway Inspection	8-830	No BMP available <sup>1</sup>
	Highway Patrol	8-840	No BMP available <sup>1</sup>
	Bridge Inspection	8-850	No BMP available <sup>1</sup>

<sup>1</sup>This document is limited to 15 types of MoT maintenance activities only.

# 3 How to Use This Document

This document is organized into three main sections:

- 1 – **Key Environmental Concerns**, where environmental issues arising from highway maintenance activities are discussed;
- 2 – **Legislative Requirements and Performance Standards**, where environmental objectives, standards, and legal requirements for highway maintenance activities are summarized; and
- 3 – **Best Management Practices (BMPs)**, where suggested resources, planning tools, and technique options are presented for various types of highway maintenance activities.

It is hoped that this format will help different user groups to quickly access information that is particularly relevant to them. For example, if you are planning maintenance activities, a review of the **Key Environmental Concerns** and **Legislative Requirements and Performance Standards** sections will help to familiarize you with environmental issues and standards relating to your works. Or, if you are putting together work plans and preparing for work on a particular site, the **Best Management Practices** section will provide you with guidance to help you meet the requirements of performance standards and environmental legislation.

Both supervisors and highway maintenance field crews can use the BMPs as well as the links provided to other BMP sources as guides to meeting performance standards and environmental legislation. Examples of regulatory agency protocols and BMPs that have been developed in parts of the province are also provided for certain activities. Maintenance Contractors are encouraged to develop similar protocols with regulatory agency staff in your local area.

Electronic “links” to other sources of BMP information are provided to supplement the BMP section and to assist you in identifying appropriate environmental protection measures that address the specific concerns of you project site.

## 4 Key Environmental Concerns

Many aspects of highway maintenance are routine and carry little risk of environmental harm. However some highway maintenance activities can cause physical, chemical and biological changes to the surrounding environment. These changes to fish and wildlife habitats and species, and water, air and soil quality may be significant and enduring. Site-specific factors such as proximity of the work site to environmentally sensitive areas, the scale of the work, and the type of materials used can influence the level of risk that your maintenance activity poses to the environment.

Maintenance and construction activities completed in and adjacent to watercourses are of particular concern because of their potential for wide-reaching effects on fish, fish habitat, and many other organisms. Primary impacts are associated with inputs of contaminants and pollutants, reductions in flow, and the physical alteration of the stream channel including the channel banks and riparian (or streamside) areas. Some of these effects may not directly or immediately kill fish or other wildlife but they are none-the-less significant because they weaken populations over time by affecting their ability to perform basic life functions such as eating and reproducing. Table 2 provides a review of some of the primary potential impacts your works may have on watercourses. A document produced by Fisheries and Oceans Canada, *Road Maintenance Activities and The Fisheries Act: A Guidance Document to Avoiding Conflict* (Stoneman *et al*, 1997), provides additional guidance regarding impacts to fish habitat resulting from a range of highway maintenance works.

How do you know what effects your highway maintenance works may have on the environment? Table 3 contains a quick summary of key environmental impacts for each type of maintenance activity described in this document..

Table 2. Key environmental concerns related to working near watercourses.

CONCERN	ACTIVITIES	SOURCES	CONDITION	IMPACT
WATER QUALITY	<ul style="list-style-type: none"> <li>• Surface and structure maintenance</li> <li>• Clearing and grubbing</li> <li>• Debris removal</li> </ul>	<ul style="list-style-type: none"> <li>• Disturbed soil</li> <li>• Culverts/ channels</li> <li>• Ineffective soil stabilization/site restoration</li> </ul>	Increased erosion and sedimentation	<ul style="list-style-type: none"> <li>• Spawning grounds become covered with sediment and made unusable; deposited eggs are covered and suffocate</li> <li>• Increases turbidity of the water; fish cannot see their prey (i.e., food items); food sources become buried or leave the area</li> <li>• Fish gills become clogged; decreased respiration; mortality</li> <li>• Turbidity decreases passage of light through the water column, affecting photosynthesis; aquatic plants do not grow as well</li> </ul>
	<ul style="list-style-type: none"> <li>• Surface and structure cleaning and repair</li> <li>• Clearing and grubbing</li> <li>• Equipment use and servicing</li> </ul>	<ul style="list-style-type: none"> <li>• Materials (concrete, chlorinated water)</li> <li>• Storage piles (de-icing compounds)</li> <li>• Equipment fluids and fuel</li> </ul>	Flow of contaminated material/runoff into a watercourse	<ul style="list-style-type: none"> <li>• Contaminated material can lead to a change in water chemistry (e.g., pH, dissolved oxygen) that might kill fish</li> <li>• Poor water quality may affect reproduction or the development of juvenile fish into healthy adults</li> <li>• Organic contaminants (e.g., phosphates) cause excessive growth of algae and decreases available dissolved oxygen to fish</li> <li>• Direct mortality to some sensitive species</li> </ul>
WATER QUANTITY	<ul style="list-style-type: none"> <li>• Vegetation removal</li> <li>• Soil compaction</li> </ul>	<ul style="list-style-type: none"> <li>• Uninterrupted overland flow</li> <li>• Reduced infiltration</li> </ul>	Increased runoff from surrounding areas	<ul style="list-style-type: none"> <li>• Increased water levels cause bank erosion, channel scour and affect riparian vegetation</li> <li>• Possible habitat destruction, fish populations suffer</li> <li>• “Flashy” hydrograph; reduction in base flows</li> </ul>
	<ul style="list-style-type: none"> <li>• Worksite water management (isolation and diversion)</li> </ul>	<ul style="list-style-type: none"> <li>• Intercepted flow and redirection</li> </ul>	Decreased water volume (from small tributaries or ground water)	<ul style="list-style-type: none"> <li>• Downstream flows decreased</li> <li>• Possible habitat loss; populations suffer decreased volume in tributaries</li> <li>• Possible reduction in fish passage</li> <li>• Decreased quantity in waterway may increase temperature, causing fish to avoid the waterway; loss of species to that area</li> </ul>
STREAM HABITAT ALTERATIONS	<ul style="list-style-type: none"> <li>• Instream construction and maintenance activities</li> <li>• Vegetation or debris removal</li> </ul>	<ul style="list-style-type: none"> <li>• Watercourse crossings and ditches</li> <li>• New or modified structures</li> <li>• Access road construction</li> </ul>	Alteration, disruption or destruction of instream habitat	<ul style="list-style-type: none"> <li>• Loss of instream and channel structure (e.g., boulders, woody debris, root systems) reduces habitat complexity and overall habitat value; productive capacity of habitat reduced; habitat enhancement or compensation required to off set loss</li> <li>• Alterations to habitat have potential to hydraulically affect other reaches of the watercourse</li> </ul>
	<ul style="list-style-type: none"> <li>• Project design, construction and maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Diversions to accommodate infrastructure</li> <li>• Bank stabilization measures</li> </ul>	Alteration of natural channel flow (blockage by debris dams, culverts, etc)	<ul style="list-style-type: none"> <li>• Fish passage is affected; fish may not be able to access upper reaches of waterways or spawning grounds; ecological balance may be upset by removal of fish from an area where they acted as predators or prey</li> </ul>
RIPARIAN HABITAT ALTERATIONS	<ul style="list-style-type: none"> <li>• Clearing and grubbing</li> <li>• Access to watercourse crossing structures</li> </ul>	<ul style="list-style-type: none"> <li>• Riparian zone disturbance or alteration</li> </ul>	Alteration of riparian vegetation	<ul style="list-style-type: none"> <li>• Critical functions (i.e., erosion control, filtering function, climate control) provided by riparian vegetation are lost; altered function affects quality and value of fish habitat; productive capacity decreases</li> <li>• Surface flow rate increases causing potential for bank scour</li> </ul>

## Key Environmental Concerns

Table 3. Summary of routine highway maintenance activities and their potential environmental impacts.

MAINTENANCE ACTIVITY	INSTREAM HABITAT ALTERATION	VEGETATION REMOVAL/ ALTERATION	EFFECTS ON WILDLIFE (BEAVERS AND BIRDS)	WATER QUALITY				WATER QUANTITY	
				SEDIMENT RELEASE	CONCRETE LEACHATE RELEASE	OTHER CONTAMINANTS RELEASE	DE-ICING COMPOUNDS USE/ RELEASE	DISRUPTION OF FLOW	WITHDRAWAL OF WATER
Highway Surface Management				✓	✓	✓	✓		
Gravel Surface Management				✓		✓			✓
Dust Management				✓		✓			✓
Debris Removal				✓		✓	✓		
Ditch and Watercourse Management	✓	✓	✓	✓		✓		✓	
Drainage Appliance Management	✓	✓	✓	✓	✓	✓		✓	
Shore, Bank, and Watercourse Management	✓	✓	✓	✓		✓		✓	
Engineered Wetland and Water Quality Pond Management				✓		✓			
Winter Road Management		✓		✓		✓	✓		
Roadside Vegetation Management		✓	✓	✓		✓			
Rest Area and Roadside Facilities Management						✓			
Bridge Structure Management	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retaining Structure Management	✓	✓		✓	✓	✓	✓	✓	
Multiplate Structure Management	✓	✓		✓	✓	✓		✓	
Highway Incident and Vandalism Response				✓		✓			



# 5 Legal Requirements and Performance Standards

## 5.1 What Legal Requirements Apply to My Works?

In addition to the commitment of the MoT to environmental protection and the public expectation that the Ministry and its Maintenance Contractors will do their part in protecting environmental values, you must ensure your works are compliant with (i.e., meet) environmental legislation (federal, provincial, and local). This legislation may regulate where, when and how you undertake your highway maintenance works. A table summarizing the primary legal requirements applicable to highway maintenance activities is provided on the following page (Table 4).

### Due Diligence

To ensure that you undertake your highway maintenance works in a manner that demonstrates environmental due diligence, it is your responsibility to:

1. Be familiar with the municipal, provincial, and federal legal requirements;
2. Recognize and address the potential environmental impacts of your works to the physical, chemical, and biological components of the environment;
3. Avoid, mitigate or lessen those impacts or risks in the planning of work;
4. Ensure the protection of properties and human health;
5. Obtain the appropriate permits and authorizations from all regulatory agencies before proceeding with activities; and
6. Conduct your works in a manner that complies with the law and avoids, mitigates or lessens potential impacts to aquatic and riparian habitats, water quality and quantity, fish and wildlife populations, and public safety and property.

### Note:

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

## Legal Requirements and Performance Standards

Table 4. Summary of key environmental legislation, regulations and policy applicable to highway maintenance activities.

STATUTE	SECTION(S) / REGULATIONS	REGULATING AGENCY	AREA OF REGULATION	POTENTIAL APPROVAL OR PERMIT REQUIREMENTS	MAXIMUM PENALTIES
<i>Fisheries Act</i>	Section 35(1)	Department of Fisheries and Oceans	Prohibits harmful alteration, disruption or destruction (HADD) of fish habitat	Application to DFO for an Authorization for a HADD of fish habitat may be required	Summary convictions - fines up to \$100,000 per offence per day or up to 1 year of imprisonment. Indictable offences - fines up to \$500,000 per offence per day or up to 2 years of imprisonment, or both. Court orders may require the restoration of impacted areas
	Sections 34(1), 36(3)	Department of Fisheries and Oceans; Environment Canada	Prohibits the deposit of deleterious substances into waters frequented by fish		Summary convictions - fines up to \$100,000 per offence per day or up to 1 year of imprisonment. Indictable offences - fines up to \$500,000 per offence per day or up to 2 years of imprisonment, or both. Court orders may require the restoration of impacted areas
<i>Navigable Waters Protection Act</i>	Sections 5(1), 6(1), 6(4), 10(1), 10(2)	Transport Canada	Prohibits the construction of marine projects and projects on navigable freshwater without approval under the act	Application may be required for an Approval under the act	Summary convictions - fines not more than \$5000. Costs may also be assessed for the removal of works.
<i>Migratory Bird Convention Act</i>	Section 12	Environment Canada	Prohibits the injury, molestation, and destruction of migratory birds and their nests	A permit must be issued for all activities affecting migratory birds	Summary convictions - fines up to \$100,000 for a corporation, up to \$50,000 and/or 6months imprisonment for individuals. Indictable offences – fines up to \$250,000 for a corporation, up to \$100,000 and/or up to 5 years imprisonment for individuals.
<i>Water Act</i>	Section 9, <i>Water Act</i> Regulation, Part 7	Land and Water British Columbia (LWBC), Ministry of Water, Land and Air Protection (WLAP)	Prohibits large works in or about a stream, and short-term use, storage and diversion of water unless an Approval has been obtained under the act. Protects water quality, habitat, and water users by regulating changes in and about a stream.	Application may be required to LWBC for a Section 9 Water Act Approval. Certain works are permitted under a notification process to WLAP.	Fine of up to \$200,000 per offence per day or to imprisonment not exceeding 12 months, or to both.
<i>Fish Protection Act</i>		Ministry of Water, Land and Air Protection	Regulates activities that affect flow fish habitat and riparian areas. Requires the maintenance of flows, the establishment of setbacks, and the designation and protection of sensitive streams.	Approval for works in sensitive streams must be obtained from the comptroller or regional water manager.	No direct fines under the <i>Fish Protection Act</i> . Fines may be levied under associated acts.

**Legal Requirements and Performance Standards**

STATUTE	SECTION(S) / REGULATIONS	REGULATING AGENCY	AREA OF REGULATION	POTENTIAL APPROVAL OR PERMIT REQUIREMENTS	MAXIMUM PENALTIES
<i>Wildlife Act</i>	Section 9, Section 34, Section 35	Ministry of Water, Land and Air Protection	Regulates works having impact on wildlife including the damage or removal of beaver dams; the possession, disturbance or destruction of birds, their eggs and nests; and the transportation and possession of carcasses	A permit must be obtained from WLAP to allow activities under the act including beaver dam and bird nest removal, and carcass possession and transportation.	Convictions under the <i>Wildlife Act</i> may lead to a fine of between \$1,000 and \$100,000, or a term of imprisonment not exceeding one year, or both.
<i>Waste Management Act</i>	Special Wastes Regulation	Ministry of Water, Land and Air Protection	Regulates the disposal and storage of hazardous materials and hazardous materials spill reporting	Application may be required for permits for the disposal and storage of special wastes	Fines ranging in value up to \$1,000,000.
<i>Weed Control Act</i>	Weed Control Regulations	Ministry of Agriculture, Food and Fisheries	Regulates the management of noxious weeds and prohibits the dispersal of weeds and their seed.	A permit may be required for the removal of noxious weed and seed containing materials	Costs related to weed control activities.
<i>Health Act</i>	Sewage Disposal Regulations	Ministry of Health Services	Regulates the installation, construction and maintenance of sewage disposal facilities	A permit for the installation of a sewage system may be required under the act, provided the works meet the requirements of the Regulation.	Fines up to \$200,000 for each day an offence continues and/or 12 months imprisonment.

## 5.2 What is a Performance Standard?

**SMART Objectives:**

- Specific
- Measurable
- Achievable
- Realistic
- Time specific

A performance standard identifies the desired result of your works. It must be met to ensure compliance with applicable environmental legislation. In some cases, it may be defined by scientifically-supported maximum permissible disposal or impact thresholds; for example, the concentration of a particular chemical in wastewater discharge. At other times, it may be a simple general statement such as the requirement to cause no harmful alteration, disruption or destruction of fish habitat.

Most of the performance standards that apply to routine highway maintenance activities are general statements rather than specific thresholds. In many cases, impact thresholds are site-specific and may vary between regions and regulatory agencies. Staff from your local WLAP and DFO offices may be able to provide you with more information on specific impact thresholds related to your work.

**An Example Performance Standard: Deleterious Substance Discharge**

The general performance standard identified is simply a restatement of a section of the *Fisheries Act*: **No release of any substance that could be deleterious (toxic) to fish or fish habitat (*Fisheries Act*, Sections 34(1) and 36(3)).**

Many highway maintenance works involve the disturbance of sediment and soil or the use of potentially hazardous or harmful materials. Without proper containment measures and careful use, these materials may be released to the environment as deleterious substances. A deleterious substance is any compound or material which, when introduced into the environment, causes a harmful effect. A substance may be considered deleterious because of its concentration or chemical or physical effects on the water quality and organisms within the watercourse or water body receiving the discharged substance.

Examples of deleterious (or potentially deleterious) substances resulting from highway maintenance activities include, but are not limited to:

- Runoff from patching and sealing compounds, tar, asphalt, and chemical surface treatments used in highway surface management activities
- Sediment in runoff from bridge deck cleaning activities, disturbed soils, newly applied gravel or riprap materials, and materials stockpiles
- Leachate and raw product from concrete and cement-based products used to repair concrete structures
- Runoff or overspray containing de-icing compounds and dust control palliatives
- Equipment oils and fuels

**The Sediment Question**

Studies have shown that the introduction of fine sediments generated directly from digging activity in the stream and indirectly from run-off from exposed soils has severe negative impacts on all life stages of fish and other aquatic life and their habitats. While no amount of a deleterious substance is permitted to be discharged, DFO uses the following threshold value to identify the level at which sediment becomes deleterious. Sediment becomes a deleterious substance when a water sample taken from the discharging water source has a total suspended solids (TSS) value more than **25mg/l** above the background TSS value of the receiving watercourse. During storm events, sediment-laden waters are considered deleterious when the TSS value of the discharging water source is more than **75mg/l** above the background TSS value for the receiving watercourse.

## 6 Best Management Practices

Best Management Practices (BMPs) are recommended techniques that have been demonstrated to be effective and a practical means of preventing or limiting harmful impacts to the environment. In the context of this document, they include any operating method, measure, or device that controls, prevents, removes, or reduces pollution.

The Ministry's primary objective in developing the following BMPs is to provide current information on recommended measures that will achieve performance standards identified in existing environmental legislation. It is intended to reduce the interaction between Maintenance Contractors and regulatory agency staff for routine maintenance activities that are regularly undertaken. The BMPs represent an initial standard that is relevant across the province, although it recognized that the wide-ranging topographical and climatic conditions found in the different regions of the province will likely require site- and activity-specific BMP modifications through consultation with local regulators.

The BMPs provided in this document address some of the most common and routine highway maintenance practices. There are many other BMPs that may be applicable, but the BMPs contained in this document provide a starting point for you to use to ensure you complete your work in a manner that is compliant with environmental legislation. Other documents and resources are available which have more detailed information on specific BMPs (e.g., erosion and sediment control BMPs). Links to several of these key sources of information are provided throughout the following sections. Appropriately qualified professionals may also provide advice on the selection and application of BMPs, including the use of alternative practices.

Highway Maintenance  
Specification Sections

- 1-100 Highway Pavement Patching and Crack Sealing
- 1-110 Highway Surface Treatment
- 1-180 Pavement Surface Cleaning



## 6.1 Highway Surface Management

Highway surface management activities are undertaken to ensure public safety on our highways by maintaining clean, level, and unbroken road surface conditions through activities such as pavement cleaning, patching, application of surface treatments, and pavement crack sealing.

### Environmental Issues

Primary environmental issues relating to routine highway surface management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Patching and Sealing	<ul style="list-style-type: none"> <li>• May introduce deleterious substances to a watercourse through runoff of patching and sealing compounds and chemical surface treatments</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>• May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials on site and at work yards</li> </ul>	<ul style="list-style-type: none"> <li>• Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>
Pavement Surface Cleaning	<ul style="list-style-type: none"> <li>• May pose air quality concerns during spring cleaning of winter aggregate</li> </ul>	<ul style="list-style-type: none"> <li>• Compliance with regional or local air quality bylaws and regulations</li> </ul>
	<ul style="list-style-type: none"> <li>• May introduce sediment or other deleterious substances to roadside watercourses through the side casting of materials cleaned from the highway surface</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>• May contaminate surface waters, groundwater, and soils through improper disposal of collected winter aggregate that may contain hazardous materials (e.g., de-icing compounds)</li> </ul>	<ul style="list-style-type: none"> <li>• Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>



### Best Management Practices

The following BMPs are provided as guidelines to help you ensure your works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

**REGULATORY AGENCY CONTACT**

- Prior to beginning your surface management activities, identify any sensitive habitat areas, including watercourses – streams, lakes and marine foreshores, found within your work area.
- Determine how much impact your required works will have on the identified areas. Are you repairing a large area of paved surface immediately adjacent to a watercourse? Are you planning to clean accumulated winter aggregate from an area where air quality has been a concern in the past? Where will you place the material you have cleaned from the road surface? By asking these questions, you should be able to identify any planned works that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

**TIMING OF WORKS**

For most work activities the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of deleterious materials and runoff. Typically this is also a less sensitive period for fish and wildlife than other seasons.
- If the work schedule requires working in the rain, take steps to install appropriate site isolation and sediment controls. You must ensure that any disturbance you create is contained and that the release of sediment-laden water or any other deleterious substances to nearby watercourses is prevented, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.

**Surface Cleaning:**

- Surface cleaning activities are best scheduled after a rainfall, when accumulated aggregate is damp, easier to collect and less likely to generate dust.
- While a little rain may be helpful to crews cleaning pavement surfaces, work should be halted if precipitation continues or increases. Under heavy rainfall, disturbed materials are more likely to release sediment and other deleterious substances to nearby watercourses.

**SITE MANAGEMENT**

- When your works involve the disturbance of soils or the use or storage of erodible materials (e.g., sands, topsoil), prevent the transport of sediment through the installation of appropriate erosion and sediment control BMPs and devices.

### MATERIALS STORAGE

- Use temporary covers to keep erodible construction materials dry if they are stored on site near watercourses.
- Store hazardous materials (chemicals, sealants, patching materials) in accordance with applicable regulations and ensure that deleterious substances are handled with care.
- Mix concrete compounds, sealants or other chemicals used in a contained area and away from any watercourse if there is the potential for materials used in your work to contaminate soils or surface waters adjacent to the road surface.
- Clean equipment and tools off-site, if possible. Ensure that any wash water generated by cleaning tools and equipment is managed in a manner that will prevent its release to watercourses or road drains.
- Ensure all equipment used on site is well maintained and free of fluid leaks.

### WASTE AND MATERIALS CONTAINMENT

- Have a spill response plan in place and spill kits on site.
- If potentially deleterious materials (e.g., cement-based products) are used for repair works, ensure raw material and wash water will not be released to any watercourse.
- Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site. Any clean material should be removed to an area where it will not enter any watercourse, ditch, or channel.
- Inspect drain blocks, sediment controls and wash water runoff areas regularly to ensure they are functioning. Repair as required.

#### Surface Cleaning:

- Keep aggregate from entering road drains, gutters and watercourses by cleaning or sweeping material away from these areas rather than using these structures as collection and disposal routes.
- Consider the potential impacts of side casting collected materials. Collected winter aggregate and other materials accumulated on the road surface may contain deleterious substances and have the potential to cause harm to surrounding soils, groundwater, and surface water. In some areas, collected aggregate is recovered and recycled for future use, while in other regions complete removal from the highway right of way is the preferred option for managing collected material. If collected material is to be disposed of on the highway right of way, designate disposal sites away from sensitive habitats and watercourses. Ensure that materials are placed in a manner that will prevent their future introduction to any watercourse.



- Consider the use of a cleaning system such as a vacuum sweeper or sweeper with applied water if dust generated by cleaning activities is a concern.



## Key Information Sources

The documents and websites listed below are recommended resources for highway surface management. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Roadway and Bridge Maintenance Water Quality BMPs.** Water, Air and Climate Change Branch, WLAP.

[http://wlapwww.gov.bc.ca/wat/wq/nps/BMP\\_Compendum/Municipal/Bridge\\_Maintenance/Bridge.htm](http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendum/Municipal/Bridge_Maintenance/Bridge.htm)

**Catalogue of Stormwater Best Management Practices.** 2<sup>nd</sup> Edition, August 2001. Idaho Department of Environmental Quality.

[http://www.deq.state.id.us/water/stormwater\\_catalog/index.asp](http://www.deq.state.id.us/water/stormwater_catalog/index.asp)

**Paving and Grinding Operations.** March 2003. Caltrans Storm Water Quality Handbook: Construction Site Best Management Practices Manual.

<http://www.dot.ca.gov/hq/construc/stormwater/NS-03.pdf>

**Asphalt - Pollution Prevention Best Management Practices.** Asphalt Pavement Association of West Virginia, West Virginia Department of Highways, West Virginia Department of Environmental Protection.

<http://www.asphaltnv.com/apa00%20bmp.pdf>

**Storm Water Management Fact Sheet - Dust Control.** Sept. 1999. US EPA. <http://www.epa.gov/owm/mtb/dustctr.pdf>



### Checklist for Environmental Protection Requirements

- Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
- Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
- Have site-specific environmental protection requirements been identified? List below:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

Highway Maintenance  
Specification Sections

- 1-130 Gravel Surface Grading and Reshaping
- 1-150 Highway Surface and Shoulder Graveling
- 1-160 Highway Shoulder Maintenance
- 1-170 Road Base Maintenance

## 6.2 Gravel Surface Management

Gravel surface management includes activities such as graveling and grading of unpaved road surfaces and maintenance of road shoulders (on both paved and unpaved roads) that are required to maintain good road conditions and ensure public safety on highways and roads.



### Environmental Issues

Primary environmental issues relating to routine gravel surface management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Gravel Placement and Grading	<ul style="list-style-type: none"> <li>• May introduce sediment or other deleterious substances to a watercourse through runoff from newly placed or disturbed gravels</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>• May damage roadside watercourses, riparian vegetation or other significant habitats through the side casting of aggregate</li> </ul>	<ul style="list-style-type: none"> <li>• No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>• No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
Shoulder Maintenance	<ul style="list-style-type: none"> <li>• May introduce sediment or other deleterious substances to a watercourse through runoff from newly placed or disturbed gravels</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>• May damage roadside watercourses, riparian vegetation or other significant habitats through the side casting of aggregate</li> </ul>	<ul style="list-style-type: none"> <li>• No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>• No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
Road Base Stabilization	<ul style="list-style-type: none"> <li>• May introduce sediment or other deleterious substances (dust control palliatives) to a watercourse through road base repair</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>• May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials used as dust control palliatives</li> </ul>	<ul style="list-style-type: none"> <li>• Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>

## Gravel Surface Management



### Shoulder Stabilization - Erosion Protection Works

If your planned erosion protection works involve alterations to stream banks, or lake or marine foreshores, consult your local WLAP Habitat and DFO Habitat Management staff.

For information on your requirements to obtain permits and approvals for your works, consult the provincial WLAP *Standards and Best Practices for Instream Works* document (<http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf>)

### Working in the Rain

Some gravel surface management activities are best scheduled after a rainfall, when road aggregate is damp, easier to compact and less likely to generate dust. While a little rain may be helpful, work should be halted if precipitation continues or increases. Under heavy rainfall, disturbed materials are more likely to release sediment and other deleterious substances to nearby watercourses.

## Best Management Practices

The following BMPs are provided as guidelines to help you ensure your works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

### REGULATORY AGENCY CONTACT

- Prior to beginning your gravel surface management activities, identify any sensitive habitat areas, including watercourses – streams, lakes and marine foreshores, found within your work area.
- Determine how much impact your required works will have on the identified areas. Are you placing gravel along a portion of road immediately adjacent to a watercourse? Are you planning shoulder stabilization works beside a lake or fish-bearing watercourse? Where will you place any excess gravel left on site after your re-grading works are complete? By asking these questions, you should be able to identify any planned works that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

### TIMING OF WORKS

For most work activities within this category, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons.
- If the work schedule requires working in the rain, take steps to ensure that appropriate site isolation and sediment controls are in place. Contain any disturbance you create and prevent the release of sediment-laden water or any other deleterious substances to nearby watercourses.
- If your maintenance activities require work instream (e.g., erosion protection as part of bank shoulder stabilization), you must schedule them to coincide with your region's instream work window. Contact your local WLAP and DFO offices for further information on timing windows in your District.

### SITE MANAGEMENT

- When preparing your worksite and undertaking your maintenance works, minimize vegetation-clearing activities.
- When your works involve the disturbance of soils or the use of erodible materials (e.g., sands, topsoil), prevent the transport of sediment through

the installation of appropriate erosion and sediment control BMPs and devices.

**MATERIALS STORAGE**

- Use temporary covers to keep erodible construction materials dry if they are stored on site near watercourses.
- Store hazardous materials (surface treatments, dust palliatives) in accordance with applicable regulations and ensure that deleterious substances are handled with care.
- Mix any hazardous materials to be used in a contained area to reduce the risk of contaminating soils or surface waters adjacent to the road surface.
- Clean equipment and tools off-site, if possible. Ensure that any wash water generated by cleaning tools and equipment is managed in a manner that will prevent its release to watercourses or road drains.
- Ensure all equipment used on site is well maintained and free of fluid leaks.

**WASTE AND MATERIALS CONTAINMENT**

- Have a spill response plan in place and spill kits on site.
- Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site. Any clean surplus material should be removed to an area where it will not enter any watercourse, ditch, or channel.
- Limit the application of surface treatments including dust palliatives to the road surface. Avoid over-spraying near watercourses and at watercourse crossings.
- Inspect sediment controls and wash water runoff areas regularly to ensure they are functioning. Repair as required.
- Consider the potential impacts of side cast materials. Avoid grading materials into roadside watercourses. If excess material is to be disposed of on the highway right of way, designate disposal sites away from sensitive habitats and watercourses. Ensure that materials are placed in a manner that will prevent their future introduction to any watercourse.



**Key Information Sources**

The documents and websites listed below are recommended resources for gravel surface management. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- Riprap. Skeena BMPs for Road Maintenance. MoT. 2003.
- \_\_\_\_\_
- \_\_\_\_\_

**Catalogue of Stormwater Best Management Practices.** 2<sup>nd</sup> Edition, August 2001. Idaho Department of Environmental Quality.  
[http://www.deq.state.id.us/water/stormwater\\_catalog/index.asp](http://www.deq.state.id.us/water/stormwater_catalog/index.asp)

**Storm Water Management Fact Sheet - Dust Control.** Sept. 1999. US EPA. <http://www.epa.gov/owm/mtb/dustctr.pdf>

**Gravel Roads: Maintenance and Design Manual.** Nov. 2000. Skorseth, Ken and Ali A. Selim, Ph.D., P.E.  
<http://www.epa.gov/owow/nps/gravelroads/>

**Recommended Practices Manual: A Guideline for Maintenance and Service of Unpaved Roads.** Feb. 2000. Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority.  
<http://www.epa.gov/owow/nps/unpavedroads.html>



### **Checklist for Environmental Protection Requirements**

<input type="checkbox"/> Is your proposed work considered a “routine: maintenance activity”? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
<input type="checkbox"/> Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
<input type="checkbox"/> Have site-specific environmental protection requirements been identified? List below: <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____

Highway Maintenance  
Specification Sections

- 1-140 Dust Control and Base Stabilization
- 1-180 Pavement Surface Cleaning

## 6.3 Dust Management

Dust management activities include the application of dust control products to reduce the creation of airborne particulates (*i.e.*, dust) during the operation and maintenance of unpaved road surfaces and the cleaning of winter aggregate from highway surfaces.



### Environmental Issues

Primary environmental issues relating to routine dust management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Dust Control	<ul style="list-style-type: none"> <li>• May introduce sediment or other deleterious substances to a watercourse through runoff or by direct application of dust control chemicals to watercourses at crossings</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>• May damage roadside riparian vegetation or other significant habitats through the over-spraying of road shoulders</li> </ul>	<ul style="list-style-type: none"> <li>• No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>• No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>• May contaminate surface waters, groundwater, and soils through improper storage or disposal of dust control palliatives</li> </ul>	<ul style="list-style-type: none"> <li>• Disposal and storage of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>
Pavement Surface Cleaning	<ul style="list-style-type: none"> <li>• May degrade air quality and highway visibility, posing health and safety problems for highway users and nearby residents</li> </ul>	<ul style="list-style-type: none"> <li>• Compliance with local air quality regulations and municipal bylaws</li> </ul>
	<ul style="list-style-type: none"> <li>• May introduce sediment or other deleterious substances to roadside watercourses through the clearing of materials from the highway surface</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>• May contaminate surface waters, groundwater, and soils through improper storage or disposal of collected accumulated winter aggregate</li> </ul>	<ul style="list-style-type: none"> <li>• Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>



### Best Management Practices

The following BMPs are provided as guidelines to help you ensure your works are completed in compliance with the performance standards and

## **Dust Management**

environmental legislation. Please note that the general BMPs provided apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

### **REGULATORY AGENCY CONTACT**

- Prior to beginning your dust control activities identify any sensitive habitat areas, including watercourses – streams, lakes and marine foreshores, found within your work area.
- Determine how much impact your required works will have on the identified areas. What type of equipment are you planning to use to apply dust control measures? Are you applying dust palliatives immediately adjacent to any watercourse? Are you planning to clean accumulated winter aggregate from an area where air quality has been a concern in the past? By asking these questions, you should be able to identify any planned works that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

### **TIMING OF WORKS**

- As dust palliatives are best applied to a pre-wetted surface, work should be scheduled after a rainfall, when unpaved road surfaces and accumulated aggregate are damp and better able to absorb control measures.
- While damp surfaces are desirable, working in rain is not. Avoid applying dust control palliatives to overly wet or saturated roadbeds. Under heavy rainfall, applied chemicals are more easily transported in runoff to roadside soils and nearby watercourses. Work should be halted if precipitation increases during dust control application.

### **SITE MANAGEMENT**

- Ensure the spray of dust palliatives is limited to the travelled road surface.
- Be cautious of applying dust control chemicals to road surfaces near watercourses or over watercourse crossings.

### **MATERIALS STORAGE**

- Store hazardous materials (dust palliatives) in accordance with applicable regulations and ensure that deleterious substances are handled with care.
- Mix any hazardous materials to be used in a contained area to reduce the risk of contaminating soils or surface waters adjacent to the road surface.
- Transfer and load dust control products at a designated site away from watercourses. Take care to avoid spilling chemicals during transfer and loading of applicator tanks.



- Clean equipment and tools off-site, if possible. Ensure that any wash water generated by cleaning tools and equipment is managed in a manner that will prevent its release to watercourses or road drains.
- Ensure all equipment used on site is well maintained and free of fluid leaks.

**WASTE AND MATERIALS CONTAINMENT**

- Have a spill response plan in place and a functional spill kit on each applicator.
- Do not overspray chemicals used for dust control. Recognized dust control palliatives including magnesium chloride, calcium chloride, calcium lignosulphonate, and sodium lignosulphonate, can seriously impact water quality through long-term use. Materials sprayed can also damage vegetation, soils and wildlife.



**Key Information Sources**

The documents and websites listed below are recommended resources for dust management. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Fine Particulates: What They Are and How They Affect Us.** Feb. 2002. Water, Air and Climate Change Branch. Ministry of Water, Land and Air Protection.

<http://wlapwww.gov.bc.ca/air/particulates/fpwttaht.html>

**Storm Water Management Fact Sheet - Dust Control.** Sept. 1999. US EPA. <http://www.epa.gov/owm/mtb/dustctr.pdf>

**Dust Palliative Selection and Application Guide.** Nov. 1999. Bolander, Peter and Alan Yamada. San Dimas Technology and Development Centre. [http://www.ecy.wa.gov/programs/air/pdfs/Dust\\_Palliative.pdf](http://www.ecy.wa.gov/programs/air/pdfs/Dust_Palliative.pdf)



### Checklist for Environmental Protection Requirements

<ul style="list-style-type: none"><li><input type="checkbox"/> Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.</li><li><input type="checkbox"/> Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.</li><li><input type="checkbox"/> Have site-specific environmental protection requirements been identified? List below:<ul style="list-style-type: none"><li><input type="checkbox"/> _____</li><li><input type="checkbox"/> _____</li><li><input type="checkbox"/> _____</li><li><input type="checkbox"/> _____</li></ul></li></ul>
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## 6.4 Debris Removal

Debris removal activities include the removal of litter, rubbish, vegetation, fallen rocks, dead animals, spilled materials, brush, branches and other tree parts, or other items that are not part of the highway from the road surface.



### Environmental Issues

Primary environmental issues relating to routine debris removal activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Rock and Soil Removal	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse through removal activities</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage roadside riparian vegetation or other significant habitats through the side casting of rock or soils</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act Regulation</i>, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage habitat through the improper location of disposal sites in ditches, wetlands, or other significant habitat areas</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act Regulation</i>, Part 7).</li> </ul>
Carcass Disposal	<ul style="list-style-type: none"> <li>May cause a threat to both wildlife and public safety through the attraction of wildlife to highway rights-of-way and storage locations</li> </ul>	<ul style="list-style-type: none"> <li>Disposal and storage of carcasses in a manner that will not attract dangerous wildlife (<i>Wildlife Act</i>, local bylaws)</li> </ul>
	<ul style="list-style-type: none"> <li>May pose a threat of disease through improper storage or disposal of roadkill</li> </ul>	<ul style="list-style-type: none"> <li>Disposal and storage of carcasses in accordance with local public health regulations and bylaws</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>
Abandoned Vehicle Removal	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through disturbance or improper disposal of abandoned vehicles</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>



### Best Management Practices

The following BMPs are provided as guidelines to help you ensure your works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided apply

## Debris Removal

for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

### REGULATORY AGENCY CONTACT

- Prior to beginning your debris removal activities, identify any sensitive habitat areas, including wetted ditches and natural watercourses (streams, lakes and marine foreshores), found within your work area that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.
- Local agency staff may also be able to provide options for the appropriate removal and disposal of rock and soil, carcasses, or abandoned vehicles from highway rights-of-way.

### TIMING OF WORKS

For most work activities, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons. If the work schedule requires working in the rain, your area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances.
- If your maintenance activities require work instream, you must schedule them to coincide with your region's instream work window. Contact your local WLAP and DFO offices for further information on timing windows in your District.

### SITE MANAGEMENT

- If machinery will be working on site, have a spill response plan in place and spill kits on site.
- Ensure equipment used is clean and free of fluid leaks.

### WASTE AND MATERIALS MANAGEMENT

#### Rock and Soil Removal

- Prevent sediment and other potentially harmful materials from entering into road drains and watercourses during removal activities (this may be accomplished by temporarily blocking road drains or constructing containment berms).
- Remove material to an appropriate storage or disposal site: do not simply flush materials into roadside ditches or side cast debris.
- Ensure removed rock and soil is placed in a location that will prevent the introduction of sediment or other potentially harmful materials to a watercourse.

### Emergency Works – Rock and Soil Removal

On some occasions, your maintenance activities may be required as part of an emergency response to mass earth movement events such as landslides or bank failures.

Should such work be required, contact your local agency representatives to advise them of your works.

Document the actions you take to ensure you meet debris removal performance standards and legal requirements (i.e., erosion and sediment controls).

**Carcass Disposal**

- If carcasses must be stored before disposal, do so in a manner that will not attract animals to the remains and that will prevent any possible contamination of ground and surface water.
- Do not store or bury carcasses near water bodies, watercourses, or any sources of drinking water.

**Abandoned Vehicle Removal**

- Take care while removing a vehicle to ensure that potentially harmful materials, including vehicle fluids (i.e., gasoline, motor oil), are contained and prevented from contaminating soils and ground and surface waters.
- Have a spill response plan in place and spill kits on site.
- Ensure that the vehicle is transported to an appropriate storage or disposal facility.



**Key Information Sources**

The documents and websites listed below are recommended resources for debris removal. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational best management practices (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Stormwater and Erosion Module, Aggregate Operators Best Management Practices Handbook for British Columbia.** April 2002. Ministry of Energy and Mines.

[http://www.em.gov.bc.ca/Mining/MiningStats/Aggregate%20BMP%20Handbook/Chapters/5-5\\_Stormwater%20&%20Erosion%20Control.pdf](http://www.em.gov.bc.ca/Mining/MiningStats/Aggregate%20BMP%20Handbook/Chapters/5-5_Stormwater%20&%20Erosion%20Control.pdf)

**Erosion and Sediment Control Guide for Roadway Projects.** Summer 2004 (upcoming) Transportation Association of Canada.

<http://www.tac-atc.ca/english/productsandservices/tacnews/spring2004-5.HTM>

**Manual of Control of Erosion and Shallow Slope Movement.**

August 1997. Ministry of Transportation.

[http://www.th.gov.bc.ca/publications/eng\\_publications/environment/references/Man\\_Control\\_Erosion.pdf](http://www.th.gov.bc.ca/publications/eng_publications/environment/references/Man_Control_Erosion.pdf)

**Abandoned Vehicle Process, Section 8 - Highway Scenic Improvement Act.**

Environmental Management Section. Engineering Branch. Ministry of Transportation.

[http://www.th.gov.bc.ca/publications/eng\\_publications/environment/references/Abandoned\\_Vehicle\\_Process.pdf](http://www.th.gov.bc.ca/publications/eng_publications/environment/references/Abandoned_Vehicle_Process.pdf)



**Checklist for Environmental Protection Requirements**

<input type="checkbox"/> Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
<input type="checkbox"/> Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
<input type="checkbox"/> Have site-specific environmental protection requirements been identified? List below:
<input type="checkbox"/> _____
<input type="checkbox"/> _____
<input type="checkbox"/> _____
<input type="checkbox"/> _____

Highway Maintenance  
Specification Section

2-250 Ditch and Watercourse  
Maintenance

## 6.5 Ditch and Watercourse Management

Ditch and watercourse management activities include debris, sediment, and vegetation removal from both natural channels and constructed ditches; repair of bank erosion; and grading and construction of roadside ditches. These activities are undertaken to provide safe, unobstructed drainage for all highway surface runoffs, natural roadside runoffs and ditches; and to create collection areas for debris, ice, and snow.



### Environmental Issues

Primary environmental issues relating to routine ditch and watercourse management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
<b>Debris, Sediment and Vegetation Removal</b>	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse through removal activities</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage habitat through the alteration of instream and riparian vegetation and watercourse structures</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May disturb wildlife species (e.g., birds, beavers) through vegetation removal or the removal of dam and lodge structures</li> </ul>	<ul style="list-style-type: none"> <li>No disturbance, molestation or destruction of a beaver house or den, unless undertaken to provide irrigation or drainage under lawful authority for the protection of property, or if the action is authorized by regulation (<i>Wildlife Act</i>, Section 9)</li> <li>No injury, molestation or destruction of a bird, its egg, and occupied nest, or the nest of an eagle, Peregrine Falcon, Gyrfalcon, Osprey, heron, or Burrowing Owl, unless the species is listed under Schedule C as exempt from this protection (<i>Wildlife Act</i>, Section 34).</li> <li>No killing, capturing, injuring, taking or disturbing migratory birds or damaging, destroying, removing or disturbing their nests, unless permitted under the Act (<i>Migratory Birds Convention Act</i>)</li> </ul>

## Ditch and Watercourse Management

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Bank Erosion Repair	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse through further disturbances to watercourse banks, types of materials used for repairs, proximity of earthmoving equipment to a watercourse</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage habitat by altering instream and bank structures and vegetation through the placement of riprap</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>
Channel Maintenance (grading, construction)	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage habitat by altering instream and bank structures and vegetation</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials excavated from channels</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>



### Best Management Practices

The following BMPs have been compiled for routine maintenance works that **do not** require a *Water Act* Notification or further approvals from regulatory agencies (i.e., works on non-fish bearing roadside runoffs, ephemeral channels which do not contain fish habitat). Should your works require a *Water Act* Notification or DFO authorization (i.e., works on ditches or watercourses which contain fish and other aquatic species or fish habitat), you will be provided with more detailed BMPs by the regulatory agencies in response to your application.

The BMPs provided in this document are provided as guidelines to help you ensure your works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.



**Assessing Potential Risks**

Watercourses can generally be divided into the following three classes based on their habitat value and the level of protection they require:

1. Any fish-bearing wetted channel
2. Any wetted channel where fish may not be present yet which provides food, nutrients, or cool water to downstream watercourses and habitat for other aquatic species
3. Any non-fish-bearing channel which dries after rainfall and provides insignificant food, nutrient or habitat value

Consider what type of watercourse you will be working in when assessing the level of regulatory agency contact your works will require.

**If you are planning work in or around watercourses that provide direct or indirect fish habitat, contact WLAP and DFO.**

**REGULATORY AGENCY CONTACT**

- Prior to beginning your ditch and watercourse management activities, identify any sensitive habitat areas, including wetted ditches and natural watercourses – streams, lakes and marine foreshores, found within your work area.
- Determine how much impact your required works will have on the identified areas. Are you planning to re-grade a non-vegetated roadside drainage ditch that only conveys storm water? Are you required to remove debris jams from a permanently wetted fish-bearing watercourse that crosses the highway right-of-way? What type of equipment and materials are you planning to use to stabilize a large lakeside section of highway embankment that has been damaged by erosion? Are there any areas within your jurisdiction prone to regular debris accumulations or erosion issues? By asking these questions, you should be able to identify any planned works or areas that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

**Important Note:**

The *Water Act* (Sections 44(1)(d) and (k)) permits MoT to carry out restoration and maintenance of a stream channel as well as repair or maintenance of erosion protection works through a Notification process, providing certain conditions are met. For information on what works are permitted and application submission requirements, review WLAP's *Standards and Best Practices for Instream Works* document at <http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

DFO, however, may view your ditch and watercourse maintenance works affecting fish bearing watercourses or fish habitat as causing a harmful alteration, disruption, or destruction (or “HADD”) of fish habitat and require you to obtain an authorization for your works under Section 35(2) of the *Fisheries Act*. Contact the DFO Habitat Management staff at your local DFO office for further information.

**TIMING OF WORKS**

For most work activities within this category, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons. If the work schedule requires working in the rain, the area of work must be isolated

## Ditch and Watercourse Management

### Beaver and Beaver Dam Management

If your works require you to modify or remove a beaver dam, you will require a permit for the works under the *Wildlife Act* Regulations.

Contact your local Conservation Officer for assistance. Permit applications may be submitted online through WLAP's Permit and Authorization Service Bureau (<http://wlapwww.gov.bc.ca/pasb/>)

Best Management Practices for beaver dam modifications and removals may be found in the *WLAP Standards and Best Practices for Instream Works* document, accessible online at <http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances.

- If your maintenance activities require work instream, you must schedule them to coincide with your region's instream work window. Contact your local WLAP and DFO offices for further information on timing windows in your District.

### Emergency Debris Removal

- If there is a demonstrable risk posed to highway stability and safety by debris or other materials limiting drainage within or across the highway right-of-way during a flood event, it is appropriate for you to undertake works to reduce the flood threat as soon as possible. Where possible, notify your local WLAP Habitat Officers and DFO Habitat Management staff before beginning your debris removal works or as soon as you are able. Limit your work to only that which is required to reduce the threat to the highway and associated structures. Take steps to minimize your impact to watercourse structures and vegetation and ensure that appropriate measures (e.g., erosion and sediment control, revegetation) are in place to mitigate any impacts resulting from your work.

### SITE MANAGEMENT

- Minimize disturbance to areas surrounding the worksite and avoid impacts to surrounding trees and shrubs when preparing your worksite and undertaking your maintenance works. To assist with bank stability leave topsoil and root systems intact on upper portions of cleaned channel banks and above areas where riprap is placed.

### EQUIPMENT USE

- Select appropriate equipment and work access routes to reduce damage to riparian vegetation and watercourse banks when using earth-moving equipment.
- If removing debris from a watercourse, operate equipment from the bank or road shoulder. Do not allow machinery to cross through water.
- Ensure all equipment used on site is well maintained and free of fluid leaks. Refuel and lubricate equipment on dry land away from watercourses. Use drip trays to contain any spillage during equipment maintenance.

### WORKSITE ISOLATION

- Isolate your work area from any flowing water that may be present. Ensure any flows are temporarily diverted around the portion of the ditch or watercourse where you are working.
- Contain any sediment-laden water generated during your works in an isolated work cell. Use a pump to draw sediment-laden water out of the

work cell and discharge it to a level vegetated area where sediment can settle as the water infiltrates the ground.

**EROSION AND SEDIMENT CONTROL**

- Use clean materials, free of fine soils that may contribute sediment to the watercourse, when installing riprap or other bank erosion protection measures.
- If excavated materials or any other erodible materials are to be left on site, ensure they are placed in a manner that will prevent the introduction of sediment to any watercourse (i.e., temporary covers, grading and seeding, installation of silt fence around spoil piles).
- Install appropriate erosion and sediment control devices (e.g., silt fence installed below disturbed slopes, rock check dams and temporary silt dikes in low velocity, low volume ditches) to prevent the movement of sediment to downstream watercourses. Ensure that any structures installed are maintained and monitored until they are no longer needed (i.e., vegetative cover on seeded areas is adequate to control erosion).



**Key Information Sources**

The documents and websites listed below are recommended resources for ditch and watercourse management. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- *Riprap - Skeena BMPs for Road Maintenance.* 2003. MoT.  
[http://www.th.gov.bc.ca/publications/eng\\_publications/best\\_practices/bp.pdf](http://www.th.gov.bc.ca/publications/eng_publications/best_practices/bp.pdf)
- *Ditching - Skeena BMPs for Road Maintenance.* 2003. MoT.  
[http://www.th.gov.bc.ca/publications/eng\\_publications/best\\_practices/bp.pdf](http://www.th.gov.bc.ca/publications/eng_publications/best_practices/bp.pdf)

**Standards and Best Practices For Instream Works.** March 2004.

Ministry of Water, Land and Air Protection.

<http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

**General Best Management Practices to Protect Water Quality website.**

June 2004. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection.

[http://wlapwww.gov.bc.ca/wat/wq/nps/BMP\\_Compendum/General/General\\_Home.htm](http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendum/General/General_Home.htm)

**Catalogue of Stormwater Best Management Practices.** 2<sup>nd</sup> Edition, August 2001. Idaho Department of Environmental Quality.

[http://www.deq.state.id.us/water/stormwater\\_catalog/index.asp](http://www.deq.state.id.us/water/stormwater_catalog/index.asp)

**Agricultural Watercourse Maintenance Guide for the Lower Fraser Valley/Vancouver Island.** June 2001. Ministry of Agriculture, Food, and Fisheries and Ministry of Water, Land and Air Protection.  
<http://www.agf.gov.bc.ca/resmgmt/ditchpol/guide/AgWatercourseMaintenance.pdf>

**Manual of Control of Erosion and Shallow Slope Movement.** August 1997. Ministry of Transportation.  
[http://www.th.gov.bc.ca/publications/eng\\_publications/environment/references/Man\\_Control\\_Erosion.pdf](http://www.th.gov.bc.ca/publications/eng_publications/environment/references/Man_Control_Erosion.pdf)



### **Checklist for Environmental Protection Requirements**

<ul style="list-style-type: none"><li><input type="checkbox"/> Is your proposed work considered a “routine: maintenance activity”? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.</li><li><input type="checkbox"/> Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.</li><li><input type="checkbox"/> Have site-specific environmental protection requirements been identified? List below:<ul style="list-style-type: none"><li><input type="checkbox"/> _____</li><li><input type="checkbox"/> _____</li><li><input type="checkbox"/> _____</li><li><input type="checkbox"/> _____</li></ul></li></ul>
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Highway Maintenance  
Specification Section

2-260 Drainage Appliance  
Maintenance

## 6.6 Drainage Appliance Management

Drainage appliance management activities are undertaken to ensure that highway surfaces are safe and efficiently drained, water is efficiently channeled to ditches and watercourses, and erosion of highways and adjacent properties is prevented. They include the cleaning and maintenance of drainage appliances and related hardware, as well as the replacement of existing and installation of new drainage appliances.



### Environmental Issues

Primary environmental issues relating to routine drainage appliance management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Debris and Sediment Removal	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances (de-icing compounds in accumulated winter aggregate, heated water used to clear ice blocks from drainage appliance) to a watercourse through removal activities</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, sediment, de-icing compounds and chlorinated water.</li> </ul>
	<ul style="list-style-type: none"> <li>May damage roadside riparian vegetation or other significant habitats through the side casting of rock or soils</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act Regulation</i>, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage habitat through the improper location of disposal sites in ditches, wetlands, or other significant habitat areas</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act Regulation</i>, Part 7).</li> </ul>
Repair Works	<ul style="list-style-type: none"> <li>May release deleterious substances (sediment, cement-based products, epoxies, sealants) to a watercourse</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, paints, sealants, concrete leachate, and sediment.</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>

## Drainage Appliance Management

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Installation of New Drainage Appliances	<ul style="list-style-type: none"> <li>May damage habitat by altering instream and bank structures and vegetation through construction and installation activities</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (Fisheries Act, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage habitat through the enclosure of an existing open channel, should the drainage appliance be located on a roadside channel containing fish habitat</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (Fisheries Act, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May release deleterious substances (sediment, cement-based products, epoxies, sealants) to a watercourse</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, paints, cleaners, concrete leachate, and sediment.</li> </ul>
Placement of Scour Protection (Riprap)	<ul style="list-style-type: none"> <li>May damage habitat by altering instream and bank structures and vegetation through the placement of riprap</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (Fisheries Act, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse through bank disturbance or the placement of rock material contaminated with fine sediment</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>



### Best Management Practices

The following BMPs have been compiled for routine maintenance works that **do not** require a *Water Act* Notification or further approvals from regulatory agencies (i.e., works on non-fish bearing roadside runoffs, ephemeral channels which do not contain fish habitat). Should your works require a *Water Act* Notification or DFO authorization (i.e., works on ditches or watercourses which contain fish and other aquatic species or fish habitat), you will be provided with more detailed BMPs by the regulatory agencies in response to your application.

The BMPs in this document are provided as guidelines to help you ensure your works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

### REGULATORY AGENCY CONTACT

- Prior to beginning your drainage appliance management activities, identify any sensitive habitat areas, including wetted ditches and natural watercourses – streams, lakes and marine foreshores, found within your work area.

**Assessing Potential Risks**

Watercourses can generally be divided into the following three classes based on their habitat value and the level of protection they require:

1. Any fish-bearing wetted channel
2. Any wetted channel where fish may not be present yet which provides food, nutrients, or cool water to downstream watercourses and habitat for other aquatic species
3. Any non-fish-bearing channel which dries after rainfall and provides insignificant food, nutrient or habitat value

Consider what type of watercourse you will be working in when assessing the level of regulatory agency contact your works will require.

**If you are planning work in or around watercourses that provide direct or indirect fish habitat, contact WLAP and DFO.**

- Determine how much impact your required works will have on the identified areas. Are you planning to replace a small diameter culvert that conveys storm water to a non-vegetated roadside drainage ditch? Are you required to remove debris jams from a culvert on a permanently wetted fish-bearing watercourse that crosses the highway right-of-way? What type of equipment and materials are you planning to use to stabilize a large lakeside section of highway embankment that has been damaged by erosion? Are there any areas within your jurisdiction prone to regular debris accumulations or erosion issues? By asking these questions, you should be able to identify any planned works or areas that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

**TIMING OF WORKS**

For most work activities within this category, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances.
- If your maintenance activities require work instream, you must schedule them to coincide with your region’s instream work window. Contact your local WLAP and DFO offices for further information on timing windows in your District.

**Emergency Debris Removal or Drainage Appliance Repair**

- If there is a demonstrable risk posed to highway stability and safety by debris or other materials limiting drainage within or across the highway right-of-way during a flood event, it is appropriate for you to undertake works to reduce the flood threat as soon as possible. Where possible, notify your local WLAP Habitat Officers and DFO Habitat Management staff before beginning your debris removal works or as soon as you are able. Limit your work to only that which is required to reduce the threat to the highway and associated structures. Take steps to minimize your impact to watercourse structures and vegetation and ensure that appropriate measures (e.g., erosion and sediment control, revegetation) are in place to mitigate any impacts resulting from your work.

### Beaver and Beaver Dam Management

If your works require you to modify or remove a beaver dam, you will require a permit for the works under the *Wildlife Act* Regulations. Contact your local Conservation Officer for assistance. Permit applications may be submitted online through WLAP's Permit and Authorization Service Bureau (<http://wlapwww.gov.bc.ca/pasb/>)

Best Management Practices for beaver dam modifications and removals may be found in the WLAP *Standards and Best Practices for Instream Works* document, accessible online at <http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

#### Important Note:

The *Water Act* (Section 44 (1)(p)) permits MoT to remove obstructions, including beaver dams, as an **emergency** measure if the dams are obstructing bridges or road culverts during flood conditions. However, DFO may view dam removal as causing a harmful alteration, disruption, or destruction (or "HADD") of fish habitat and require you to obtain an authorization for your works under Section 35 (2) of the *Fisheries Act* prior to undertaking the works.

For information on emergency works and application submission requirements, contact your local WLAP Habitat Officers or review WLAP's *Standards and Best Practices for Instream Works* document at <http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

### SITE MANAGEMENT

- Minimize disturbance to areas surrounding the worksite and avoid impacts to surrounding trees and shrubs when preparing your worksite and undertaking your maintenance works. To assist with bank stability leave topsoil and root systems intact on channel banks surrounding your work area.
- Ensure any works to repair damaged appliances retain the pre-repair channel conditions (e.g., streambed profile, substrate, channel cross-section) and do not constrict the stream width.

### EQUIPMENT USE

- Select appropriate equipment and work access routes to reduce damage to riparian vegetation and watercourse banks when using earth-moving equipment.
- For smaller scale debris and sediment removal activities, remove materials by hand.
- If working near a watercourse, operate equipment from the bank or road shoulder. Do not allow machinery to cross through water.
- Ensure all equipment used on site is well maintained and free of fluid leaks. Refuel and lubricate equipment on dry land away from watercourses. Use drip trays to contain any spillage during equipment maintenance.

### WORKSITE ISOLATION

- Isolate your work area from any flowing water that may be present. Ensure any flows are temporarily diverted around the portion of the ditch or watercourse where you are working.
- If potentially deleterious materials (e.g., cement-based products) are used for repair works, ensure raw material and wash water will not be released to any watercourse.



- Contain any sediment-laden water generated during your works in your isolated work cell. Use a pump to draw sediment-laden water out of the work cell and discharge it to a level vegetated area where sediment can settle as the water infiltrates the ground.

**WASTE AND MATERIALS MANAGEMENT**

- Have a spill response plan in place and spill kits on site.
- Clean equipment and tools off-site, if possible. Ensure that any wash water generated by cleaning tools and equipment is managed in a manner that will prevent its release to watercourses or road drains.
- Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site. Any clean surplus material should be removed to an area where it will not enter any watercourse, ditch, or channel.
- Dispose of excess materials, excavated soils, and removed debris away from any watercourse. Ensure that the material is placed in such a manner as to prevent its future introduction into any watercourse by installing silt fencing, seeding, or using similar sediment control BMPs..

**Debris Removal**

- If excavated materials or any other erodible materials are to be left on site, ensure they are placed in a manner that will prevent the introduction of sediment to any watercourse (i.e., temporary covers, grading and seeding, installation of silt fence around spoil piles).

**Repair Works**

- Store any hazardous materials use (chemicals, sealants, patching materials) in accordance with applicable regulations and ensure that deleterious substances are handled with care.
- Mix concrete compounds, sealants or other chemicals used in a contained area and away from any watercourse if there is the potential for materials used in your work to contact soils or surface waters adjacent to the road surface.

**EROSION AND SEDIMENT CONTROL**

- Install appropriate erosion and sediment control devices (e.g., silt fence installed below disturbed slopes, rock check dams and temporary silt dikes in low velocity, low volume ditches) to prevent the transportation of sediment to downstream watercourses. Ensure that any structures installed are maintained and monitored until they are no longer needed (i.e., vegetative cover on seeded areas is adequate to control erosion).
- Use clean materials, free of fine soils that may contribute sediment to the watercourse, when installing rock or other scour protection measures.





### Checklist for Environmental Protection Requirements

- Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
- Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
- Have site-specific environmental protection requirements been identified? List below:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

Highway Maintenance  
Specification Section

2-270 Shore, Bank, and  
Watercourse  
Maintenance

## 6.7 Shore, Bank, and Watercourse Management

To protect highway safety and stability, shore, bank and watercourse management activities include the removal of obstructions, beaver dams, and debris from natural and man-made shores, banks, and watercourses and the placement of riprap for bank protection.



### Environmental Issues

Primary environmental issues relating to routine shore, bank and watercourse management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
<b>Obstruction, Beaver Dam, and Debris Removal</b>	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse through removal activities</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, and sediment.</li> </ul>
	<ul style="list-style-type: none"> <li>May damage riparian vegetation or disturb wildlife through the removal of trees adjacent to watercourses</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No injury, molestation or destruction of a bird, its egg, and occupied nest, or the nest of an eagle, Peregrine Falcon, Gyrfalcon, Osprey, heron, or Burrowing Owl, unless the species is listed under Schedule C as exempt from this protection (<i>Wildlife Act</i>, Section 34).</li> <li>No killing, capturing, injuring, taking or disturbing migratory birds or damaging, destroying, removing or disturbing their nests, unless permitted under the Act (<i>Migratory Birds Convention Act</i>)</li> </ul>
	<ul style="list-style-type: none"> <li>May damage fish and wildlife habitat through removal of beaver dams</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No disturbance, molestation or destruction of a beaver house or den, unless undertaken to provide irrigation or drainage under lawful authority for the protection of property, or if the action is authorized by regulation (<i>Wildlife Act</i>, Section 9)</li> </ul>
<b>Bank Protection (Riprap)</b>	<ul style="list-style-type: none"> <li>May harmfully alter shorelines and channel banks through the placement of riprap materials</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse through site preparation for riprap placement or the placement of silt-laden or acid-rock riprap materials</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, sediment, and acid-rock leachate.</li> </ul>



## Best Management Practices

The following BMPs have been compiled for routine maintenance works that **do not** require a *Water Act* Notification or further approvals from regulatory agencies (i.e., works on non-fish bearing roadside runoffs, ephemeral channels which do not contain fish habitat). Should your works require a *Water Act* Notification or DFO authorization (i.e., works on ditches or watercourses which contain fish and other aquatic species or fish habitat), more detailed BMPs will be provided to you by the regulatory agency in response to your application.

### Assessing Potential Risks

Watercourses can generally be divided into the following three classes based on their habitat value and the level of protection they require:

1. Any fish-bearing wetted channel
2. Any wetted channel where fish may not be present yet which provides food, nutrients, or cool water to downstream watercourses and habitat for other aquatic species
3. Any non-fish-bearing channel which dries after rainfall and provides insignificant food, nutrient or habitat value

Consider what type of watercourse you will be working in when assessing the level of regulatory agency contact your works will require.

**If you are planning work in or around watercourses that provide direct or indirect fish habitat, contact WLAP and DFO.**

The BMPs provided in this document are provided as guidelines to help you ensure your works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

### REGULATORY AGENCY CONTACT

- Prior to beginning your planned shore, bank and watercourse management activities, identify any sensitive habitat areas including wetted ditches and natural watercourses – streams, lakes and marine foreshores– found within your work area.
- Determine how much impact your required works will have on the identified areas. Are you planning to install riprap along a bank on a non-vegetated roadside drainage ditch that only conveys storm water or a large area of marine foreshore? Are you required to remove trees from riparian areas to prevent future blockages? Will you be impacting areas of vegetation along a lakeshore as a result of your riprap placement? Are there any areas within your jurisdiction prone to regular debris accumulations or erosion issues? By asking these questions, you should be able to identify any planned works or areas that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

### TIMING OF WORKS

For most work activities within this category, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances.

## Shore, Bank, and Watercourse Management

### Beaver and Beaver Dam Management

If your works require you to modify or remove a beaver dam, you will require a permit for the works under the *Wildlife Act* Regulations. Contact your local Conservation Officer for assistance. Permit applications may be submitted online through WLAP's Permit and Authorization Service Bureau (<http://wlapwww.gov.bc.ca/pas/b/>)

Best Management Practices for beaver dam modifications and removals may be found in the WLAP *Standards and Best Practices for Instream Works* document, accessible online at <http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

- If your maintenance activities require work instream, you must schedule them to coincide with your region's instream work window. Contact your local WLAP and DFO offices for further information on timing windows in your District.

### Emergency Debris Removal or Erosion Protection Works

- If there is a demonstrable risk posed to highway stability and safety by debris or other materials limiting drainage within or across the highway right-of-way during a flood event, it is appropriate for you to undertake works to reduce the flood threat as soon as possible. Where possible, notify your local WLAP Habitat Officers and DFO Habitat Management staff before beginning your debris removal works or as soon as you are able. Limit your work to only that which is required to reduce the threat to the highway and associated structures. Take steps to minimize your impact to watercourse structures and vegetation and ensure that appropriate measures (e.g., erosion and sediment control, revegetation) are in place to mitigate any impacts resulting from your work.

#### **Important Note:**

The *Water Act* (Section 44 (1)(p)) permits MoT to remove obstructions, including beaver dams, as an **emergency** measure if the dams are obstructing bridges or road culverts during flood conditions. The *Water Act* (Section 44 (1)(o)) also permits the construction or placement of erosion protection works or flood protection works during a **flood emergency**. However, DFO may view dam removal works or riprap placement as causing a harmful alteration, disruption, or destruction (or "HADD") of fish habitat and require you to obtain an authorization for your works under Section 35 (2) of the *Fisheries Act* prior to undertaking the works.

For information on emergency works and application submission requirements, contact your local DFO Habitat Management staff and WLAP Habitat Officers or review WLAP's *Standards and Best Practices for Instream Works* document at:

<http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

### **SITE MANAGEMENT**

- Minimize disturbance to areas surrounding the worksite. Avoid impacts to surrounding trees and shrubs when preparing your worksite and undertaking your maintenance works. To assist with bank stability leave topsoil and root systems intact within your work area.
- Ensure any riprap works to armour eroding banks or shores retain the pre-work channel or shore conditions (e.g., streambed profile, substrate,

channel cross-section) as much as possible and do not constrict the stream width.

### **Beaver Dam and Debris Obstruction Removal**

- Remove the dam or obstruction in a controlled manner. Notch the centre of the structure and allow the level of water impounded behind the obstruction to slowly drop.
- Allow water levels on both sides of the obstruction to stabilize before the next level drop; this helps to minimize silt release and reduces the risk of erosion to downstream banks.
- Consider the placement of sediment control measures (i.e., floating silt curtain) downstream to minimize the risk of sediment discharge to downstream areas during obstruction removal.

### **Tree Removal**

- Only remove trees that pose a significant risk of impacting drainage within the highway right-of-way. Vegetation within riparian areas plays a significant role in maintaining bank stability, water quality, and habitat value. Unnecessary impacts to it should be avoided.
- Ensure that no bird or wildlife species are currently occupying the tree and that the tree does not contain a protected nest.
- If possible, limit your removal activities to topping the tree. Leave the stump and root mass in place.
- If the site conditions permit, buck the cut portion of the tree and leave on site, above the high water mark in a manner that will prevent its future movement into the watercourse.

### **EQUIPMENT USE**

- Select appropriate equipment and work access routes to reduce damage to riparian vegetation and watercourse banks.
- For smaller scale debris and sediment removal activities, remove materials by hand.
- When working near watercourses, operate equipment from the bank or road shoulder. Do not allow machinery to cross through water.
- Ensure all equipment used on site is well maintained and free of fluid leaks. Refuel and lubricate equipment on dry land away from watercourses. Use drip trays to contain any spillage during equipment maintenance.

### **WORKSITE ISOLATION**

- Isolate your work area from any flowing water that may be present. Ensure any flows are temporarily diverted around the portion of the ditch or watercourse where you are working.
- Contain any sediment-laden water generated during your works in your isolated work cell. Use a pump to draw sediment-laden water out of the work cell and discharge it to a level vegetated area where sediment can settle as the water infiltrates the ground.

**WASTE AND MATERIALS CONTAINMENT**

- If machinery will be working on site, have a spill response plan in place and spill kits on site.
- Clean equipment and tools off-site, if possible. Ensure that any wash water generated by cleaning tools and equipment is managed in a manner that will prevent its release to watercourses or road drains.
- Dispose of excess materials, excavated soils, and removed debris away from any watercourse. Ensure that the material is placed in such a manner as to prevent its future introduction into any watercourse by installing silt fencing, seeding, or using similar sediment control BMPs.

**EROSION AND SEDIMENT CONTROL**

- If excavated materials or any other erodible materials are to be left on site, ensure they are placed in a manner that will prevent the introduction of sediment to any watercourse (i.e., temporary covers, grading and seeding, installation of silt fence around spoil piles).
- Install appropriate erosion and sediment control devices (e.g., silt fence installed below disturbed slopes, rock check dams and temporary silt dikes in low velocity, low volume ditches) to prevent the movement of sediment to downstream watercourses. Ensure that any structures installed are maintained and monitored until they are no longer needed (i.e., vegetative cover on seeded areas is adequate to control erosion).
- Use clean materials, free of fine soils that may contribute sediment to the watercourse, when installing riprap or other shore or bank protection measures.



**Key Information Sources**

The documents and websites listed below are recommended resources for shore, bank and watercourse management. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- *Riprap - Skeena BMPs for Road Maintenance.* 2003. MoT.  
[http://www.th.gov.bc.ca/publications/eng\\_publications/best\\_practices/bp.pdf](http://www.th.gov.bc.ca/publications/eng_publications/best_practices/bp.pdf)
  - *Removal of Beaver Dams from Culverts at Pre-approved Locations.* 2003. Skeena BMPs for Road Maintenance. MoT.  
[http://www.th.gov.bc.ca/publications/eng\\_publications/best\\_practices/bp.pdf](http://www.th.gov.bc.ca/publications/eng_publications/best_practices/bp.pdf)
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**Standards and Best Practices For Instream Works.** March 2004.  
Ministry of Water, Land and Air Protection.  
<http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

**General Best Management Practices to Protect Water Quality website.**  
June 2004. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection.  
[http://wlapwww.gov.bc.ca/wat/wq/nps/BMP\\_Compendum/General/General\\_Home.htm](http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendum/General/General_Home.htm)

**Catalogue of Stormwater Best Management Practices.** 2<sup>nd</sup> Edition, August 2001. Idaho Department of Environmental Quality.  
[http://www.deq.state.id.us/water/stormwater\\_catalog/index.asp](http://www.deq.state.id.us/water/stormwater_catalog/index.asp)

**Beaver Management Guidelines.** 2001. Ministry of Water, Land and Air Protection. Vancouver Island Region.  
<http://wlapwww.gov.bc.ca/vir/pa/Beaver-Guide.pdf>

**Manual of Control of Erosion and Shallow Slope Movement.**  
August 1997. Ministry of Transportation.  
[http://www.th.gov.bc.ca/publications/eng\\_publications/environment/references/Man\\_Control\\_Erosion.pdf](http://www.th.gov.bc.ca/publications/eng_publications/environment/references/Man_Control_Erosion.pdf)



### Checklist for Environmental Protection Requirements

- Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
- Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
- Have site-specific environmental protection requirements been identified? List below:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

Highway Maintenance  
Specification Section

2-280 Engineered Wetland  
and Water Quality  
Pond Maintenance

## 6.8 Engineered Wetland and Water Quality Pond Management

Engineered wetland and water quality pond management activities include the hand and machine removal of debris from pond inlets and outlets and the repair and replacement of drainage appliances to allow settling of suspended sediments from road runoff and filtering of road runoff prior to discharge downstream.



### Environmental Issues

Primary environmental issues relating to routine engineered wetland and water quality pond management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Cleaning and Debris Removal	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse through sediment and debris removal activities</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage roadside riparian vegetation or other significant habitats through the side casting of accumulated sediment</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage habitat through the improper location of sediment and debris disposal sites in ditches, wetlands, or other significant habitat areas</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
Repair Works	<ul style="list-style-type: none"> <li>May release deleterious substances (sediment, cement-based products, epoxies, sealants) to a watercourse through repair works to drainage appliances</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, paints, sealants, concrete leachate, and sediment.</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials used in repair works (e.g., concrete, sealants, epoxies)</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>

## Engineered Wetland and Water Quality Pond Management

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Replacement of Drainage Appliances	<ul style="list-style-type: none"> <li>May damage habitat by altering instream and bank structures and vegetation through the removal of existing drainage appliances and replacement activities</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May release deleterious substances (sediment, cement-based products, epoxies, sealants) to a watercourse through replacement activities</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, concrete leachate, and sediment.</li> </ul>
Placement of Riprap	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse through site preparation for riprap placement or the placement of silt-laden or acid-rock riprap materials</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, sediment, and acid-rock leachate.</li> </ul>



### Best Management Practices

The following BMPs have been compiled for routine maintenance works that **do not** require a *Water Act* Notification or further approvals from regulatory agencies (i.e., works on engineered wetlands and water quality ponds that are non-fish bearing and disconnected from fish-bearing channels). Should your works require a *Water Act* Notification or DFO authorization (i.e., works on a watercourse that contain fish and other aquatic species or fish habitat), more detailed BMPs will be provided to you by the regulatory agency in response to your application.

The BMPs in this document are provided as guidelines to help you ensure your works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

#### REGULATORY AGENCY CONTACT

- Prior to beginning your engineered wetland and water quality pond management activities, identify any areas that may be of particular concern (sensitive habitat areas) found within your work area.
- Determine how much impact your required works will have on the identified areas. Is your engineered wetland or water quality pond occupied or accessible to fish? Are you removing a small debris pile from the pond inlet by hand or a large volume of accumulated sediment using an excavator? Will you be using cement-based materials or other potentially deleterious substances to repair a drainage appliance? Will your work sites be easy to isolate from flow? By asking these questions, you should be able to identify any planned works or areas that may be of concern to regulatory agencies.

## Engineered Wetland and Water Quality Pond Management

### Assessing Potential Risks

Watercourses can generally be divided into the following three classes, based on their habitat value and the level of protection they require:

1. A fish bearing wetted channel
2. Any wetted channel where fish may not be present yet which provides food, nutrients, or cool water to downstream watercourses and habitat for other aquatic species
3. Any non-fish-bearing channel which dries after rainfall and provides insignificant food, nutrient or habitat value

Consider what type of watercourse you will be working in when assessing the level of regulatory agency contact your works will require.

**If you are planning work in or around watercourses that provide direct or indirect fish habitat, contact WLAP and DFO.**

- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

### TIMING OF WORKS

For most work activities within this category, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances.

### SITE MANAGEMENT

- Minimize disturbance to areas surrounding the worksite and avoid impacts to surrounding trees and shrubs when preparing your worksite and undertaking your maintenance works.

### EQUIPMENT USE

- Ensure all equipment used on site is well maintained and free of fluid leaks. Refuel and lubricate equipment on dry land away from watercourses. Use drip trays to contain any spillage during equipment maintenance.

### WORKSITE ISOLATION

- Isolate your work area from any flowing water that may be present. Ensure any flows are temporarily diverted around the wetland or pond.
- Contain any sediment-laden water generated during your works within your isolated work cell. Allow any generated sediment time to settle from the water column and ensure that water discharging from the pond is clear and free of sediment.

### WASTE AND MATERIALS CONTAINMENT

- Have a spill response plan in place and spill kits on site.
- Use clean materials, free of fine soils that may contribute sediment to the watercourse, when installing riprap or other bank erosion protection measures.
- If potentially deleterious materials (e.g., cement-based products) are used for repair works, ensure raw material and wash water will not be released to any watercourse.
- Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site. Any clean surplus material

should be removed to an area where it will not enter any watercourse, ditch, or channel.

- Dispose of excess materials, excavated soils, and removed debris away from any watercourse. Ensure that the material is placed in such a manner as to prevent its future introduction into any watercourse by installing silt fencing, seeding, or using similar sediment control BMPs.

**EROSION AND SEDIMENT CONTROL**

- If excavated materials or any other erodible materials are to be left on site, ensure they are placed in a manner that will prevent the introduction of sediment to any watercourse (i.e., temporary covers, grading and seeding, installation of silt fence around spoil piles).
- Install appropriate erosion and sediment control devices (e.g., silt fence installed below disturbed slopes, rock check dams and temporary silt dikes in low velocity, low volume outflow ditches) to prevent the transportation of sediment from your work area to downstream watercourses. Ensure that any structures installed are maintained and monitored until they are no longer needed (i.e., vegetative cover on seeded areas is adequate to control erosion).



**Key Information Sources**

The documents and websites listed below are recommended resources for engineered wetland and water quality pond management activities. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Pond and Wetland Replacement Fact Sheet.** 2000. Environmental Management Section, Engineering Branch. Ministry of Transportation. [http://www.th.gov.bc.ca/publications/eng\\_publications/environment/references/Ponds\\_and\\_Wetlands\\_Fact\\_Sheet.pdf](http://www.th.gov.bc.ca/publications/eng_publications/environment/references/Ponds_and_Wetlands_Fact_Sheet.pdf)

**Case Study: Engineered Wetlands – Inland Island Highway.** Stewardship Centre website. Ministry of Transportation. [http://www.stewardshipcentre.bc.ca/caseStudies/cs\\_builder.asp?request\\_no=147](http://www.stewardshipcentre.bc.ca/caseStudies/cs_builder.asp?request_no=147)

**Standards and Best Practices For Instream Works.** March 2004. Ministry of Water, Land and Air Protection. <http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

**Catalogue of Stormwater Best Management Practices.** 2<sup>nd</sup> Edition, August 2001. Idaho Department of Environmental Quality.  
[http://www.deq.state.id.us/water/stormwater\\_catalog/index.asp](http://www.deq.state.id.us/water/stormwater_catalog/index.asp)

**Manual of Control of Erosion and Shallow Slope Movement.** August 1997. Ministry of Transportation.  
[http://www.th.gov.bc.ca/publications/eng\\_publications/environment/references/Man\\_Control\\_Erosion.pdf](http://www.th.gov.bc.ca/publications/eng_publications/environment/references/Man_Control_Erosion.pdf)



### **Checklist for Environmental Protection Requirements**

<input type="checkbox"/> Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
<input type="checkbox"/> Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
<input type="checkbox"/> Have site-specific environmental protection requirements been identified? List below: <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____

Highway Maintenance  
Specification Section

- 3-300 Highway Snow Removal
- 3-310 Winter Abrasive and Chemical Snow and Ice Control
- 3-320 Roadside Snow and Ice Control

## 6.9 Winter Road Management

Winter road maintenance activities include snow removal, snow and ice control, and application of winter abrasives and de-icing chemicals. These activities are undertaken to ensure winter road surfaces remain clear and safe for the traveling public.



### Environmental Issues

Primary environmental issues relating to routine winter road management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
<b>Snow Removal</b>	<ul style="list-style-type: none"> <li>• May introduce sediment or other deleterious substances to a watercourse through snow removal activities or improper storage</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> <li>• Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>
	<ul style="list-style-type: none"> <li>• May damage roadside riparian vegetation or other significant habitats through the side casting of accumulated sediment and de-icing compounds</li> </ul>	<ul style="list-style-type: none"> <li>• No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>• No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>• May damage habitat through the improper location of sediment and debris disposal sites in ditches, wetlands, or other significant habitat areas</li> </ul>	<ul style="list-style-type: none"> <li>• No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>• No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
<b>Application of Winter Aggregate and De-icing Compounds</b>	<ul style="list-style-type: none"> <li>• May introduce sediment or other deleterious substances to a watercourse through application or improper materials containment at storage location</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> <li>• Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>
	<ul style="list-style-type: none"> <li>• May damage roadside riparian vegetation or other significant habitats through the over-spraying of de-icing compounds</li> </ul>	<ul style="list-style-type: none"> <li>• No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>• No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>



### Best Management Practices

The following BMPs are provided as guidelines to help you ensure your routine works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.





Local and regional information sources (fill in with any locally-developed BMPs):

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Water Quality Best Management Practices Compendium Website.** Water, Air and Climate Change Branch, MWLAP.

[http://wlapwww.gov.bc.ca/wat/wq/nps/BMP Compendium/BMP Introduction/bmphome.htm](http://wlapwww.gov.bc.ca/wat/wq/nps/BMP%20Compendium/BMP%20Introduction/bmphome.htm)

**Road Salt and Snow and Ice Control Primer.** Transportation Association of Canada. December 1999.

<http://www.tac-atc.ca/english/roadsalt/primer.pdf>

**Roadsalt and Winter Maintenance for British Columbia Municipalities, Best Management Practices to Protect Water Quality.** Warrington, P.D. December 1998

Warrington, P.D. December 1998

<http://wlapwww.gov.bc.ca/wat/wq/bmps/roadsalt.html>

**Environmental Impacts of Road Salts.** Environment Canada Science and Environment Bulletin. January/February 2002.

[http://www.ec.gc.ca/science/sandejan02/article3\\_e.html](http://www.ec.gc.ca/science/sandejan02/article3_e.html)



### Checklist for Environmental Protection Requirements

<input type="checkbox"/> Is your proposed work considered a “routine: maintenance activity”? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
<input type="checkbox"/> Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
<input type="checkbox"/> Have site-specific environmental protection requirements been identified? List below:
<input type="checkbox"/> _____
<input type="checkbox"/> _____
<input type="checkbox"/> _____
<input type="checkbox"/> _____

Highway Maintenance  
Specification Section

4-350 Roadside Vegetation  
Maintenance

## 6.10 Roadside Vegetation Management

Roadside vegetation management activities include mowing, brushing, and landscape maintenance activities undertaken to maintain clear sight lines for highway users, control noxious weeds, facilitate effective drainage, and reduce possible fire hazards.



### Environmental Issues

Primary environmental issues relating to routine roadside vegetation management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Brushing	<ul style="list-style-type: none"> <li>May disturb riparian vegetation (upland fish habitat)</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (Fisheries Act, Section 35(1)).</li> </ul>
	<ul style="list-style-type: none"> <li>May expose erodible soils and promote sediment discharge or cause erosion of watercourse banks if riparian buffer zones along watercourses are cleared</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (Fisheries Act, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (Water Act, Section 9), or through a Notification (Water Act Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May disturb birds and their nests</li> </ul>	<ul style="list-style-type: none"> <li>No injury, molestation or destruction of a bird, its egg, and occupied nest, or the nest of an eagle, Peregrine Falcon, Gyrfalcon, Osprey, heron, or Burrowing Owl, unless the species is listed under Schedule C as exempt from this protection (<i>Wildlife Act</i>, Section 34).</li> <li>No killing, capturing, injuring, taking or disturbing migratory birds or damaging, destroying, removing or disturbing their nests, unless permitted under the Act (<i>Migratory Birds Convention Act</i>)</li> </ul>
Mowing	<ul style="list-style-type: none"> <li>May disturb riparian vegetation (upland fish habitat)</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (Fisheries Act, Section 35(1)).</li> </ul>
	<ul style="list-style-type: none"> <li>May disturb birds and their nests</li> </ul>	<ul style="list-style-type: none"> <li>No injury, molestation or destruction of a bird, its egg, and occupied nest, or the nest of an eagle, Peregrine Falcon, Gyrfalcon, Osprey, heron, or Burrowing Owl, unless the species is listed under Schedule C as exempt from this protection (<i>Wildlife Act</i>, Section 34).</li> <li>No killing, capturing, injuring, taking or disturbing migratory birds or damaging, destroying, removing or disturbing their nests, unless permitted under the Act (<i>Migratory Birds Convention Act</i>)</li> </ul>
Noxious Weed Removal	<ul style="list-style-type: none"> <li>May contribute to the spread of noxious weeds if the removed material is improperly handled</li> </ul>	<ul style="list-style-type: none"> <li>No dispersal of noxious weeds or their seeds (<i>Weed Control Act</i>, Weed Control Regulation)</li> </ul>



## **Best Management Practices**

The following BMPs are provided as guidelines to help you ensure your routine works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

### **REGULATORY AGENCY CONTACT**

- Work with your local regulatory agencies to establish a protocol for vegetation removal in your area.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

### **TIMING OF WORKS**

- Be aware that vegetation clearing can negatively impact nesting birds in spring and early summer. Inspect your work area for any occupied bird nests, eggs, or nests of species protected under the *Wildlife Act* and *Migratory Bird Convention Act* during this period.

### **Riparian Buffer Widths**

The width of vegetation you are required to protect on each bank of a watercourse can vary greatly depending on the specific conditions of the site.

Contact your local regulatory agencies to discuss what buffer widths are applied in your area.

### **SITE MANAGEMENT**

- Keep cut vegetation out of the watercourse. Move debris away from the bank to prevent its movement into the channel.
- If your works create areas of exposed soils and there is the potential for sediment to be transported to a watercourse, install appropriate erosion and sediment controls. Areas of exposed soils should be stabilized through reseeded or some other manner.

### **Brushing and Mowing**

- Prior to beginning your vegetation management activities, identify sensitive habitat areas, including watercourses – streams, lakes and marine foreshores– found within your work area.
- Determine how much impact your required works will have on the identified areas – are you required to remove a sight distance obstruction on an inside curve above a watercourse crossing? Are you required to mow vegetation within a drainage ditch that may constitute fish habitat? By asking these questions, you should be able to identify planned works that may be of concern to regulatory agencies.
- Maintain established riparian buffer zones, which should be visible from past vegetation removal activity. If no clear buffer zone is visible, determine the width of the buffer required for the watercourse. Typical widths may range from 15-50m, but the required width will vary depending on factors including the type and size of the watercourse and its fisheries value. Consultation



**Riparian Management Area Guidebook.** 1995. Forest Practices Code. Ministry of Forests.  
<http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/riparian/Rip-toc.htm>

**BC Weed Control Act: Noxious Weeds in BC Website.** Ministry of Agriculture, Food and Fisheries.  
<http://www.agf.gov.bc.ca/cropprot/noxious.htm>

**Roadside Vegetation Management Website.** US Department of Transportation, Federal Highway Administration  
<http://www.fhwa.dot.gov/environment/vegmt/>



### Checklist for Environmental Protection Requirements

- Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
- Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
- Have site-specific environmental protection requirements been identified? List below:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

Highway Maintenance  
Specification Section

4-380 Rest Area and  
Roadside Facilities  
Maintenance

## 6.11 Rest Area and Roadside Facilities Management

Highway rest areas and roadside facilities require regular maintenance activities, including septic field maintenance, disposal of compost toilet materials, and litter and garbage collection, to ensure they remain safe and useable for the driving public.



### Environmental Issues

Primary environmental issues relating to routine rest area and roadside facilities management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Septic System Maintenance	<ul style="list-style-type: none"> <li>May pose a threat of disease through improper storage or disposal of sewage</li> </ul>	<ul style="list-style-type: none"> <li>Installation, construction and maintenance of sewage disposal facilities in accordance with applicable legislation (<i>BC Health Act, Sewage Disposal Regulations</i>)</li> <li>Disposal and storage of septic wastes in accordance with local public health regulations and bylaws</li> </ul>
	<ul style="list-style-type: none"> <li>May damage habitat through the improper location of septic systems or disposal sites near ditches, wetlands, or other significant habitat areas</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act, Sections 34(1) and 36(3)</i>).</li> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act, Section 35(1)</i>).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act, Section 9</i>), or through a Notification (<i>Water Act Regulation, Part 7</i>).</li> </ul>
Garbage and Litter Disposal	<ul style="list-style-type: none"> <li>May cause a threat to both wildlife and public safety through the attraction of wildlife to rest areas and roadside facilities</li> </ul>	<ul style="list-style-type: none"> <li>Disposal and storage of carcasses in a manner that will not attract dangerous wildlife (<i>Wildlife Act, local bylaws</i>)</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage or disposal of waste materials</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act, Special Wastes Regulation</i>)</li> </ul>



### Best Management Practices

The following BMPs are provided as guidelines to help you ensure your routine works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

**REGULATORY AGENCY CONTACT**

- Prior to beginning your rest area and roadside facilities management activities, identify any sensitive habitat areas, including watercourses – streams, lakes and marine foreshores– found within your work area.
- Determine how much impact your required works will have on the identified areas. Are you replacing a septic tank at a lakeside rest area? Where will you place the wastes you remove from the site? By asking these questions, you should be able to identify any planned works that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline any planned works of concern (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

**TIMING OF WORKS**

For most work activities within this category, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances.
- If your maintenance activities require work instream, you must schedule them to coincide with your region’s instream work window. Contact your local WLAP and DFO offices for further information on timing windows for your District.

**SITE MANAGEMENT**

- Should your works involve the disturbance of soils or the use of erodible materials (e.g., sands, topsoil) near watercourses, prevent the transport of sediment through the installation of appropriate erosion and sediment control BMPs and devices.

**Septic Waste Systems**

- Maintain septic tanks and fields in accordance with manufacturer’s maintenance specifications.
- Divert surface water, perimeter drains and roof drains away from septic fields.
- Ensure no trees or plants with strong root systems are planted near septic fields and tanks.
- Limit the use of bleaches and chemical cleaners and ensure toxic substances are not placed in toilets.

**EQUIPMENT USE**

- Ensure any equipment used on site is well maintained and free of fluid leaks.
- Clean equipment and tools in a manner that will ensure any wash water generated is managed so as to prevent its release to watercourses or road drains.

**WASTE AND MATERIALS CONTAINMENT**

- Store any hazardous materials used in accordance with applicable regulations and ensure that deleterious substances are handled with care.
- Mix any hazardous materials to be used in a contained area to reduce the risk of contaminating soils or surface waters adjacent to the road surface.
- Ensure septic tanks are cleaned regularly, as required by use levels and maintenance requirements.

**Garbage and Waste Disposal**

- Use secure garbage containers designed to be “bear-proof” or inaccessible to wildlife.
- Remove any accumulated garbage or litter regularly and dispose of at a designated landfill.
- Do not bury garbage onsite.
- Ensure composted waste is disposed of in accordance with applicable public health regulations.
- Dispose of composted waste only when it is completely decomposed.
- If compost is disposed of on-site, bury compost materials completely, near tree roots or other non-edible plants and away from watercourses and wells.



**Key Information Sources**

The documents and websites listed below are recommended resources for rest area and roadside facilities management. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_



**Water Quality Best Management Practices Compendium Website.**

Water, Air and Climate Change Branch, BC MWLAP.

[http://wlapwww.gov.bc.ca/wat/wq/nps/BMP\\_Compndium/Municipal/OnSite/Septic.htm](http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compndium/Municipal/OnSite/Septic.htm)

**Composting Toilets Technology Fact Sheet.** United States

Environmental Protection Agency. [http://www.epa.gov/OW-](http://www.epa.gov/OW-OWM.html/mtb/comp.pdf)

[OWM.html/mtb/comp.pdf](http://www.epa.gov/OW-OWM.html/mtb/comp.pdf)

**Don't Attract Bears to Garbage Brochure.** BC Ministry of Environment,

Lands and Parks. 1999.

[http://wlapwww.gov.bc.ca/wld/beargarbage/garbg\\_br1.htm](http://wlapwww.gov.bc.ca/wld/beargarbage/garbg_br1.htm)



**Checklist for Environmental Protection Requirements**

- Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
- Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
- Have site-specific environmental protection requirements been identified? List below:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

**Highway Maintenance  
Specification Sections**

- 6-500 Bridge Deck Maintenance**
- 6-510 Bridge and Structure Cleaning**
- 6-520 Bridge Drain and Flume Maintenance**
- 6-530 Bridge Joint Maintenance**
- 6-540 Bridge Bearing Maintenance**
- 6-560 Bailey and Acrow Bridge Maintenance**
- 6-570 Minor Painting of Bridge Structure**
- 6-600 Concrete Structure Maintenance**
- 6-605 Steel and Aluminum Structure Maintenance**
- 6-620 Timber Truss Bridge Maintenance**
- 6-640 Bridge Piling Maintenance**
- 6-650 Timber and Log Structure Maintenance**
- 6-690 Bridge Railing Maintenance**

## 6.12 Bridge Structure Management

Bridge structure management activities include the cleaning and painting of bridge structures as well as the repair, rehabilitation, and replacement of bridge elements including decks, railings, abutments, and bearings. Works may include concrete works, and timber truss and piling maintenance. These activities help to ensure bridge structures remain structurally sound and safe for public use.



Ministry of Transportation Website, 2004



### Environmental Issues

Primary environmental issues relating to routine bridge structure management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
<p><b>Cleaning</b></p>	<ul style="list-style-type: none"> <li>• May introduce accumulated deleterious substances (sediment, oils, de-icing chemicals, paint chips, treated wood debris) to a watercourse</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, paint, concrete leachate, sediment, and chlorinated water.</li> </ul>
	<ul style="list-style-type: none"> <li>• May disrupt flow, damage habitat and kill fish through the extraction of water for cleaning</li> </ul>	<ul style="list-style-type: none"> <li>• No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>• No destruction of fish by any means other than fishing, except as authorized by the Act or the regulations (<i>Fisheries Act</i>, Section 32).</li> <li>• No diversion or use of water without a formal approval (through a temporary water use permit or license) under the Act (<i>Water Act</i>)</li> </ul>
	<ul style="list-style-type: none"> <li>• May cause erosion of watercourse banks and generation of sediment if bridge abutments are not protected from draining wash water</li> </ul>	<ul style="list-style-type: none"> <li>• No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> <li>• No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> </ul>
	<ul style="list-style-type: none"> <li>• May disturb birds and their nests on bridge structures</li> </ul>	<ul style="list-style-type: none"> <li>• No injury, molestation or destruction of a bird, its egg, and occupied nest, or the nest (occupied or otherwise) of an eagle, Peregrine Falcon, Gyrfalcon, Osprey, or heron, unless the species is listed under Schedule C as exempt from this protection (<i>Wildlife Act</i>, Section 34).</li> <li>• No killing, capturing, injuring, taking or disturbing migratory birds or damaging, destroying, removing or disturbing their nests, unless permitted under the Act (<i>Migratory Birds Convention Act</i>)</li> </ul>
<p><b>Repair Works</b></p>	<ul style="list-style-type: none"> <li>• May release deleterious substances (sediment, cement-based products, wood preservatives, epoxies, mineral oils, sealants) to a watercourse</li> </ul>	<ul style="list-style-type: none"> <li>• No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, paint, concrete leachate, sediment, and chlorinated water.</li> </ul>
	<ul style="list-style-type: none"> <li>• May disturb instream and riparian habitat by changing the channel structure, banks, substrate, or vegetation</li> </ul>	<ul style="list-style-type: none"> <li>• No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1))</li> <li>• No alteration of a stream unless authorized by a <i>Water Act</i> approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>• May disturb wildlife species (e.g., birds, beavers)</li> </ul>	<ul style="list-style-type: none"> <li>• No injury, molestation or destruction of a bird, its egg, and occupied nest, or the nest of an eagle, Peregrine Falcon, Gyrfalcon, Osprey, heron, or Burrowing Owl, unless the species is listed under Schedule C as exempt from this protection (<i>Wildlife Act</i>, Section 34).</li> <li>• No killing, capturing, injuring, taking or disturbing migratory birds or damaging, destroying, removing or disturbing their nests, unless permitted under the Act (<i>Migratory Birds Convention Act</i>)</li> <li>• No disturbance, molestation or destruction of a beaver house or den, unless undertaken to provide irrigation or drainage under lawful authority for the protection of property, or if the action is authorized by regulation (<i>Wildlife Act</i>, Section 9)</li> </ul>
	<ul style="list-style-type: none"> <li>• May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials</li> </ul>	<ul style="list-style-type: none"> <li>• Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>

## Bridge Structure Management

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Painting	<ul style="list-style-type: none"> <li>May release deleterious substances such as sediment, paints, sealants, or other chemicals to a watercourse</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat. Deleterious substances include, but are not limited to, gasoline, oils, paint, concrete leachate, sediment, and chlorinated water (<i>Fisheries Act</i>, Sections 34(1) and 36(3))</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage and disposal of materials</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>



### Best Management Practices

The following BMPs are provided as guidelines to help you ensure your works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

#### REGULATORY AGENCY CONTACT

- Prior to beginning your bridge management activities, identify any sensitive habitat areas including watercourses – streams, lakes and marine foreshores– found within your work area.
- Determine how much impact your required works will have on the identified areas. Are you undertaking small-scale routine bridge deck patching or large-scale repairs to bridge abutments? What types of materials will you be using? If you are planning to clean a bridge structure, where will you obtain any water used for rinsing the structure? By asking these questions, you should be able to identify any planned works that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

#### Why Clean Bridges in the Rain?

Sediment is considered a deleterious substance when it has a negative impact on a receiving watercourse. At freshet or during periods of high flow a large watercourse will often have its highest background levels of sediment. At this time, the introduction of a small amount of sediment to a watercourse (from bridge cleaning) will have a lower risk of potential impact when considered against those high natural background levels.

#### TIMING OF WORKS

For most work activities within this category, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances.
- If your maintenance activities require work instream, you must schedule them to coincide with your region's instream work window. Contact your local WLAP and DFO offices for further information on timing windows in your District.

**Bridges and Birds...**

Some bridges may provide nesting habitat for birds. Most active bird nests, eggs and young are protected under Section 34 of the *Wildlife Act* and cannot be harmed. Raptor nests (including those of eagles, Peregrine Falcons, Gyrfalcons, Osprey, herons or Burrowing Owls) are protected at all times of year.

Several species of common birds (crows, Black-billed Magpies, European Starlings, House Sparrows, Rock Doves, and Black-headed Cowbirds) are listed in Schedule C of the *Wildlife Act* as exempt from the protection of the Act. You may remove such birds, their nests or young as part of your works.

If your bridge maintenance works require the removal of a nest of a species other than those listed in Schedule C, you will need to obtain a Wildlife Act exemption permit from WLAP.

**Water Extraction**

The DFO document, *Freshwater Intake End-of-Pipe Fish Screen Guidelines*, is available under the “Guidelines” heading at [http://www-heb.pac.dfo-mpo.gc.ca/publications/publications\\_e.htm](http://www-heb.pac.dfo-mpo.gc.ca/publications/publications_e.htm)

**Bridge Cleaning:**

- Schedule bridge-cleaning activities to coincide with the watercourse’s spring freshet when possible.
- If works are planned outside the freshet or if your region does not experience a freshet, discuss your protocol and the timing of these works with your local DFO and WLAP Habitat Officers

**SITE MANAGEMENT**

- When preparing your worksite and undertaking your maintenance works, minimize vegetation-clearing activities.
- When your works involve the disturbance of soils or the use of erodible materials (e.g., sands, topsoil), prevent the transport of sediment through the installation of appropriate erosion and sediment control BMPs and devices.

**MATERIALS STORAGE**

- Use temporary covers to keep erodible construction materials dry if they are stored on site near watercourses.
- Store hazardous materials in accordance with applicable regulations and ensure that deleterious substances are handled with care.
- Mix concrete compounds, sealants and paints off the bridge and away from any watercourse.
- Clean tools and equipment off-site to prevent the release of wash water that may contain deleterious substances.
- Ensure all equipment used on site is well maintained and free of fluid leaks.

**WASTE AND MATERIALS CONTAINMENT**

- Have a spill response plan in place and spill kits on site.
- If potentially deleterious materials (e.g., cement-based products) are used for repair works, ensure raw material and wash water will not be released to any watercourse.
- Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site. Any clean material should be removed to an area where it will not enter any watercourse, ditch, or channel.
- For larger works or sites with greater sensitivity, suggested techniques to help prevent wash water and construction and maintenance debris entering the watercourse include: building forms around the work area, hanging tarps to trap loose material, and (for inert substances and debris) using booms on surface waters below work areas to trap and remove any floating substances that may escape the primary containment system.
- Inspect tarps, drain blocks, and wash water runoff areas regularly to ensure they are functioning. Repair as required.

### Treated Wood Product Information

The DFO document, *Guidelines to protect fish and fish habitat from treated wood used in aquatic environments in the Pacific Region*, is available under the “Guidelines” heading at [http://www-heb.pac.dfo-mpo.gc.ca/publications/publications\\_e.htm](http://www-heb.pac.dfo-mpo.gc.ca/publications/publications_e.htm)

### Impacts of Cement-based Products

One litre of concrete washwater or leachate in 1000L of water will kill fish. Cement-based products including grouts and concrete are lethal to fish and many other aquatic organisms. Raw product or leachate entering a watercourse will alter water chemistry, making it more basic or alkaline.

### Bridge Cleaning:

- Dry sweep and collect loose material off bridge surfaces before washing the bridge.
- Use water alone. If your cleaning activities require degreasers or any other chemical, approval for use must be obtained from DFO and MWLAP staff.
- If superstructure cleaning is undertaken above or on the bridge deck level, prevent potentially harmful materials from entering into road drains. Block deck drains with suitable barriers (e.g., polyethylene or drain blocks) to prevent direct discharge to a watercourse.
- Contain any wash water or runoff to the bridge deck. Direct wash water towards the bridge approaches and away from the watercourse, then to a vegetated area or contained settling area (e.g., dry ditch channel unconnected to a watercourse) where it can infiltrate.
- If dry sweeping is not feasible for the surface to be cleaned, discussion with local regulatory agencies will be required should the work plan calls for a flushing of materials off the bridge and directly into the watercourse.
- If water for cleaning is extracted from a watercourse, a short-term water use approval must be obtained from Land and Water BC (<http://www.lwbc.bc.ca/03water/licencing/index.html>). On fish-bearing watercourses, the pump intake must be screened to specifications outlined in DFO’s fish screening directive (<http://www.dfo-mpo.gc.ca/Library/223669.pdf>).

### Repairs Using Treated Wood Products:

- If treated wood is to be used, ensure it has been treated with a wood preservative appropriate for the project. Certain wood treatments (e.g., creosote) must not be used in or near freshwater.
- If treated timber must be cut to size, ensure cutting takes place away from the bridge and watercourse. Treated sawdust is harmful to aquatic organisms and must be prevented from entering any watercourse.
- Wood preservatives should not be applied over water

### Repairs Using Cement-based Products:

- If cement-based products are used for repairs of structures in or near water (i.e., bridge abutments) strict protocols must be followed to prevent the introduction of raw product or wash water to a watercourse. The concrete works should be isolated from water with a waterproof barrier (e.g., polyethylene sheets and wood forms or sealed sandbag coffer dams) to prevent leachate generation and contain leachate and raw materials for the duration of the product curing period (a minimum of 72 hrs).

- If your repair works are small and in areas away from the wetted portion of the watercourse, isolation of the site is as simple as ensuring that any washwater generated from the repaired area is prevented from entering bridge drains and watercourses.

**Bridge and Structure Painting:**

- Lead-based paints and the abrasives used to remove them may be considered hazardous wastes. Lead paint removal requires special equipment and procedures for the containment, storage, transportation and treatment of lead-based paint waste. If your works will involve the removal of lead-based paint, please consult the Worker’s Compensation Board and the WLAP Water Quality Best Management Practices Compendium Website ([http://wlapwww.gov.bc.ca/wat/wq/nps/BMP\\_Compendum/Municipal/Bridge\\_Maintenance/Bridge.htm](http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendum/Municipal/Bridge_Maintenance/Bridge.htm)).



**Key Information Sources**

The documents and websites listed below are recommended resources for bridge structure management. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- Omineca Region Bridge Washing Guidelines. MoT. 2003.
- Skeena BMPs for Road Maintenance. MoT. 2003.
- \_\_\_\_\_

**Roadway and Bridge Maintenance Water Quality BMPs.** Water, Air and Climate Change Branch, WLAP.

[http://wlapwww.gov.bc.ca/wat/wq/nps/BMP\\_Compendum/Municipal/Bridge\\_Maintenance/Bridge.htm](http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendum/Municipal/Bridge_Maintenance/Bridge.htm)

**Guidelines for the protection of fish and fish habitat during bridge maintenance operations in British Columbia.** Samis, S.C., M.D.

Nassichuk and B.J. Reid. 1990.

[http://www.bicapfremf.org/toolbox/pdfs/guidelines\\_for\\_protection\\_of\\_fish\\_and\\_fish\\_habitat\\_during\\_bridge\\_maintenance\\_operations\\_in\\_bc.pdf](http://www.bicapfremf.org/toolbox/pdfs/guidelines_for_protection_of_fish_and_fish_habitat_during_bridge_maintenance_operations_in_bc.pdf)

**Standards and Best Practices for Instream Works.** March 2004. Lower Mainland Region, WLAP.

<http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

<http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf>

**Best Management Practices for Fish Habitat Issues Related to Minor Bridge Maintenance.** Alberta Transportation. March 2003.

<http://www.trans.gov.ab.ca/Content/doctype247/production/bmpfish.pdf>



### **Checklist for Environmental Protection Requirements**

- Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
- Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
- Have site-specific environmental protection requirements been identified? List below:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_



Highway Maintenance  
Specification Section

6-660 Retaining Structure  
Maintenance

## 6.13 Retaining Structure Management

Retaining structure management includes the regular cleaning, maintenance, repair and replacement of highway retaining structures to ensure their continued safe and stable condition.



### Environmental Issues

Primary environmental issues relating to routine retaining structure management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Cleaning and Debris Removal	<ul style="list-style-type: none"> <li>May introduce deleterious substances to nearby watercourses as a result of cleaning and debris removal activities</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, and sediment.</li> </ul>
	<ul style="list-style-type: none"> <li>May damage roadside riparian vegetation or other significant habitats through the side casting of debris</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act Regulation</i>, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage habitat through the improper location of disposal sites in ditches, wetlands, or other significant habitat areas</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act Regulation</i>, Part 7).</li> </ul>
Repair Works	<ul style="list-style-type: none"> <li>May release deleterious substances (sediment, cement-based products, treated wood, wood preservatives, epoxies, mineral oils, sealants) to nearby watercourses</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, sealants, concrete leachate, and sediment.</li> </ul>
	<ul style="list-style-type: none"> <li>May disturb instream and riparian habitat adjacent to retaining structures if repair works involve changing the channel structure, banks, substrate, or vegetation</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1))</li> <li>No alteration of a stream unless authorized by a <i>Water Act</i> approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act Regulation</i>, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>



### Best Management Practices

The following BMPs are provided as guidelines to help you ensure your routine works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided

## **Retaining Structure Management**

apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

### **REGULATORY AGENCY CONTACT**

- Prior to beginning your bridge management activities, identify any sensitive habitat areas including watercourses – streams, lakes and marine foreshores – found within your work area.
- Determine how much impact your required works will have on the identified areas. Are you undertaking small-scale debris removal behind a retaining structure or larger-scale repairs to address stability concerns? What types of materials will you be using? By asking these questions, you should be able to identify any planned works that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

### **TIMING OF WORKS**

For most work activities within this category, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances.
- If your maintenance activities require work instream, you must schedule them to coincide with your region's instream work window. Contact your local WLAP and DFO offices for further information on timing windows in your District.

### **SITE MANAGEMENT**

- When preparing your worksite and undertaking your maintenance works, minimize vegetation-clearing activities.
- When your works involve the disturbance of soils or the use of erodible materials (e.g., sands, topsoil), prevent the transport of sediment through the installation of appropriate erosion and sediment control BMPs and devices. Some suggested options include the temporary placement of silt fencing between disturbed areas of slopes and watercourses or drainage areas and the seeding of exposed soils.

### **MATERIALS STORAGE**

- Use temporary covers to keep erodible construction materials dry if they are stored on site near watercourses.

- Store hazardous materials in accordance with applicable regulations and ensure that deleterious substances are handled with care.
- Mix concrete compounds, sealants and paints away from any watercourse.
- Clean tools and equipment off-site to prevent the release of wash water that may contain deleterious substances.
- Ensure all equipment used on site is well maintained and free of fluid leaks.

### WASTE AND MATERIALS CONTAINMENT

- Have a spill response plan in place and spill kits on site.
- If potentially deleterious materials (e.g., cement-based products) are used for repair works, ensure raw material and wash water will not be released to any watercourse. Suggested techniques to help prevent wash water and construction and maintenance debris entering the watercourse include: building forms around the work area, hanging tarps to trap loose material, and (for inert substances and debris) using booms on surface waters below work areas to trap and remove any floating substances that may escape the primary containment system.
- Inspect containment structures regularly to ensure they are functioning. Repair as required.
- Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site. Any clean material should be removed to an area where it will not enter any watercourse, ditch, or channel.

### Treated Wood Product Information

The DFO document, *Guidelines to protect fish and fish habitat from treated wood used in aquatic environments in the Pacific Region*, is available under the “Guidelines” heading at [http://www-heb.pac.dfo-mpo.gc.ca/publications/publications\\_e.htm](http://www-heb.pac.dfo-mpo.gc.ca/publications/publications_e.htm)

### Impacts of Cement-based Products

One litre of concrete washwater or leachate in 1000L of water will kill fish. Cement-based products including grouts and concrete are lethal to fish and many other aquatic organisms. Raw product or leachate entering a watercourse will alter water chemistry, making it more basic or alkaline.

### Repairs Using Treated Wood Products:

- If treated wood is to be used, ensure it has been treated with a wood preservative appropriate for the project. Certain wood treatments (e.g., creosote) must not be used in or near freshwater.
- If treated timber must be cut to size, ensure cutting takes place away from the bridge and watercourse. Treated sawdust is harmful to aquatic organisms and must be prevented from entering any watercourse.
- Wood preservatives should not be applied over water

### Repairs Using Cement-based Products:

- If cement-based products are used for repairs of structures in or near water (i.e., bridge abutments) strict protocols must be followed to prevent the introduction of raw product or wash water to a watercourse. The concrete works should be isolated from water with a waterproof barrier (e.g., polyethylene sheets and wood forms or sealed sandbag coffer dams) to prevent leachate generation and contain leachate and raw materials for the duration of the product curing period (a minimum of 72 hrs).

## Retaining Structure Management

- If your repair works are small and in areas away from the wetted portion of the watercourse, isolation of the site is as simple as ensuring that any raw material or washwater generated from the repaired area is prevented from entering all watercourses.



### Key Information Sources

The documents and websites listed below are recommended resources for retaining structure management. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

#### Local and regional information sources (fill in with any locally-developed BMPs):

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Standards and Best Practices for Instream Works.** March 2004. Lower Mainland Region, WLAP.

<http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

<http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf>

**General Best Management Practices to Protect Water Quality website.** June 2004. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection.

[http://wlapwww.gov.bc.ca/wat/wq/nps/BMP\\_Compendium/General/General\\_Home.htm](http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendium/General/General_Home.htm)

**Catalogue of Stormwater Best Management Practices.** 2<sup>nd</sup> Edition, August 2001. Idaho Department of Environmental Quality.

[http://www.deq.state.id.us/water/stormwater\\_catalog/index.asp](http://www.deq.state.id.us/water/stormwater_catalog/index.asp)



### Checklist for Environmental Protection Requirements

- Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
- Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
- Have site-specific environmental protection requirements been identified? List below:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

Highway Maintenance  
Specification Section

6-680 Multiplate Structure  
Maintenance

## 6.14 Multiplate Structure Management

Multiplate structures, including culverts and arches, require routine maintenance to ensure they allow unimpeded flow. Multiplate structure management activities include the replacement or repair of multiplate components such as bolts, plates, aprons, and headwalls, and the placement or repair of scour and erosion protection structures.



### Environmental Issues

Primary environmental issues relating to routine multiplate structure management activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Repair Works	<ul style="list-style-type: none"> <li>May release deleterious substances (sediment, cement-based products, epoxies, sealants) to a watercourse</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, sealants, concrete leachate, and sediment.</li> </ul>
	<ul style="list-style-type: none"> <li>May disturb instream and riparian habitat by changing the channel structure, banks, substrate, or vegetation</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1))</li> <li>No alteration of a stream unless authorized by a <i>Water Act</i> approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>
Placement of Riprap	<ul style="list-style-type: none"> <li>May harmfully alter channel structures through the placement of riprap materials</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse through site preparation for riprap placement or the placement of silt-laden riprap materials</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)). Deleterious substances include, but are not limited to, gasoline, oils, concrete leachate and sediment.</li> </ul>



### Best Management Practices

The following BMPs are provided as guidelines to help you ensure your routine works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

### **REGULATORY AGENCY CONTACT**

- Prior to beginning your bridge management activities, identify any sensitive habitat areas including watercourses – streams, lakes and marine foreshores, found within your work area.
- Determine how much impact your required works will have on the identified areas. Are you undertaking small-scale routine activities like bolt replacement outside a wetted channel or large-scale concrete repairs to the bed of the multiplate structure? What types of materials will you be using? By asking these questions, you should be able to identify any planned works that may be of concern to regulatory agencies.
- If you have not yet met with local regulatory agencies to outline your planned works (as detailed in Part A of the MoT and WLAP Memorandum of Understanding), contact your local WLAP Habitat or Conservation Officer and DFO Habitat Management staff (listed in Section 7) to discuss any site-specific environmental protection measures.

### **TIMING OF WORKS**

For most work activities within this category, the following general BMPs apply:

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment. Typically this is also a less sensitive period for fish and wildlife than other seasons. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances.
- If your maintenance activities require work instream, you must schedule them to coincide with your region's instream work window. Contact your local WLAP and DFO offices for further information on timing windows in your District.

### **SITE MANAGEMENT**

- When preparing your worksite and undertaking your maintenance works, minimize vegetation-clearing activities.
- When your works involve the disturbance of soils or the use of erodible materials (e.g., sands, topsoil), prevent the transport of sediment through the installation of appropriate erosion and sediment control BMPs and devices.

### **WORKSITE ISOLATION**

- Isolate your work area from any flowing water that may be present. Ensure any flows are temporarily diverted (using a pump, flume or other diversion) around the portion of the watercourse where you are working.
- Contain any sediment-laden water generated during your works in your isolated work cell. Use a pump to draw sediment-laden water out of the work cell and discharge it to a level vegetated area where sediment can settle as the water infiltrates the ground.

**WASTE AND MATERIALS CONTAINMENT**

- Store hazardous materials in accordance with applicable regulations and ensure that deleterious substances are handled with care.
- Have a spill response plan in place and spill kits on site.
- Ensure all equipment used on site is well maintained and free of fluid leaks.
- Clean tools and equipment off-site to prevent the release of wash water that may contain deleterious substances.
- Mix concrete compounds, sealants and paints away from any watercourse.
- If potentially deleterious materials (e.g., cement-based products) are used for repair works, ensure raw material and wash water will not be released to any watercourse. Suggested techniques to help prevent wash water and construction and maintenance debris entering the watercourse include: building forms around the work area, hanging tarps to trap loose material, and (for inert substances and debris) using booms on surface waters below work areas to trap and remove any floating substances that may escape the primary containment system.
- Inspect containment structures regularly to ensure they are functioning. Repair as required.
- Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site. Any clean material should be removed to an area where it will not enter any watercourse, ditch, or channel.

**Impacts of Cement-based Products**

One litre of concrete washwater or leachate in 1000L of water will kill fish. Cement-based products including grouts and concrete are lethal to fish and many other aquatic organisms. Raw product or leachate entering a watercourse will alter water chemistry, making it more basic or alkaline.

**Repairs Using Cement-based Products:**

- If cement-based products are used for repairs of structures in or near water (i.e., headwall structures, bed liners, scour protection) strict protocols must be followed to prevent the introduction of raw product or wash water to a watercourse. The concrete works should be isolated from water with a waterproof barrier (e.g., polyethylene sheets and wood forms or sealed sandbag coffer dams) to prevent leachate generation and to contain leachate and raw materials for the duration of the product curing period (a minimum of 72 hrs).

**EROSION AND SEDIMENT CONTROL**

- Use temporary covers to keep erodible construction materials dry if they are stored on site near watercourses.
- Install appropriate erosion and sediment control devices (e.g., silt fence installed below disturbed slopes, rock check dams and temporary silt dikes in low velocity, low volume ditches) to prevent the transportation of sediment to downstream watercourses. Ensure that any structures installed are maintained and monitored until they are no longer needed (i.e., vegetative cover on seeded areas is adequate to control erosion).

- Use clean materials, free of fine soils that may contribute sediment to the watercourse, when installing riprap or other scour protection measures.



## **Key Information Sources**

The documents and websites listed below are recommended resources for multiplate structure maintenance. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

### **Local and regional information sources (fill in with any locally-developed BMPs):**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Standards and Best Practices for Instream Works.** March 2004. Lower Mainland Region, WLAP.

<http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

<http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf>

**Culverts and Fish Passage Fact Sheet.** Oct. 2000. Environmental Management Section, Engineering Branch. Ministry of Transportation.

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

**Fish Stream Crossing Guidebook.** 2002. Forest Practices Branch, Ministry of Forests.

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

**General Best Management Practices to Protect Water Quality website.** June 2004. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection.

[http://wlapwww.gov.bc.ca/wat/wq/nps/BMP\\_Compndium/General/General\\_Home.htm](http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compndium/General/General_Home.htm)

**Catalogue of Stormwater Best Management Practices.** 2<sup>nd</sup> Edition, August 2001. Idaho Department of Environmental Quality.

[http://www.deq.state.id.us/water/stormwater\\_catalog/index.asp](http://www.deq.state.id.us/water/stormwater_catalog/index.asp)

**Manual of Control of Erosion and Shallow Slope Movement.**

August 1997. Ministry of Transportation.

[http://www.th.gov.bc.ca/publications/eng\\_publications/environment/references/Man\\_Control\\_Erosion.pdf](http://www.th.gov.bc.ca/publications/eng_publications/environment/references/Man_Control_Erosion.pdf)





### Checklist for Environmental Protection Requirements

- Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
- Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
- Have site-specific environmental protection requirements been identified? List below:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

Highway Maintenance  
Specification Section

7-780 Highway Incident  
and Vandalism  
Response

## 6.15 Highway Incident and Vandalism Response

Highway incident and vandalism response activities include responding to motor vehicle accidents, removing vehicles and debris from the road, and assisting with materials spills. Such activities are required to protect the driving public from unsafe road conditions. Emergency response is often an activity coordinated with local law enforcement or other first-response agencies.



### Environmental Issues

Primary environmental issues relating to routine highway incident and vandalism response activities are summarized in the following table. It should be noted that site-specific conditions might present additional issues you will need to address in planning and undertaking your works.

Work Activity	Potential Environmental Impacts	Performance Standards and Legal Requirements
Removal of Vehicles, Spilled Materials, and Debris	<ul style="list-style-type: none"> <li>May introduce sediment or other deleterious substances to a watercourse</li> </ul>	<ul style="list-style-type: none"> <li>No release of any substance that could be deleterious (toxic) to fish or fish habitat (<i>Fisheries Act</i>, Sections 34(1) and 36(3)).</li> </ul>
	<ul style="list-style-type: none"> <li>May damage roadside riparian vegetation or other significant habitats through the side casting of rock or soils</li> </ul>	<ul style="list-style-type: none"> <li>No harmful alteration, disruption or destruction of fish habitat without authorization (<i>Fisheries Act</i>, Section 35(1)).</li> <li>No alteration of a stream unless authorized by an approval, licence, or order (<i>Water Act</i>, Section 9), or through a Notification (<i>Water Act</i> Regulation, Part 7).</li> </ul>
	<ul style="list-style-type: none"> <li>May contaminate surface waters, groundwater, and soils through improper storage or disposal of materials</li> </ul>	<ul style="list-style-type: none"> <li>Disposal of all waste materials in accordance with the Act and reporting of any hazardous materials spills (<i>Waste Management Act</i>, Special Wastes Regulation)</li> </ul>



### Best Management Practices

The following BMPs are provided as guidelines to help you ensure your routine works are completed in compliance with the performance standards and environmental legislation. Please note that the general BMPs provided apply for most work activities within this category; if BMPs specific to the activity are available they are also noted below.

#### REGULATORY AGENCY CONTACT

- Coordinate response with regulatory agencies, police and the Province in accordance with your established protocols.

**Emergency Contacts**

MWLAP's Environmental Emergency Program can be contacted through the BC Provincial Emergency Program (PEP) at 1-800-663-3456.

The Canadian Transport Emergency Centre of the Department of Transportation (CANUTEC) can be contacted for highway incidents involving Dangerous Goods at 1-613-996-6666 (will accept collect calls).

**SPILL RESPONSE**

- As part of your responsibility to contain spills on highways in conjunction and cooperation with regulatory agencies, police authorities and the Province:
  - Prevent all potentially harmful materials from entering into road drains and watercourses. Block road drains and construct a containment cell around the spill. Deploy spill kits.
  - Apply containment devices as quickly as possible.
  - Collect any waste material and dispose of in an approved manner.
  - Sweep up contaminated absorbents; don't flush materials into roadside ditches.
  - Any soils that have been contaminated by a highway accident may need to be excavated from the site and disposed of in accordance with provincial and federal waste management regulations.
  - Ensure that hazardous materials use, storage and disposal is in accordance with the information contained in their Material Safety Data Sheets.
  - If you are responding to a highway incident that resulted in the disturbance of soils in an area where there is a chance that sediment could enter a watercourse, install appropriate temporary sediment control devices (e.g., silt fence).



**Key Information Sources**

The documents and websites listed below are recommended resources for highway incident and vandalism response activities. They can provide examples of existing protocols and management strategies, as well as additional information on specific operational BMPs (e.g., erosion and sediment control techniques).

**Local and regional information sources (fill in with any locally-developed BMPs):**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Emergency Response Guidebook.** 2000. CANUTEC website. Transportation Canada.

<http://www.tc.gc.ca/canutec/en/services/services.htm>

**Provincial Emergency Program.** Ministry of Public Safety and Solicitor General.

<http://www.pep.bc.ca/>



### Checklist for Environmental Protection Requirements

- Is your proposed work considered a “routine: maintenance activity? If not, approvals or permits may be required. Contact your local municipal, provincial, or federal regulatory agency staff.
- Has this project been discussed with local environmental regulatory staff? In addition to the BMP information presented, other site-specific conditions may apply.
- Have site-specific environmental protection requirements been identified? List below:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

# 7 Regulatory Agency Contacts

To locate your local provincial regulatory agency staff (e.g., Habitat Officers, Conservations Officers), contact **Enquiry BC** (available between 7:30am and 5:00pm PST, Monday through Friday).

In Victoria call:	<b>387-6121</b>
In Vancouver call:	<b>604 660-2421</b>
Elsewhere in BC call:	<b>1 800 663-7867</b>
Outside British Columbia:	<b>604 660-2421</b>
Email address	<a href="mailto:EnquiryBC@gems3.gov.bc.ca">EnquiryBC@gems3.gov.bc.ca</a>

Regional WLAP and LWBC, and federal Fisheries and Oceans Canada offices may be reached through the contact information presented below:

Ministry of Water, Land and Air Protection Regional Ecosystem Section Contacts		
Office	Mailing Address	Phone/Fax/Email
<b>Region 1</b> Vancouver Island	Ministry of Water, Land and Air Protection 2080 A Labieux Road, Nanaimo BC V9T 6J9	Phone: (250) 751-3100 Fax: (250) 751-3103
<b>Region 2</b> Lower Mainland	Ministry of Water, Land and Air Protection 2 <sup>nd</sup> Floor – 10470-152 <sup>nd</sup> St., Surrey, BC V3R 0Y3	Phone: (604) 582-5235 Fax: (604) 930-7119
<b>Region 3/8</b> Thompson/Okanagan	Ministry of Water, Land and Air Protection 1259 Dalhousie Drive, Kamloops, BC V2C 5Z5	Phone: (250) 371-6281
<b>Region 4</b> Kootenay	Ministry of Water, Land and Air Protection #401 - 333 Victoria Street, Nelson, BC V1L 4K3	Phone: (250) 354-6333 Fax: (250) 354-6332
<b>Region 5</b> Cariboo	Ministry of Water, Land and Air Protection #400 - 640 Borland Street, Williams Lake, BC V2G 4T1	Phone: (250) 398-4530 Fax: (250) 398-4214
<b>Region 6</b> Skeena	Ministry of Water, Land and Air Protection PO Box #5000 - 3726 Alfred Avenue, Smithers, BC V0J 2N0	Fax: (250) 847-7728
<b>Region 7</b> Omineca	Ministry of Water, Land and Air Protection 4051-18 <sup>th</sup> Ave. Prince George, BC V2N 1B3	Phone: (250) 565-6135 Fax: (250) 565-6940
<b>Region 9</b> Peace	Ministry of Water, Land and Air Protection 10003-110 <sup>th</sup> Ave. Rm. 400, Fort St. John, BC V1J 6M7	Phone: (250) 787-3567

## Regulatory Agency Contacts

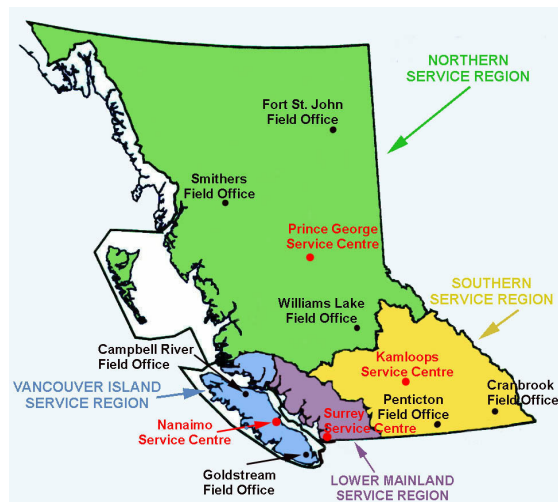
<b>BC Conservation Officer Service</b>	
<b>South Coast Region</b>	
<b>Nanaimo Office (regional headquarters):</b> Phone: (250) 751-3190	<b>Campbell River Office:</b> Phone: (250) 286-7630
<b>Chilliwack Office:</b> Phone: (604) 795-8422	<b>Duncan Office:</b> Phone: (250) 746-1236
<b>Port Alberni Office:</b> Phone: (250) 724-9290	<b>Port Hardy Office:</b> Phone: (250) 949-2800
<b>Powell River Office:</b> Phone: (604) 485-3612	<b>Sechelt Office</b> Phone: (604) 740-5033
<b>Squamish Office</b> Phone: (604) 898-2175	<b>Surrey Office:</b> Phone: (604) 582-5250
<b>Southern Interior Region</b>	
<b>Kamloops Office (regional headquarters):</b> Phone: (250) 371-6281	<b>Castlegar Office:</b> Phone: (250) 365-8611
<b>Clearwater Office:</b> Phone: (250) 674-3722	<b>Cranbrook Office:</b> Phone: (250) 489-8540
<b>Creston Office:</b> Phone: (250) 428-3220	<b>Fernie Office:</b> Phone: (250) 423-7551
<b>Grand Forks Office:</b> Phone: (250) 442-4350	<b>Invermere Office:</b> Phone: (250) 342-4266
<b>Kelowna Office:</b> Phone: (250) 861-7670	<b>Lillooet Office:</b> Phone: (250) 265-4636
<b>Merritt Office:</b> Phone: (250) 378-8489	<b>Nelson Office:</b> Phone: (250) 354-6397
<b>Penticton Office:</b> Phone: (250) 490-8203	<b>Princeton Office:</b> Phone: (250) 295-6343
<b>Revelstoke Office:</b> Phone: (250) 837-9683	<b>Vernon Office:</b> Phone: (250) 558-1776
<b>Northern Region</b>	
<b>Prince George Office (regional headquarters):</b> Phone: (250) 565-6140	<b>Atlin Office:</b> Phone: (250) 638-6530
<b>Bella Coola Office:</b> Phone: 982-2421	<b>Burns Lake Office:</b> Phone: (250) 692-7777
<b>Chetwynd Office:</b> Phone: (250) 788-3611	<b>Dawson Creek Office:</b> Phone: (250) 784-2304
<b>Dease Lake Office:</b> Phone: (250) 771-3566	<b>Fort Nelson Office:</b> Phone: (250) 774-3547
<b>Ft. St. John Office:</b> Phone: (250) 787-3701	<b>Mackenzie Office:</b> Phone: (250) 997-6555
<b>100 Mile House Office</b> Phone: (250) 395-5511	<b>Queen Charlotte Island Office:</b> Phone: (250) 559-8431
<b>Quesnel Office:</b> Phone: (250) 992-4212	<b>Smithers Office:</b> Phone: (250) 847-7266
<b>Terrace Office:</b> Phone: (250) 638-6530	<b>Vanderhoof Office:</b> Phone: (250) 567-6304
<b>Williams Lake Office:</b> Phone: (250) 398-4569	

## Regulatory Agency Contacts



### Ministry of Water, Land and Air Protection Regions

<b>Land and Water BC Service Centres</b>		
<b>Office</b>	<b>Mailing Address</b>	<b>Phone/Fax/Email</b>
<b>Lower Mainland Service Region</b> Service Centre - Surrey	Suite 200-10428 153rd St Surrey BC V3R 1E1	Tel: (604) 586-4400 Fax: (604) 586-4434
<b>Northern Service Region</b> Service Centre - Prince George	Suite 455-1011 4th Ave Prince George BC V2L 3H9	Tel: (250) 565-6779 Fax: (250) 565-6941
<b>Southern Service Region</b> Service Centre - Kamloops	3rd Floor 145 3rd Ave Kamloops BC V2C 3M1	Tel: (250) 377-7000 Fax: (250) 377-7036
<b>Vancouver Island Service Region</b> Service Centre - Nanaimo	501-345 Wallace St Nanaimo BC V9R 5B6	Tel: (250) 741-5650 Fax: (250) 741-5686



**LWBC Regions and Service Centre Locations**

**Regulatory Agency Contacts**

<b>Fisheries and Oceans Canada (DFO) BC Offices</b>			
<b>Office</b>	<b>Address</b>	<b>Contact Information</b>	<b>Hours of Operation</b>
<b>Bella Bella</b>	Box 38, Bella Bella, BC V0T 1B0	Tel: (250) 957-2363 Fax:(250) 957-2767	Call Ahead: No Admin. Staff
<b>Bella Coola</b>	Box 130 (Hwy 20) Bella Coola, BC V0T 1C0	Tel: (250) 799-5345 Fax:(250) 799-5540	M to F: 8 AM to 4 PM
<b>Campbell River</b>	315-940 Alder Street, Campbell River, BC V9W 2P8	Tel: (250) 850-5701 Fax:(250) 286-5852	M to F: 8 AM to 4 PM
<b>Chilliwack</b>	45742 A Yale Road West, Chilliwack, BC V2P 2N4	Tel: 604-702-2278 Fax:604-702-2280	M to F: 10 AM to 2 PM
<b>Clearwater</b>	Box 610-1121 E. Hwy,16 Clearwater, BC V0E 1N0	Tel: (250) 674-2633 Fax:(250) 674-3553	Call Ahead: Open one day a week
<b>Comox</b>	148 Port Augusta Street, Comox, BC V9M 3N6	Tel: (250) 339-2031 Fax:(250) 339-4612	M to F: 9 AM to 3:30 PM
<b>Cranbrook</b>	P.O. Box 676 #201-101, 10th Ave., Cranbrook, BC V1C 4J2	Tel. (250) 417-2360 Fax. (250) 417-2361	M to F: 8 AM to 4 PM
<b>Delta</b>	100 Annacis Parkway, Unit 3 Delta, B.C. V3M 6A2	Tel: 604-666-8266 Fax:604-666-7112	M to F: 8 AM to 4 PM
<b>Duncan</b>	Box 241, 5653 Club Road, Duncan, BC V9L 3X3	Tel: (250) 746-6221 Fax:(250) 746-8397	M to F: 8 AM to 4 PM
<b>Gold River</b>	499 Muchalaht Drive (Box 130) Gold River BC, V0P 1G0	Tel: (250) 283-9075 Fax: (250) 283-9058	Call Ahead: No Admin Staff
<b>Hazelton</b>	Box 490 4351-11th Avenue, New Hazelton, BC V0J 2J0	Tel: (250) 842-6327 Fax:(250) 842-6283	Call Ahead: No Admin. Staff
<b>Kamloops</b>	985 McGill Place, Kamloops, BC V2C 6X6	Tel: (250) 851-4950 Fax:(250) 851-4951	M to F: 8 AM to 4 PM
<b>Langley</b>	5550 - 268th Street, Langley, BC V4W 3X4	Tel: 604-607-4150	M to F: 8 AM to 4 PM
<b>Lillooet</b>	Box 315 - 654 Industrial Place, Lillooet, BC V0K 1V0	Tel: (250) 256-2650 Fax:(250) 256-2660	M to F: 8 AM to 4 PM
<b>Masset</b>	Box 99, 1590 Old Beach Road, Masset, BC V0T 1M0	Tel: (250) 626-3316 Fax:(250) 626-3253	M to F: 8-12 AM and 1-4 PM
<b>Mission</b>	32873 London Avenue, Mission, BC V2V 6M7	Tel: 604-814-1055 Fax:604-826-1064	M to F: 8 AM to 4 PM



<b>Fisheries and Oceans Canada (DFO) BC Offices</b>			
<b>Office</b>	<b>Address</b>	<b>Contact Information</b>	<b>Hours of Operation</b>
<b>Nanaimo (Front Street)</b>	60 Front Street, Nanaimo, BC V9R 5H7	Tel: (250) 754-0230 Fax:(250) 754-0309	M to F: 8 AM to 4 PM
<b>Nanaimo (SCD)</b>	3225 Stephenson Point Road, Nanaimo, BC V9T 1K3	Tel: (250) 756-7270 Fax:(250) 756-7162	M to F: 8 AM to 4 PM
<b>Nelson</b>	112 McDonald Drive, Nelson, BC V1L 6B9	Tel. (250) 352-0891 or (250) 352- 0892 Fax. (250) 352-0916	M to F: 8 AM to 4 PM
<b>Parksville</b>	457 East Stanford Avenue, Parksville, BC V9P 1V7	Tel: (250) 954-2675 Fax:(260) 248-6776	Call Ahead: No Admin. Staff
<b>Parksville</b>	1100 Lee Rd. Parksville, BC V0R 2S0	Tel: (250) 954-1354 Fax:(250) 954-0173	M to F: 8 AM to 4 PM
<b>Pender Harbour</b>	Box 10 12841 Madeira Park Rd, Madeira Park, BC V0N 2H0	Tel: (604) 883-2313 Fax: (604) 883-2152	M to F: 8 AM to 12 PM
<b>Penticton</b>	201-3547 Skaha Lake Road, Penticton, BC V2A 7K2	Tel: (250) 770-4486 or (250) 770-4487 Fax: (250) 492-1314	M TO F: 8AM - 4PM
<b>Port Alberni</b>	250 - 4877 Argyle Street Port Alberni, BC V9Y 1V9	Tel: (250) 724-0195 Fax:(250) 724-2555	M to F: 8 AM to 4 PM
<b>Port Hardy</b>	Box 10, 8585 Wolloson Road, Port Hardy, BC V0N 2P0	Tel: (250) 949-6422 Fax:(250) 949-6755	M to F: 8 AM to 4 PM
<b>Powell River</b>	7255 Duncan Street, Powell River, BC V8A 5N6	Tel: (604) 485-7963 Fax:(604) 485-7439	M to F: 8:30 AM to 12:30 PM
<b>Prince George</b>	3690 Massey Drive, Prince George, BC V2N 2S8	Tel: (250) 561-5366 Fax:(250) 561-5534	M to F: 8 AM to 4 PM
<b>Prince Rupert</b>	417-2nd Avenue West, Prince Rupert, BC V8J 1G8	Tel: (250) 627-3499 Fax:(250) 627-3427	M to F: 8 AM to 4 PM
<b>Queen Charlotte City</b>	PO Box 99, 137 Bay Street, QCC, BC V0T 1S0	Tel: (250) 559-4413 Fax:(250) 559-4678	M/W/F: 8 AM to 4 PM T/R: 8 AM to 12 PM
<b>Quesnel</b>	1205 North Cariboo Hwy, #97, Quesnel, BC V2J 2Y3	Tel: (250) 992-2434 Fax:(250) 992-7232	M to F: 8 AM to 1 PM
<b>Salmon Arm</b>	Box 1160, 1751-10th Ave SW, Salmon Arm, BC V1E 4P3	Tel: (250) 804-7000 Fax:(250) 804-7010	M to F: 8 AM to 4 PM
<b>Smithers</b>	Box 578, 3177 Tatlow Road, Smithers, BC V0J 2N0	Tel: (250) 847-2312 Fax:(250) 847-4723	M to F: 8 AM to 4 PM
<b>Squamish</b>	1120 Hunter Place, Box 2360, Squamish, BC V0N 3G0	Tel: 604-892-3230 Fax:604-892-2378	Call Ahead: No Admin. Staff
<b>Steveston</b>	12551 No. 1 Road, Richmond, BC V7E 1T7	Tel: 604-664-9250 Fax:604-664-9255	M to F: 8 AM to 4 PM
<b>Terrace</b>	5235 A Keith Avenue, Terrace, BC V8G 1L2	Tel: (250) 615-5350 Fax:(250) 615-5364	M to F: 8 AM to 4:30 PM
<b>Tofino</b>	Box 48, 161 1st Street 2nd Fl, Tofino, BC V0R 2Z0	Tel: (250) 725-3468 Fax:(250) 725-3944	M to F: 8 AM to 12 PM

## Regulatory Agency Contacts

<b>Fisheries and Oceans Canada (DFO) BC Offices</b>			
<b>Office</b>	<b>Address</b>	<b>Contact Information</b>	<b>Hours of Operation</b>
<b>Upper Nass (New Aiyansh)</b>	Box 29, Nass Camp, BC V0J 3J0	Tel: (250) 633-2408 Fax: (250) 633-2439	Call Ahead: No Admin. Staff
<b>Vancouver RHQ</b>	Suite 200 - 401 Burrard Street, Vancouver, BC V6C 3S4	Tel: 604-666-0384 Fax: 604-666-1847	M to F: 8 AM to 4 PM
<b>Victoria</b>	4250 Commerce Circle, Victoria, BC V8Z 4M2	Tel: (250) 363-3252 Fax: (250) 363-0191	M to F: 8 AM to 4 PM
<b>Victoria - CCG</b>	25 Huron Street, Victoria BC V8V 4V9	Tel: (250) 480-2600 Fax: (250) 480-2702	M to F: 8 AM to 4 PM
<b>Whitehorse</b>	100 - 419 Range Road, Whitehorse, Yukon Y1A 3V1	Tel: (867) 393-6722 Fax: (867) 393-6738	M to F: 8:00 AM to 4:30 PM
<b>Williams Lake</b>	310A North Broadway, Williams Lake, BC V2G 2Y7	Tel: (250) 305-4002 Fax: (250) 305-3017	M to F: 8 AM to 4 PM: No admin staff after 12.

## 8 Glossary

**Aquatic habitat:** Areas associated with water that provide food and cover and other elements critical to the completion of an organism's life cycle (*e.g.*, bogs, swamps, riparian areas and streams).

**Avoidance:** Minimizing the effects of an undertaking on fish habitat through the identification and bypassing of areas of concern to fisheries.

**Bedload:** Particulates that are transported along the channel bottom in the lower layers of stream flow by rolling and bouncing.

**Best Management Practices (BMPs):** A practice or combination of practices that are determined to be the most technologically and economically feasible means of preventing or managing potential impacts.

**Berm:** A ridge or small dyke that breaks the continuity of a slope.

**Buffer:** An area left undisturbed between a leave area and work site.

**Bioengineering:** The use of living plant materials to perform some engineering function (*e.g.*, enhanced soil stability).

**Check dam:** A small dam constructed in a ditch or similar place to decrease water velocity and promote the accumulation of sediment.

**Cofferdam:** A watertight enclosure built in a shallow river or creek that is pumped dry to allow construction activities in the isolation of flowing water.

**Compensation:** "The placement of natural habitat, increase in the productivity of existing habitat or maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada's fisheries resources" (DFO, 1986).

**Deleterious substance:** any substance harmful to fish or fish habitat.

**DFO:** Department of Fisheries and Oceans, also Fisheries and Oceans Canada.

**Diversion dam:** A barrier built within the active channel of a watercourse in order to divert water along a different flow path.

**Diversion ditch:** A ditch that directs water and silt into stabilized areas away from a watercourse.

## Glossary

**Due diligence:** A legal term that requires individuals on the job to maintain a reasonable standard of care. This term applies to environmental precautions but also to other areas such as safety, for example.

**Dyke:** An impervious elongated mound of earth constructed to confine water or another liquid from entering or leaving an area of land.

**Erosion:** The wearing away of soil and rock by water and wind action.

**Environmentally Sensitive Areas (ESAs):** Areas requiring special management attention to protect important scenic values, fish and wildlife resources, historical and cultural values, and other natural systems or processes.

**Fish:** The term “fish” includes “shellfish, crustaceans, marine animals, and the eggs, spawn, sperm, spat and juvenile stages of fish, shellfish, crustaceans and marine animals” (Fisheries Act).

**Fish habitat:** The *Fisheries Act* defines fish habitat as “spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes”. Fish habitat comprises physical, chemical and biological attributes of the freshwater, estuarine, marine and terrestrial (riparian) environment that directly or indirectly support fish populations.

**Fisheries Sensitive Zone (FSZ):** An area that comprises the watercourse as well as associated riparian areas. Includes in-stream aquatic habitats, as well as the out-of-stream habitat features such as side channels and wetlands.

**Fisheries window:** Also referred to as the reduced risk window, timing window, or instream window. A time of reduced risk for important commercial, sport and resident fish species when instream construction is permitted.

**Grade:** The slope of road, channel, or natural ground.

**Geotextile fabric:** A synthetic material placed under erosion control material (*i.e.*, riprap), with the primary functions of layer separation, aggregate confinement and distribution of load.

**Harmful Alteration, Disruption or Destruction of fish habitat (HADD):** The DFO defines HADD of fish habitat as “any change in fish habitat that reduces its capacity to support one or more life processes of fish”.

**Habitat:** The place where an organism lives and the conditions of that environment including the soil, vegetation, water and food.

**Habitat enhancement:** Any manipulation of habitat that improves its value and ability to meet the specified requirements of one or more species.

**Leave area:** The area of land and vegetation adjacent to an aquatic area that is to remain in an undisturbed state, throughout and after works.

**LWBC:** Land and Water British Columbia

**Migration:** Fish movements between two or more separate habitats (*e.g.*, from over-wintering habitat to spawning habitat).

**Mitigation:** Actions taken during the planning, design, construction, and operation of a project to control, reduce or eliminate a potential adverse impact of a project.

**MoT:** BC Ministry of Transportation

**No Net Loss:** A working principle of the Federal DFO which strives to balance unavoidable habitat losses through avoidance, mitigation, and habitat replacement on a project-by-project basis. (DFO, 1986).

**Nursery habitat:** Habitat where juvenile fish feed or take refuge (*e.g.*, backwater areas, shallow creek margins).

**Results-based performance standards:** Typically define a maximum permissible disposal or impact threshold. For example, the concentration of a particular chemical in waste water discharge or a receiving environment; minimum in-stream flow levels; forest age class distribution within a defined zone. Requiring users of the environment to stay within the established threshold is presumed will achieve the environmental goal that the standard relates to. Results-based performance standards must be scientifically supported, as locally-relevant as possible, accepted by the public and stakeholders, enforceable by being capable of being measured, and affordable and feasible to implement (Brown, 2002)

**Revegetation:** The re-establishment of vegetation in disturbed areas.

**Riparian vegetation:** Vegetation adjacent to a watercourse, lake, swamp, or spring, that is generally critical for wildlife cover, fish food organisms, stream nutrients and large organic debris, and for stream bank stability.

**Riprap:** Rock or stone placed on earth surfaces for protection of the soil against the erosive action of flowing water or precipitation.

**Risk:** the probability that an undesirable event will or will not occur. It is the product of the probability of the event taking place, the probability of being exposed to the event, and the probability of certain outcomes occurring if exposure did take place. Risk can be statistically quantified in a risk assessment. (Dunster and Dunster 1996).

## Glossary

**Salmonid:** A general term that collectively refers to salmon species, trout and char.

**Sediment:** Particulate matter that is entrained within, or settled out from, water.

**Silt:** The fine-particulate fraction of sediment.

**Silt fence:** A synthetic barrier erected to restrict the movement of unconsolidated material from a disturbed area to any sensitive areas.

**Standard:** quantifiable and measurable thresholds that are typically defined in law or regulation, and are mandatory. A statement that outlines how well something should be done, rather than how it should be done. A standard does not necessarily imply fairness or equity, nor an absolute knowledge of cause-and-effect linkages. Standards are typically established using a combination of best available scientific knowledge, tempered by cautious use of an established safety (caution) factor. (Dunster and Dunster 1996).

**Stewardship:** caring for the land and associated resources so that healthy ecosystems can be passed on to future generations. (Dunster and Dunster 1996).

**Stream:** A watercourse, having an alluvial sediment bed, formed when water flows on a perennial or intermittent basis between continuous definable banks.

**Substrate:** The bottom or bed materials of a water body or watercourse in which plants and organisms live and grow.

**Suspended solids:** Particulate matter, such as silt or clay that is entrained within a water column (*i.e.*, has not settled to the substrate)

**Spawning habitat:** Fish habitat associated with the breeding of fish.

**Watercourse:** Any channel carrying water, either continuously or intermittently.

**WLAP:** British Columbia Ministry of Water, Land and Air Protection

**Woody debris:** Sound and rotting logs and stumps that provide cover for fish and wildlife.

## 9 Literature Cited

Daryl Brown Associates Inc. and Victoria Consulting Network Ltd. Performance-based environmental management in British Columbia. 2002. Written for MSRM, MWLAP and EAO September 2002.

Dunster, Julian and Katherine Dunster. 1996. *Natural Resource Management Dictionary*. Univ. of BC. Vancouver, BC. 380 pp.

Stoneman, C.L., C.B. Portt and S. Metikosh. Road maintenance activities and the Fisheries Act: a guidance document to avoiding conflicts. Can. Manu. Rep. Fish . Aquat. Sci. 2404 iv + 19pp.