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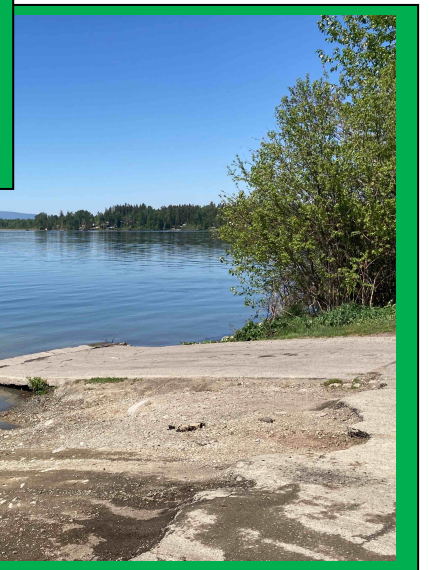
**Environmental Management Plan:  
Dragon Lake  
Public Access Area Improvements**

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*Prepared For:*

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**June 2023**



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TABLE OF CONTENTS

**Table of Contents**..... i

**Introduction**..... 1

    Project Background..... 1

    Environmental Management Plan Objectives..... 1

    Project Location..... 2

**Project Development Methodology**..... 2

    Site Assessments..... 2

    Existing Data Review..... 3

    Environmental Management Plan Development..... 3

**Results and Recommendations**..... 3

    General Study Area..... 3

    Fish and Wildlife Habitat Values..... 4

    Description of Proposed Activities..... 5

        Site 1: Outhouse Replacement..... 5

        Site 2: Dock Structure..... 6

        Site 3: Boat Launch Temporary Repairs..... 6

        Site 4: Permanent Boat Launch..... 6

**Impacts and Proposed Mitigation Strategies**..... 7

    Removal of Riparian Vegetation..... 7

    Project Timing..... 7

    Water Quality Protection and Deleterious Substance Control..... 8

    Monitoring..... 9

**Project Permitting**..... 9

**General Mitigative and Monitoring Measures**..... 9

**LITERATURE CITED**..... 11

**APPENDIX 1: Project Location Map**..... 12

**APPENDIX 2: Representative Photos**..... 14

**APPENDIX 3: Marked Up Overview Photo**..... 16

**APPENDIX 4: Best Management Practices**..... 18

## **INTRODUCTION**

In the Spring of 2023, Quesnel River Environmental (QRE) was retained by the City of Quesnel (the City), to develop an Environmental Management Plan (EMP) for proposed improvements to the Dragon Lake public access area. An initial project consultation occurred between Lindsay Blair (City of Quesnel, Senior Community Development Coordinator) and Quesnel River Environmental representative Robert Mills, at which time project scope and objectives were discussed. This Environmental Management Plan includes: project background information; a description of project objectives; project development methodology; detailed site plans and an overview illustration that identifies proposed activities.

## ***PROJECT BACKGROUND***

The Dragon Lake public access area is a highly valued and utilized recreational area. However, as this site falls outside of the City of Quesnel boundaries and no public or private organization has been formally overseeing its maintenance, over time the public access area has fallen into a state of disrepair. To remedy this situation, the City of Quesnel is applying for a License of Occupation which will grant the City authorization to upgrade and maintain this site, in both the short and long term.

The first component of this public access improvement project is to remove the damaged section of the existing boat launch and replace it with a temporary precast concrete slab in order to enable public recreational use of the boat launch in the short term. This EMP identifies environmentally sensitive areas and provides strategies to protect these areas both during and after project implementation. In order to receive provincial approval for work at the boat launch (both temporary and permanent), the City is applying for a License of Occupation for the site. Once a License of Occupation is granted and a permanent double-wide boat launch design is developed, a Construction Environmental Management Plan (CEMP) will be required for the proposed works. A CEMP cannot be developed at this time as the design details are unavailable, pending the License of Occupation approval.

## ***ENVIRONMENTAL MANAGEMENT PLAN OBJECTIVES***

The primary objective of this report is to present a detailed Environmental Management Plan intended for the proposed improvements of the public lake access at Dragon Lake. This report will focus on the following five fundamental objectives:

- 1. To protect fish and fish habitat during all project phases.**

2. To protect the water quality during any construction activities in or adjacent to Dragon Lake.
3. To protect any environmentally sensitive areas during and after project implementation.
4. To summarize the results of the site assessment and identify potential impacts.
5. To specify strategies which will be implemented to mitigate any potential impacts to the aquatic environment and other environmental values in the vicinity of the project site.

This report will focus on the existing Dragon Lake boat launch and associated parking areas.

#### ***PROJECT LOCATION***

**SITE LAT/LONG: 52° 57' 55" N, 122° 24' 16" W**

The project is located at the public lake access area (existing boat launch) at the northeast end of Dragon Lake (see Appendix 1: Project Location Map). The site can be accessed by traveling south from the City of Quesnel's downtown core on Highway 97. After crossing the Quesnel River Bridge, continue on Highway 97 for 3.0km to the start of Quesnel-Hydraulic Road on the east side of the highway. Turn left onto Quesnel-Hydraulic Road and follow for approximately 3.4km to the boat launch site on the right.

#### **PROJECT DEVELOPMENT METHODOLOGY**

##### ***SITE ASSESSMENTS***

Prior to EMP development, two preliminary site assessments to collect physical and biological data were conducted on May 9th and May 14th 2023. During these site assessments, proposed plans were reviewed, potential impacts were identified, and suitable design and mitigative strategies were developed. Fisheries information for this site was obtained from existing reconnaissance level fish and fish habitat inventories combined with available information from the Fisheries Data Warehouse. Potential parking and dock access areas were identified, as well as a location for a permanent double-wide boat launch. Potential dock and boat launch locations were selected based on the following criteria:

1. Minimizing environmental disturbance.
2. Existing use.

3. Recommendations from Lindsay Blair (City of Quesnel, Senior Community Development Coordinator).
4. Maintaining existing vehicle access patterns.
5. Maintaining and protecting existing vegetative buffers between the public access and Dragon Lake.

#### ***EXISTING DATA REVIEW***

All recent available data on the project area was compiled and reviewed from provincial and federal online fisheries and habitat information sources. This included sources such as: B.C. Habitat Wizard; B.C. Fish Inventory Data Queries (FIDQ); B.C. EcoCat Ecological Reports Catalogue; and the Fisheries and Oceans Canada Aquatic Species at Risk Maps.

#### ***ENVIRONMENTAL MANAGEMENT PLAN DEVELOPMENT***

Based on discussions with Lindsay Blair (City of Quesnel, Senior Community Development Coordinator), two reconnaissance site assessments, and an existing fisheries data review, a detailed Environmental Management Plan was developed. The EMP follows guidelines set out in *A User's Guide for Changes In and About A Stream in British Columbia* (Government of BC, January 2022), *Requirements and Best Management Practices for Making Changes in and About a Stream in British Columbia* (Government of BC, January 2022), and *Best Management Practices for Boat Launch Construction and Maintenance on Lakes* (Ministry of Environment, July 2006). Key components of the EMP include: a description of the existing fisheries resource values; an outline of the proposed work and how it will be carried out; identification of potential impacts to the fisheries resources; a description of proposed mitigation strategies; and proposed actions to ensure the planned activities are completed and meet the requirements of the fisheries agency granting the approval.

### **RESULTS AND RECOMMENDATIONS**

#### ***GENERAL STUDY AREA***

The Dragon Creek Watershed (WSC: 160-001700) is located partially within, and southeast of, the City of Quesnel. This 3<sup>rd</sup> order tributary to the Quesnel River has a 16 km mainstem length and drains a 7 km<sup>2</sup> area within the Quesnel Natural Resource District. There are two major lakes along the mainstem drainage; Dragon Lake is located 5 km upstream from the confluence with the Quesnel River, and Hallis Lake which is located 9 km upstream from Dragon Lake.

### **FISH AND WILDLIFE HABITAT VALUES**

The Dragon Creek Watershed is a heavily modified system with several barriers to upstream fish passage. In 1960 the lake was chemically treated to eliminate coarse fish from the system in order to facilitate the creation of a recreational fishery in the lake. The endemic Dragon Lake whitefish were also eradicated from the system. In 1963 a lake stocking program began; as a result, Dragon Lake is now home to a world-renowned rainbow trout (*Oncorhynchus mykiss*) recreational fishery. The lake also provides brood stock for approximately 50% of the provincial lake stocking program. Goldfish (*koi*) were discovered to have been illegally introduced into Dragon Lake in the 2000's and have become quite prolific in the lake in recent years.

Dragon Creek flows out of the northwest end of the lake, and continues for approximately 5km, traversing private and municipal lands, crossing Highway 97 through a culvert (fish barrier) and finally entering the Quesnel River after passing through a very long culvert under the round-about at the west end of the Johnston bridge. A flow control structure (a dam with gate valves) at the outlet of the lake is used to moderate lake level fluctuations, and prevents outflow from the lake into Dragon Creek at lower lake levels. Approximately 400m upstream from Lawlor Drive there is a concrete weir structure (historically constructed by the province) across the Dragon Creek channel which is a barrier to upstream fish migration and which also acts as a grade control structure in the stream channel. The culverted outflow of Dragon Creek into the Quesnel River is also a barrier to upstream fish migration from the Quesnel River, as the outflow is perched on the Quesnel River bank during all but the highest river flows. Rainbow trout (presumably escaped stock from Dragon Lake) are now the only fish documented in Dragon Creek.

The area of Dragon Lake where the project site is located, is a relatively shallow low gradient section of shoreline dominated by common cattail (*Typha latifolia*) as the emergent aquatic vegetation. Dragon Lake is an extremely high value lake within the Cariboo region for its recreational fishery as well as for water recreation activities. However, in addition to its recreational values, the shoreline areas on the lake, including both emergent and upland riparian vegetation, also provide sensitive and productive fish and wildlife habitats. Riparian vegetation acts as a filter, preventing sediment and pollutants from entering water bodies. The roots of riparian vegetation bind and restrain soil particles, reducing erosion and helping to stabilize banks. Lakeside vegetation also provides habitat and forage for insects, which can be a significant food source for fish. In addition, riparian vegetation slows and dissipates the energy associated with floodwaters during high flows, thus reducing the effects of erosion within a watershed. An important function of both emergent vegetation and terrestrial riparian vegetation, is the creation of nearshore habitat complexity and cover, as well as shade for moderating water temperatures along the lake periphery and shallow shoreline.

Riparian function is limited at the project site due to historic urban land use developments (linear road, boat launch and parking area; see Appendix 2: Representative Photos) and associated loss of riparian vegetation. Additionally, invasive species as well as snow plowing and/or roadside mowing activities have also adversely impacted the functional riparian area. Woody riparian vegetation found along the shore of Dragon Lake in the vicinity of the project site includes: willows (*Salix spp.*), alder (*Alnus sp.*), cottonwood (*Populus balsamifera*), paper birch (*Betula papyrifera*) spruce (*Picea sp.*), black twinberry (*Lonicera involucrata*), snowberry (*Symphoricarpos albus*), saskatoon (*Amelanchier alnifolia*), soopolallie (*Shepherdia canadensis*), red osier dogwood (*Cornus stolonifera*), and prickly rose (*Rosa acicularis*). Herbaceous vegetation in the riparian area is dominated by non-native and/or invasive species including agronomic grasses and herbs such as clover (*Trifolium spp.*), dandelions (*Taraxacum spp.*), and burdock (*Arctium minus*); horsetails (*Equisetum spp.*), and intermittently mountain lady's slipper (*Cypripedium montanum*).

The proposed works will occur in areas of existing disturbance and removal of existing riparian vegetation for the project should not be required. Every effort will be made to maintain all existing riparian vegetation, and any disturbance will be limited to the existing site footprint. As the condition of riparian vegetation in the project area is already compromised, the conservation of existing vegetation is a priority in order to preserve the health of aquatic and terrestrial organisms within Dragon Lake.

#### **DESCRIPTION OF PROPOSED ACTIVITIES**

##### **SITE 1: OUTHOUSE REPLACEMENT**

According to the *Public Health Act: Sewerage System Regulation* (Ministry of Health, May 2008), the current outhouse has the potential to cause a health hazard as it is not self contained and is located in close proximity to Dragon Lake (see Appendix 3: Marked Up Overview Photo), resulting in the potential for the discharge of sewage into surface water of the lake. To remedy this situation, a septic hydrovac truck will be used to remove any existing waste material from the site and the existing outhouse structure will be removed and hauled to a designated landfill facility. A new self contained, vault outhouse will be installed at the same location within the existing footprint. Although this location is adjacent to the lake, due to the close proximity of the public access area to the Quesnel-Hydraulic Road, it is impossible to displace the outhouse further from the lake.

In order to prevent any health hazards while nevertheless providing a suitable bathroom facility at this location, the new structure will be a self contained, vault outhouse that will be emptied periodically by an approved septic pumping truck. Additionally, the privy design will be approved by a Registered Onsite Wastewater Practitioner (ROWP) or an individual registered with the Association of Professional Engineers and Geoscientists of BC (APEGBC) as required by the Ministry of Health: Sewerage System Regulation.

***SITE 2: DOCK STRUCTURE***

The City of Quesnel has been informed by provincial authorities that the Freshwater Fisheries Society of B.C. are intending to install a dock in the vicinity of the public access area (see Appendix 3: Marked Up Overview Photo) to increase the recreational fisheries opportunities on the lake. The City is not expected to have any involvement and will not be responsible for the design and installation of the dock, however it is recommended that the provincial BMPs for dock construction are followed (see Appendix 4: Best Management Practices).

***SITE 3: BOAT LAUNCH TEMPORARY REPAIRS***

The compromised concrete panel of the existing boat launch (see Appendix 2: Representative Photos) will be removed and replaced with a new, precast concrete panel of the same dimensions. The intent of the temporary repair is to provide immediate access and prevent chronic disturbance to the shoreline and the streambed adjacent to the existing boat launch (where users are currently launching boats to avoid the damaged concrete panel). The recurrent launching in the adjacent area is resulting in continual sediment impacts to fish and fish habitat. Currently the control structure at the outlet of the lake is open and it is anticipated the lake level will continue to drop and the work will be completed in the dry. During construction if the compromised panel is within the wetted lake perimeter (i.e. underwater), a sandbag/poly site isolation dam will be installed in order to capture any sediment laden water which will then be pumped to a stable well vegetated area well away from the aquatic environment. This will be a temporary repair which will be initiated once a License of Occupation is acquired by the City of Quesnel and will provide a safe boat launching surface at the site until a permanent boat launch design is developed and installed.

***SITE 4: PERMANENT BOAT LAUNCH***

A permanent boat launch design will be developed once the City has secured tenure for the public access area. Once the design is complete a Construction Environmental Management Plan (CEMP) will be developed to provide guidance to the City and their contractors for



environmental management during installation. This will ensure that proper environmental mitigation protocols are followed during construction, as the CEMP should clearly indicate how the works will be undertaken to avoid negative impacts to the environment. As a result, the CEMP should include environmental procedures for any work in and around environmentally sensitive areas. These procedures should follow guidelines outlined in Appendix 4: Best Management Practices, including but not limited to: concrete use protocols; fish salvage procedures; and instream work isolation procedures. Environmental monitoring requirements should be outlined in the CEMP to ensure compliance with environmental specifications and proper implementation of any environmental procedures. The CEMP should also include contingency planning in the event of an environmental emergency or failure of any of the mitigating or protective measures.

### **IMPACTS AND PROPOSED MITIGATION STRATEGIES**

#### ***REMOVAL OF RIPARIAN VEGETATION***

Riparian areas serve as transition zones between the aquatic and terrestrial environment. As such, they are tremendously complex and important to both aquatic and terrestrial species. As discussed above, the condition of riparian health in the project area is already compromised, and any removal of existing riparian vegetation may have a dramatic effect on aquatic and terrestrial habitats. Existing riparian vegetation along the Dragon Lake shoreline should not be disturbed during construction or any other activities.

In order to protect the long term health of the existing riparian vegetation within the access area, a protocol should be established for all maintenance activities that occur at the site. These include, but are not limited to, protecting riparian vegetation during grass mowing activities, protection of riparian vegetation during snow removal activities and the management of invasive species along the shoreline of Dragon Lake. All City workers assigned to maintenance activities at the public access area should be briefed on these protocols and monitoring should occur to ensure they are being followed.

#### ***PROJECT TIMING***

The proposed timing for the project does not need to coincide with the reduced risk work window for fish and fish habitat as work may proceed outside this timing window so long as it is completed during low water conditions and all proposed activities follow mitigative measures outlined within this document and are completed in isolation, ensuring no deleterious substance is delivered into the aquatic environment.

**WATER QUALITY PROTECTION AND DELETERIOUS SUBSTANCE CONTROL**

Spills of deleterious substances, including sedimentation as a result of surface erosion from disturbed areas, have the potential to impact water quality so that it becomes toxic to organisms or their habitats, potentially resulting in the death of vegetation, fish and/or their food sources within Dragon Lake. Negative impacts include degradation of spawning habitat by infilling with fine sediment, reduction of salmonid ability to detect prey, direct gill damage to fish, and abandonment of rearing areas. Potential negative impacts will be minimized through the use of spill and sediment control measures.

In order to proactively protect against spills, a spill prevention and response plan will be incorporated into the CEMP and will be onsite throughout project construction, applying procedures outlined in *Requirements and Best Management Practices for Making Changes in and About a Stream in British Columbia* (Government of BC, January 2022). All equipment and machinery working within 5m of the wetted perimeter of Dragon Lake will undergo daily checks to ensure they are free of leaks or excess oil and grease, are power washed prior to project initiation, and are equipped with spill prevention and response measures. Equipment refueling or servicing will occur at least 30m from any watercourse or surface water drainage. Environmentally sensitive, biodegradable hydraulic fluids will be used in all hydraulic machinery working instream. A spill containment kit will be readily accessible onsite and all onsite staff will be trained in spill kit location and deployment. Should a reportable quantity of a toxic substance be spilled, a report will immediately be made to the Emergency Management B.C. 24-hour phone line at 1-800-663-3456.

Permanent soil erosion control measures will also be incorporated during project construction at the earliest practical time, applying procedures outlined in *Land Development Guidelines for the Protection of Aquatic Habitat* (Fisheries and Oceans Canada, September 1993). Silt fencing or an alternative approved system will be installed below disturbed areas where there is potential for down slope surface erosion into the aquatic environment. These fences will be maintained regularly and monitored after any rainfall. Construction will be halted if heavy or persistent precipitation presents an unacceptable risk of sediment transfer into the aquatic environment. Disturbed areas of exposed soil immediately adjacent to the lake will be covered with straw mulch and grass seeded with a non-sod forming bunch grass mix in order to prevent surface erosion prior to the establishment of a suitable ground cover.

### **MONITORING**

An environmental monitor will be onsite during project startup and for the duration of both the temporary and permanent works. A copy of this document and the CEMP will be forwarded to the contractor and/or crew supervisor prior to construction. A preconstruction meeting will be held between the environmental monitor and the contractor in order to ensure a common understanding of all aspects of the EMP and CEMP.

### **PROJECT PERMITTING**

The permanent boat launch will likely require a Section 11 Approval for Changes In And About A Stream, under the jurisdiction of the *Water Sustainability Act* (WSA; Government of BC, February 2016). This online application should be submitted to Front Counter BC a minimum of 120 days prior to proposed project startup. A Section 11 Notification for Changes In And About A Stream (also under the WSA) should be sufficient for permitting the temporary works, once the City receives the License of Occupation for the site. This online application should be submitted to Front Counter BC a minimum of 45 days prior to proposed project startup. A Fish and Wildlife Application for a Scientific Fish Collection Permit will be required in order to ensure no fish are trapped within the isolated work area. This online application should also be submitted to Front Counter BC a minimum of 45 days prior to proposed project startup.

### **GENERAL MITIGATIVE AND MONITORING MEASURES**

1. An experienced and knowledgeable professional will be onsite to provide direction and monitor the prescribed mitigative measures outlined above.
2. All activities associated with this project will be completed under the direction of a project supervisor who has successfully carried out similar projects of comparable scope and magnitude. Project supervision by a qualified individual who also understands the importance of protecting all environmentally sensitive areas during project implementation will be critical in ensuring project success.
3. A preconstruction meeting should be held with all personnel associated with the project in order to ensure a common understanding of the project design, review any permit conditions, and identify all issues associated with operating within an environmentally sensitive area.
4. Construction will be halted if heavy or persistent precipitation presents an unacceptable risk of sediment transfer into the aquatic environment.
5. Equipment will be serviced and refueled at least 30 m from any watercourse.

6. All temporary erosion control measures will remain in place until site rehabilitation is complete and will be monitored to ensure functioning as intended and then removed when no longer necessary.

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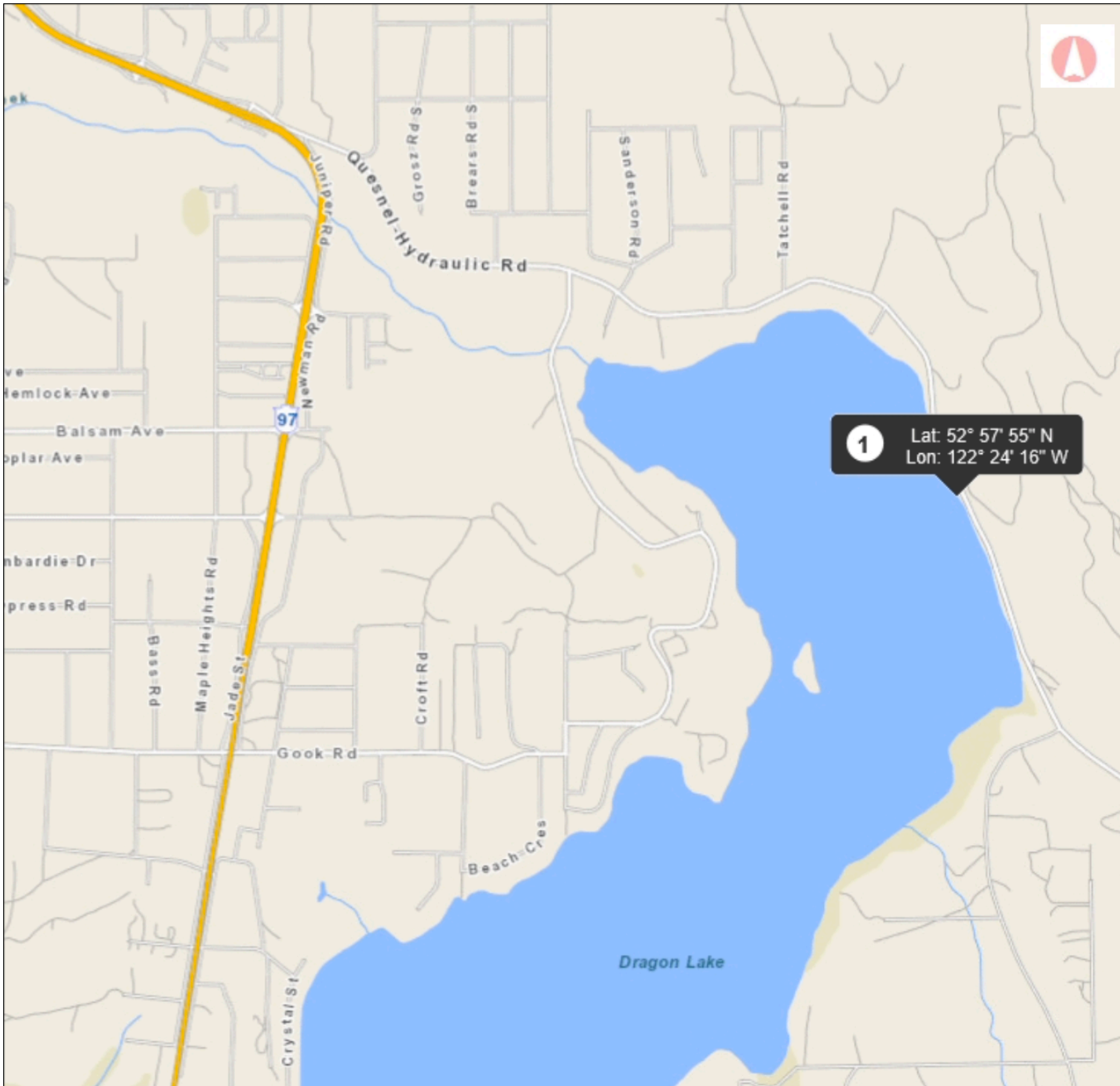
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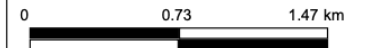
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**APPENDIX 1: PROJECT LOCATION MAP**



Dragon Lake Public  
Access  
Legend



1: 36,112

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Datum: NAD83  
Projection: WGS\_1984\_Web\_Mercator\_Auxiliary\_Sphere

Key Map of British Columbia



**APPENDIX 2: REPRESENTATIVE PHOTOS**





Access May 30<sup>th</sup> 2023: Drone View of Existing Boat Access Area



Access May 30<sup>th</sup> 2023: Drone View of Existing Boat Access Area



Access May 14<sup>th</sup> 2023: Damage to Existing Boat Launch Structure



Access May 14<sup>th</sup> 2023: Damage to Area Adjacent to Boat Launch Structure



Access May 30<sup>th</sup> 2023: Existing Riparian Vegetation



Access May 14<sup>th</sup> 2023: Existing Outhouse Structure



**Quesnel River Environmental**

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 E-Mail Address: millarcy@yahoo.com

PROJECT : DRAGON NAME: Dragon Lake Access Improvements  
 LOCATION: Dragon Lake Public Access @km 3.4 on Quesnel-Hydraulic Road  
 CLIENT: City of Quesnel BY: R.M.  
 DATE: June 2023 PAGE: 1 OF 1

**APPENDIX 3: MARKED UP OVERVIEW PHOTO**

Proposed Outhouse Location  
(Footprint to remain the same)

Existing Outhouse Structure

Proposed Double-Wide Boat  
Launch Location

Existing Boat Launch Structure

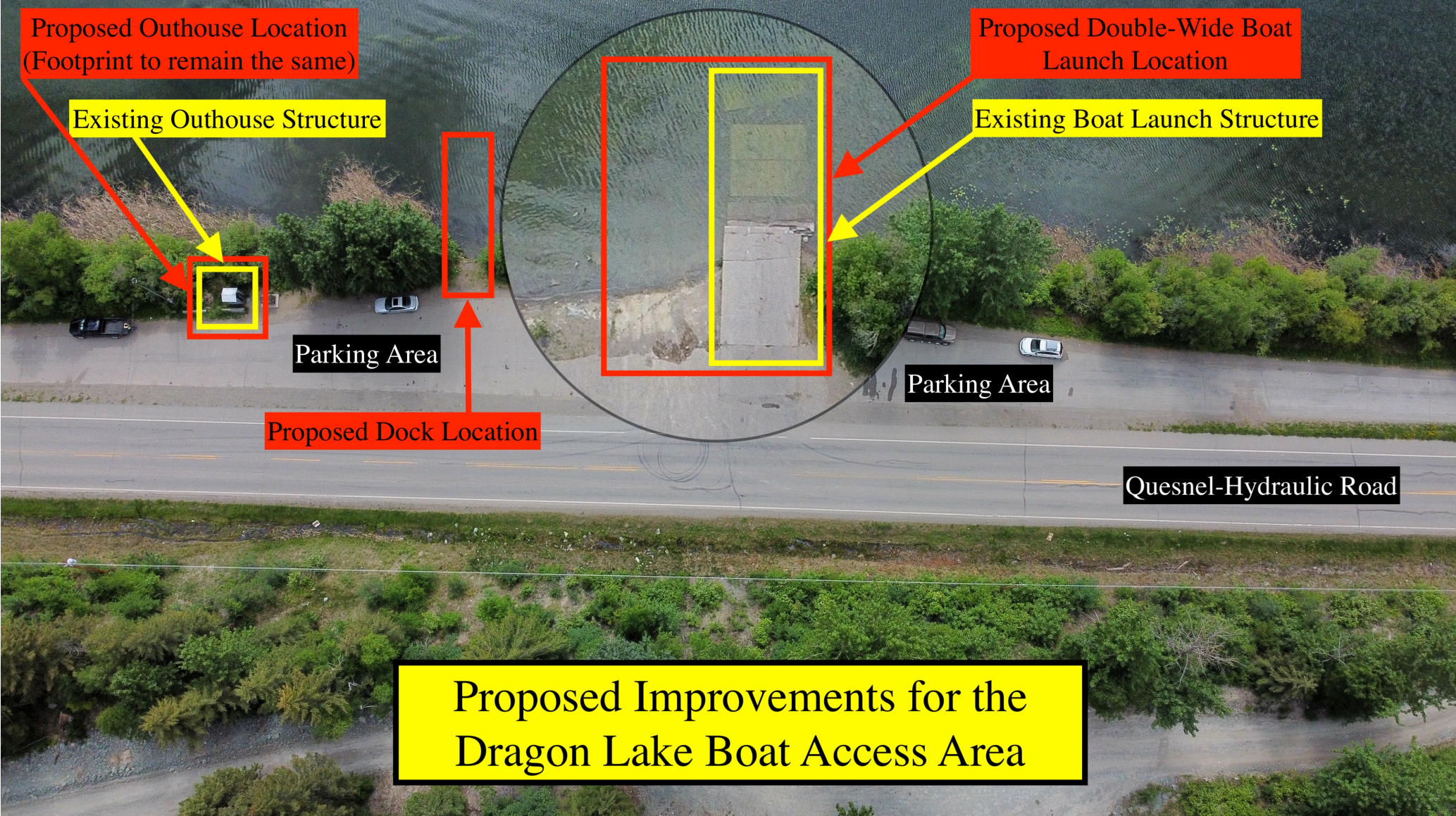
Parking Area

Proposed Dock Location

Parking Area

Quesnel-Hydraulic Road

Proposed Improvements for the  
Dragon Lake Boat Access Area



**APPENDIX 4: BEST MANAGEMENT PRACTICES**

## A5. Best Management Practices for Boat Launches

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

### **IMPORTANT: Mandatory vs. Non-Mandatory**

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

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

### **Background**

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

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

### **Additional Permissions**

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

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

**IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs**

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

**Best Management Practices**

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

**Boat Launch Planning and Design**

- a) A Qualified Professional with expertise in boat launch impacts and design must be engaged early in the design process.
- b) The boat launch must be designed to avoid sensitive areas, such as within the stream and stream channel, which include but are not limited to: lake inlet/outlet streams, spring and aquifer discharge zones, fish habitat (e.g., spawning, holding and rearing areas), habitat for species at risk, unstable/easily erodible areas, areas of unstable stream banks, and other geomorphically sensitive areas.
- c) The location and layout of the boat launch must consider the seasonal and long-term changes in water levels, prevailing wind direction, water current, potential for ice, and avoid unstable areas such as eroding banks. Additional protection measures such as riprap and breakwaters may be needed, particularly for launches in rivers.
- d) The boat launch design must consider requirements for future maintenance and include monitoring recommendations specific to dredging and instream vegetation removal. The boat launch design must allow for site access for future maintenance and repairs for long-term use.
- e) Associated infrastructure must be located as far back from the edge of water as possible, ideally located a minimum of thirty (30.0) metres from the high-water mark. This includes but is not limited to parking areas, vehicle turn around space for typical trailers and tow vehicles, and signage.

**Boat Launch Construction and Maintenance**

- f) The construction area and access routes should be marked onsite prior to starting work and existing vegetation left in place, as much as possible.
- g) Natural materials such as rocks or logs located within the water removed to facilitate construction must be carefully relocated to an area with similar habitat conditions.
- h) Ongoing maintenance activities must be minimized, including dredging and the cutting or removal of instream and riparian vegetation.

**Boat Launch Removal**

- i) The removal of a boat launch must have the same level of planning as launch construction.
- j) Actions are taken to avoid causing depressions in the river or lakebed that could strand fish.

**Additional Resources**

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

**Amendments**

New Version #	Date Amended	Amendment Description
NA	NA	NA

**Recommended Citation**

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

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## A1. Best Management Practices for Concrete Use

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

### **IMPORTANT: Mandatory vs. Non-Mandatory**

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

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

### **Background**

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

### **Authorized Changes under WSR Part 3**

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

### **IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs**

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

### **Best Management Practices**

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

- a) Pre-cast concrete structures are used.
- b) All works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials (concrete) must not deposit, directly or indirectly,



- sediments, debris, concrete, concrete fines, wash or contact water into or about any stream. Concrete materials cast-in-place must remain inside formed structures.
- c) A carbon dioxide (CO<sub>2</sub>) tank with regulator, hose and gas diffuser must be readily available during any work involving the mixing or pouring of concrete. Operators must have appropriate training to operate such equipment and to release carbon dioxide gas and neutralize pH levels should a concrete (and/or derivative) spill occur.
  - d) Wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment must be contained in a manner that prevents wash-down water from entering a stream, stormwater runoff or aquifer.
  - e) Concrete work must be isolated from any water within any watercourse or stormwater system and/or be prevented from entering into any watercourse or stormwater system.
  - f) Where concrete work occurs within the stream or stream channel, a location immediately downstream of the work must be monitored regularly for pH.
  - g) Concrete work must stop if downstream pH:
    - i. has changed by **more than 1.0 pH unit**, measured to an accuracy of +/- 0.2 pH units from the background level; or,
    - ii. where applicable, is recorded to be **below 6.0 or above 9.0 pH units** and may only resume when pH levels have returned to levels within this range.
  - h) Water that contacts uncured or partly cured concrete during activities, such as exposed aggregate wash-off, wet curing, or equipment washing, must be prevented from directly or indirectly entering any stream, stormwater system, or aquifer if it will adversely alter the water quality as compared to the pre-disturbed state.
  - i) All cast-in-place concrete and grouting must be isolated from fish-bearing waters for a minimum of 48 hours if ambient air temperature is above 0°C and for a minimum of 72 hours if ambient air temperature is below 0°C.

### Amendments

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NA	NA	NA

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

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

### **IMPORTANT: Mandatory vs. Non-Mandatory**

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

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

### **Background**

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

### **Authorized Change under WSR Part 3**

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

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

## Additional Permissions

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

### **IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs**

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

## Best Management Practices

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

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

## Amendments

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NA	NA	NA

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## A4. Best Management Practices for Fish and Wildlife Salvage

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

### **IMPORTANT: Mandatory vs. Non-Mandatory**

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

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

### **Background**

Altering, destroying or damaging wildlife habitat is an offence under the [Wildlife Act](#). On some projects, certain wildlife species must be removed before work begins to avoid contravening the [Wildlife Act](#). By ensuring any fish or wildlife found within your isolated work area are transferred to adjacent, non-impacted areas, you can help to protect aquatic and terrestrial life.

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

### **Permits and Responsibilities**

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

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

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

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

**IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs**

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

**Best Management Practices**

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

**Capture and Release**

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

- a) All fish are to be removed from the isolated area. Death or harm to fish without prior authorization is prohibited under the federal *Fisheries Act*. Achieving total removal can often include but not limited to:
  - i) At least three collection methods on a risk hierarchy of passive (e.g., minnow traps, fyke nets) and active techniques (e.g., beach and pole seines, electrofishing, angling) and low risk to higher risk to fish health are used in fish salvage.
  - ii) For active collection methods a minimum of two consecutive passes that produces a zero catch must be completed, as per total population removal methodology (95% or greater fish removal to be achieved).
- b) All aquatic species must be released into the same stream they were removed from and downstream of the work areas or with enough distance upstream into waters of equivalent baseline quality and habitat type (e.g., pool, riffle, run) (distance is recommended as five channel widths to a maximum of 100 metres).
- c) Caution must be applied when completing salvages that might involve species at risk (SAR). If species at risk are expected to be present, contact the Ministry office in your area for more information regarding assessment and salvage requirements.

**Sampling and Data**

- d) All data fields (reference and location, fish collection methods, individual fish, stream site) under scientific [Fish Collection Permits](#) are to be completed in full.
- e) Data entered into a Fish Data Submission Template must be submitted to the appropriate agency following the completion of a fish salvage within 90 days of permit expiry.
- f) Sampling fish species under a Fish Collection Permit for fish salvage must follow the best practices outlined in Table A for the minimum individual fish data information to be included when conducting fish salvages.

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

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

<sup>1</sup>More information on [Fish Data Submission](#) form.

<sup>2</sup>RB-Rainbow, CT(CCT)-Cutthroat, DV-Dolly Varden, BT- Bull Trout, EBT- Eastern Brook Trout, GR- Arctic Grayling, LT- Lake Trout, KO- Kokanee.

<sup>3</sup>Sex and Maturity only if possible through visual observation.

### Additional Resources

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

### Amendments

New Version #	Date Amended	Amendment Description
NA	NA	NA

**Recommended Citation**

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

“Best Management Practices for Fish and Wildlife Salvage”. Appendix, Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia. Version 2022.01. Government of British Columbia.

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## A12. Best Management Practices for Instream Work Area Isolation

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

### **IMPORTANT: Mandatory vs. Non-Mandatory**

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

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

### **Background**

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

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

### **Authorized Changes under Part 3 WSR**

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

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

### **Additional Permissions**

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

## Worksite Isolation Methods

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

### Cofferdam Method

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

### Dam and Flume Method

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

### Dam and Pump Method

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

### Stream Diversion Method

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

### Sediment Curtain Method

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

Table B: Work area isolation method summary.

Method	Common Applications	Advantages	Disadvantages
<b>Cofferdam</b>	<ul style="list-style-type: none"> <li>• Instream bridge piers</li> <li>• Boat launches</li> <li>• Large pipeline crossings</li> </ul>	<ul style="list-style-type: none"> <li>• Works well for larger bodies of water</li> <li>• Can be used for long term projects</li> <li>• Can be used to dam off a portion of a stream or lake</li> <li>• Fish passage may continue around the site</li> </ul>	<ul style="list-style-type: none"> <li>• Tend to be more expensive to install, particularly if using sheet piles</li> <li>• Additional measures may be required if pile driving to prevent vibrations causing death to fish</li> <li>• Can be difficult to get a good seal if substrate is cobbles and/or boulders</li> </ul>
<b>Dam and Flume</b>	<ul style="list-style-type: none"> <li>• Culverts</li> <li>• Bridges</li> <li>• Pipeline crossings</li> </ul>	<ul style="list-style-type: none"> <li>• Can be left in place for longer term projects</li> <li>• May support fish passage with careful design</li> </ul>	<ul style="list-style-type: none"> <li>• Requires sufficient gradient for passive flow around the site</li> <li>• Requires careful design and installation to support fish passage</li> <li>• Could result in fish stranding during installation; salvage is required</li> </ul>
<b>Dam and Pump</b>	<ul style="list-style-type: none"> <li>• Small stream crossing replacements (culvert to culvert or culvert to bridge)</li> <li>• Small pipeline crossings</li> </ul>	<ul style="list-style-type: none"> <li>• Easy to install</li> <li>• Works well for smaller streams</li> </ul>	<ul style="list-style-type: none"> <li>• Not ideal for projects longer than a day (i.e., require overnight pumping)</li> <li>• Not recommended for freezing temperatures</li> <li>• Pumping requires continuous monitoring to ensure there is no downstream fish stranding</li> <li>• Possible fuel and oil spills from pumps or generators</li> <li>• Fish passage is blocked and could result in fish stranding during installation; fish salvage is required</li> <li>• Large streams require excessive pump sizing and could cause excessive erosion if discharge is not controlled</li> </ul>
<b>Stream Diversion</b>	<ul style="list-style-type: none"> <li>• Bridges</li> <li>• Larger culverts</li> </ul>	<ul style="list-style-type: none"> <li>• Works well for diversions over multiple days</li> <li>• Can be used during freezing conditions</li> <li>• Works well for streams of all sizes</li> <li>• Typically maintains fish passage</li> </ul>	<ul style="list-style-type: none"> <li>• Requires additional area to be allocated to excavation and restoration activities</li> <li>• Area required for diversion may infringe on construction site activities</li> </ul>
<b>Sediment Curtain</b>	<ul style="list-style-type: none"> <li>• Bank Protection projects</li> <li>• Stream channel maintenance</li> <li>• Boat launches</li> </ul>	<ul style="list-style-type: none"> <li>• Allows projects to work “in the wet”</li> <li>• Curtains can often be reused</li> <li>• Typically maintains fish passage around the work area</li> </ul>	<ul style="list-style-type: none"> <li>• Care must be taken when removing the curtain to avoid sediment flush</li> <li>• May not work well with all substrates</li> </ul>

**IMPORTANT: Adherence to General and Applicable Scope-Specific BMPs**

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

## Best Management Practices

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

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

### Planning and Set-up

- a) Determine the diversion method that will work best for your site and duration of project. If the site is dry at the time of construction, groundwater can be encountered that must be managed.
- b) The diversion must be sized to account for additional flows and water levels that can result from precipitation events, snow melt, or wave action in the case of lakes.
- c) Determine the best area to set up the diversion to avoid high quality habitat (e.g., spawning grounds) and natural occurring areas of instability (e.g., braided channels, steep eroding banks, alluvial fans, etc.).
- d) When diverting water around a site, the natural rate and quality of water flow must be maintained at all times.
- e) The isolated work area must be defined and marked, with sufficient space to complete all of the required construction work, the placement of pumps and hoses, and for equipment to move around.
- f) All materials and equipment must be on site prior to commencing work to minimize the amount of time the diversion is in place; this includes contingencies such as extra pumps.

### Dewatering the Isolated Area

- g) If the area is in a fish-bearing stream, a fish and wildlife salvage must be completed first.
- h) Pumps must be set in spill trays while working within thirty (30.0) metres of the water and monitored regularly to ensure they are operating continuously, particularly for dam and pump sites.
- i) Sumps must be installed to allow pumps to capture sediment laden water and pump it to a vegetated area to allow for sediment to settle or filter out prior to re-entering the stream.
- j) The outlet of any diversion (hose outlet, flume, pipe, diversion channel etc.) must include energy dissipation measures to protect against erosion where the water rejoins the stream. This can include energy dissipaters such as diffusers, sandbags, plastic, and riprap.
- k) Downstream water flow levels must be sufficient at all times to support the aquatic life present.

### Work Completion/Site Remediations

- l) Water must be returned to the stream channel slowly to avoid flushes of sediment. A pump can be used downstream to temporarily direct sediment-laden water away from the stream until it clears.
- m) The work area must be deactivated and recontoured to the original ground as best as possible (e.g., restore sumps, rutting and depressions if present).

## Installation and Removal

### **Cofferdam**

- n) If sheet piles are being driven in fish-bearing water, additional exclusion measures such as bubble curtains must be used as required to protect fish from vibrations and shock waves.
- o) When installing a cofferdam in a flowing stream, work must start at the upstream end and progress downstream until the work area has been isolated from the stream. The upstream face must be installed at an angle to the flow rather than perpendicular to deflect flow from the site.
- p) Dam installation in flowing streams must not constrict the channel such that it unsafely impedes the flow of water or restricts fish passage.
- q) When installing a dam from the shore in still water (e.g., lakes) systems, work must take place from the shore in an outward direction until the work area has been isolated from the water.
- r) The ends of the cofferdam must be stable prior to working in the isolated work area.
- s) When removing the dam in flowing systems, work must be done from the downstream side of the work area in an upstream direction until the cofferdam is completely removed.
- t) When removing the dam in non-flowing systems, work must be done towards the bank in an inward direction until the until the cofferdam is completely removed.

### **Dam and Flume Method**

- u) The flume must be installed parallel to the stream. Depending on the volume of water, multiple flumes/pipes can be used.
- v) An upstream dam must be built perpendicular to the stream at the upstream end of the flume to direct water towards it.
- w) A downstream dam must be installed, perpendicular to the stream, when necessary to prevent backwatering; and it must be constructed upstream of the flume outlet.
- x) The dam(s), flume, and associated works must be removed once the water is returned to the stream channel.

### **Dam and Pump Method**

- y) The pump intake(s) must be located upstream of the dam, preferably in a natural pool or depression in the streambed.
- z) The hoses must be placed where they will not be in the travel path of equipment.
- aa) The dams must be constructed upstream and downstream of the worksite isolation area once the pumps and hoses are set up and ready.
- bb) The pumps must be monitored full time during diversion to ensure they are fuelled and maintain flow downstream at all times.

### **Stream Diversion Method**

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

- ee) A dam to help divert water to the diversion channel must be installed upstream prior to moving the water to the diversion channel. A dam must be installed downstream to prevent water back flooding the work area if necessary.
- ff) After the work is completed, water must be allowed to flow slowly into the stream channel. A pump must be used at the downstream end to collect sediment-laden water and pump it away from the stream. Once the water clears, the full flow must be returned to the stream and the dams and diversion channel deactivated.

### **Sediment Curtain Method**

- gg) If installing a sediment curtain in moving water, installation must begin at the upstream end by attaching it securely to a fixed anchor on shore.
- hh) The sediment curtain must encircle the entire work site allowing enough room for works to occur such that the curtain does not need to be moved during the project.
- ii) The top of the sediment curtain must not be allowed to become submerged during any anticipated water levels. The bottom of the sediment curtain must be ‘fit’ to the substrate as well as practicable to contain all sediment within the worksite.
- jj) The sediment curtain must not be physically impacted by equipment or flows that could allow turbid water from inside of the worksite to escape into the stream (e.g., watercourse or lake).
- kk) Prior to removing the sediment curtain, as much sediment as possible must be removed and the site to must be stabilized as much as possible.
- ll) The sediment curtain must be removed slowly, starting at the downstream end while constantly maintaining control of it.

### **Additional Resources**

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

### **Amendments**

<b>New Version #</b>	<b>Date Amended</b>	<b>Amendment Description</b>
NA	NA	NA

### **Recommended Citation**

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