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# Parks Canada National Best Management Practices

## Roadway, Highway, Parkway and Related Infrastructure

Canada



## Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure

Approved by

Original signed by Mike Wong

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July 23, 2015

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Date



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## Introduction

The Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure will allow an identified suite of project activities to be undertaken in such a manner that there will not be resulting significant adverse environmental effects.

The Best Management Practice (BMP) pathway is applied when there is a suite of routine, repetitive projects (e.g. paving) or activities (e.g. de-watering), with well understood and predictable effects. This fulfils Park's Canada's obligations under the *Canadian Environmental Assessment Act 2012* as a manager of federal land, see the [Guide to the Parks Canada EIA Process](#). The BMP maximizes efficiency through creation of a pre-approved impact assessment for the defined suite of projects, to which standard mitigation and environmental management measures can be applied.

The impact assessment officer (IAO) will review a proposed project and advise the functional manager of the project if and how this BMP should be applied. The IAO's advice will be based on whether the project falls within the scope of the BMP, and whether application of the mitigation measures in the BMP will adequately address potential adverse effects of the project.

Project Managers are responsible to ensure all mitigation measures applicable to the project are added to the terms and conditions of any permits or contracts issued for the project.

The Impact Assessment Officers must ensure the project, EIA pathway applied and determination are recorded in the Parks Canada National Impact Environmental Assessment [Tracking System](#).

## Scope of Application

This BMP outlines the impact assessment of repetitive and routine projects on roadways, highways and parkways. If a project involves some or all of below activities, and the initial assessment of site and project indicate "the project is unlikely to result in significant adverse environmental effects" the BMP can be applied. Projects that this BMP would likely be applied to include:

- The proposed maintenance or repair of an **existing** sidewalk, or parking lot.
- The proposed maintenance or repair of an **existing** road, including pull-off areas, that would be carried out on the existing right of way<sup>1</sup>.

Activities included in the scope of this BMP are:

1. Project Design
2. General Activities
  - Worksite Conditions/Staging/Laydown
  - Equipment operations
  - Fuel storage and refueling

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<sup>1</sup> Highway Footprint or Right of Way (ROW): The permanent physical intrusion of a highway or freeway, including the road surface, shoulders, side slopes, drainage ditches and/or storm drainage ponds (Transport Canada, 2008).



- Site Clean Up/Waste Disposal
3. Asphalt Production and Handling
    - Asphalt Plant Operation
    - Gravel Crushing and Washing
    - Oiling of Truck Boxes
    - Clean Up and Disposal of Waste Products
  4. Concrete Handling
    - Operation, maintenance and inspection of Onsite Temporary Concrete Washout Facility
    - Removal of Temporary Concrete Washout Facilities
    - Onsite concrete management
  5. Paving, Resurfacing and Grading
    - Grading
    - Paving and Resurfacing
    - Pavement Marking and Barrier and Guardrail Reinstatement
  6. Barriers and Guardrails
    - Repair, replacement and upgrades of barriers and guardrails
  7. Vegetation Removal
    - Vegetation Removal
    - Grubbing
    - Brushing
    - Disposal of Vegetation Debris
    - Integrated Pest Management
  8. Excavation, Soil Stripping and Overburden Removal
    - Excavation
    - Soil Stripping
    - Topsoil Salvage
    - Excavated Material Storage
    - Excess Material and Waste (overburden removal)
  9. Slope Stabilization, Drilling and Blasting
    - Slope stabilization-scaling, hydraulic hammers
    - Drilling and blasting for Slope Stabilization and Geotechnical Investigations
  10. Soil and Vegetation Restoration
    - Topsoil Replacement
    - Soil Amendments
    - Seedbed Preparation
    - Species Selection
    - Seed Lot Selection
    - Seed Mixture Composition
    - Seeding
    - Alternatives to Seeding
    - Reclamation Standards
    - Reclamation Plot Evaluation
    - Time Limits



10. Drainage Structures
  - Drainage structures
  - Culverts
11. Bridge Maintenance
  - Bridge Cleaning
  - Bridge Repairs Using Treated Wood Products
  - Bridge and Structure Painting
12. Water Withdrawal and Dewatering
  - Water Withdrawal
  - Pump Screens
  - Dewatering

## Exceptions

This BMP is not suitable for the following project activities as they would require supplemental assessment and/or mitigations:

- Work that may impact aquatic or terrestrial wildlife habitat connectivity, such as fences or culverts;
- Elongation of culverts; realigning water courses; dredging; or work below the high water mark of a fish bearing water body;
- Bridge projects needing work to occur below the High-Water Mark<sup>1</sup>, with permanent alteration to the water course, such as replacement of piers/abutments or permanent installation of structures on the bed of a water body;
- Greater than 10% increase in land use footprint (e.g. gravel pit expansion); and,
- Work which might adversely impact any potential or established Aboriginal and Treaty rights or traditional use<sup>2</sup>.

If the project has the potential to have an adverse effect on the critical habitat of a species at risk (with endangered, threatened, or extirpated status) this BMP does NOT apply. The project will require a separate environmental impact analysis.

If the project has the potential for **residual** adverse effects on a listed species at risk (including effects to individuals and residence of the individuals) this BMP does NOT apply, the project will require a separate environmental impact analysis.

**Note:** If there is any uncertainty regarding potential adverse effects to species at risk, consult a member of the [National Office Species Conservation team](#).

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<sup>1</sup> High-water Mark is the usual or average level to which a body of water rises at its highest point and remains for a sufficient time so as to leave a mark on the land. (Fisheries and Oceans, 2015). Upper Controlled Water Elevation (UCWE) is used as definition of High-water Mark in managed waterways.

<sup>2</sup> Parks Canada must engage in additional and separate consultations with Aboriginal groups if there is a possibility of a project adversely affecting established or potential Aboriginal or Treaty rights. This is required to fulfill federal government responsibilities in upholding the honour of the crown. If there is uncertainty regarding the need for Aboriginal consultation with respect to a project, refer the matter to Parks Canada Legal Services for advice. Guidance on consultation may be sought from the [Aboriginal Affairs Secretariat](#) and from the guidance document “[A Handbook for Parks Canada Employees on Consultation with Aboriginal Peoples](#)”.



## Approved geographic area of application

This BMP is intended for use in all Parks Canada administered protected heritage places with roadways, highways and parkways.

## Components of the environment that may be affected

Potential effects from projects of this type are well understood and predictable. They include:

### Water Resources:

- Adverse modifications to surface drainage patterns
- Reduced water quality due to increased erosion, sedimentation, transportation of debris and contamination (i.e. from leaks and accidental spills, etc.)

### Soil/Land Resources:

- Change in slopes, landforms, and landscape
- Soil compaction and rutting
- Slope instability, due to increased soil exposure and improper excavation and storage
- Soil contamination

### Air quality:

- Decreased ambient air quality (i.e. from dust, equipment emissions, etc.)
- Increased ambient noise levels
- Temporary increased levels of CO<sub>2</sub> and other pollutants
- Temporary increased localized temperatures from paving and equipment operation.

### Flora and Fauna:

- Damage to and/or removal of vegetation in immediate or adjacent areas
- Introduction of non-native species populations, or expansion of existing populations
- Wildlife sensory disturbance causing displacement/preferred habitat avoidance
- Wildlife habituation/attraction to artificial food sources
- Impeded/altered wildlife movement
- Damage to nests/disruption of nesting animals
- Mortality from project activities

### Cultural Resources:

- Adverse effects on the heritage value or character-defining elements of a cultural resource
- Impacts to archaeological resources (known or potential)

## Mitigation Measures

To use the document efficiently, keep the activity mitigation lists that apply to the project expanded and collapse the other activities by clicking on the section titles, print this as a pdf or



paper document and include with the EIA determination record. This will reduce the overall size and scope of the mitigations to present to contractors and project managers.

*Choose all that apply to project. Each title is hyperlinked to the related section.*

*Module*

1.	Project Design
2.	General Activities
3.	Asphalt Production and Handling
4.	Concrete Handling
5.	Paving, Resurfacing, Grading
6.	Barriers and Guardrails
7.	Vegetation Removal
8.	Excavations, Soil Stripping and Overburden Removal
9.	Slope Stabilization, Drilling and Blasting
10.	Soil and Vegetation Restoration
11.	Drainage Structures
12.	Bridge Maintenance
13.	Water Withdrawal and Dewatering





# 1. Project Design

When upgrades to infrastructure are planned opportunities to decrease the environmental impacts of long term operation should be considered in the engineering design. Some examples are: directing runoff into vegetated areas rather than directly into surface waters to decrease pollution in surface waters, increasing the span length of bridges during replacements to allow for terrestrial wildlife passage underneath and converting smaller culverts to larger culverts or clear span bridges to allow for better fish passage and less restricted flows.

## 2. General Activities Mitigations Module

Construction activities involve the use of laydown/staging areas, equipment operations, storage and handling of hazardous materials. Potential adverse effects include: destruction of vegetation, erosion and sedimentation, constriction for wildlife movements and introduction/spread of non-native vegetation.

### Work Site Conditions/Staging/Laydown

- 2.1. All employees must attend a briefing with an Impact Assessment Officer (IAO) or Surveillance Officer (SO) before beginning work at the site review and explain the mitigations that are conditions of the project approvals.
- 2.2. Minimize vegetation-clearing activities and ground disturbance by staging on existing hardened areas wherever possible.
- 2.3. Avoid or terminate activities on site that attract or disturb wildlife. Vacate the area and stay away from the immediate location if wildlife display aggressive behaviour or persistent intrusion.
- 2.4. Control materials that might attract wildlife (e.g. petroleum products, human food and garbage).
- 2.5. Notify the SO immediately about dens, litters, nests, carcasses (road kills), wildlife activity or encounters on or around the site or crew accommodation. Other wildlife-related encounters are to be reported to SO within 24 hours.
- 2.6. Delineate the work zone; clearly mark the limits to active construction and the access and egress locations.
- 2.7. When work involves the disturbance of soils or the use of erodible materials (e.g. sands, topsoil), prevent the transport of sediment by the installing of appropriate erosion and sediment control.
- 2.8. An Erosion and Sedimentation Management Plan shall be prepared for the components of the work undertaken in proximity to watercourses, wetlands or riparian environments. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger. The ponds shall also be designed to handle 1:5 year storm events, with overflow spill capacity for 1:10 year storm events and emergency spillway capacity for 1:100 year storm events. All components require regular maintenance to ensure effectiveness.

### Equipment Operations

- 2.9. Equipment movements and workers' private vehicles shall be restricted to the 'footprint' of the construction area.



- 2.10. Ensure machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species, noxious weeds and soils from off-site.
- 2.11. Operate machinery on land above the high water mark, on ice, or in another manner that minimizes disturbance to the banks and bed of any water body.
- 2.12. Limit machinery crossing (fording) a stream or watercourse to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, construct a temporary crossing structure in compliance with the *Fisheries Act*.
- 2.13. For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g., swamp mats, pads) if minor rutting is likely to occur during fording.
- 2.14. Use temporary crossing structures or other practices to cross streams or water bodies with steep and highly erodible (e.g., dominated by organic materials and silts) banks and beds.

## Fuel Storage and Refueling/Emergency Plans

- 2.15. A Spill Response Plan will be prepared and detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products in accordance with all applicable federal and provincial legislation. The Plan shall include a list of products and materials to be used or brought to the construction site that are considered or defined as hazardous or toxic to the environment. Such products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, hot poured rubber membrane materials, asphalt cement and sand blasting agents.
- 2.16. Spill kits shall be provided at re-fuelling, lubrication, and repair locations that are capable of dealing with 110% of the largest potential spill and shall be maintained in good working order. Site staff shall be informed of the location of the spill response kit(s) and be trained in its use.
- 2.17. If potentially hazardous materials (e.g. cement-based products, sealants or paints) are used on site ensure raw material, mixed compounds and wash water are not released to any watercourse or soils. Measures such as collection/drip trays and berms lined with occlusive material such as plastic and a layer of sand, and double-lined fuel tanks can prevent spills into the environment.
- 2.18. Hazardous or toxic products shall be stored no closer than 100 metres from streams, wetlands, water bodies or waterways.
- 2.19. Timely and effective action shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The SO shall be notified immediately of any spill. In the event of a major spill, all other work shall be stopped and all personnel devoted to spill containment and clean-up.
- 2.20. The costs involved in a spill incident (the control, clean up, disposal of contaminants and site remediation to pre-spill conditions), shall be the responsibility of the proponent. The site will be inspected to ensure completion to the expected standard and to the satisfaction of Parks Canada.

## Site Clean Up/Waste Disposal

- 2.21. Clean tools and equipment off-site to prevent the release of wash water that may contain deleterious substances.



- 2.22. 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.
- 2.23. Construction, trade, hazardous waste and domestic waste materials shall not be burned, buried or discarded at the construction site or elsewhere in Parks Canada protected heritage places. These wastes shall be contained and removed in a timely and approved manner and disposed at an appropriate waste landfill site located outside the Parks Canada protected heritage place. Construction waste storage containers, shall be emptied when 90% full. Waste containers will have lids, be wildlife proof if there attractants and waste loads shall be covered while being transported.
- 2.24. Sanitary facilities, such as a portable container toilet, shall be provided and maintained in a clean condition.

### 3. Asphalt Production and Handling Mitigations Module

Asphalt is a common building material for transportation infrastructure. Its production requires the use of gravel, water, and petroleum products, and associated project activities include transportation, storage and handling of these materials. Installation of asphalt plants is common within the larger parks where gravel extraction is undertaken.

#### Timing of Works

- 3.1. Asphalt works are preferably undertaken during periods of dry weather as this allows easier control of contaminated runoff and sediment.
- 3.2. 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 into surface waters, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.

#### Operation of Asphalt Plants

- 3.3. Asphalt plant operation must comply with all environmental pollution control regulations, including provincial regulations, and the plant operational plan.
- 3.4. Spoil piles and stock piles will be at least 30 meters from the edge of any water body.
- 3.5. There must be enough room between the stockpiles and the asphalt plant for a loader in the event of a spill at the asphalt plant.
- 3.6. A containment berm with an associated liner made of occlusive material (e.g. plastic of a thickness approved by the SO) and covered with absorbent sand or clay shall be installed under the asphalt storage tank to ensure containment of 110% of the tank's capacity.
- 3.7. The proponent shall be responsible for the purchase and safe delivery/storage/handling of asphalt cement and emulsions to the asphalt plant site.
- 3.8. Excess hot mix or reject new asphalt shall be temporarily stored in the containment area sufficient to prevent runoff of petroleum into soils or surface waters as directed by the SO, and removed from the Parks Canada protected heritage place, prior to project completion.



- 3.9. Every effort will be made to recycle waste asphalt, either as a base course, or by recycling waste asphalt through the asphalt plant according to engineering specifications. Old cured ground asphalt material shall be removed, recycled, or stored for future recycling at an approved operational gravel pit or asphalt plant site. Stockpiles must be further than 30 metres from any surface waters.
- 3.10. Remaining stockpiles will be removed or incorporated into reclamation plans for the gravel pits or asphalt plant sites.
- 3.11. Asphalt to be removed must be sampled and analyzed to determine possible lead contamination. Contaminated asphalt will be transported to an approved waste disposal facility. A receipt of delivery is to be provided to the SO.
- 3.12. Proponent should protect containment/catchment areas and drip trays at the asphalt plant from rainfall since, if contaminated, all of the collected water will require disposal of at an approved disposal facility at the expense of the Proponent.
- 3.13. Dyking and ponding will be required to control the rate and quality of runoff from the plant site.
- 3.14. Ensure that the water in the settling ponds remains clean of petroleum products. Any contaminated water will require disposal at an approved disposal facility at the expense of the Proponent.

## Gravel Crushing and Washing

- 3.15. Where possible within engineering constraints, asphalt materials should be recycled to reduce the need for new gravel.
- 3.16. Gravel will be obtained from an approved operational borrow pit only. For gravel obtained from a borrow pit within a protected heritage place or borrow pit, gravel extraction within the footprint of the disturbed area of the approved operational borrow pit is permitted.
- 3.17. Gravel will not be crushed within 30 meters of any water body.
- 3.18. If water for cleaning is extracted from a watercourse, refer to [water withdrawal section](#) of this BMP.
- 3.19. If gravel requires washing, the water used will not be returned directly to any watercourse.
- 3.20. Water free from chemical contaminants will be discharged into ground where further erosion and runoff into surface water is prevented. Discharging into well vegetated ground surface, at a rate which prevents erosion can often provide increased absorption and reduction of sediment load.
- 3.21. Contaminated water must be treated to meet CCME guidelines or transported outside of the Parks Canada protected heritage place for disposal at an approved facility.
- 3.22. For waste removed from the park a detailed receipt of delivery to an approved facility will be provided to the SO.

## Oiling of Truck Boxes

Trucks for hauling asphalt mixture shall have tight, clean, smooth metal beds that have been sprayed with a minimum amount of thin fuel oil to prevent the mixture from adhering and causing waste asphalt.

- 3.23. Truck boxes may be oiled only when absolutely necessary.



- 3.24. Oiling will take place in a bermed area, consisting of a plastic underlay with 15 centimetres overlay of clean gravel. Oil contaminated gravel will be hand collected (so as to prevent tearing of the plastic) from the bermed area daily, and put through the asphalt plant.
- 3.25. Vehicle covers shall be securely fastened.

### Air Quality Mitigations

- 3.26. Asphalt plants should be 500 meters from buildings with human habitation.
- 3.27. Emissions from the asphalt plant and paving project equipment will comply with End Product Specifications (EPS) emission control standards and other provincial emissions regulations. Stack test results provided to the ESO by the operator or surveillance contractor may be required when the asphalt plant is at full capacity to ensure the plant is operating within the required standards. If the plant is not operating within the appropriate levels, production will cease until the requirements are met.
- 3.28. Sludge removed from the clarifier that is free of chemical contamination will be contained to prevent fine dust particles from becoming airborne during windy periods.
- 3.29. Unannounced stack tests will be conducted throughout the project. If the plant does not meet requirements, operation will cease until the requirements can be met.

### Disposal and Clean Up of Other Waste Products

- 3.30. To ensure regular clean-up of waste asphalt and petroleum spills, a defined clean up schedule will be established during the preconstruction meeting.
- 3.31. Leaks will be collected in drip-trays, the collected material will either be removed from the park, or recycled back through the Asphalt Plant. For any material removed outside the park to an approved facility, a detailed receipt will be provided to the ESO.
- 3.32. Used oil, filters, grease cartridges, oil cans and other waste products of plant servicing will be collected and disposed of at the nearest industrial waste facility.

## 4. Concrete Handling Mitigations Module

Concrete is a common construction material used in transportation infrastructure. Its use ensures longevity of the infrastructure and safety for public use. One litre of concrete wash water 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.

### Onsite Temporary Concrete Washout Facility

- 4.1. Temporary concrete washout facilities shall be located a minimum of 30m from storm drain inlets, open drainage facilities, and watercourses.
- 4.2. Temporary concrete washout facilities shall be temporary pit or bermed areas constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- 4.3. Straw bales, wood stakes, and sandbag materials can be used to construct temporary containment walls or “barriers”.



- 4.4. Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material.
- 4.5. The soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.
- 4.6. Perform washout of concrete mixer trucks in designated areas only.
- 4.7. Wash concrete from mixer truck chutes into approved concrete washout facility or collect in an impermeable bag for disposal.
- 4.8. Pump excess concrete in concrete pump bin back into concrete mixer truck.
- 4.9. Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed offsite.
- 4.10. Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of per federal and provincial regulations.

### **Maintenance and Inspection of Temporary Concrete Washout Facilities**

- 4.11. Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100 mm (4 inches) for above grade facilities and 300 mm (12 inches) for below grade facilities.
- 4.12. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition.
- 4.13. Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- 4.14. Temporary concrete washout facilities shall be inspected for damage (i.e. tears in PVC liner, missing sand bags, etc.).
- 4.15. Onsite concrete waste storage and disposal procedures should be monitored at least weekly or as directed by the ESO.

### **Removal of Temporary Concrete Washout Facilities**

- 4.16. Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and restored.

### **Onsite Concrete Management**

- 4.17. Rolling concrete mixers with surplus concrete in amounts less than one cubic metre of wet concrete may waste this concrete in the grade right-of-way as directed by the Parks Canada Representative in areas that drain well away from watercourses. Surplus amounts in excess of one cubic metre are to be returned to the batching yard.
- 4.18. Water contaminated in the placing of cement and curing of concrete shall be contained and removed from the site to an approved disposal facility.
- 4.19. The concrete batching plant must be operated pursuant to applicable dust, air emission, and water quality control regulations.



- 4.20. Waste, solidified concrete from rolling concrete mixers in amounts less than 1 cubic meter and waste solidified concrete from construction pour shall be buried in the grade within 48 hours of the pour, subject to approval and direction from the Departmental Representative

## 5. Paving, Resurfacing, Grading Mitigations Module

Highway surface management activities are undertaken to ensure public safety on Parks Canada Agency 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. Grading is used to address drainage issues, vegetation encroachment, potholes and rough surfaces.

### Timing of Works

- 5.1. Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of contaminated runoff and sediment.
- 5.2. 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 into surface waters, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.

### Grading

- 5.3. During grade construction conducted close to any watercourse, water body or wetland ensure materials are not pushed, fall or are eroded into the water or wetlands.
- 5.4. No grade building shall occur outside of the delineated work area or within 1 metre of the drip line of existing forest. Any material inadvertently falling outside the work limits will be removed promptly in a manner that does not damage trees or vegetation.
- 5.5. Materials shall be placed at storage sites or on the grade without spillage outside the work limits. Any material inadvertently falling outside the work limits will be removed promptly in a manner that does not damage trees or vegetation.
- 5.6. Retain a 30 metre vegetated buffer around water bodies or install runoff management structures.
- 5.7. If possible grade roads early in the spring before vegetation develops seed heads or late in season after vegetation has set seed and is dormant to minimize non-native vegetation propagation.
- 5.8. Ensure gravel or road bed material is free of weeds and comes from an approved operational gravel source free of other contaminants.

### Paving and Resurfacing

- 5.9. Minimize changes to the surface that could affect infiltration and runoff characteristics and maintain effective surface drainage to limit direct runoff into surface waters.
- 5.10. Minimize application of seal coats in wet conditions. Attempt to apply only to dry surfaces and not prior to (within 24 hrs.) or during rainfall. If unforeseen rain arrives ensure runoff from recently seal coated surfaces are prevented from entering surface waters.
- 5.11. For asphalt handling and management see the [Asphalt Mitigation Module](#) of the BMP.



## Pavement Marking and Barrier and Guardrail Reinstatement

- 5.12. Minimize changes to the surface that could affect infiltration and runoff characteristics and maintain effective surface drainage to limit direct runoff into surface water. Pavement marking shall be undertaken pursuant to standard methods applied in National Parks for control of paint products, both in transport and handling. The Contractor shall present a description of methods to be employed for transporting and controlling paint and hazardous products, application of paint, cleaning of equipment, containment and disposal of waste paint and cleaning products, etc. the satisfaction of the Parks Canada Representative.
- 5.13. Where concrete barriers or guard rails are temporarily removed, for highway improvements, temporary glow posts shall be installed, at 20.0 m intervals on straight sections and at 10.0 m intervals on curves and shall remain in place until permanent barrier system has been installed.

## 6. Barriers and Guardrails Mitigations Module

Repair, installation and upgrade of barriers and guardrails involves laydown/staging areas, equipment operations, minor excavation (e.g., for barrier post holes) and use of concrete. Potential adverse effects include destruction of vegetation and erosion and sedimentation.

### Timing of Works

- 6.1. Where excavation is required, schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 6.2. If the work schedule requires working in the rain, appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

### Repairs, Replacement and Upgrades

- 6.3. An Erosion and Sedimentation Management Plan shall be prepared for the components of the work undertaken within 100m of watercourses, wetlands or riparian environments. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger.
- 6.4. Where use of concrete is required for guardrail post holes, Concrete Handling Mitigations apply.
- 6.5. If vegetation removal is required for barrier or guardrail works, Vegetation Removal Mitigations apply.
- 6.6. Where concrete barriers or guardrails are temporarily removed, temporary glow posts shall be installed, at 20.0 m intervals on straight sections and at 10.0 m intervals on curves and shall remain in place until permanent barrier system has been installed.

## 7. Vegetation Removal Mitigations Module

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. Mature timber





may need to be removed for improving road alignments, improving sight lines or replacing or repairing associated infrastructure. Grubbing (stump and root removal) may be required to prepare the ground surface for other activities.

## Timing Windows

- 7.1. Vegetation clearing can negatively impact nesting birds and/or bats in spring and summer. Avoid all vegetation removal during this time. If vegetation removal is scheduled to occur within these times a qualified professional biologist/ecologist should further clarify the species presence and timing particular to the work site and any occupied bird nests, eggs, or nests of species protected under the Migratory Bird Convention Act (MBCA). See [appendix on regulatory guidance for further detail on the MBCA and SARA](#).
- 7.2. If a nest is found during the pre-work surveys, the vegetated area will be left intact with a suitable sized buffer of shrubs/trees around it until the young have fledged and left the nest. Size of buffer species dependent, to be determined in consultation with professional biologist or park ecologist.
- 7.3. Grass mowing and trimming should not occur during peak spring or fall reptile/amphibian migrations and hatching. Consult a local biologist/ecologist for site and species specific timing windows.

## Vegetation Removal Mitigations

- 7.4. Vegetation removal should be limited to the minimum Clear Zone Distance<sup>1</sup> dependent on type and size of road and maximum height needed to meet the road safety objectives.
- 7.5. Minimize full removal and retain vegetation when possible to reduce erosion.
- 7.6. Prior to the commencement of any vegetation removal, the worksite must be surveyed for species at risk. If species at risk are found, work must be stopped until site-specific mitigations to address potential adverse effects are developed.
- 7.7. Survey vegetation for non-native species, clear vegetation areas with non-native vegetation in spring and early summer to avoid further spread and development of the non-native seed bank.
- 7.8. Clearing activities shall be avoided during nesting seasons for birds, reptiles and amphibian species in the project area.
- 7.9. If wildlife is observed during work, if possible, give animals the opportunity to escape the work area to the surrounding forest or elsewhere to seek new shelter.
- 7.10. Avoid ground vegetation removal during dry, windy periods to prevent erosion of topsoil and reduction of air quality with dirt/dust.
- 7.11. Retain 30 metre vegetated buffer around water bodies, where disturbance is necessary and unavoidable restoration is required.
- 7.12. Debris will not be deposited in water bodies.
- 7.13. Ensure tree limbs/stumps are flush cut as close to the ground or stem as possible.

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<sup>1</sup> A clear zone is an unobstructed, traversable roadside area designed to enable a driver to stop safely or regain control of a vehicle that has accidentally left the roadway. The selection and design of appropriate clear zone dimensions is project-specific and should be the responsibility of professionals trained in roadside design.



- 7.14. Logs and other salvage materials are to be conveyed to and placed at a storage site without spread of debris or damage to other standing trees or landscape resources outside the marked clearing or storage limits. They shall not be skidded through wetlands, waterways or water bodies.
- 7.15. During the grubbing component, stumps, roots, imbedded logs and other non-soil debris shall be pulled and shaken free of loose soil and rocks before transport to a designated pit.
- 7.16. Where possible preserve identified wildlife trees by limbing or topping if they are not assessed as hazard trees.

## Disposal of Vegetation Debris

- 7.17. All vegetation debris must be removed as soon as possible from the right-of-way, either by transporting off-site for disposal or piling and burning on-site.
- 7.18. All vegetation containing non-native species will be piled and burnt or bagged and removed off site to disposal facility.
- 7.19. Piles will be made where trees are felled, piles will be 1.2-1.8 (4 to 6 feet) in diameter and no more than 1.2 m (4 feet) high (approximately 1 to 3 trees per pile) or as instructed by local fire and vegetation specialists.
- 7.20. Piles are to be located so that they do not scorch surrounding live trees and measures must be in place to ensure that fires do not spread (i.e., conduct burning on snow or on mineral soil).
- 7.21. Piles will be left until fall for burning to allow for curing of green fuels.
- 7.22. Provincial regulations for air quality must be met.
- 7.23. Where fire fuel loading is not a concern vegetation debris of limited amounts will be dragged in the forest to mimic natural tree fall.
- 7.24. If removal or burning are not feasible a chipper may be used for less than 50 boles per hectare. Chip depth is to be a maximum of 5 cm (2 inches), spread over area no greater of 5m x 5m per hectare so as to not cover underlying vegetation, prevent new native seedlings from sprouting, and cause soil/seed bank sterilization. Spreading of chips may extend beyond these parameters with permission from Parks Canada.
- 7.25. To facilitate chipping of woody debris, all trees/shrubs/vines can be left temporarily along the road shoulders and laid facing the same direction.
- 7.26. In some cases, logs from newly cut trees may be set aside for use elsewhere as directed by local park site managers and the ESO.
- 7.27. Store removed vegetation on already disturbed areas to minimize disturbance area.
- 7.28. In appropriate areas re-establish native vegetation where it has been completely removed/damaged.

## Integrated Pest Management

- 7.29. A Field Unit Integrated Pest Management Plan (IPMP) must be completed and approved prior to the use of herbicides to ensure the most effective and least harmful substances are properly used.



## 8. Excavations, Soil Stripping and Overburden Removal

### Mitigations Module

Construction projects often involve excavations. To successfully complete reclamation of disturbed areas, and protect areas from erosion proper soil handling and backfilling procedures must be followed. Post excavation and stripping soil and vegetation restoration mitigations should be applied. See section of this BMP for [Soil and Vegetation Restoration](#).

#### Timing of Works

- 8.1. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 8.2. If the work schedule requires working in the rain, appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

#### Excavation

- 8.3. Materials shall be placed at storage sites or on the grade without spillage outside the working limits. Any material inadvertently falling outside the work limits is to be removed promptly in a manner that does not damage trees or vegetation.
- 8.4. All sediment control measures must be in place before starting work in the vicinity of rivers, water bodies, watercourses, and wetlands.
- 8.5. Special precautions may have to be taken during excavation in the vicinity of intermittent or active drainage channels.
- 8.6. Excavation plans must be compared to local archaeological resource inventories, if available. If no archaeological information is available for the work area, an Archaeological Overview Assessment (AOA) may be required to determine the archaeological potential of the work area. Based on the results from the AOA, an Archaeological Impact Assessment might be required. It would be time and cost efficient to refer the plan to Parks Canada's Terrestrial Archaeology section before conducting any excavation to determine the appropriate course of action.
- 8.7. If cultural resources (eg. archaeological resources) are discovered, immediately cease work, and alert SO.
- 8.8. Minimize changes to the ground surface that affects its infiltration and runoff characteristics and maintain/re-establish effective surface drainage on completion of the project
- 8.9. Backfill and compact excavations as soon as possible. Optimize degree of compaction to minimize erosion and allow for re-vegetation.
- 8.10. All trenches or ditches left unattended overnight must be fenced or covered to prevent wildlife entrapment.

#### Soil Stripping

- 8.11. Strip topsoil under dry conditions, whenever possible.
- 8.12. No stripping shall occur outside of the delineated work area or within 1 metre of the drip line of existing forest.



- 8.13. In the event of a work program shutdown during inclement weather (e.g. winter conditions unfavourable for construction, heavy rain events, construction delays, etc.) erosion control of bared soils or excavated material stockpiles is required.
- 8.14. Stripping close to any watercourse, water body or wetland shall employ methods to ensure materials are not pushed, do not fall or erode into the water or wetlands.
- 8.15. Work within a 100 metre buffer from the high water mark of waterways or wetlands will require a site specific sediment and erosion control plan.
- 8.16. An erosion control plan is also needed to control dust generated from the construction site.

### Topsoil Salvage

- 8.17. Salvage topsoil at all excavation sites for reclamation purposes.
- 8.18. Usually the upper 15 cm of soil, below the sod layer if present, is considered topsoil, where depths exceed 15cm salvage the entire depth of topsoil.
- 8.19. Remove stumps and woody debris from topsoil, wherever possible.

### Excavated Material Storage

- 8.20. Allow space for separate storage of topsoil and spoil; where space is available separate stored topsoil from spoil by at least 1 m. Use appropriate material (e.g., geo-textile) to separate soil components where space is limited.
- 8.21. Topsoil may be stored on hardened surfaces, geo-textile material or directly on undisturbed vegetation. If storage occurs on vegetation, material recovery by hand may be required.
- 8.22. Cover all stockpiled material with heavy-duty plastic or filter cloth to prevent erosion during precipitation events.
- 8.23. Topsoil should be stockpiled on the uphill side of the disturbance on sloped terrain.
- 8.24. Construct barricades to prevent losses on steep terrain ( $>18^\circ$ , 3:1) and within 100m of watercourses.

### Excess Materials and Waste (Overburden Removal)

- 8.25. Remove excess excavated material from site where it cannot be used for the final grading of the area. Site specific arrangements must be made for disposal locations and procedures of overburden.
- 8.26. Surplus excavated material may be used to fill depressions around the project site providing topsoil is stripped before filling, with approval from SO.

## 9. Slope Stabilization, Drilling and Blasting Mitigations Module

Where standard excavation is not sufficient, scaling, hydraulic hammers, drilling units or trim blasting are used to break up rock or soil for removal. Accumulations of debris in ditches reduce their effectiveness at trapping rock fall and reduce public safety. Ditches will be cleaned using a loader and back hoe. Guardrails and rock fences may be temporarily removed to permit this activity.



## Timing of Works

- 9.1. Time any vegetation removal work should adhere to the Migratory Bird windows for the area.
- 9.2. Time work to reduce impact to mammals, amphibians and reptiles using rock faces during sensitive life stages such as birthing and rearing of young. This often occurs during the spring. Confirm timing windows with local wildlife ecologists.
- 9.3. Avoid ditch clearing during wet periods and wait until ditches are dry to reduce impacts to amphibians and reptiles and limit sedimentation.

## Slope Stabilization-Scaling, Hydraulic Hammers

The use of hydraulic hammers attached to excavators is considered the ideal solution for rock disintegration. It avoids rock blasting where the parent rock is no longer rippable by the excavator's bucket but still has enough planes of weakness for economical operation and effective use of the hydraulic hammer. Scaling is the manual removal of loose material on rock slopes using pry bars, hydraulic press, brooms, shovels and power equipment operated by personnel using roped access to a rock face.

- 9.4. For vegetation clearing refer to the [vegetation removal mitigation module](#) of this BMP.
- 9.5. For slope-stabilization in soils, please refer to the Excavation section.
- 9.6. Survey the work site for cultural resources such as rock art (ex. pictographs, petroglyphs, etc. prior to the work commencing, establish site specific mitigations for their protection.
- 9.7. Measures shall be taken to control dust as much as possible during the removal and falling of rock materials down slope.
- 9.8. Placement of rip rap and backfill on shorelines shall be undertaken without contacting the watercourse, wetted margins and must not be below the High Water Mark.
- 9.9. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, then ensure that appropriately- sized, clean rock is used, and rock is installed at a similar slope to maintain a uniform bank.
- 9.10. Direct concentrated surface water (runoff) away from cut and fill slopes.
- 9.11. Immediately stabilize banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through vegetation restoration with native species suitable for the site-refer to [soil and vegetation restoration section of BMP](#).

## Drilling and Blasting for Slope Stabilization and Geotechnical Investigations

Trim blasting is used for controlled blasts in which explosive charges are placed in predetermined pattern of holes drilled into the rock face and then detonated. Potentially unstable masses of rock can sometimes be stabilized using rock bolts and long steel rods drilled into the rock to bind it together. Drilling is a common method of investigation to obtain geotechnical reports required for engineering design.



## Drilling

- 9.12. Debris from drilling will be contained (screened or settle out) so it will not cover the surrounding area or enter any water course. All debris will be removed, [see section on overburden removal](#) for further mitigations.
- 9.13. The cuttings from all drilling will be contained so they can be removed entirely from the site. If contaminated, the cuttings are to be disposed at an approved waste disposal facility.
- 9.14. Control of spoil and sediment loaded water is required on the drill site. Dyking will be required to retain the deposit on non-vegetated surfaces. If contaminated, the spoil pile must be disposed at an approved waste disposal facility.
- 9.15. During aquifer tests, the water must be piped so it does not erode any soil or any part of the ground. If the water from the tests is piped to a creek, stream, or river, the pipe is to be situated so that there is no erosion of the stream bank or bed. If any sand or similar material is discharged during the aquifer test, care must be taken that the sand does not cover any vegetation.
- 9.16. All test wells will be filled in after the testing is completed. The proponent will be responsible for rectifying any future problems associated with any of the wells or test wells.

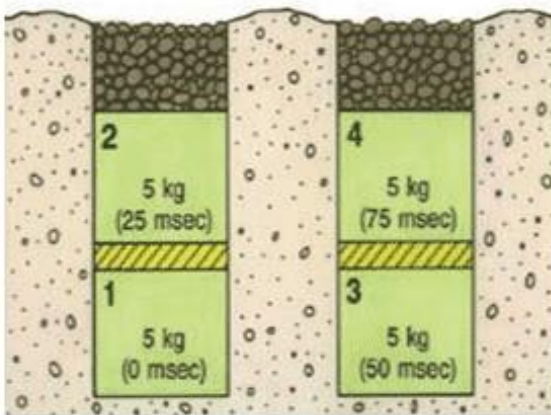
## Blasting

- 9.17. The Parks Canada Representative will identify a magazine location for explosives should a factory site or "ready-to-use" explosives storage site be required
- 9.18. The blasting supervisor will ensure no damage to infrastructure, people, surrounding vegetation or wildlife by mitigating risk of fly rock.
- 9.19. Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.
- 9.20. If explosives are required as part of a project (e.g., removal of structures such as piers, pilings, footings; removal of obstructions such as beaver dams; or preparation of a river or lake bottom for installation of a structure such as a bridge or culvert), the potential for impacts to fish and fish habitat will be minimized by implementing the following measures:
  - Time in water work requiring the use of explosives to prevent disruption of vulnerable fish life stages, including eggs and larvae, by adhering to appropriate fisheries [timing windows](#).
  - Isolate the work site to exclude fish from within the blast area by using bubble/air curtains (i.e., a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose), cofferdams or aquadams.
  - Remove any fish trapped within the isolated area and release unharmed beyond the blast area prior to initiating blasting.
  - Minimize blast charge weights used and subdivide each charge into a series of smaller charges in blast holes (i.e. Decking) with a minimum 25 millisecond (1/1000 seconds) delay between charge detonations (see Figure 1).



- Back-fill blast holes (stemmed) with sand or gravel to grade or to streambed/water interface to confine the blast.
- Place blasting mats over top of holes to minimize scattering of blast debris around the area.
- Do not use ammonium nitrate based explosives in or near water due to the production of toxic by-products. Remove all blasting debris and other associated equipment/products from the blast area.

Figure 1: Sample Blasting Arrangement



Per Fig. 1: 20 kg total weight of charge; 25 msecs delay between charges and blast holes and decking of charges within holes. (Fisheries and Oceans Canada, 2015)

## 10. Soil and Vegetation Restoration Mitigations Module

Almost all projects activities included in this BMP will require some ecological restoration- *the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed*. The restoration plan can be a simple application of the following mitigations and can be at the site or both at the site and in concert with another site designated to offset the permanent impact of a project. For disturbance areas greater than a hectare a restoration plan is required. The restoration works can be often be considered projects in and of themselves. Soil and vegetation restoration must apply the principles of effective, efficient and engaging solutions.

### Timing Windows

- 10.1. Develop restoration plan as part of the project scoping and specifications prior to project approvals.



- 10.2. Vegetation restoration is most effective if seeded in the fall, this allows for full scarification of the seed over the winter and adequate moisture available. Spring and early summer will also work, consider using seed that requires shorter scarification times for these applications. Transplants will do best in the spring and summer and will require adequate watering.

## Topsoil Replacement

- 10.3. Implement restoration plan for the disturbed area immediately following completion of construction.
- 10.4. Replace topsoil to all areas immediately following fine grading.
- 10.5. Do not compact topsoil.
- 10.6. Where insufficient topsoil is available imported soil may be used as a last resort. Imported topsoil must be certified completely free of non-native seeds and compost developed from sewage treatment plants. Methods of improving vegetation succession using locally sourced, weed and contaminant free materials are preferred.
- 10.7. Slopes to be seeded should be no steeper than 2 horizontal to 1 vertical (2:1) and covered with a minimum of 5 cm (2 inch) of topsoil. Finish grading should always follow top soil placement.
- 10.8. Where remaining soils are unstable due to steepness or soil characteristics, immediate installation of sod or erosion control blanket is required.
- 10.9. Methods of bioengineering such as terracing, willow staking, live pole drain systems should be assessed as solutions where soils are steeper or remain unstable.

## Soil Amendments

### Fertilizer Application

- 10.10. Avoid use of fertilizer to limit non-native vegetation growth and allow for local species to use available nutrients.
- 10.11. If needed use locally sourced mycorrhizae compost teas to improve vegetative success.

### Topsoil substitute

- 10.12. Apply an organic cellulose only amendment as a soil substitute if reclamation standards are not being met within the defined time frame.
- 10.13. Determine the type of organic amendment based on the site-specific requirements (e.g., peat moss, compost).

## Seedbed Preparation

- 10.14. The seedbed will be scarified by hand or, with the approval of the SO, by machine on large areas (i.e., roadbeds) where it is accessible and appropriate.
- 10.15. The seedbed will be scarified if seeding takes place more than 7 days after final grading or if there has been a rainfall between final grading and the seeding date.





- 10.16. The cleats of a tracked vehicle or a harrow device will be used, where possible, to prepare an adequate seedbed with seedling safe-sites (microsites) substantially free of soil crusts.
- 10.17. Align cleat marks at right angles on slopes to trap seed and sediment and reduce erosion.

## Species Selection

- 10.18. When selecting species and varieties:
  - Use species of local native plant communities.
  - Species viability in proposed environment and climatic conditions.
  - Capability to effectively control erosion, where required.
  - Adaptation to the variable site conditions of undulating topography.
  - Consider palatability of some species to herbivores and avoid growing attractants in areas of increased risk to wildlife and visitors.
  - Variable life expectancy to produce variable, delayed die-out of seeded species and replacement with indigenous native plants.

## Seed Lot Selection

- 10.19. Select seed lots based on indigenous species variety and quality (guaranteed weed seed free content and highest purity and germination), consult with vegetation restoration specialist or fire/vegetation ecologist.
- 10.20. Reject any seed lots containing any seed of undesirable crop or weed species.

## Seed Mixture Composition

- 10.21. The proportion of each species should be calculated to provide an adequate quantity of pure live seed (PLS) per unit area of each key component.
- 10.22. Aim for density of about 140 seedlings/m<sup>2</sup> at the end of the first growing season to provide adequate ground cover and allow native species to re-colonize the site over time.
- 10.23. Consider that parameters such as seed lot purity, seed germination, seedling establishment, seed size and seeding method affect the final stand composition.

## Seeding

- 10.24. Use approved native seed mixes developed for site-specific conditions for various elevations.
- 10.25. Seed and stabilize (e.g. mulch/tackifier) bare areas as soon as possible after disturbance, preferably as soon as a significant area is graded and finished and before the next rain event. If there is a risk of seedling mortality as a result of fall frost stabilize until appropriate growing conditions exist.
- 10.26. Use sod in high traffic areas or places that need extra erosion control. Source sod grown from native species (often called fescue sod) and ensure adequate anchoring and watering is in place.
- 10.27. Use temporary seeding when outside the seeding dates for permanent vegetation
- 10.28. Apply a seed mixture which is appropriate for the climate, soil, and drainage conditions of the site.
- 10.29. Apply seed at a rate appropriate to the seed mixture, seeding method and existing vegetation conditions.



- 10.30. Conduct broadcast seeding under calm wind conditions. Hydro-seeding is acceptable where access is available.
- 10.31. Do not exceed 30 kg/ha for the broadcast method, ensure seed is integrated with the soil by light rake or harrow. Broadcast method seeding rate is 25 kg/ha (2.5g/m<sup>2</sup>) (e.g., 1x25 kg bag will cover 10,000m<sup>2</sup> or 1 hectare).
- 10.32. For hydro-seeding do not exceed 75 kg/ha with light mulch rates (500 kg/ha- of mulch with hydro-seeding) and 150 kg/ha with heavy mulch rates (1500 kg/ha of mulch with hydro-seeding).
- 10.33. Do not increase the seeding rate to compensate for poor seedbed conditions.
- 10.34. Monitor temporary erosion control measures to prevent seed loss.
- 10.35. Some seeding procedures may have to be completed or repeated in subsequent years.

### Alternatives to Seeding

- 10.36. Use topsoil seed bank in small areas when there is no risk of erosion or competition from invasive species (i.e., natural regeneration).
- 10.37. Use native transplants in areas where conventional seeding applications are not applicable or where slope stability is an issue.
- 10.38. Use conventional forestry planting methods for container grown transplants, see website for guidance.

### Reclamation Standards

- 10.39. Minimum standard for plant density is 25 plants/m<sup>2</sup>, with 90% frequency.
- 10.40. Minimum standard for plant cover is 80% ground cover, with 90% frequency.
- 10.41. Minimum standard for plant community composition standard is 50% cover and 90% frequency of native species.
- 10.42. Exclude species designated as weeds in the work sites from the plant density standard consult local vegetation ecologist for current site specific non-native vegetation management program.
- 10.43. Rock, plant litter and non-vascular species are included in the cover standard.
- 10.44. Remaining plant cover of seeded native species is acceptable.

### Reclamation Plot Evaluation

- 10.45. Select any site within reclamation area measuring 10 x 10 m, providing 100 plots of 1 square meter.
- 10.46. Measure the plant density, cover and composition in each of the 100 square meter plots.
- 10.47. The reclamation standard will have been met if 90 of the 100 plots match or exceed the criteria.
- 10.48. No fertilizer will be applied one year before the reclamation standard is evaluated.

### Time Limits

- 10.49. Inspect site annually during the growing season.
- 10.50. Minimum reclamation standard, as above, to be met within one season post planting.
- 10.51. Apply amendments annually, depending on reclamation progress.



- 10.52. Re-seed site if the plant density standard is not expected to be achievable within 5 years.
- A new restoration plan will be prepared and implemented when reclamation standards have not been met after 5 years.

## 11. Drainage Structures Mitigations Module

Drainage structures on roadway, highway and parkways are structures such as culverts, ditches and drains. Drainage structure management activities are undertaken to ensure that surfaces are safe and efficiently drained, water is efficiently channeled to ditches and watercourses, and erosion of highways and adjacent properties is prevented. These mitigations include the cleaning and maintenance of drainage structures and related hardware, as well as the repair or replacement of existing and installation of new drainage structures.

### Timing of Works

- 11.1. Time work in water to respect [timing windows](#) to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. Contact your local aquatics specialists and DFO offices for further information on [timing windows](#) in your region.
- 11.2. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
- 11.3. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 11.4. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

### Drainage Structures

- 11.5. 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.
- 11.6. Select appropriate equipment and work access routes to reduce damage to riparian vegetation and watercourse banks when using earth-moving equipment.
- 11.7. For smaller scale debris and sediment removal activities, remove materials by hand.
- 11.8. To assist with bank stability and invasive plant prevention, leave topsoil and root systems intact on channel banks surrounding your work area.
- 11.9. Ensure any works to repair damaged structures retain the pre-repair channel conditions (e.g., streambed profile, substrate, channel cross section) and do not constrict the stream width.
- 11.10. Maintain effective sediment and erosion control measures until complete re-vegetation of disturbed areas is achieved.

### Culverts

If a proposed culvert crosses a stream where fish are present, the crossing should be designed or upgraded to provide fish passage and avoid interference with fish habitat. To mitigate the



impact of culverts on fish movement technical assessment of the water flows and fish species is required to establish a culvert design that will allow for passage of fish. Often there are regional or provincial best practices available online and qualified professionals can assist with designs. Some best management practices for installation or replacement of culverts follows.

#### Culvert Design and Alternatives

Utilize alternative crossing structures (e.g. clear span bridges, lock blocks and concrete decks) as a replacement for culverts, where possible.

- 11.11. Ideally, crossings should have natural streambed material through them to allow continuous substrate that matches the streambed below and above the crossing. Open bottom crossings are ideal for maintaining natural substrate.
- 11.12. Utilize a single large culvert design over a multiple culverts design (i.e. several smaller culverts) to reduce debris blockage and increased fish and wildlife passage, where hydrologically feasible
- 11.13. Design culvert bottoms to be placed at least 30cm below the stream bed elevation to ensure culverts remain passable by fish and wildlife by preventing culverts from becoming perched.
- 11.14. A minimum water depth of 200 mm should be provided throughout the culvert length. To maintain this water depth at low flow periods an entrance/downstream pool can be constructed. In some cases, an upstream pool may also be necessary.
- 11.15. The culvert slope should follow the existing streambed slope where possible.
- 11.16. The culvert, inlet(s) and outlet(s) should be adequately protected with rip-rap to prevent erosion and scour around the culvert during high runoff events. The following measures should be incorporated when using replacement rock to stabilize the culvert:
  - Place appropriately-sized, clean rocks into the eroding bank area by hand or machinery operating outside the water course.
  - Do not obtain rocks from below the ordinary high water mark of any water body.
  - Where possible, install rock at a slope similar to the stream bank to maintain a uniform stream profile and natural stream alignment. Otherwise, install the rock at the closest slope required to ensure it is stable.
  - Ensure rock does not interfere with fish passage or constrict the channel width.
- 11.17. Trash racks should not be used near the culvert inlet. Accumulated debris may lead to severely restricted fish passage and potential injuries to fish. Where trash racks cannot be avoided in culvert installations, they must only be installed above the water surface indicated by bank full flow. A minimum of 9 inches clear spacing should be provided between trash rack vertical members. If trash racks are used, a long term maintenance plan must be provided along with the design, to allow for timely clearing of debris.
- 11.18. Natural or artificial supplemental lighting should be considered in new or replacement culverts that are over 150 feet in length.
- 11.19. Ensure designs locate culvert structures in areas that minimize impacts to riparian vegetation and associated wildlife.



### Culvert Installation

- 11.20. It may be necessary to exclude fish from the immediate construction site while a culvert is being installed. If this practice is necessary, fish shall be salvaged by a qualified aquatics professional from within the exclusion area.
- 11.21. If dewatering is required refer to the [dewatering mitigation module](#) of this BMP for appropriate mitigations.
- 11.22. Maintain effective sediment and erosion control measures until complete re-vegetation of disturbed areas is achieved.
- 11.23. Remove any old structures to a suitable upland disposal facility away from the riparian area and floodplain to avoid waste material from re-entering the watercourse

### Wildlife Considerations for Culverts

At times, culverts are placed along portions of highways that bisect wetlands or specific habitats that support an abundance of wildlife. Consider building natural rock ledges through culverts to allow for small and medium-sized animals to walk on during periods of high flow.

## 12. Bridge Maintenance Mitigations Module

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 asphalt, concrete works, chipping, painting, grouting, timber truss, abutment and piling maintenance. These activities help ensure bridge structures remain structurally sound and safe for public use.

### Timing of Works

- 12.1. Time work in water to respect [timing windows](#) to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. Contact your local aquatics ecologists, provincial jurisdictions and DFO offices for further information on [timing windows](#) in your region.
- 12.2. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
- 12.3. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 12.4. Cover or otherwise contain stockpiled materials during heavy rain events or extended absences.
- 12.5. If the work schedule requires working in the rain, the area of work must be isolated with appropriate sediment controls installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

### Bridge Cleaning

- 12.6. Schedule bridge-cleaning activities to coincide with the watercourse's spring freshet when possible. 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.



- 12.7. If works are planned outside the freshet or if your region does not experience a freshet, discuss the protocol and timing of these works with your local aquatics ecologist and/or DFO Officer.
- 12.8. Dry sweep and collect loose material off bridge surfaces before washing the bridge. Adequately seal drains and any open joints on the bridge deck before sweeping or washing to prevent material or sediment-laden wash water from entering any watercourse
- 12.9. If dry sweeping and preventing direct runoff to waterway is not a feasible way to clean the surface, discussion and planning with local aquatic ecologists will be required.
- 12.10. Use water alone. If your cleaning activities require degreasers or any other chemical, approval for use must be obtained from local aquatics specialists and/or DFO.
- 12.11. 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.
- 12.12. 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, or re-route runoff through temporary piping onto adjacent settling pond or structure, using a hydro vacuum would be another option.
- 12.13. If water for cleaning is extracted from a watercourse, refer to [water withdrawal section](#) of this BMP.

## Repairs Using Treated Wood Products

- 12.14. Untreated wood products are recommended, if treated wood is to be used, ensure it has been treated with a wood preservative appropriate for the project. Refer to the [Parks Canada Guide for the Use, Handling and Disposal of Pressure Treated Wood 2009](#) and any further updates from [Parks Canada Real Property – Environmental Management](#).
- 12.15. If treated timber must be cut to size, ensure cutting takes place away from the bridge and watercourse. Sawdust from treated wood is harmful to aquatic organisms and must be prevented from entering any watercourse.
- 12.16. Wood preservatives should be applied in a contained area and not be applied over or within 200m of water.

## Bridge and Structure Painting

- 12.17. Ensure paint flakes, abrasive grits and abrasive/paint flake mixtures do not enter the watercourse as they may leach toxic heavy metals into receiving waters and/or be ingested by fish.
- 12.18. Install ground covers and/or vertical drapes such as sheets of plastic or air-permeable cloth (e.g., burlap or canvas) prior to removal activities to capture falling debris. Floating barges may be deployed in watercourses to capture falling debris, such as paint flakes and dust.
- 12.19. Waste materials collected during removal and application of protective coating operations (e.g., blasting abrasives, paint particles, rust and grease) should be



collected and retained for disposal at appropriate locations. Waste materials must not be deposited into watercourses or riparian areas.

- 12.20. Use hydro blasting or manual techniques, where possible, when removing road dirt, soluble salts and loose paint to minimize impacts to the watercourse.
- 12.21. Use water without cleaning agent additives if grease film removal is necessary.
- 12.22. Avoid use of toxic liquid paints, primers, solvents, degreasers and rust inhibitors.
- 12.23. Minimize spill potential by storing, mixing and transferring paints and solvents on land.

## 13. Water Withdrawal and Dewatering Mitigations Module

Construction often requires the use of water, many common methods of excavation and site isolation require dewatering. Temporary, short term water withdrawal provides an efficient uncontaminated water source for local project sites. Dewatering can allow sites to be effectively dry during construction, reducing the impact of sediment laden water entering fish bearing waters.

### Timing Windows

- 13.1. As a general guide to prevent taking more water than aquatic system can support, limit total take of water to less than 5 successive days and less than 10 days in any period of 30 days.
- 13.2. Avoid water withdrawal during breeding seasons of amphibians and reptiles to avoid destruction of egg masses, consult local aquatics ecologist for site specific guidance.

### Water Withdrawal

- 13.3. Water should not be withdrawn from a wetland or stream less than 5 metres wide at the surface or a lake less than one hectare in area.
- 13.4. Water withdrawal should follow the 10/90 rule which allows for up to 10% of the stream flow to be withdrawn, as long as the stream flow does not fall below the 90% exceedence flow (eg. 1 in 10 chance in a given year).
- 13.5. No permanent or semi-permanent works for water withdrawal should be placed in the stream channel.
- 13.6. Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish, amphibians and/or reptiles. Entrainment occurs when a fish or amphibian is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish, reptile or amphibian is held in contact with the intake screen and is unable to free itself.

### Pump Screens

- 13.7. In freshwater, fish-bearing waters design and installation of intake end-of-pipe fish screens:
  - Locate screen in areas and depths of water with low concentrations of fish throughout the year away from natural or artificial structures that may attract fish that are migrating, spawning, or in rearing habitat.
  - Orient the screen face in the same direction as the flow of water.
  - Ensure openings in the guides and seals are less than the opening criteria to make “fish tight”.



- Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
- Provide structural support to the screen panels to prevent sagging and collapse of the screen. Large cylindrical and box type screens should have a manifold installed to ensure even water velocity distribution across the screen surface. The end of the structure should be made of solid materials and the end of the manifold capped.
- Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where debris loading (woody material, leaves, algae mats, etc.) is a concern. A 150 mm (6 in.) spacing between bars is typical.
- Provision should be made for the removal, inspection, and cleaning of screens.
- Ensure regular maintenance and repair of cleaning apparatus, seals, and screens to prevent debris fouling and impingement of fish.
- Pumps must be shut down when fish screens are removed for inspection and cleaning.

## Dewatering

- 13.8. A site specific dewatering plan is required be provided before commencing a pump-out sump to dewater excavation sites with specific details on how and where the water will be discharge.
- 13.9. Site specific mitigations may be required depending on the conditions of the discharge area, freezing conditions operation, overflow avoidance, decanting and settlement pond reclamation.
- 13.10. Water containing suspended materials shall not be pumped into watercourses, drainage systems or on to land, except with the permission of the SO.
- 13.11. Soil and vegetation erosion protection is required for water pumped on to land.





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## Appendix 1 Regulatory Guidance

### Jurisdictions

While all projects on lands managed by Parks Canada must adhere to Federal law and regulation, it is considered best practice to refer to local community, regional, provincial regulation and best practices where federal guidance is silent and/or attempt to meet those targets if it can reduce the overall impact of the project.

Some of the project activities reviewed have potential environmental impacts that are addressed by various provincial, federal and territorial acts and regulations. All activities must meet current environmental law and regulations in their design and construction. The following is a brief description of some of the key federal acts and regulations. Further review, understanding and application of other federal, provincial and territorial environmental laws are part of a rigorous approach to project planning and execution.

### *Canada National Parks Act and Regulations-Parks Canada*

All work inside National Parks and Protected Areas must be performed in accordance with the laws and regulations set out in the *Canada National Parks Act* and Regulations. This includes the requirement for most activities described to only be done under a permit such as: business licence for contractor, disturbance of natural objects, travel in restricted areas, special events or use of disposal sites.

### *Fisheries Act - Fisheries and Oceans Canada*

If a project is to be conducted near water, it is the proponent's responsibility to ensure they avoid causing [serious harm to fish](#) in compliance with the *Fisheries Act*. The [advice in on the Fisheries and Oceans website](#) will help a proponent avoid causing harm and comply with the Act.

If the water body in the project area has fish or is connected to waters at any time that have fish the project must meet the [self assessment criteria on the Fisheries and Oceans website](#), if not a project review can be made by Fisheries and Oceans Canada to assess whether the project requires authorization or authorization can be requested directly. Given the level of detail required for a review and/or authorization request the EIA officer may need to consider a more involved EIA pathway in those circumstances.

### *Migratory Bird Convention Act – Environment Canada*

The purpose of this Act is to implement the Convention by protecting and conserving migratory birds - as populations and individual birds - and their nests. Section 6 - prohibits the disturbance, destruction, or taking of a nest, egg, or nest shelter of a migratory bird.

In Canada, the general nesting period may start as early as mid-March and may extend until end of August. This is a general nesting period that covers most federally protected migratory bird species. This period varies regionally across Canada mainly due to differences in species assemblages, climate, elevation and habitat type. Generally, the nesting period is delayed in more northerly latitudes, corresponding to vegetation development and food availability. (Environment Canada, 2014). To help with determining regionally relevant periods where



nesting is likely to occur, Environment Canada is publishing estimated regional nesting periods within large geographical areas across Canada referred as "nesting zones". These periods are estimated for each zone and consider the time of first egg-laying until the young have naturally left the vicinity of the nest. Field Units may wish to refine this section and add their known local nesting periods.

### ***Species at Risk Act***

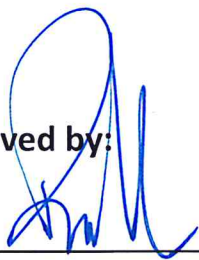
If a species listed under the *Species at Risk Act* (SARA) is found within the project area, any potential adverse effects from the proposed project to the individuals of the species, their residences and/or their critical habitat must be understood. Species at risk considerations require specific expertise, due to additional legal requirements under the SARA and CEAA 2012. If the projects or activities to be addressed by the BMP could affect a listed species or its critical habitat, the EIA officer may need to consider a more involved EIA pathway in those circumstances.

# Direction for *Permitted Users* conducting water-related activities in MRGNP

## ***Interim Direction***

***This information and permit conditions are to be added to Restricted Activity Permits, Development Permits or other tools used to permit researchers, contractors, partners, stakeholders, etc. who are working in muddy or aquatic environments in MRGNP but not handling fish. If handling fish, there is a more rigorous protocol to be followed.***

Approved by:



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Bruno Delesalle

**Date: 15 May 2019**

**Resource Conservation Manager, MRGNP Field Unit, Parks Canada.**

# Direction for *Permitted Users* conducting water-related activities in MRGNP

*The following document is intended to provide consistent direction, in the form of permitting conditions, for anyone who is conducting work in or near water bodies, ephemeral or otherwise, or involved in the use or transportation of surface waters in Mount Revelstoke and Glacier National Parks. This decontamination protocol has been developed to prevent the spread of aquatic invasive species (AIS), with special consideration to Myxobolus cerebralis, the causative agent for whirling disease as well as chytrid and didymo.*

## **Background:**

The first documented case of Whirling Disease (WD) anywhere in Canada was in Banff National Park, in August 2016. While there are no human health concerns, effects on native fish populations can be very significant with 90% mortality being reported in other jurisdictions. The parasite attacks juvenile fish and causes spinal deformity (whirling swimming pattern) and discoloration (blackened tails). Some species of fish, or individual fish, can be infected but show no visible symptoms at all. Whirling Disease has not been detected in MRGNP. Whirling Disease is a parasitic freshwater disease that affects most salmonids, including bull trout. The disease is spread by a small parasite that goes through both spore and planktonic life stages, which infect both fish and aquatic tubifex worms.

The invasive freshwater algae *Didymosphenia geminata*, commonly referred to as Didymo (and sometimes referred to as 'rock snot') is a microscopic freshwater algae that can form large mats in rivers and streams. It is a species of diatom that produces nuisance growths in freshwater rivers and streams with consistently cold temperatures and low nutrient levels and can adversely impact stream habitats and sources of food in aquatic environments.

Chytrid Disease is caused by the fungus *Batrachochytrium dendrobatidis*. This disease has driven the decline or complete extinction of over 200 species, mainly frogs, worldwide. The fungus has been detected throughout much of Canada, although disease outbreaks are not known to be common.

## HOW IS WHIRLING DISEASE SPREAD?

The disease is most often spread by (in descending order):

1. **Movement of fish** (fish stocking) or parts of fish (use of live or dead baitfish). All of these activities are illegal in Mount Revelstoke National Park.
2. **Movement of mud** that is laden with the resistant spore stage or infected tubifex worms. Likely vectors include dirty waders, boats, and construction equipment (*spores are small & hard to destroy*).
3. **Movement of water** that is transporting the planktonic life stage called a TAM (*triactinomyxon (TAM) platonic lifestage*).

The only effective means of killing the WD spores include hot water (>90°C) or 10 minutes soaking in effective detergents (preferably bleach although stronger alternatives such as quaternary ammonium-based cleaners can be used if required); pro-longed freezing (7 days at -20°C) or complete desiccation (drying) for at least 24 hours (less if exposed to direct sunlight). Therefore, preventing the movement/transport of mud from infected water ways (where spores are most often found) is of critical importance. Although the TAM stage is more vulnerable to hot water, effective detergents, freezing or desiccation, the TAM stage is still a concern because it is often more mobile as it floats in the water column. For this reason, movement of water also needs to be prevented (e.g. water withdrawal permits for hydro-seeding, paving crews, etc.).

## SIMPLIFIED PERMIT CONDITIONS:

If you have been issued a permit to conduct a) in-stream works, b) work in wet or muddy riparian areas, or soils that are seasonally wetted (ephemeral) **or** c) the pumping or moving of surface water, you are required to follow these decontamination protocols:

1. **PREVENTION:** Do not allow equipment to enter a watercourse or wet riparian area, or to pump or transport water, unless the equipment has been properly decontaminated **before AND after** use in different waterbodies. The current extent of Whirling Disease in Alberta and/or British Columbia is not known, so your equipment may already be contaminated or may become contaminated during use. Never move equipment between water bodies without applying the following decontamination protocols.
2. **PRE-CLEAN:** When you leave a work area **remove all mud**. The most resistant life stage is the myxospore and these spores settle into the mud. By washing off all mud (in an area where the rinse water will not re-enter the watercourse, a storm water system, or sanitary sewer system) you can reduce the chances of spreading this disease.
3. **HOT WASH or DISSINFECT:** At an appropriate facility, where wastewater will not re-enter a watercourse (either through storm water or sanitary water treatment), wash or disinfect your equipment as follows:
  - a. **HOT WASH** – use a low pressure hot water wash system (e.g. Hotsy) to apply very hot water (>90°C) across all equipment surfaces for at least 10 minutes. Appropriate PPE is required to prevent injury when using water at these temperatures. For smaller items or in remote locations – boiling in water for 10 minutes will destroy the spores.

**OR**

- b. **DISSINFECT** – For equipment that cannot withstand these temperatures, (e.g. glued fabrics such

as inflatable watercraft, aqua-dams, Gore-Tex, etc.) use regular water to remove any residual mud and destroy the TAM stage. Extra diligence must be taken in disinfecting this equipment in order to destroy the spore stage. All equipment must be soaked, for at least 10 minutes, in an appropriate concentration of disinfectant (see Appendix A and B)\*. Disposal of rinse water containing disinfectant may go into sanitary sewers (spores should be chemically destroyed) provided quantities are diluted enough not to impact your local wastewater treatment plant by killing bacteria. Contact your Wastewater Treatment Plant for approval if disposing of more than 45 gallons in any given day.

4. **DRY:** Allow all equipment to dry thoroughly (fully dry + an additional 24 hours) before being used in each new waterbody. Drying is **ONLY** effective if every surface is completely dry. Again, this is why removal of **ALL** mud is so important, as it aids effective drying. **Note** - Freezing (<-20°C) for 7 or more days will also kill spores and TAMs provided temperatures remain below -20°C.

*\*Follow all manufactures MSDS and instructions for use of Personal Protective Equipment.*



## APPENDIX A: Sample Calculation/Method to Mix a 2% Bleach Solution

### EXAMPLE:

Regular strength bleach has a concentration of about 5.25% sodium hypochlorite (check your bottle to make sure) and “concentrated” bleach has a concentration of about 8.25% sodium hypochlorite.

The “Dilution Equation” states that the initial concentration of a solution multiplied by the initial volume of that solution is equal to the final concentration multiplied by the final volume:

$$C1 \times V1 = C2 \times V2$$

In this example:

C1= initial concentration of regular strength bleach = 5.25%

V1= initial volume of regular strength bleach = Unknown (what we want to solve for)

C2= final concentration of solution = 2%

V2= final volume of solution = 1L = 1,000 mL

Solving the above equation for V1:

$$V1 = \frac{C2 \times V2}{C1} = \frac{2\% \times 1,000 \text{ mL}}{5.25\%} = 380.95 \text{ mL} \approx 400 \text{ mL}$$

Therefore, mix 400 mL (conservatively rounded up for simplicity of mixing) of regular strength bleach (5.25%) into 600 mL of water for a final volume of 1,000 mL of 2% bleach/sodium hypochlorite solution.

For a 20L, 2% solution, simply multiply both numbers above by 20.

**Therefore, mix 8L of regular strength bleach (5.25%) into 12L of water for a final volume of 20 L and a 2% bleach/sodium hypochlorite solution.**

## APPENDIX B: Bleach Alternatives (i.e. QACs)

Higher strength (bleach alternative) solutions exist and can be used should there be an elevated risk of exposure to AIS's due to local conditions, origin of equipment/gear or other factors. However, with higher strength solutions comes the requirement to neutralize the solution post decontamination as well as the fact that these solutions/products are inherently more harmful to the natural environments as well as the equipment/gear they are decontaminating. As such, within MRG, use of these alternatives should be minimized whenever possible.

The main alternative, higher strength products are called Quaternary Ammonia Compounds or QACs. QAC's can be sourced from a variety of suppliers (see Appendix D), have special disposal requirements (see Appendix C) and may not be permitted in local wastewater treatment facilities.

Should it be determined that the use of QACs is required and appropriate, the following provides a sample calculation for mixing a 2000 ppm solution which is the suggested concentration to be used for AIS (specifically Whirling Disease) decontamination.

### EXAMPLE:

Quat Plus (for example) has a 4.8% active QAC concentration. Converting between percentage and parts per million (ppm), 1% of 1 million = 10,000. Therefore 1% = 10,000 ppm. If Quat Plus = 4.8% active concentration, then it also equals 48,000 ppm (4.8% x 10,000 ppm/%).

The "Dilution Equation" states that the initial concentration of a solution multiplied by the initial volume of that solution is equal to the final concentration multiplied by the final volume:

$$C1 \times V1 = C2 \times V2$$

In this example:

- C1= initial concentration of Quat Plus = 4.8% = 48,000 ppm
- V1= initial volume of Quat Plus= Unknown (what we want to solve for)
- C2= final concentration of solution = 2,000 ppm (0.2%)
- V2= final volume of solution = 1L = 1,000 mL

Solving the above equation for V1:

$$V1 = \frac{C2 \times V2}{C1} = \frac{2,000 \text{ ppm} \times 1,000 \text{ mL}}{48,000 \text{ ppm}} = 42 \text{ mL}$$

Therefore, mix 42 mL of 4.8% Quat Plus into 958mL of water for a final volume of 1,000 mL of 2,000 ppm QAC solution.

Similarly (and conservatively rounded up for simplicity of mixing), combine 1L of 4.8% Quat Plus into 19L or water for a final volume of 20L of ~2000 ppm QAC solution.

A 2,000 ppm QAC solution will remain stable for a one week period, depending on organic load. Replace the solution every week and test QAC concentrations using extra high level QAC test strips.

## APPENDIX C: SUPPLIERS

### QAC Suppliers

Chemical	Commercial Product / Manufacturer	SUPPLIER
QAC Concentrate	Quat Plus / Dustbane 4 L Jug	Apple Cleaning Supplies Calgary, Ab (403) 569-6969
QAC Concentrate	Quat Plus / Dustbane 4 L Jug	ARME Supply Calgary, Ab (403) 243-6662 ext. 1100
QAC Test Strips	100/pkg for 2000 ppm	Indigo Instruments Waterloo, ON (519) 746-4761
QAC Neutralizer	NeutraQuat / Hydro Solutions	Hydro Solutions Phone: 1-888-734-9376 (Elizabeth or Kennedy) Louisville, KY <a href="http://www.hydrosolutions.com">www.hydrosolutions.com</a>

## APPENDIX D: Disposal of Used Bleach and QAC Solutions

### Disposal of Bleach Solutions - Front-country Locations

Large volumes of bleach solution need to be neutralized (as per information below) before disposal into a waste water treatment system or directly into the environment.

<u>Small volumes</u>	< 10 L can be diluted with additional water and disposed of directly to the waste water treatment system, i.e. flush down toilet.
<u>Moderate Volumes</u>	10L – 30 L can be spread over pavement or concrete with exposure to UV light to allow evaporation of the water component, leaving the safe residue of chloride ions. Bleach solution can also be diluted in batches with additional water, i.e. in a sink with the water running.
<u>Large Volumes</u>	> 30 L can be neutralized with an additional chemical compound (see options below) before release into the environment or wastewater treatment system. OR diluted in 10L batches in a sink with plenty of water.

### Neutralizing Hypochlorite Options

	Choose one option	
BLEACH (Sodium hypochlorite)	Sodium thiosulfate (dry)	Calcium thiosulfate (solution)
20 L 500ppm (0.05%)	20 g	50 mL
55 gallon barrel	220 g	500 mL
275 gallon tote	1.15 kg	2.5 L

### Disposal of QAC Solutions - Front-country Locations

Contact the applicable wastewater treatment plant to see if it is possible to dispose of used QACs down the sink. **Do Not** pour sediment down the drain. If mud accumulates in any of the containers, it should be treated as hazardous waste. Untreated sediment cannot be dumped into the environment as it may contain viable myxospores or TAMs. Treated sediment cannot be dumped into the environment or down the drain due to the ability of QACs to bind to organic material. Water can be decanted and disposed of as per municipal wastewater treatment plant guidelines and the mud reserved for future disposal. **NEVER dispose of QACs in the environment.** In order to comply with the Fisheries Act and National Parks Act, neutralize and or dispose of QAC in accordance with federal, provincial, and municipal regulations. QAC solutions can also be “neutralized” using a NeutraQuat however, this **must** be done in consultation with the manager of wastewater treatment plant to confirm disposal is approved.

# Preapproved Routine Impact Assessment

## VEGETATION REMOVAL

Mount Revelstoke & Glacier national parks

IAA 2019

Preapproved Routine Impact Assessments (PRIA) are pre-determined environmental management and mitigation measures for a defined class of routine, repetitive projects or activities with well understood and predictable effects. Approved PRIAs are an acceptable Impact Assessment pathway as they fulfill Parks Canada's obligations as a manager of federal lands under the Impact Assessment Act (IAA). This document replaces BMP01.03 Vegetation Removal, September 2019.

Project activities included under this PRIA are maintenance activities that may alter or remove vegetation.

Work occurring in designated frontcountry Day Use Areas or defined as routine trail maintenance and falls within the existing corridor of the trail, should be managed by the Parks Canada Preapproved Routine Impact Assessment for Frontcountry Areas, the Parks Canada Preapproved Routine Impact Assessment for Campgrounds, and the National Best Management Practices for Trail Maintenance and Modification. These PRIA's may be used in conjunction with this PRIA or additional analysis such as a Basic Impact Analysis (BIA).

Removal or use of natural objects (e.g., vegetation) for construction purposes is a prohibited activity under the Canadian National Parks Act General Regulations Section 11(1) and therefore requires a Restricted Activity Permit (RAP) authorized by the Field Unit Superintendent (FUS). The mitigation measures outlined in this PRIA can and should form part of the conditions of the RAP.

<b>Scope of Application:</b>	<p>This PRIA includes (but is not limited to) project activities that may alter or remove vegetation including:</p> <ul style="list-style-type: none"><li>▪ mowing,</li><li>▪ brushing,</li><li>▪ landscape maintenance activities,</li><li>▪ invasive alien species management,</li><li>▪ fire hazard reduction, and</li><li>▪ Prescribed fire operations.</li></ul>
<b>Conditions and Exceptions:</b>	<p>This section specifies circumstances when the PRIA <u>would not apply</u> or <u>should be used in conjunction</u> with additional analysis such as a Basic Impact Analysis (BIA), including the following:</p> <ul style="list-style-type: none"><li>▪ The project results in residual adverse effects on migratory birds or their nests. Refer to the draft- <i>Parks Canada Guidance on Reducing Risk to Migratory Birds</i> and associated draft- <i>Conservation Measures for Minimizing Impacts to Migratory Birds during the Nesting Period</i>.</li><li>▪ The project results in residual adverse effects on an individual, a residence or the critical habitat of a listed species at risk under the Species at Risk Act.</li><li>▪ See mitigations section to ensure no residual adverse effects to species at risk.</li><li>▪ The project involves the removal of or causes damage to cultural resources of heritage value, for example, heritage buildings designated by the Federal Heritage Buildings Review Office, archaeological sites, historical and archaeological objects, or cultural landscapes.</li></ul>

	<ul style="list-style-type: none"> <li>▪ The project adversely impacts sites of significance to Indigenous peoples or current access and use of areas where hunting, fishing or gathering rights are exercised by Indigenous peoples.</li> <li>▪ Mowing areas outside the Trans-Canada Highway right-of-way, the Meadows in the Sky (MIS) Parkway and existing Day Use Areas;</li> <li>▪ Invasive alien plant control through chemical means (i.e. use of herbicides)</li> <li>▪ Cutting or removing trees through the use of heavy equipment (e.g. skidders, harvesters, excavators, etc.)</li> </ul>
<b>Approved geographic areas of application:</b>	This PRIA may be used in: Mount Revelstoke & Glacier national parks, include Rogers Pass National Historic Site.

### **Valued Components and Effects Analysis**

Terrestrial vegetation	<ul style="list-style-type: none"> <li>▪ Introduction or spread of invasive species;</li> <li>▪ Destruction of rare plants;</li> <li>▪ Increased risk of wildfire from removed vegetation and associated debris management;</li> <li>▪ Reduction in abundance / diversity;</li> <li>▪ Increase in disease / infestation (e.g., Douglas Fir Beetle).</li> </ul>
Terrestrial wildlife	<ul style="list-style-type: none"> <li>▪ Incidental take of migratory birds including removal of nests and disturbance to birds;</li> <li>▪ Removal of food sources;</li> <li>▪ Disturbance / displacement of wildlife due to noise / human presence;</li> <li>▪ Mortality of amphibians/reptiles during breeding and dispersal.</li> </ul>
Aquatic ecosystems <sup>1</sup>	<ul style="list-style-type: none"> <li>▪ Increased light from vegetation removal could lead to changes in water temperature and chemistry, which may impact aquatic flora and fauna;</li> <li>▪ Increased sedimentation due to increased potential for erosion;</li> <li>▪ Reduced stream channel stability;</li> <li>▪ Impairment to amphibian breeding habitat;</li> <li>▪ Increase in contamination from fuels and lubricants, increased pollutants from overland flow.</li> </ul>
Soils	<ul style="list-style-type: none"> <li>▪ Increased soil compaction;</li> <li>▪ Exposed soil may lead to greater erosion potential;</li> <li>▪ Less infiltration during heavy rainfall events leading to overland flow and increased sedimentation/erosion;</li> <li>▪ Contamination from spills or leaks of fuels or lubricants.</li> </ul>
Visitor experience	<ul style="list-style-type: none"> <li>▪ Visual impacts: noticeable cut/modified vegetation may be visually unappealing to visitors and overly-cleared areas may diminish the characteristics of the environment important to key visitor experience objectives;</li> <li>▪ Noise pollution from use of electric powered equipment;</li> <li>▪ Dangers to public safety and exclusion from work sites while work is being conducted.</li> </ul>
Cultural resources	<ul style="list-style-type: none"> <li>▪ Accidental removal of undocumented Culturally Modified Trees (CMTs).</li> <li>▪ Incidental damage to undocumented cultural resources during vegetation removal or grubbing activities that include minor ground disturbance.</li> </ul>

<sup>1</sup> Aquatic ecosystems includes lakes, rivers, streams, wetlands and surrounding riparian zones.

## **Mitigation Measures**

Table 1: Environmental Timing Windows Table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fish	AVOID INSTREAM WORK					Least risk window for work in and around freshwater, June 01 – Sept 01 – SPECIES DEPENDANT				AVOID INSTREAM WORK		
Birds	Reduced risk for harm to birds			AVOID VEGETATION REMOVAL Bird Nesting Period: April 01 – August 31					Reduced risk for harm to birds			
Bats	Bat in Hibernacula			Bats Nursing Pups					Reduced risk for harm to bats: Sept 01 – Nov 15		Bat in Hibernacula	

Table 2: Environmental Timing Windows

Consideration	Applicable	Restricted Window	Notes
Migratory Bird General Breeding Period	✓	April 1 to August 31	
Bat Maternity Roost Activity Period	✓	April 1 to August 31	
Bat in hibernacula	✓	November 15 – March 31	
Bull Trout Restricted Work Periods	✓	August 31 to August 15	Different fish species have different instream work windows, consult with IAO
Additional Timing Considerations (e.g., weed seed set, soil protection)	✓	Dry late summer and fall conditions	Before plants have gone to seed, generally around July. Before mowing, timing must be approved by IAO

### **General**

- 1 Remove vegetation in early spring, late fall or winter. Avoid vegetation removal during sensitive species windows e.g., breeding birds and amphibians. If timing of work cannot be postponed, further mitigations (as outlined in the following mitigation measures) must be implemented.
- 2 Minimize full removal and retain vegetation when possible to reduce erosion.
- 3 Use temporary fencing /signs or close an area as necessary to ensure visitor safety.
- 4 Flag or fence area to delineate the work site and minimize the amount of vegetation removal required. Equipment should remain within the flagged clearing limits.
- 5 Remove vegetation during frozen or snow-covered ground conditions to minimize impacts to soil from heavy equipment.
- 6 Erosion and sediment control measures will be installed and maintained to reduce sediment transport into watercourses and waterbodies from vegetation removal activities.
- 7 For temporary vegetation clearing, use erosion controls on exposed soils, especially within 30m of a watercourse or water body.
- 8 Suspend vegetation removal activities during wet weather to minimize erosion and sediment transport.
- 9 Remove vegetation by chainsaw and/or brushsaw and on foot.
- 10 Use biodegradable chainsaw bar oil for work occurring over water.
- 11 Ensure machinery is free of leaks and well maintained.

- 12 Equipment will arrive on site clean and free of soil and will be inspected by the ESO prior to use on site. Equipment will also be cleaned prior to moving to a different work site.
- 13 Restrict heavy machinery to existing roadways and/or hardened surfaces.
- 14 Maintenance and re-fuelling should be done at least 30 m from any water body and at designated areas.
- 15 A spill kit capable of contain 110% of available fuel should be available on site at all times and staff working at the site trained in its correct use.

### **Selective Removal**

- 16 Prune limbs close to the tree trunk. For a clean cut, make a shallow undercut first, then follow with the top cut.
- 17 Selectively cut vegetation to allow for diversity of vegetation types and heterogeneous plant heights.
- 18 Maintain fruit bearing shrubs outside of high density Human Use Areas.
- 19 When practical, do not fall trees >15cm DBH; instead remove lower limbs and/or top trees.
- 20 Maintain canopy vegetation immediately adjacent to streams and lakes, unless deemed to be a hazard tree.
- 21 Do not remove vegetation within 30 m of fish-bearing water bodies. Instead, trim shrubs to a height of 1 meter and limb trees to a height of 2.5 meters.
- 22 Selectively cut clusters of young trees to allow some to continue to grow.
- 23 Mow to a minimum height of 15 cm where appropriate (i.e. roadsides).

### **Hazard Tree Assessment**

- 24 Prior to removal of potential danger trees, a Qualified Danger Tree Assessor should conduct a danger tree hazard assessment as per the BC Wildlife/Danger Tree (WDT) Assessors guidelines.
- 25 Submit a copy of the signed hazard tree assessment report to the IA Officer prior to tree removal.
- 26 If the hazard tree assessment identifies a tree with high wildlife value, contact the IA Officer before falling to determine if additional mitigation measures are required.
- 27 If the hazard tree assessment identifies a tree with high wildlife or cultural value, contact the IA Officer and CRM Advisor before falling to determine if additional mitigation measures are required.

### **Rare Plants / Invasive Alien Plants**

- 28 Plant surveys for rare or invasive alien plants (IAPs) may be required for specific sites based on input from Park specialists. Results of the survey may result in additional mitigations as determined by the IA Officer and Vegetation Ecologist.
- 29 Equipment will arrive on site clean and free of soil and weed seeds to prevent the spread of IAP and will be inspected by the ESO prior to use on site. Equipment will also be cleaned prior to moving to a different work site.
- 30 Avoid staging or parking equipment on sites with high concentrations of IAP.
- 31 Mow early to mid-July along the TCH. Clean mower frequently to prevent the spread of IAPs over large areas.
- 32 Post-construction monitoring of IAP.
- 33 If IAP concerns are present, the IA Officer and Vegetation Ecologist will recommend the appropriate approach to mitigate the establishment/spread of IAP.

### **Migratory Birds**

- 34 No killing, capturing, injuring, taking or disturbing migratory birds or damaging, destroying, removing or disturbing their nests during vegetation removal.



- 35 Implement the recommended mitigation measures for vegetation removal in the Parks Canada *National Best Management Practices for Migratory Birds* (2018).
- 36 Prior to vegetation removal during the MRG breeding bird period (April 1 – August 31), a breeding activity survey must be conducted by a Qualified Environmental Professional (QEP). For areas near tree-line (over 1,000m elevation) and based on site conditions and professional opinion, breeding activity surveys can be delayed to May 1 (by qualified Park staff and/or a QEP).
- 37 Nesting bird surveys in areas likely to support raptors (including owls) and/or waterfowl may be required from February 15 to September 30 based on input from the MRG Wildlife Ecologist.
- 38 Submit bird breeding activity survey results to the IA Officer prior to starting vegetation removal. If active nests and/or tree cavities are observed, consult with the IA Officer for advice on timing of tree removal/trimming and additional mitigation measures including buffer and setback distances from the active nest.

#### **Bats**

- 39 No killing, capturing, injuring, taking or disturbing bats or damaging, destroying, removing residences or roosts during vegetation removal.
- 40 Trees should be removed outside of the period of April 1 to August 31. Ideally, work will occur after weaning of pups (approximately August 31) but before hibernation (October 15 – November 15, depending on weather).
- 41 If trees must be removed between April 1 and August 31, a QEP or qualified PCA staff will conduct an inspection prior to the removal of trees to determine their potential to support breeding or roosting bats. Refer to the MRGNP Guidelines for Inspection of Trees and Built Assets for Bats for survey methods.
- 42 Submit bat roost inspection results to the IA Officer immediately after inspection. For trees not deemed to be roosts, removal must occur within two to five days of inspection; the timing of this should be decided in consultation with the IA Officer.
- 43 If tree removal of large diameter trees with roosting characteristics occurs in winter, conduct the removal slowly and consult with the IA Officer in advance of removal regarding the possibility that bats need to be relocated.

#### **Amphibians**

- 44 If vegetation removal is to occur within 300 m from a confirmed or potential amphibian breeding wetland, or within 500 m from a confirmed SAR amphibian breeding wetland, additional impact analysis is required and site-specific mitigations developed.
- 45 If vegetation removal is scheduled to occur during non-frozen conditions, the Wildlife Ecologist may complete an amphibian and reptile ground search immediately prior to equipment activities.
- 46 Minimize removal of riparian and wetland vegetation during the amphibian breeding and dispersal period (April 1 – September 30) in areas that have confirmed or potential presence of Western Toad e.g., Rogers Pass sewage lagoon. This will avoid accidental crushing of adult toads during the breeding migration and of juvenile western toads during dispersal.
- 47 If ground disturbance activities are scheduled to occur in frozen conditions, amphibian exclusion fencing may be required in the preceding fall season at the discretion of the Wildlife Ecologist.

#### **Cultural Resources**

- 48 Consult with the Cultural Resource Management Advisor prior to start of work to determine required mitigation measures to protect potential Culturally Modified Trees (CMTs).
- 49 For all works, implement the *Accidental Finds Protocol*: if a suspected cultural resource is discovered, halt work and contact the Cultural Resource Management Advisor immediately.

## Vegetation Disposal

- 50 Consult with IA Officer to select the appropriate project-specific disposal method. The method for disposal of vegetative debris will depend on specific project details and environmental site conditions at the time of the project (e.g., Fire Danger Rating). Options for vegetation disposal include any one, or combination of, the following:
- i. Buck and limb trees so that the trunk (bole) of the tree touches the ground, scatter to avoid fuel loading;
  - ii. For large diameter (>15 cm DBH) spruce, Douglas fir and subalpine fir, bark must be peeled or scored if fallen trees are left in place or used for firewood;
  - iii. Alternative preventative measures may be taken in consultation with the Vegetation Ecologist;
  - iv. Buck/spilt for re-use (for firewood: 15" to 20" long and 8" maximum diameter);
  - v. Chip and leave in-situ (see mitigation measure #53);
  - vi. Chip and dispose of elsewhere (i.e. landfill or designated area); or
  - vii. Debris may be brought to a designated area to be disposed of by burning. Additional mitigation measures may be required for burning as determined in consultation with the Fire Management Officer any burning will be authorized through a separate Restricted Activity Permit.
- 51 No mulching will occur within 30 m of riparian areas, water bodies, bogs, lakes, streams or wetlands (including ephemeral water features) due to the potential for acid leachate to negatively affect aquatic ecosystems. The distribution of mulch chips will be non-uniform so that native vegetation is not completely covered by mulched material. Rough mulching (i.e. removing branches but leaving logs intact) is preferable to fine mulch in areas with larger stems (i.e. where small trees are being mulched).
- 52 Debris will not be deposited in water bodies.

## Site Restoration, Monitoring and Control

- 53 Topsoil removal, storage and management should follow the guidelines described in the Parks Canada National PRIA for *Roadway, Highway, Parkway and Related Infrastructure* (2020).
- 54 Sod removal and storage is not covered under this BMP, consult the IA officer for specific mitigations.
- 55 For temporary clearing, re-seed as soon as practical with MRG-approved native seed mix and monitor re-growth. Seed certificates must be provided to the IA Officer for approval before seed mixes are ordered or applied to site.
- 56 Project proponents are responsible for ensure growth of vegetation and controlling any non-native vegetation for one year post-construction.
- 57 Site inspections should be conducted by the proponent in order to monitor restoration success during the first year post construction.
- 58 For vegetation restoration, expectations are that:
- i. greater than 90% survivorship of planted live stakes will be achieved after the first growing season (if planted in the spring with dormant stakes from that year), greater than 70% survivorship if planted in the fall;
  - ii. by the fifth growing season at least 50% of planted stakes should survive;
  - iii. greater than 90% of representative native plant cover will be established on the restored site, and;
  - iv. less than 10% priority invasive species plant cover will be present on the restored site.
- 59 For seeded grass, excessive bare ground areas after two growing season's needs to be addressed with additional seeding or alternative vegetation establishment.
- 60 Vegetation restoration and/or IAP will be assessed by Parks Canada before a Certificate of Project Completion is issued.



## **Development and Review Team**

Team of experts who took part in the development and review of the PRIA		
1.	Sara DeVita, A/ Impact Assessment Officer, Mount Revelstoke and Glacier national parks	2015
2.	Danielle Backman, A/Ecologist Team Leader, Mount Revelstoke and Glacier national parks	2015
3.	Janet Mercer, A/Environmental Assessment Scientist, Natural Resource Conservation Branch	2015
4.	Duane Flick, Supervisor Trail Crew, Mount Revelstoke and Glacier national parks	2015
5.	Sarah Boyle, Ecologist Team Leader, Mount Revelstoke and Glacier national parks	2015
6.	Rick Reynolds, Manager of Visitor Experience, Mount Revelstoke and Glacier national parks	2015
7.	Bruno Delesalle, Manager of Resource Conservation, Mount Revelstoke and Glacier national parks	2015
8.	Natalie Stafl, A/ Ecologist Team Leader, Mount Revelstoke and Glacier national parks	2017
9.	Elizabeth Vincer, Impact Assessment Coordinator – FII Projects, Mount Revelstoke and Glacier national parks	2017
10.	Marie-Claude Martel, Impact Assessment Specialist, Natural Resources Branch, Parks Canada	December 2019 (converting BMP to PRIA)
11.	Heather Cherry, Impact Assessment Scientist, Natural Resources Branch, Parks Canada	December 2019 (converting BMP to PRIA)
12.	Albert Rand, Impact Assessment Coordinator – Field Unit Projects, Mount Revelstoke and Glacier national parks	January 2020 (converting BMP to PRIA)
13.	Danielle Backman, Impact Assessment Scientist, Mount Revelstoke & Glacier national parks	January 2020 (converting BMP to PRIA)

## **FUS/Director of Waterway Approval**

Name: Nicholas Irving, Field Unit Superintendent	Date:
Signature:	
SIGNED JUNE 4, 2015	

**References:**

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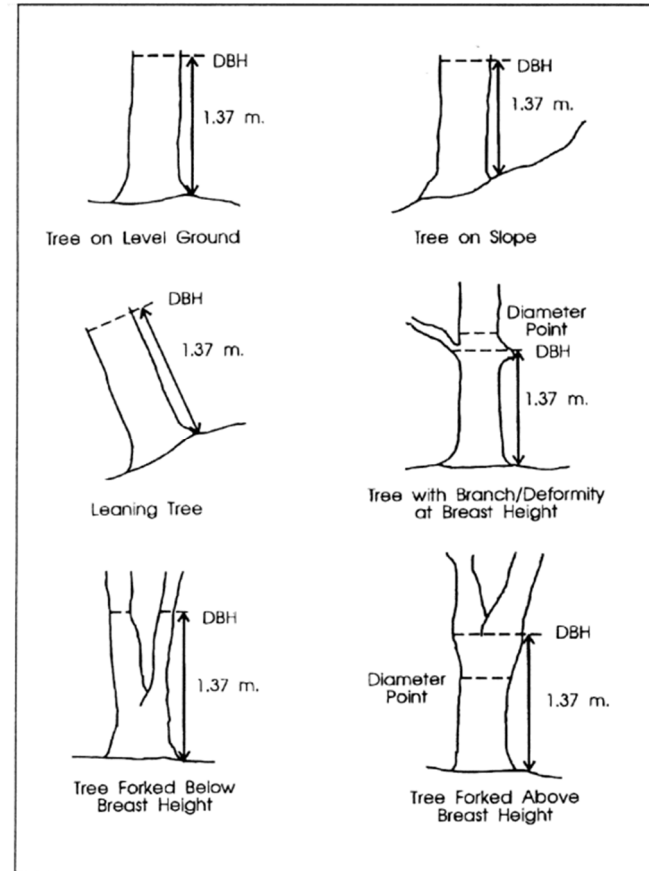
# Appendix A

## DEFINITIONS

### Approved Native Seed Mix\*:

General Location	Species	% by Weight in each Seed Mix
Beaver Valley TCH and lower Mount Revelstoke	<i>Elymus glaucus</i>	38%
	<i>Bromus carinatus</i> var. <i>marginatus</i>	47%
	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	15%
TCH (except Beaver Valley)	<i>Calamagrostis canadensis</i>	2%
	<i>Agrostis scabra</i>	2%
	<i>Elymus glaucus</i>	54%
	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	42%

\*Approved mix for highway corridor, some areas of MRGNPs will require specific seed mixes, IAO will identify the mix in the approved IA pathway document.



Source : <http://www.fs.fed.us/psw/publications/documents/gtr-155/06-duriscoe.html>

**Bat Roost Survey:** A survey conducted by a qualified professional to determine the presence of bat roosts in trees, caves, or buildings, and is conducted as per direction of the Parks' Ecologist.

**Diameter at Breast Height:** The diameter of a tree taken at approximately 1.37 metres from ground level. See diagram on right.

**Hazard Tree:** (Danger Tree) A tree which has been assessed by a qualified Danger Tree Assessor as dead or dying, dead parts of live trees or unstable trees that have the potential to cause property damage, personal injury or fatality due to the proximity to public use areas, assets, roads or trails.

**Qualified Danger Tree Assessor:** A person that has a minimum of 3 years of practical field experience in forestry or related field and has completed a 2 day Wildlife Danger Tree Assessor's Course and has passed the written and field practical exam. Renewal required every 4 years.

**Qualified Environmental Professional (QEP):** an applied scientist or technologist, acting alone or together with another QEP. He or she must be registered and in good standing in British Columbia with an appropriate professional organization constituted under an Act, acting under that association's code of ethics and subject to disciplinary action by that association. The QEP may be a professional Biologist, Agrologist, Forester, Geoscientist, Engineer, or Technologist. To be able to certify that they are

qualified to conduct an assessment methodology, the individual's area of expertise must be recognized in the assessment methods as one that is acceptable for the purpose of providing all or part of an assessment report in respect of the particular development proposal that is being assessed. The individual is considered a QEP only for that portion of the assessment that is within their area of expertise, as identified in the assessment methodology (BC Ministry of Environment Website).

*Nesting Bird and Bat Roost Survey:* A nest survey conducted by a QEP or qualified PCA staff to observe the presence of nesting bird habitat and is conducted as per the Resource Inventory Standards Committee Inventory Methods for Forest and Grassland Songbirds, March 16, 1999 V 2.0 or equivalent. A bat roost survey conducted QEP following the most recent approved survey methods (federal and provincial).

*Wildlife Tree:* Any standing dead or live tree with special characteristics that provide valuable habitat for the conservation or enhancement of wildlife.