

Windermere Lake Groyne Installation of Navigation Markers: Environmental Regulations, Mitigations, and Monitoring Recommendations

Prepared for:

Public Services and Procurement Canada
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LIST OF GLOSSARY OF TERMS

Term	Definition
BC	British Columbia
CDC	British Columbia Conservation Data Centre
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EM	Environmental Monitor
FLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
Hemmera	Hemmera Envirochem Inc.
MOE	Ministry of Environment
Project	Installation of navigation markers at the Windermere Groyne
PSPC	Public Services and Procurement Canada
SARA	<i>Species at Risk Act</i>
VEC	valued ecosystem component
VSC	valued social component
WSA	<i>Water Sustainability Act</i>

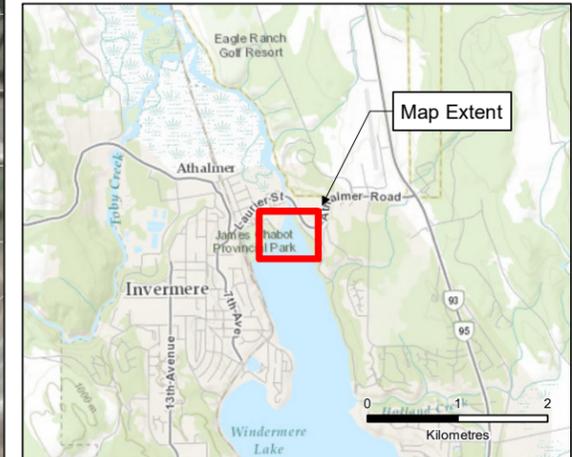
1.0 INTRODUCTION

Public Services and Procurement Canada (PSPC) currently has administrative responsibility for the Windermere Groyne located in Windermere Lake near the Columbia River headwaters, adjacent to the town of Invermere, British Columbia (BC) (**Figure 1-1**). The groyne is situated near the lake outlet at the north end of the lake (located at approximately 50°30'44" N and 116°01'14" W), approximately 400 m upstream of the Athalmer Road bridge crossing (Hemmera 2013, G3 2014). The groyne is approximately 210 m long and ranges between 2 to 5 m in width with a footprint of approximately 850 m².

The groyne was originally installed in the 1890s to focus water and vessel traffic towards the navigation channel at the east end of the groyne, while reducing the need for ongoing dredging. However, minimal maintenance on the rock groyne has occurred since its construction and its functionality has declined substantially since that time. In addition, previously installed navigation markers on the groyne have deteriorated at a relatively rapid rate due to inclement weather conditions (e.g., winter ice formation) and vandalism. While the channel immediately east of the site is considered to be navigable, the groyne itself has become a navigation hazard to the public and boating community. For example, reports of boat propellers hitting the rock groyne have been documented when boats shortcut across shallow inundated sections of the groyne (e.g., a partial gap located close to the centre of the groyne, **Figure 1-1**) (Hemmera 2013).

PSPC has completed numerous investigations of the groyne while exploring options for either divesting or removing the groyne. Some of the studies that investigated removal of the rock groyne included: a fish assessment (Hemmera 2012a), a contaminated site study (Hemmera 2012b), an environmental effects evaluation (Hemmera 2013), and a biological assessment (G3 2014). Based on the results of these investigations, PSPC has made the decision to leave the groyne in place and install new navigation markers and piles around the groyne to increase public safety and meet navigation requirements (the "Project").

To help ensure that environmental requirements are met, Hemmera Envirochem Inc. (Hemmera) has been retained to provide environmental support for the Project (TA700406254). The following report provides: a summary of the site background and habitat values; advice for regulatory review; an effects assessment and environmental mitigation plan to be implemented during construction (including recommendations on construction timing); and, an environmental monitoring plan in support of the Project.



Legend

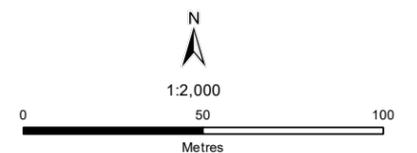
- Pile Location
- Approximate Location of Rock Groyne
- ▭ Provincial Park

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Aerial Image: ESRI World Imagery
- Inset Basemap: ESRI World Topographic Map



NAD 1983 UTM Zone 11N

Page Size: 11" x 17"

DRAFT
For Discussion Purposes Only

2.0 PROJECT DESCRIPTION

The Project involves the installation of 13 navigation piles and signs as shown on **Figure 1-1**. The piles will consist of untreated 36 cm diameter (14 inch), approximately 10 m long, Douglas-fir round wood. Each pile will be topped with an aluminum cap. The piles will be driven into the substrate until refusal. Installation of the piles and signage is anticipated to take approximately two to three days to complete. No existing piles will be removed as part of the current scope of work. While the tender has not yet been awarded, it is anticipated that the equipment used for construction will include a boat, and barge and hammer (either a vibratory hammer or an impact hammer, to be determined upon selection of the successful Contractor).

3.0 EXISTING CONDITIONS

Windermere Lake can be classified as a widening of the Columbia River, rather than a true lake. Its hydraulic conditions are dominated by Columbia River flow patterns, with peak discharge observed during the late spring to early summer freshet. The lake covers approximately 1,610 hectares and is long (approximately 17.7 km in length with an average width of 1.1 km), and shallow with a mean depth of 3.4 m and a maximum depth of 6.4 m (CBA 2011, Hemmera 2012*b*). The total annual depth fluctuation of the lake is approximately 1.5 m/year (CBA 2011). Due to its shallow depth, little to no stratification occurs in the lake (Hemmera 2012*b*).

The rock groyne (**Appendix A: Photos 1 and 2**) is located near the narrowing of the lake outlet at the north end of the lake (**Appendix A: Photo 3**). There are no documented streams that drain into Windermere Lake near the Project site (Hemmera 2013). The rock groyne is marginally elevated and was observed to extend, on average, 15 cm above the lake bottom during an assessment by Hemmera in November 2010 (Hemmera 2012*a*). A bathymetric survey conducted in 2010 indicated that bathymetry on both sides of the groyne were relatively uniform, with slightly higher elevations recorded on the downstream side of the groyne (Hemmera 2012*a*).

The original groyne was constructed with a wood crib frame to contain the cobble and boulder material within the groyne. The groyne is currently estimated to consist of approximately 5% wood cribbing, and 95% sediment in the form of rocks. However, the rock groyne has largely infilled with silts over the years and only a single layer of rock is visible, with some parts of the groyne being fully covered. There is some aquatic macrophyte growth on top of the groyne; however, vegetation growth is denser in the navigation channel to the east (Hemmera 2012*a*) (**Appendix A: Photo 4**). The average width of the groyne, originally reported to be approximately 4 m, has been recently documented as 3 m (G3 2014). The lake depth above the groyne varies seasonally, depending on flows in the Columbia River, but during an assessment in March 2010, Hemmera estimated that the highest points of the groyne were within 0.5 m of the water's surface, with the deepest point approximately 1 m from the surface at the eastern end of the groyne (Hemmera 2013).

Based on observations from Hemmera in September 2010 and February 2011, there are three wooden piles on the east side of the groyne, and seven wooden piles at the west end of the groyne. Based on visual observations and the results of laboratory tests, these piles do not appear to be chemically treated (e.g., with creosote) (Hemmera 2012*b*).

3.1 Adjacent Land Uses

The Project site is surrounded by residences, many with recreational boat docks. James Chabot Provincial Park and the Lakeside Pub are both located on the west side of the Project site. The upland habitat adjacent to the site has been impacted by residential developments and road construction (e.g., Lakeview Place). This upland area can currently be described as a hilly, open shrub and grassland landscape with scattered coniferous and deciduous trees and shrubs (**Appendix A: Photos 1 and 2**).

The lake is valued by residents of the East Kootenay Regional District for recreational activities including boating, fishing, and swimming. Summer is the primary season for recreation on the lake with the predominant uses including motorized boating, swimming and beach use (CBA 2011).

4.0 FISH AND FISH HABITAT

Windermere Lake is part of a wide and low gradient section of the Columbia River, and fish species present in nearby upstream and downstream sections of the Columbia River are able to freely access habitat in the lake. **Table 4-1** provides a list of fish species that have been recorded in the lake, based on a review of the provincial database and background fish reports (McPhail 2007, McPherson and Hlushak 2008, Hemmera 2012a, G3 2014, MOE 2018).

Table 4-1 Fish Species Recorded within Windermere Lake

Common Name	Scientific Name	BC Status	Sport Fish	Regional or Conservation Concern
Bull trout	<i>Salvelinus confluentus</i>	Native	Yes	Yes
Burbot	<i>Lota lota</i>	Native	Yes	Yes
Kokanee	<i>Oncorhynchus nerka</i>	Native	Yes	No
Largemouth bass	<i>Micropterus salmoides</i>	Non-Native	Yes	No
Largescale sucker	<i>Catostomus macrocheilus</i>	Native	No	No
Longnose dace	<i>Rhinichthys cataractae</i>	Native	No	No
Longnose sucker	<i>Catostomus catostomus</i>	Native	No	No
Mountain whitefish	<i>Prosopium williamsoni</i>	Native	Yes	No
Northern pike minnow	<i>Ptychocheilus regonensis</i>	Native	No	No
Peamouth chub	<i>Mylocheilus caurinus</i>	Native	No	No
Prickly sculpin	<i>Cottus asper</i>	Native	No	No
Pumpkinseed	<i>Lepomis gibbosus</i>	Non-Native	No	No
Rainbow trout	<i>Oncorhynchus mykiss</i>	Native	Yes	No
Redside shiner	<i>Richardsonius balteatus</i>	Native	No	No
Torrent sculpin	<i>Cottus rhotheus</i>	Native	No	No
Westslope Cutthroat Trout	<i>Oncorhynchus clarkii lewisi</i>	Native	Yes	Yes
Species Recorded but Unlikely to Occur in Windermere Lake¹				
Brassy minnow	<i>Hybognathus hankinsoni</i>	Native	No	No
Brook trout	<i>Salvelinus fontinalis</i>	Non-Native	Yes	No
Chiselmouth	<i>Acrocheilus alutaceus</i>	Native	No	Yes
Dolly Varden	<i>Salvelinus malma</i>	Native	Yes	No
Lake chub	<i>Couesius plumbeus</i>	Native	No	No
Tidepool sculpin	<i>Oligocottus maculosus</i>	Native	No	No
Walleye	<i>Sander vitreus</i>	Native	Yes	No
White sturgeon	<i>Acipenser transmontanus</i>	Native	Yes	Yes

Common Name	Scientific Name	BC Status	Sport Fish	Regional or Conservation Concern
<p>¹Due to specific habitat requirements, known distributions and the results of a literature review, eight of the species listed as occurring in Windermere Lake are unlikely to presently occur in the lake, as described below.</p> <ul style="list-style-type: none"> • Brassy minnow (2013 observation, G3 2014): Brassy minnow is not known to occur in the Columbia River system. In BC, it is only known to have a scattered distribution in the Fraser and Upper Peace River systems (McPhail 2007). • Brook trout (1925 observation, MOE 2018): Brook trout is a non-native species that was introduced to the Columbia River system (McPhail 2007); however, the last public observation of brook trout in Windermere Lake is from 1925. McPherson and Hlushak (2008) indicated that since the 1920s, no brook trout have been recorded in Windermere Lake (e.g., during subsequent fish inventories). • Chiselmouth (1977 observation, MOE 2018): Chiselmouth is not known to occur in the Columbia River system, and subsequent fish inventories in Windermere Lake have not identified this species (McPherson and Hlushak 2008). • Dolly Varden (1977 observation, MOE 2018): Dolly Varden is a coastal species that is not known to occur in southeastern BC (McPhail 2007). • Lake chub (2001 reference, discussed in McPherson and Hlushak 2008): This species is known to occur in the Columbia River drainage in scattered and isolated populations (McPhail 2007). However, based on a fish assessment conducted by McPherson and Hlushak (2008), this species is not likely to occur in Windermere Lake. • Tidepool sculpin (1975 observation, MOE 2018): Tidepool sculpin is a marine species that would not be found in fresh water in Windermere Lake (McPhail 2007). • Walleye (1975 observation, MOE 2018): Walleye is a species native to northeastern BC which has been introduced to the Columbia River system but is not known to occur as far upstream in the Columbia River as Windermere Lake (McPhail 2007). • White Sturgeon (2001 observation, MOE 2018) is a species considered to be absent and functionally extirpated upstream of the Revelstoke and Mica Dams (Hildebrand and Parsley 2013). 				

While there is a relatively high diversity of fish in the lake (**Table 4-1**), the total density of sport fish is relatively low which could be due to factors such as the limited availability of spawning and recruitment habitat, urban development, eutrophication, high water temperatures, overfishing, and exotic fish introductions including largemouth bass (*Micropterus salmoides*), and pumpkinseed (*Lepomis gibbosus*) (McPherson and Hlushak 2008).

The native sport fish in Windermere Lake, including kokanee (*Oncorhynchus nerka*), rainbow trout (*O. mykiss*), westslope cutthroat trout (*O. clarkii lewisii*), and bull trout (*Salvelinus confluentus*), generally exhibit fluvial life histories and migrate from the lake/river into suitable tributaries to spawn. These fluvial fish typically use the lake as a migration corridor to gain access to their spawning beds located in other parts of the Columbia River system. For example, the outlet of Windermere Lake (downstream of the Athalmer Road bridge crossing, approximately 400 m downstream of the Project site), is known to provide important kokanee spawning habitat. Other downstream areas, including habitats associated with the Columbia River Wetlands, are known to provide important spawning and rearing habitat values for bull trout, rainbow trout, burbot (*Lota lota*), and kokanee. The lake is likely only used for short periods of time by fluvial populations due to most species' preference for cold water habitats (McPherson and Hlushak 2008). The lake is not known to provide suitable beach spawning sites for kokanee or mountain whitefish (*Prosopium williamsoni*). The Project site would, however, provide habitat in the form of cover during migrational movements of fluvial populations of these sport fish. Of the native sport fish, burbot is the only species that is suspected of spawning in the lake (McPherson and Hlushak 2008). In lakes, burbot are known to spawn in the winter or early spring in relatively shallow waters (ranging from approximately 1 to 10 m in depth) over gravel, sand or silt bottoms. Yearling burbot usually occupy water less than 2 m deep and are strongly associated with cover (e.g., rock jetties and natural boulders) such as those areas present at the Project site.

Windermere Lake provides habitat with rearing value. Early life history stages of fluvial sport fish are likely to be found along the lake margins after emergence from tributary streams (McPherson and Hlushak 2008). For example, juvenile mountain whitefish have been well documented to use vegetated shorelines along Windermere Lake (McPherson and Hlushak 2008). Juvenile trout are also expected to feed and seek refuge in the lake during cooler months but are likely to leave to seek out colder water refuge areas in the Columbia River system during the warmer summer months (McPherson and Hlushak 2008).

At the Project site, siltation has affected much of the groyne and has resulted in the loss of potentially beneficial interstitial spaces which would otherwise provide suitable rearing habitat for fish (G3 2014). However, some large cobbles (e.g., 10 to 25 cm in diameter) are still present at the top of the groyne and do provide rearing value (Hemmera 2012a). Previous on-site fish assessments have indicated that the groyne provides high quality rearing substrate but low quality spawning substrate and low quality cover for fish (G3 2014). Information from Fisheries and Oceans Canada (DFO) indicates that the rock groyne constitutes fish habitat in the form of holding, feeding and rearing areas (Hemmera 2013). The Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) has also indicated that the groyne provides good habitat for burbot (Hemmera 2013).

4.1 Fish Species of Regional or Conservation Concern

A list of fish species of provincial and federal conservation concern, with potential to occur in Windermere Lake, is provided **Table 4-2** below (CDC 2018). Of the fish known to occur in Windermere Lake, there is only one species (i.e., westslope cutthroat trout) that is listed (as a species of Special Concern) under the *Species at Risk Act* (SARA) (**Table 4-2**). Westslope cutthroat trout is primarily a cold-water species and like rainbow trout and bull trout, this species is expected to use the lake as a migratory corridor to gain access to tributary spawning grounds. Juvenile trout are expected to use lake habitat for rearing and feeding; however, during the summer months they are expected to seek out colder water refuge areas elsewhere within the Columbia River system. There is moderate potential for this species to utilize habitat areas near and overlapping with the rock groyne.

Although not federally listed, bull trout have been listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the species is provincially blue-listed (i.e., considered “Special Concern”) by the British Columbia Conservation Data Centre (CDC). There is also moderate potential for this species to utilize aquatic habitats near/at the groyne (**Table 4-2**Table 4-1).

Chiselmouth (*Acrocheilus alutaceus*) is a provincially blue-listed species; however, there has only been one record of chiselmouth in Windermere Lake, which was reported in 1959. This record may have been a misidentification as this species is considered to be absent, or extirpated, from the Upper Columbia River system and it is not anticipated to occur in Windermere Lake (McPherson and Hlushak 2008).

Table 4-2 Fish Species of Provincial and/or Federal Conservation Concern with Potential to Occur within the Project Area

English Name	Scientific Name	SARA ¹	COSEWIC ²	CDC ³	Potential to Occur at Site
Bull Trout	<i>Salvelinus confluentus</i>	-	SC (2012)	Blue	Moderate
Chiselmouth ⁴	<i>Acrocheilus alutaceus</i>	-	NAR (2003)	Blue	Nil
Westslope Cutthroat Trout	<i>Oncorhynchus clarkii lewisi</i>	1-SC (2010)	SC (2016)	Blue	Moderate

¹1-SC = Special Concern: A species of special concern (listed under Schedule 1 of SARA, the official list of wildlife species at risk) because of characteristics that make it is particularly sensitive to human activities or natural events.
²SC = Special Concern: A species of special concern because of characteristics that make it is particularly sensitive to human activities or natural events.
 NAR = Not at Risk: A species that has been evaluated and found to be not at risk.
³Blue: Any indigenous species or subspecies considered to be of Special Concern in British Columbia. Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events.

Although the Windermere Lake population of burbot is not federally or provincially listed as a population of concern, burbot are still considered a species of regional concern (McPhail 2007, Prince 2007, McPherson and Hlushak 2008, Hemmera 2013). The burbot population in Windermere Lake is considered to be in poor condition with a relatively low abundance of fish (Prince 2007). In particular, rearing habitat is considered to be limiting in Windermere Lake. During the mid-1900s, there were major burbot fisheries throughout the Columbia River system, but these fisheries have since been closed. However, despite closure of these fisheries, there have been marked declines in burbot numbers in the Canadian portion of the Columbia River system (McPhail 2007). The Project site currently provides suitable rearing and potentially spawning habitat for juvenile burbot.

5.0 WILDLIFE AND WILDLIFE HABITAT

The Project site is located in a predominantly submerged aquatic environment, with the closest pile on the east side of the groyne (Pile No. 1) proposed for installation more than 20 m from the shoreline, and the closest pile on the west side of the groyne (Pile No. 13) proposed for installation more than 30 m from the shoreline. Due to its aquatic location, the Project site provides limited habitat values for terrestrial wildlife. However, Windermere Lake provides habitat for other wildlife, including waterfowl. The lake is important for many bird species due to its diversity of high quality habitat (CBA 2011). Over 300 species of birds have been identified in the adjacent Columbia River Wetlands which provides an important stopover location for birds migrating along the Pacific flyway (Hemmera 2013). The area is known to support many nesting bald eagles (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*) (Hemmera 2013). Potential cliff nests have also been noted in the silty cliffs/banks near the Project site, which may belong to belted kingfisher (*Megaceryle alcyon*) and/or bank swallow (*Riparia riparia*), both of which were recorded during previous breeding bird surveys within the local setting (McPherson and Hlushak 2008). The lake also provides habitat for water-dependent mammals such as American beaver (*Castor canadensis*), North American river otter (*Lontra canadensis*), and common muskrat (*Ondatra zibethicus*). A variety of ungulates including moose (*Alces americanus*), mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*), also utilize habitat along the shoreline (e.g., for feeding) (CBA 2011).

5.1 Wildlife Species of Regional or Conservation Concern

Wildlife species of regional or conservation concern with potential to interact with the Project are outlined in **Table 5-1** (CDC 2018). Four at-risk wildlife species were identified with potential to occur at the Project site (i.e., three herptiles and one bird). Given known habitat preferences, all of these species were rated as either have low, or low to nil, potential to occur at the Project site.

Table 5-1 Wildlife Species of Provincial and/or Federal Conservation Concern with Potential to Occur within the Project Area

English Name	Scientific Name	SARA ¹	COSEWIC ¹	CDC ²	Potential to Occur at Site
Lewis's Woodpecker	<i>Melanerpes lewis</i>	1-T (2012)	T (2010)	Blue	Low
Painted Turtle – Intermountain – Rocky Mountain Population	<i>Chrysemys picta</i> pop. 2	1-SC (2007)	SC (2-16)	Blue	Low-Nil
Rubber Boa	<i>Charina bottae</i>	1-SC (2005)	SC (2016)	Yellow	Low-Nil
Western Toad	<i>Anaxyrus boreas</i>	1-SC (2005)	SC (2012)	Yellow	Low-Nil

¹1-T = Threatened: A species that is likely to become endangered if limiting factors are not reversed (listed under Schedule 1 of SARA, the official list of wildlife species at risk).

¹1-SC = Special Concern: A species of special concern (listed under Schedule 1 of SARA, the official list of wildlife species at risk) because of characteristics that make it is particularly sensitive to human activities or natural events.

³Blue = Species or subspecies considered to be of Special Concern in British Columbia. Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events.

Yellow = Species that are apparently secure and not at risk of extinction.

6.0 VEGETATION

Three vegetation species listed as at-risk were listed with potential to occur in lacustrine environments, near the Project site (Table 6-1, CDC 2018). However, of the listed species only one (stiff-leaved pondweed (*Potamogeton strictifolius*)) was determined to have potential to occur at the Project site due to its habitat requirements (i.e., lakes in the lowland and montane zones (Klinkenberg 2017)). Stiff-leaved pondweed was also recorded in Windermere Lake in 1972 (CDC 2018).

Table 6-1 Vegetation Species at Risk at Windermere Lake

Scientific Name	English Name	SARA	CDC ¹	COSEWIC	Potential to Occur at the Site
Alkali Plantain	<i>Plantago eriopoda</i>	-	Blue	-	Nil
Stiff-Leaved Pondweed	<i>Potamogeton strictifolius</i>	-	Blue	-	Low to Moderate
Spurless Touch-Me-Not	<i>Impatiens ecornuta</i>	-	Red	-	Nil
¹ Blue = Species or subspecies considered to be of Special Concern in British Columbia. Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Red = Species or subspecies that have, or are candidates for, Extirpated, Endangered, or Threatened status in British Columbia.					

7.0 REGULATORY OVERVIEW AND RECOMMENDATIONS

This section provides an overview of relevant and current federal environmental legislation and regulations, that may be considered to apply to the Project. It is important to note that as the Project is federally regulated, attornment to provincial and regional government processes is not necessarily considered to apply. However, if desired, applications may still be made for purposes of administrative coordination. As such, a section on provincial legislation has also been included.

7.1 Federal Legislation

7.1.1 Fisheries Act

The *Fisheries Act* protects the quality and integrity of fish habitats that support commercial, recreational and Aboriginal fisheries. Sections 32 and 35 of the *Fisheries Act* prohibit activities that may cause *serious harm to fish*, defined as the death of fish, or any permanent alteration to or destruction of fish habitat¹, unless authorized by DFO. Other sections of the *Fisheries Act* that are applicable to the Project include Section 36(3) that prohibits the deposition of deleterious substances to waters frequented by fish, and Sections 38(4) and 38(5) that require that any contraventions of either Sections 35 or 36(3) be reported without delay.

DFO provides a list of project activities and criteria where DFO review under the *Fisheries Act* is not required (DFO 2018). Specifically, pile driving activities do not trigger a review if they involve repairs to, or replacement of, existing piles, and if activities can avoid killing fish and avoid harming, harassing, taking or capturing SARA-listed aquatic species. This project involves the installation of 13 new small diameter (i.e., 14 inch), untreated, wooden piles north of the existing rock groyne, and thus the Project would not fall under this exemption category.

While a detailed Serious Harm Assessment under the *Fisheries Act* was not undertaken as part of Hemmera's scope of work for PSPC, it is very unlikely that the Project as proposed would result in *serious harm to fish*. However, as a due diligence measure, it is recommended that a Request for Project Review be submitted to DFO at least 3 months prior to planned Project commencement.² The application for this review should include this report, accompanied by a more detailed Serious Harm Assessment prepared by a Qualified Environmental Professional (e.g., Hemmera biologist).

7.1.2 Species At Risk Act

The goal of the *Species at Risk Act S.C. 2002, c. 29* (SARA) is to prevent Endangered or Threatened species from becoming extinct or lost from the wild, and to help in the recovery of these species. SARA is also intended to manage species of Special Concern and to prevent them from becoming Endangered or Threatened. SARA protects at-risk fish and wildlife species covered under the federal *Fisheries Act R.S.C. 1985, c.F-14* and *Migratory Birds Convention Act S.C. 1994, C.22*, and all species (including plants and mammals) where they occur on federal lands. Species listed as Extirpated, Endangered or Threatened

¹ Fish habitat is defined as "spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes." In the case of the Project, this includes lake habitats which the Project overlaps with.

² Bill C-68, announced on February 6, 2018, proposes significant changes to the *Fisheries Act*. Although these proposed changes could potentially affect the DFO review process and/or permitting requirements for projects of this type, it remains unclear if these changes will come into effect before the Project proceeds. It is, however, considered even less likely that the proposed works would require formal permitting (i.e., an Authorization) once these proposed legislation changes are in place.

under Schedule 1 of SARA cannot be killed or harmed, and there are prohibitions against damaging or destroying their residences. Any negative Project impacts, including negative impacts to identified Critical Habitat for Extirpated, Endangered or Threatened species listed under Schedule 1 of SARA, would require a permit under Section 73 of SARA. However, based on current site conditions and known habitat uses by species at risk in and along Windermere Lake, it is not anticipated that there will be any direct impacts to species at risk. In addition, no critical habitat has been identified within the Project area. Thus, it is not anticipated that a permit under Section 73 of SARA will be required for this Project.

7.1.3 Migratory Birds Convention Act

Federal and provincial legislation exists across Canada to protect birds, and their eggs and nestlings from harm. The *Migratory Birds Convention Act* protects various species of migratory birds including gamebirds, insectivorous birds, and non-gamebirds. This Act restricts the possession of live and dead migratory birds and bird parts, and prohibits the taking or disturbance of migratory bird nests and the deposit of harmful substances in waters or areas frequented by migratory birds. The Project is not anticipated to result in any direct impacts to bird nests, however sounds produced by pile driving activities could potentially disturb nesting birds. To prevent contravening this Act, mitigation measures as outlined in **Section 8.0**, should be implemented.

7.1.4 Navigation Protection Act

The *Navigation Protection Act* (NPA, R.S., 1985, c N-22, s. 1; 2012, c. 31, s. 316) protects the public's right to navigation and marine safety in the navigable waters of Canada. It governs any works that may construct, place, alter, repair, remove, or decommission a work in, on, over, under, through, or across any navigable water listed on "The List of Scheduled Waters". The Act is administered by Transport Canada.

While the Columbia River is included on The List of Scheduled Waters, the upstream extent of coverage is Kinbasket Lake, which is located downstream of the Project site. Furthermore, Windermere Lake is not included in the aforementioned list. As such, it is not anticipated that the work will require a Notice to the Minister under the current provisions of the Act. However, it should also be noted that changes to the *Navigation Protection Act* are proposed which would restore protections to all navigable waters, including Windermere Lake.

If changes to the *Navigation Protection Act* (i.e., the *Canadian Navigable Waters Act*) come fully into effect prior to implementation of the Project, PSPC would be required to provide information and issue a public notice on the proposed work to allow communities to meaningfully engage on the Project. PSPC would also be required to address any navigation-related concerns. If concerns cannot be resolved, the community could request that the Minister of Transport review their concerns to determine whether the Project is required to go through a formal approval process. It is, however, also noted that the Project will address existing navigational concerns and can therefore be viewed as beneficial works that are unlikely to pose concern to members of the public or regulators.

7.2 Provincial Legislation

7.2.1 Water Sustainability Act

The *Water Sustainability Act* (S.B.C. 2014, c. 15) (WSA) is administered by FLNRORD. For changes in and about a stream, which is broadly defined and includes lakes and other waterbodies, the province requires one of the following:

- Submittal of a Notification (for low risk changes in and about a stream that have minimal risk of impact on the environment or third parties); or
- Application for a Change Approval (for 'significant' works that permanently alter the direction, pattern, or flow of a stream, including watercourse realignment and bank erosion protection).

Given the nature of the Project which involves relatively low risk works, a Notification could be submitted under the WSA for the Project. The Notification would most appropriately fall under the work category of "maintenance of minor and routine nature by a public utility". If a Notification is prepared, it should be submitted a minimum of 45 days before beginning work. The Notification would be sent to FrontCounter BC, which in turn would refer the Notification to a habitat officer in the Kootenay region for review. If a habitat officer has not responded within 45 days, then works would be able to proceed as proposed and with the mitigation measures summarized in this report.

7.2.2 Wildlife Act

The *Wildlife Act* regulates the management of wildlife in British Columbia. Section 34 of the *Wildlife Act* prohibits possessing, taking or destroying (i) a bird or its egg, (ii) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or (iii) the nest of a bird not mentioned in (ii), when the nest is occupied by a bird or its egg unless authorized under permit. In conjunction with the *Migratory Birds Convention Act*, this provincial Act protects birds and their nests. The Project is not anticipated to result in any direct impacts to bird nests, however sounds produced by pile driving activities could potentially disturb nesting birds. To prevent contravening this Act, mitigation measures as outlined in **Section 8.0**, should be implemented.

8.0 EFFECTS ASSESSMENT AND MITIGATION MEASURES

Project activities have the potential to impact environmental values associated with the Project site at Windermere Lake. This section provides a general overview of anticipated valued ecosystem components (VECs) and valued social components (VSCs) that could potentially be adversely affected by construction, and it provides measures to be implemented to mitigate potential impacts to the identified VECs and VSCs, as outlined in **Table 8-1**. The implementation of site-specific mitigation measures and standard best practices will help keep the Project in compliance with applicable legislation, regulations, and policies. The identified VECs and VSCs include:

- Fish and fish habitat;
- Wildlife and wildlife habitat;
- Vegetation;
- Sediments;
- Surface water and waterbodies;
- Noise;
- Air quality;
- Navigation and water use;
- Current land use;
- Archaeology; and
- Safety.

To mitigate potential effects, pile installation should be consistent with the “Best Management Practices for Pile Driving and Related Operations” (MPDCA 2003). Throughout pile driving operations, an Environmental Monitor (EM) should be present to provide guidance on implementation of the mitigation measures as outlined in **Table 8-1**. The EM will have the authority to stop activities that, in the opinion of the EM, are likely to result in significant negative effects to the environment (see **Section 9.0** for more information regarding the Environmental Monitoring Plan). Provided that the mitigation measures outlined in **Table 8-1** are properly implemented, it is anticipated that any notable residual adverse effects can be avoided.

Note that while this section provides an assessment on potential construction impacts and environmental construction mitigation, it is anticipated that there will be operational benefits that result from the Project (e.g., a lower risk of collisions with vehicles and a decreased chance of spills within the aquatic environment).

Table 8-1 Summary of Potential Construction Effects and Mitigation Measures

VEC/VSC	Description and Potential Effects	Mitigation Measures*
Fish and fish habitat	<ul style="list-style-type: none"> • There is a risk of either direct (e.g., injury or mortality) or indirect (e.g., water quality or acoustic) impacts on aquatic species during in-water piling (e.g., disturbance of sediments has potential to interfere with rearing fish and food items such as insects, plankton and algae (MOE 2006)). • Aquatic species at risk (e.g., westslope cutthroat trout) have potential to be present in Windermere Lake and could be adversely affected during construction. • Sediment generated during the Project may have negative impacts on important spawning habitat downstream of the site. 	<ul style="list-style-type: none"> • All work must comply with the requirements of applicable laws, legislation, and best management practices (e.g., Standards and Best Practices for Instream Works (MWLAP 2004) and A Users' Guide to Working in and Around Water (MOE 2005)). • If possible, piling should be scheduled to occur during the appropriate fisheries least risk work window (i.e., July 15th to August 31st, see Section 8.1 for more information regarding work windows). Work in the window will have a lower chance of interacting with more vulnerable life stages of sensitive target fish species. For example, westslope cutthroat trout are unlikely to occur at the site during this window due to the warmer water temperatures in the lake, and spawning in important kokanee habitat downstream of the site is unlikely to have commenced. Burbot, a species of regional concern, is a winter/early spring spawning species and spawning is unlikely to be impacted by construction if it is undertaken within the appropriate window. • To avoid impacting sensitive aquatic habitats, the barge and equipment shall deploy from an appropriate boat launch. • An assessment of sediment mobilization was undertaken when groyne removal was being investigated (Hemmera 2013). The findings indicated that lake currents would be insufficient to mobilize sediments in the vicinity of the groyne, although sediments could be mobilized by storms. Given the much smaller scope of the current proposed Project (i.e., pile installation), it is unlikely that there would be any measurable impacts from sedimentation on downstream aquatic habitats. However, to minimize the potential for off-site sediment transport, work should be scheduled to occur during calm weather conditions with low wave action. • Construction start-up (i.e., commencement of piling) shall occur slowly to allow motile species to leave the work area. Fish may also be frightened out of the work area by discharging an air compressor hose into the work area and/or by two pile impacts followed by a short delay before commencing a continuous drive. • Upon completion of pile driving activities, all work areas below the lake high water mark should be left in a smooth condition, free of any depressions that may result in juvenile fish entrapment. • See additional mitigation measures for fish and fish habitat that pertain to "Sediments", "Surface water and water bodies", "Vegetation", and "Noise".

VEC/VSC	Description and Potential Effects	Mitigation Measures*
Wildlife and wildlife habitat	<ul style="list-style-type: none"> The Project site currently has existing wildlife habitat values (e.g., by providing foraging areas for waterbirds). Although the Project may benefit wildlife (e.g., by providing perching areas for birds), there is still a risk of disturbance to wildlife species (e.g., nesting birds) during construction. Although the groyne does not offer suitable nesting areas for birds, impacts to off-site nests may occur due to noise disturbance which can result in the abandonment or destruction of nests proximal to work areas and disturbance can decrease survival rates of birds. There is potential to impact tadpoles (e.g., western toad tadpoles) during pile driving activities. 	<ul style="list-style-type: none"> All work must comply with the requirements of SARA, the <i>Migratory Birds Convention Act</i>, and all other applicable laws, legislation, and best management practices (e.g., Best Management Practices for Raptor Conservation During Urban and Rural Land Development in BC (2005)). The proposed late timing of the Project (i.e., July 15th to August 31st) is anticipated to reduce or eliminate adverse effects from noise disturbance to nesting birds (including Lewis's woodpecker, a listed species with potential to occur near the Project site). A pre-construction breeding bird survey is recommended and should include observations of surrounding trees near the Project site. If any extant/active nests (e.g., Lewis's woodpecker) are detected within 500 m of the Project site, the resident nesting adult birds should be monitored to assess their response to noise associated with Project activities. Although some avian species may initially be displaced from their nests by noise (depending on proximity and noise level), many avian species will quickly acclimate to some level of repetitive noise. This is particularly true for avian species that co-exist in more urbanized conditions (such as those present at the site). If nesting birds are observed to be displaced from their nest for a period greater than 15 minutes, in apparent response to noise from Project activities, work should cease, and the area should be left undisturbed with a suitable buffer zone (e.g., 100 m). The EM will monitor the area during construction to ensure the established buffer zone is effective. If there is evidence that a buffer zone is ineffective (e.g., continued agitation/guarding behavior, birds frequently leaving the nest, etc.) work must stop immediately and the buffer zone must be adjusted by the EM. Construction activities should also be limited, as practicable, between dawn and dusk to avoid illumination of adjacent habitat. The EM will conduct a visual sweep of the aquatic habitat in advance of pile driving activities. In the unlikely event that tadpoles (e.g., western toad) or painted turtle are detected, they should be allowed to move from the area before commencing pile driving activities. Tadpoles will be motile by July 15 (most will have already metamorphosed) and they will readily move away from disturbance. There is no potential to impact amphibian eggs (for lentic breeding species) after July 15. No further mitigation is required for amphibian taxa (including western toad). While it is not anticipated that terrestrial habitat will be impacted, if coarse woody debris is altered or removed during construction, workers should be vigilant for any wildlife using the object for cover (e.g., rubber boa). If animals are detected, the wood should be left in place.

VEC/VSC	Description and Potential Effects	Mitigation Measures*
Vegetation	<ul style="list-style-type: none"> While in-water vegetation coverage within the footprint of the pilings is anticipated to be sparse, there is potential for piles to interact directly with vegetated areas (within and directly adjacent to the footprint). The use of boats can churn up adjacent shallow vegetation. Activities could impact vegetation, such as stiff-leaved pondweed, which has a low to moderate potential to be present at, or near, the Project site. There is potential for off-site boat and equipment to spread invasive species. 	<ul style="list-style-type: none"> Windermere Lake is an ideal habitat for aquatic macrophyte growth and it is unlikely that the Project will have significant impacts on plant abundance within the lake. It is anticipated that wind and river-driven currents in the lake will quickly assist in vegetation recolonization of cleared areas. However, in the event that the footprint overlaps with a high-value area of aquatic vegetation (e.g., as determined by the EM), relocation of the piles should be discussed. Stiff-leaved pondweed has been negatively affected by urban and agricultural development and the species may also be negatively affected by nutrient pollution and competition with introduced species (Pearson et al. 2012). If this species is observed within the Project site, reasonable attempts will be made to avoid it (e.g., re-positioning of the piles). Machinery will not impact vegetation above the high water mark or along the shoreline. To prevent the potential spread of invasive species and noxious weeds, equipment will be cleaned off, and visually inspected for, invasive species and noxious weeds prior to arriving on site and leaving site.
Sediments	<ul style="list-style-type: none"> There is potential for installation of piles to disturb fine sediments resulting in sedimentation downstream of the site. Stage 1 and Stage 2 Preliminary Site Investigations were undertaken at the Project site in 2010 and 2011, respectively when investigating full groyne removal (Hemmera 2012b). The investigations indicated that there is moderate risk of some sediments along the groyne having elevated levels of polycyclic aromatic hydrocarbons. During piling, there is some potential that activities could stir up buried sediment and cause contaminants to enter the water column. 	<ul style="list-style-type: none"> Effective sediment control measures should be implemented in the event that pile driving activities exceed turbidity thresholds outlined in the "Surface water and water bodies" section above. Silt curtains should be installed around the piles to retain sediments, isolate the work area and stop sediment or sediment-laden waters, including any potential sediments with elevated contaminant levels, from entering the surrounding waters. If possible, piles should avoid causing disturbance to the groyne where some patches of elevated polycyclic aromatic hydrocarbons were previously noted (Hemmera 2012b). There must be sufficient water to prevent the barge from grounding on bottom substrates. The least damaging access route for the barge and equipment will be delineated prior to mobilization to avoid grounding the barge and any equipment. The use of stabilizing spuds should be kept to a minimum and operated in a way that prevents excessive disturbance to substrates. Prop scour should not occur from tending vessels. This may require manoeuvring the barge in shallow water with ropes tied to the shore and/or pilings.

VEC/VSC	Description and Potential Effects	Mitigation Measures*
<p>Surface water and waterbodies</p>	<ul style="list-style-type: none"> • There is potential for water quality impacts to occur during construction (e.g., elevated turbidity). • There is potential for accidental spills or equipment leaks (e.g., oils, fuel, etc.) to occur during construction. 	<ul style="list-style-type: none"> • All works and activities shall be carried out in a manner that minimizes the release of sediment, sediment-laden waters, or other deleterious substances to the aquatic environment. For turbidity, reference should be made to the water quality criteria described in the British Columbia Water Quality Guidelines (MOE 2018): <ul style="list-style-type: none"> ▫ Change from background of 8 NTU at any one time for a duration of 24 hours in all waters during clear flows; and ▫ Change from background of 5 NTU at any time when the background is 8 to 50 NTU during high flows or in turbid waters. • For all machinery and equipment working on site, the Contractor shall ensure that: <ul style="list-style-type: none"> ▫ All machines and equipment are in good operating condition and free of leaks, and excess oil and grease prior to arriving on site. ▫ Daily inspections are undertaken for all equipment used on the job. ▫ All hydraulic machinery uses environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and which are readily or inherently bio-degradable. ▫ Equipment maintenance occurs offsite, when possible. If equipment maintenance is required on site, activities must be undertaken overtop an impermeable layer. ▫ Refueling and storage of machines and equipment should occur in a contained area as far away from the water as possible. Funnels and drip trays shall be used to control any fuel spills. The refueling area must have a spill containment kit immediately accessible. • The Contractor will be responsible for ensuring they have a spill prevention and containment plan for any hazardous products (e.g., hydraulic fluid, diesel, gasoline, etc.) prior to work commencing. The Contractor must ensure that crew members are trained in spill recognition, response, reporting and cleanup procedures. This plan will be reviewed by PSPC and the EM prior to the commencement of work. Any ground spills greater than 1 L, or any spills entering any watercourse or waterbody (regardless of size), must be reported to the EM. The EM will be responsible for contacting PSPC and the appropriate regulatory agencies as needed. • All reportable spills will be reported to the Provincial Emergency Program 24-hour phone line at 1.800.663.3456. • Spill kits must be available in every piece of equipment operating at the Project site. All spill kits must be fully stocked and, if used, restocked as soon as possible. Spill kits must include sorbent booms and pads. • See the “Sediments” section above for more information regarding sediment control and mitigation.

VEC/VSC	Description and Potential Effects	Mitigation Measures*
Noise	<ul style="list-style-type: none"> Construction-generated noises may affect fish and wildlife and result in temporary, localized avoidance of impacted habitats. In extreme cases, acoustic effects could result in injury or fatality of fish and/or wildlife. Pile driving may be heard by offsite users (e.g., adjacent residences). 	<ul style="list-style-type: none"> To mitigate noise impacts to sensitive fish life stages, work should be scheduled to occur during the least risk work window for fish. It is recommended that piles be installed via a vibratory hammer to reduce high intensity sound levels and prevent rapid changes in sound pressure (i.e., non-pulsed sound characterized by gradual changes of sound pressure). However, if installation by a vibratory hammer is not feasible or practical, an impact hammer could be utilized. An air bubble curtain may be required around the piles (especially if impact hammering) if noise levels exceed, or are close to exceeding, sound thresholds: i.e., 206 decibels (Reinhall et al. 2016). In addition, noise levels should not be sustained above 187 decibels. Bubble curtains will help to dampen overpressure waves and are anticipated to attenuate sounds produced during impacts by approximately 10 to 15 decibels. Based on the small size and the wooden composition of the piles, in combination with existing conditions (e.g., frequent recreational activity) and implementation of mitigation measures as required (e.g., bubble curtains), sound levels are not anticipated to be of sufficient intensity to cause physical harm to fish (MPDCA 2003). However, the EM may opt to conduct monitoring of high intensity sound (hydroacoustic monitoring) within 10 m of the installed piles to ensure sounds levels do not exceed thresholds. Noise levels from work boats, pile removal equipment, and other construction equipment will be required to use standard noise reduction mufflers. Equipment should be operated at optimum rated loads and should be turned off when not in use to minimize exhaust and noise emissions. Equipment producing excessive exhaust or noise should be repaired or replaced.
Air Quality	<ul style="list-style-type: none"> Use of construction machinery and equipment may result in a temporary, localized increase in air quality pollutants (e.g., from exhaust fumes). 	<ul style="list-style-type: none"> Vessels and equipment will be maintained in good operating condition and should be used at optimal loads to minimize air emissions. Idling of machinery will be minimized to the extent possible to limit exhaust emissions. All equipment will be fitted with standard emission control devices in compliance with applicable regulations and standards. Once a diesel engine/generator has reached its operating temperature, the engine is not to be left idling when no work is required. Stationary emission sources (e.g., portable diesel generators, compressors, etc.) should be used only as necessary and turned off when not in use.

VEC/VSC	Description and Potential Effects	Mitigation Measures*
Navigation and water use	<ul style="list-style-type: none"> • Access by, and staging of, construction machinery and equipment, could affect navigation activities in Windermere Lake. • Adjacent water users (e.g., boaters) could be temporarily affected by construction activities. 	<ul style="list-style-type: none"> • The public should be notified in advance of the proposed construction activities. • While the navigation channel at the east end of the Project site may be used by the barge and equipment during mobilization/demobilization, the majority of the pile installation is proposed downstream of the weir where water is shallow and where it is not anticipated that construction will have a notable impact on navigation. However, vessels and equipment used during pile driving will be staged in a way that does not block navigation in the eastern channel. • All vessels shall exhibit appropriate lights and day shapes at all times. • Markers with appropriate signage during construction will be used as appropriate.
Current Land Use	<ul style="list-style-type: none"> • Water-based recreational activities (e.g., boating and swimming) at the Project site and surrounding areas may be temporarily disrupted during construction (e.g., due to transit of construction vessels). 	<ul style="list-style-type: none"> • The public should be notified in advance of the proposed construction activities. • If possible, construction should be scheduled to occur during the weekday when levels of recreational activities at the lake are anticipated to be lower. • Construction activities should also be limited, as practicable, between dawn and dusk. • Where and when feasible, equipment and machinery should be staged outside the navigation channel. • Works should be pursued to completion as quickly as possible (e.g., within 2 to 3 days).
Archaeology	<ul style="list-style-type: none"> • An Archaeological Overview Assessment of the site was conducted by Leonard Ham, Ph.D., Archaeology and Heritage Consultant. The assessment concluded that the site has a low potential for archaeological resources and additional archaeological investigations are not warranted. 	<ul style="list-style-type: none"> • If the Contractor encounters (or expects to encounter) an actual or potential archaeological resource, they will implement the Chance Finds Procedure: <ul style="list-style-type: none"> ▫ Immediately stop any activities that might disturb the archaeological resource or the site in which it is contained; ▫ Not move or otherwise disturb the artifacts or other remains present at the site; ▫ Mark the location of the site to prevent additional disturbances; and • Immediately notify PSPC by email and phone.
Safety	<ul style="list-style-type: none"> • Construction activities with heavy equipment represent some health and safety risks, primarily to construction workers. 	<ul style="list-style-type: none"> • The Contractor will be responsible for developing an Occupational Health and Safety Plan which will include measures that comply with WorkSafe BC standards to ensure safe practices are implemented for the protection of workers and the public.

8.1 Work Windows

8.1.1 In-Water Work Window

Based on the Ministry of Environment's (MOE's) Kootenay Region (Region 4) Periods of Least Risk for Instream Works (MOE 2009), the ideal time to conduct in-water work is between July 15th and August 31st. This timing window was developed to protect fish species (primarily salmonids) during their most sensitive life stages, extending from spawning through egg incubation to fry emergence. It is recognized however, that this timing window was developed primarily for stream environments and may not be as suitable for application to lake environments. Online guidance provided by MOE indicates that to take advantage of high lake levels (e.g., to avoid grounding equipment), it may be more desirable for pile driving to be conducted in non-lakeshore spawning areas outside the least risk work window, provided that fish are absent within 10 m of the work area (MOE 2006). However, it is also generally recommended by MOE that if feasible (e.g., if grounding is not a risk), that works still be undertaken within the least risk work window.

As the Project site is not anticipated to provide spawning habitat for the majority of sport fish, with the potential exception of burbot which is a winter/early spring spawning species, the least risk timing window could be extended so that it falls between July 15th and October 31st. However, it should also be recognized that valuable fall spawning habitat for kokanee and other fish species is located downstream of the Athalmer Road bridge crossing, approximately 400 m downstream of the Project site. These fish could be expected to be migrating past the Project site if works are delayed into the late summer and fall months. In addition, if Project works result in the generation of excess sediment, this could have negative impacts on downstream spawning beds and/or spawning fish. While works could potentially proceed during this extended time period with additional mitigations in place, given these factors, it is conservatively recommended that Project still be scheduled to occur during the July 15th to August 31st work window.

8.1.2 Bird Nesting Window

As the rock groyne is primarily submerged and located below the high water mark in a lake environment, the Project is not anticipated to have any direct effects to bird nests. However, noise associated with the Project could have a negative impact on nesting birds. A conservative nesting window for the region falls between **March 1st and September 5th** (and could vary up to 10 days or more based on natural variability) (Rousseu and Drolet 2015). This nesting window takes into account nesting windows for eagles, hawks, owls, songbirds and woodpeckers in urban areas, grasslands and tree and shrub areas.

While it would be best to avoid the generation of any loud noises during the nesting window, pile driving works will likely have to occur during this nesting window as it overlaps with the least risk work window for fish (i.e., July 15th to August 31st). Although this is within the period when birds could be nesting, most bird species that breed in the area will have completed breeding, and fledged young, by mid-July. In addition, piles are anticipated to be installed at a minimum 20 m distance from the nearest shoreline vegetation.

9.0 ENVIRONMENTAL MONITORING PLAN

An EM should be present during pile driving activities to provide guidance on implementation of the mitigation measures (as outlined in **Section 8.0**) and to ensure compliance with applicable environmental legislation, regulations, and policies (as outlined in **Section 7.0**). It is anticipated that the work will take approximately two to three days to complete.

While bird nests are not anticipated to be present at the Project site (e.g., on the existing, small degraded piles along the groyne), there is potential for nests be present in vegetation along the shoreline. Prior to commencing construction (i.e., the day prior to construction), the EM should complete a sweep for active bird nests near the groyne to provide initial input on whether any buffers are required (as outlined in the “Wildlife and wildlife habitat” VEC/VSC segment in **Section 8.0**). This sweep would also provide a general evaluation of current site conditions and fish/wildlife use to inform the appropriate level of mitigation.

The EM should be present on site for the commencement of pile driving activities. It is recommended that turbidity measurements be taken throughout construction to assess compliance with water quality standards as described in the “Surface water and waterbodies” VEC/VSC segment in **Section 8.0**.

While the risk of exceeding sound thresholds (as outlined in the “Noise” VEC/VSC segment in **Section 8.0**) is relatively low due to the small diameter of the piles and their wooden composition, at the EM’s discretion, hydroacoustic monitoring may be undertaken to assess sound levels at a distance of 10 m from installed piles. Hydroacoustic monitoring may be continued throughout pile driving activities if there is moderate or high risk of levels exceeding sound thresholds (e.g., based on the results of the first few piles). If sound levels are determined to be adequate, and the EM feels that the Project poses a low risk for environmental impacts (e.g., due to soft substrates and low sound levels), full-time environmental monitoring may not be required for the remainder of pile driving activities. Regardless, the EM should inspect the site upon completion of the works and in advance of final reporting.

At the completion of monitoring, the EM will need to complete an environmental monitoring report. The content of the report will include the following at a minimum:

- Monitoring dates, times and weather conditions;
- Construction activities undertaken;
- Any issues identified, including any active bird nests or any observations of at risk species;
- Environmental protection and mitigation measures recommended and implemented;
- Representative photographs;
- A summary of the data collected (e.g., water quality and noise); and
- Any outstanding items, including non-compliances with this mitigation and monitoring plan, recommendations from the EM, regulatory agencies, and/or regulatory documents.

10.0 CLOSURE

This document provides a collection of industry recognized best management practices and site-specific measures to be implemented by the Contractor during pile driving activities. The regulatory overview is current to the date of issue of this report. For questions related to the nature or implementation of this document please contact the undersigned.

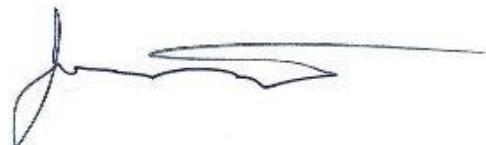
Yours truly,

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APPENDIX A

Site Photographs



Photo 1 West-facing view of the rock groyne (March 2010).



Photo 2 East-facing view of the rock groyne (March 2010).



Photo 3 Northeast-facing view of the rock groyne depicting a narrowing of the lake north of the groyne (March 2010).



Photo 4 North-facing view of the navigation channel at the east end of the rock groyne depicting dense aquatic vegetation growth (March 2010).