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Environmental Impact Analysis

Whirling Disease Eradication from Johnson Lake, Banff National Park.

Christopher Carli
Parks Canada, chris.carli@pc.gc.ca

Table of Contents

Parks Canada Basic Impact Analysis Template

Instructions for this form are available (see the Guidance and Tools section of the Parks Canada Impact Assessment intranet site or request from Parks Canada impact assessment staff).

1. PROJECT TITLE & LOCATION

Whirling Disease Eradication from Johnson Lake, Banff National Park.

2. PROPONENT INFORMATION

Parks Canada Agency
Mark Taylor, Aquatic Ecologist, Banff National Park
Box 900 Banff AB
T1L 1K2
Tel. 403 762-1418
mark.taylor@pc.gc.ca

3. PROPOSED PROJECT DATES

Planned commencement: 2017-05-11
Planned completion: 2017-12-30

4. INTERNAL PROJECT FILE

BNP-1160

5. PROJECT DESCRIPTION

5.1 Justification

Whirling disease (WD) was detected in Johnson Lake, Banff National Park (BNP), AB, in August 2016. Whirling disease is caused by an invasive myxosporean parasite, *Myxobolus cerebralis* (*Mc*) that is not native to North America. It can cause physical deformities in salmonids and sometimes mortality. Parks Canada did extensive sampling to understand the distribution of the disease and found that it is currently only present in Johnson Lake and the Bow River in Banff National Park (Figure 1). These water bodies are in the lowest elevation montane ecoregions in Banff National Park and are characterized, almost exclusively, by non-native fishes.

Higher elevation water bodies in Banff National Park are home to westslope cutthroat trout (WSCT) (*Oncorhynchus clarkii lewisi*) and bull trout (*Salvelinus confluentus*), both of which are species at risk. WSCT is listed as Threatened under Schedule 1 of the federal *Species at Risk Act* (*SARA*). Bull trout is provincially listed as Threatened under the Alberta *Wildlife Act*, has been assessed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and is expected to be listed

under Schedule 1 of the *SARA* as Threatened in the near future. Protecting these species from whirling disease is of critical importance to Banff National Park.

The proximity of Johnson Lake to the Cascade River watershed and Lake Minnewanka is a concern to Parks Canada because the headwaters of the Cascade River contain 4 of 10 "core" WSCT populations in BNP (Sawback Lake, Sawback Creek, Cuthead Creek and Elk Lake, Figure 1). Parks Canada made an interim decision to close these 4 core populations to all water-based activities (e.g. angling, boating, etc.). These closures will remain in effect throughout the summer of 2017.

Although Lake Minnewanka and the Cascade watershed are currently free of whirling disease, the potential for contamination from adjacent Johnson Lake remains high. There are a number of potential vectors for transmitting whirling disease from Johnson Lake to Lake Minnewanka and the Cascade watershed, including high levels of human use and close proximity for avian vectors such as piscivorous loons and ospreys. Johnson Lake, and the upper Cascade River (Lake Minnewanka) are not connected hydrologically, but are connected by a highly used road network. It takes only minutes to drive from contaminated Johnson Lake to the shores of Lake Minnewanka. Recreational anglers, swimmers and boaters may transmit the myxospores or triactinomyxon spores (TAMs) from Johnson Lake to Lake Minnewanka and the mouth of the Cascade River via angling equipment, recreational watercraft, or children's toys. Any object that comes into contact with water or mud can potentially be a vector for transmitting WD as humans move these objects from one recreational area to another.

If fishes living in Lake Minnewanka were to become infected, they could move up into the entire Cascade River watershed and come into contact with the "core" WSCT populations. Avian dispersal may also spread the disease from infected water bodies to the Cascade watershed.

Eradicating WD in Johnson Lake would eliminate a potential source of WD that, by virtue of its close proximity and human use patterns in the area, has a high risk of spreading the disease into the Cascade River watershed. Parks Canada initially evaluated the use of fish eradication through the removal of non-native rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) from Johnson Lake, as a containment strategy, in the fall of 2016 when the extent of the disease was largely unknown. However, the literature reviewed initially suggested *Mc* myxospores were highly resistant to freezing and drying (Sarker et al. 2015) and could remain viable for one to three decades in the sediment. Therefore, we assumed that even if fish were eradicated, the disease could still be spread via the transfer of infected sediment.

A more comprehensive review of research findings (El-Matbouli et al. 1999, Hendrick et al. 2008, Nehring et al. 2015) has since indicated that the long-term viability of myxospores of the *Mc* parasite is substantially lower than previously thought. Indeed, by removing the fish host from a small creek in central Colorado, Nehring et al. (*In press*) were able to completely eliminate evidence of *Mc* DNA, obtained from the secondary host of WD, the aquatic oligochate worm *Tubifex tubifex*, within 3 years of fish eradication. Given the success of eradicating WD from Placer Creek, Colorado, Parks Canada is confident whirling disease can be eradicated from Johnson Lake within several years following the complete removal of the salmonids within the lake.

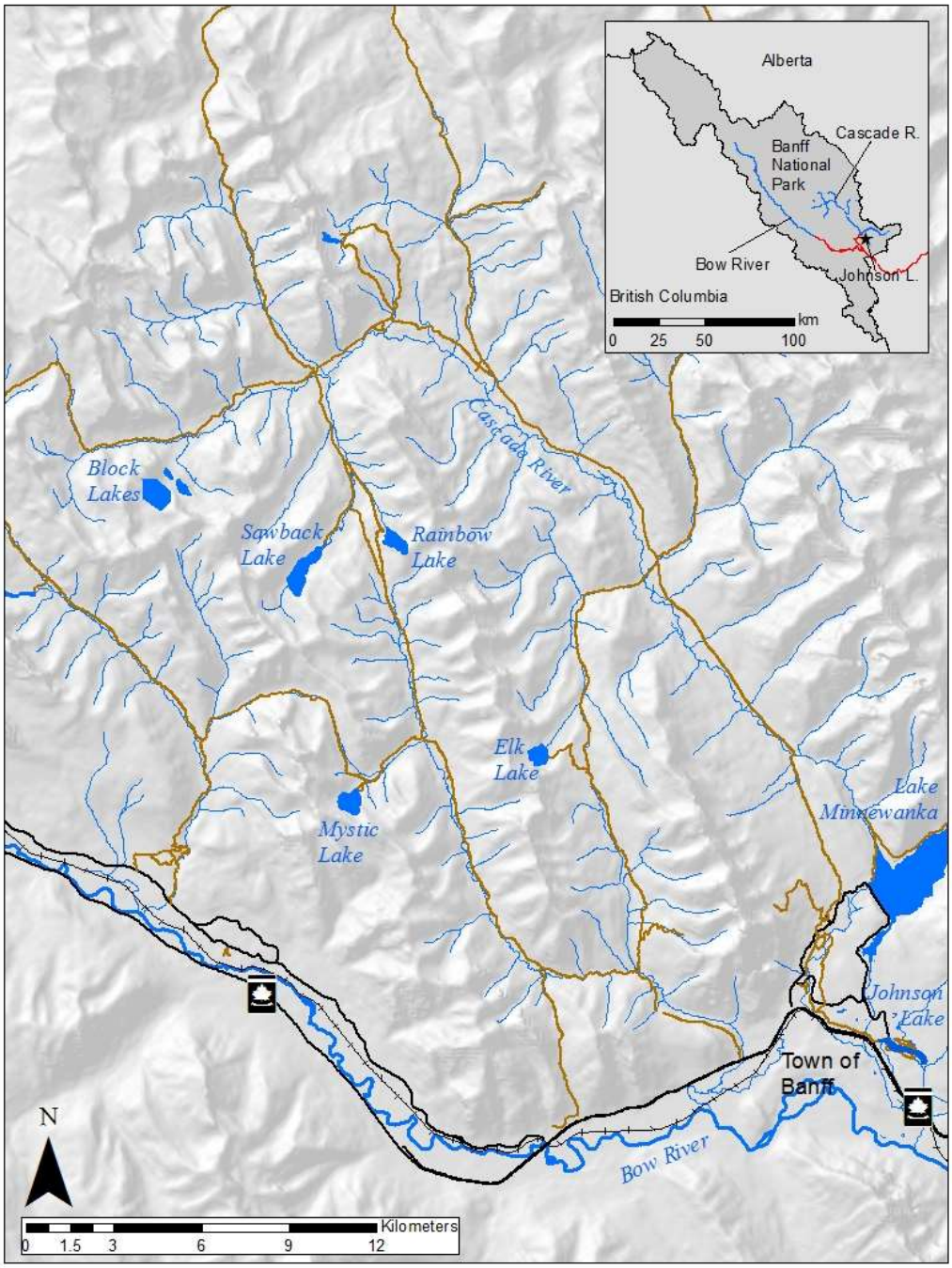


Figure 1: Banff National Park showing the proximity of Johnson Lake (bottom right) to the Cascade watershed, the mouth of which is in the northwest bay of Lake Minnewanka. The brown lines indicate the extensive trail network. WD infected areas are delineated in red on the inset map. Sawback Lake, Elk Lake and Mystic Lake contain "core" populations of WSCT. Rainbow Lake is a "conservation population."

5.2 Location

Johnson Lake is located in Banff National Park, approximately 11km west of the town of Banff in Alberta Canada (Figure 2). The lake can be accessed via the TransCanada Highway (TCH) to the Minnewanka

Loop Road and finally the Johnson Lake Road. The geographic coordinates of the lake are 51.196727°E, -115.483611°N.

Johnson Lake is a 15.6 ha reservoir with a maximum depth of 5.7 m and a mean depth of 1.9 m (Figure 3). The lake has a simple morphology and two regulated outlets: one at the east end, and one at the west end. Historically a wetland, both outlets were dammed decades ago to create the reservoir for recreational purposes. In fact, Johnson Lake is the most popular lake for recreational swimming in Banff National Park due to its proximity to the Town of Banff, shallow depth and inherently warmer temperatures than any other accessible water body. As mentioned above, Johnson Lake and the upper Cascade River are hydrologically disconnected as the upper Cascade River is dammed by the Lake Minnewanka Dam. Water flowing from the western outlet of Johnson Lake and the lower reaches of the Cascade River are connected hydrologically.

The flow out the eastern outlet has a discharge of 0.05 m^3/s and forms a small wetland immediately downstream of the earthen dam. Then, a dry channel extends for ~500m south-east from this wetland. The channel then disappears and any water that travels beyond this point is quickly absorbed into the ground. The dry channel encounters gradient barriers such as the TCH and the Canadian Pacific Railway. This relic channel is undergoing forest succession and has not seen water in decades. Even when the eastern outlet dam burst during the flood of 2013, flood-water did not reach the Cascade River.

The flow from the western outlet has a discharge of 0.05 m^3/s and flows initially through a defined channel downhill for 500 m towards the TCH. Then as it parallels the TCH, it becomes a series of beaver modified wetlands. Overall, it flows for 2.52 km before going sub-surface for 200 m after it passes under the TCH. It re-appears downstream and does flow into the Cascade River (51.178762°E, -115.484670°N). However, the Cascade River itself does not always connect to the Bow River. In recent years, TransAlta Corp. only operates the Cascade power Plant once a month to exercise the turbines. For the remaining time, the lower Cascade River flows sub-surface and is therefore a second disconnect from Johnson Lake.

Johnson Lake reservoir is fed from the north by a spring fed wetland (51.197982°E, -115.479405°N). The wetland is 2.9 ha and is very shallow throughout (< 1 m). The wetland has one outlet where water flows through an old beaver dam. There is no evidence of a beaver lodge on either Johnson Lake or the upstream wetland. Also, there are no recently fallen trees or shrubs atop the beaver dam blocking the outlet of the upstream wetland. Shrubs (*Salix* spp.) are growing along the full length of the dam making it reasonable to assume that the dam is not maintained and that the upstream wetland is historic beaver habitat and that there are no beavers living in the wetland presently.

Water flows from the upstream wetland into Johnson Lake via an inflow channel which is ~430 m long and has a discharge of 0.04 m^3/s. Rainbow trout use the inflow channel as a spawning location in the spring and brook trout use the channel in the fall to spawn.

The upstream wetland is fed by two small spring fed inflow streams. These streams originate north of the upstream wetland and flow through a complex of small channels and historic beaver ponds. It is unknown if these inflow streams and associated ponds contain any fishes. However, if fishes are present in these streams and associated ponds, the project will be expanded to include the removal of all fishes from these areas.

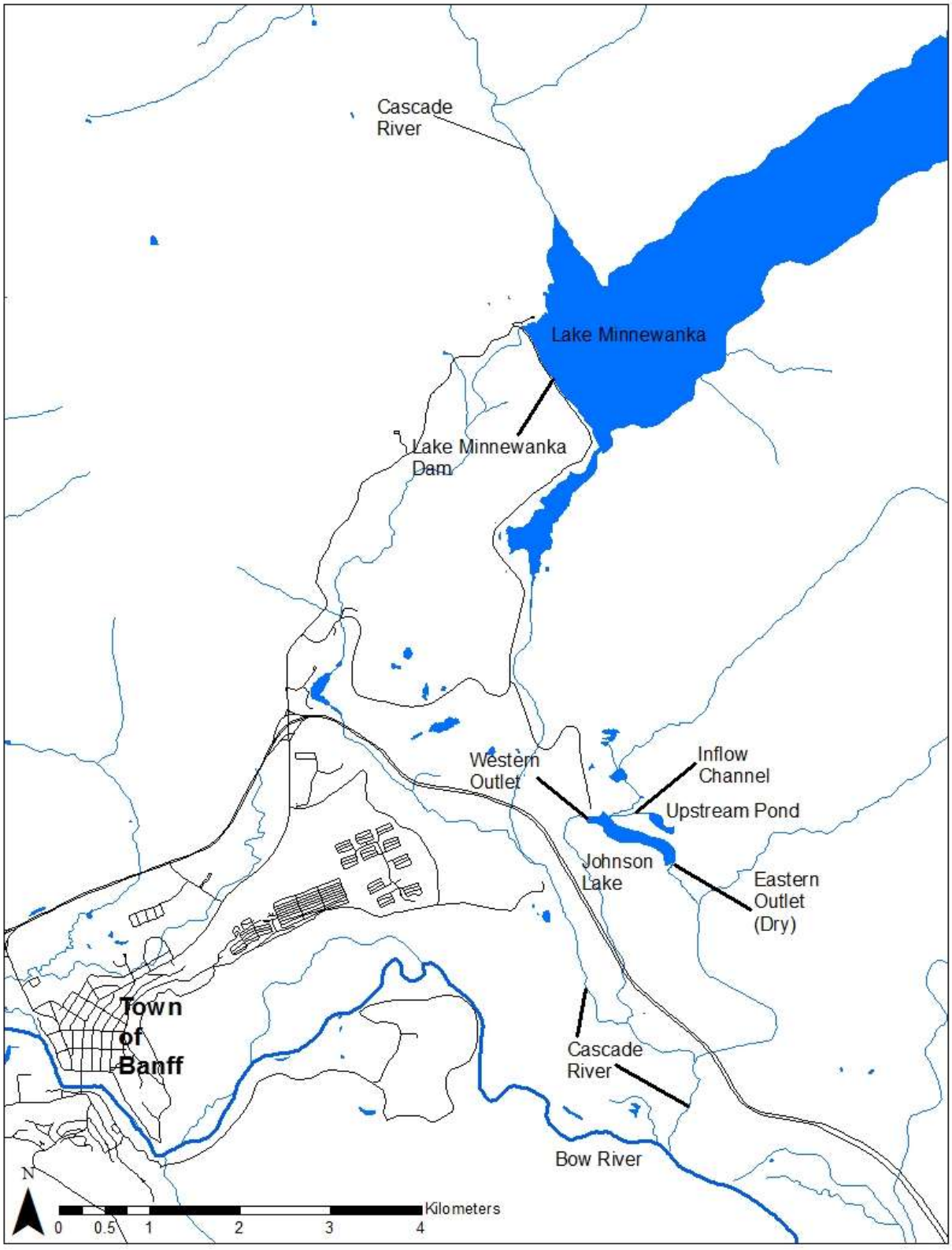


Figure 2: Johnson Lake and the surrounding waterbodies.

5.3 Scope of Work

Given the concerns about high human use at Johnson Lake and the potential to spread whirling disease to adjacent native westslope cutthroat trout populations in the Cascade watershed, Parks Canada is proposing a two-step mitigation project. The first step is to completely eradicate all salmonids from Johnson Lake to break the two-host life cycle and eradicate the disease. The second step is to create infrastructure on the shoreline of the lake to reduce the interaction between people/watercraft and lake sediment (See drawing in Attachment 1). The WD myxospores lie in the sediment and are a vector second only to moving infected fish. The scope of work is broken down by these two components of the overall project.

A Request for Review to complete all aspects of this project was submitted to Fisheries and Oceans Canada in December 2016, and an Application for Authorization was submitted in April 2017 requesting approval from Fisheries and Oceans Canada. A Paragraph 35(2)(b) Fisheries Act Authorization was received by Parks Canada from Fisheries and Oceans Canada on May 1, 2017 (Attachment 2).

5.3.1 Johnson Lake Fish Eradication

Removals of nonnative fishes from lakes and streams are routine fish management activities undertaken throughout North America (Knapp and Matthews 1998, Parker *et.al*. 2001, Schindler and Parker 2002, Pacas and Taylor 2015). Although labor intensive, the use of manual fish removal methods such as netting, angling and electrofishing has been successful in water bodies that are larger and more complex than Johnson Lake (e.g. Pacas and Taylor 2015, Taylor and Carli 2016).

The techniques Parks Canada uses to eradicate fishes (i.e., gill netting and electrofishing) have been reviewed. Best practices that mitigate any significant adverse effects have been developed for use in the mountain parks (Screening report CEAR#08-01-39627, McLean et. al. 2008 (Attachment 3).

We propose to begin fish removal during May 2017 and will close Johnson Lake to public use at that time. Once Johnson Lake is ice-free, a gill-netting crew and a back-pack electrofishing crew will begin the fish removal. A boat-mounted electrofishing unit will also be used to supplement the gill-netters and back-pack electrofishers in the spring.

During the summer months (July to early September) Johnson Lake will reopen for public use, but will remain closed to angling. Gill netting and electrofishing will resume again in September and continue as long as the weather permits (~ December 15th).

In order to eliminate WD from Johnson Lake and the upstream wetland, every salmonid must be removed. Although gill-netting and electrofishing have proven to be successful techniques for capturing and removing fish, they are labor intensive and time consuming. Therefore, in the fall season, Parks Canada will use dewatering as an additional method to help concentrate fishes into smaller areas with less structure to facilitate removal. Water from the upstream wetland and the Johnson Lake inflow channel will be pumped out the western outlet of the lake. Water from Johnson Lake itself will be pumped out from the eastern outlet. The eastern outlet is a small wetland that drains into a relic forested channel through terrestrial vegetation. We propose that pumping starts on October 15th, 2017. It will take two weeks to lower water levels to the lowest practical level. Water will continue to be

pumped, maintaining the lowest levels in the lake, for an additional two months. This will provide us with additional time to gill net and electrofish the lake and inflow streams.

The western outlet flows downhill in a confined stream channel towards the TCH. This stream has brook trout and brown trout that have tested positive for WD. Downstream of this, fishes live in a complex wetland matrix of beaver dams that would make mechanical fish removal very challenging. For now, we are not attempting to eradicate any of these downstream fishes. The western outlet is initially very steep (~10%) for 500 m. At ~200m downstream of the lake, there is a natural rock drop ~5 m high that would theoretically be a barrier to fish movement. However, we propose to construct a barrier to prevent any possible upstream movement of fishes into Johnson Lake. The barrier will be constructed mostly by hand or small equipment and will use natural materials (i.e. boulders, cobbles and logs).

During the fish removal process, native longnose suckers (*Catostomus catostomus*) will also be eradicated from Johnson Lake. Although longnose suckers are not susceptible to WD, it is unknown if the triactinomyxon spores are able to attach to longnose sucker skin. Because of this, Parks Canada does not plan on salvaging or translocating any longnose suckers from Johnson Lake to other waters in Banff National Park. In addition, Parks Canada supports the fact that the main vector for transferring WD from one waterbody to another is the movement of fish and fish remains. There is extensive messaging by Parks Canada to the public stressing the risks of such a practice. Therefore, the optics of translocating any species of fish within Parks Canada waters may be perceived as negative by the public.

Following this work, native longnose suckers will be stocked into the lake to replace the original population of suckers that was mostly displaced by nonnative trout. The suckers will be restocked once it has been confirmed that the population of tubifex worms has died off. By maintaining a fish free lake for the complete life cycle of the remaining tubifex worms (~3 years), piscivorous birds will not utilize Johnson Lake as a food source. As a result, the possibility of moving TAMs which may be attached to suckers or to waterfowl/piscivorous bird's feathers is eliminated. These suckers will be taken from a local source (e.g. Lake Minnewanka, Bow River or Vermillion Lakes). The goal would be to maintain the lake with native fish species that most resembles the original fish community.

5.3.2 Johnson Lake Shoreline Infrastructure

To prevent bathers from contacting and transporting mud from Johnson Lake, two "L" shaped docks will be installed at the "main" beach area. (Figure 4). The sediment in the littoral zone of Johnson Lake may contain myxospores and by providing users a dock to swim from, human-sediment contact may be reduced.

In addition to the two docks, clean, coarse sand will be added to the main beach area to provide an appealing beach area to users. By adding this sand and improving the beach, Parks Canada hopes to focus the use to this area preventing shoreline degradation due to human traffic.

A temporary, unheated water wash station for visitors to voluntarily rinse off any mud from their belongings will be installed in the southeast corner of the parking lot. The wash station will consist of a 1250 gallon high density polyethylene tank placed on a wooden platform. An "auto-off" faucet will be installed to minimize waste. A clean gravel drain pit will be placed below the faucet to prevent surface drainage into Johnson Lake.

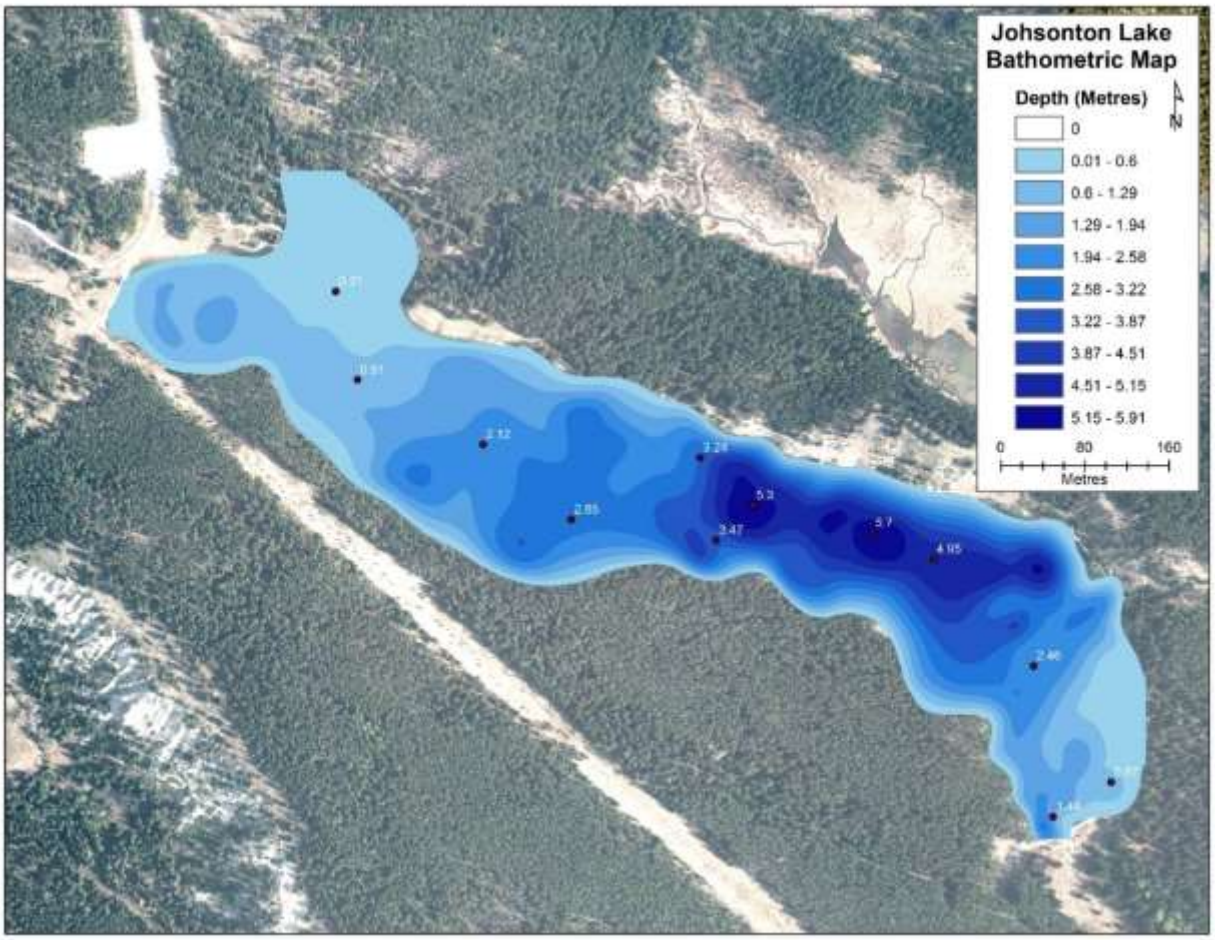


Figure 3: Bathymetric map of Johnson Lake. Note the deepest point in the basin close to the east end of the lake.

5.4 Methodology

To prevent the spread of aquatic invasive species throughout BNP, all equipment that has been exposed to any watercourse will be thoroughly decontaminated as per the Parks Canada decontamination protocol. (Parks Canada (2017), Attachment 4)

5.4.1 Fish Eradication

5.4.1.1 Gill-netting and Electrofishing, May to July, September to December 15, 2017

In May 2017, once Johnson Lake is free of ice, ~25 gill-nets will be deployed to begin fish removal efforts. The nets will be clustered in a relatively small area (1 to 3 ha) and monitored, maintained and emptied throughout the day. Parks Canada may employ two different approaches to the open-water gill-netting effort.

The first approach is to set the nets in the morning and retrieve them in the afternoon. Crews working close-by the net cluster will act as deterrents to any waterfowl or mammals that could get caught by the nets.

The second approach is to set gill-nets in the evening and retrieve them in the morning. From experience, we know that gill netting is more effective in the night, likely because fish activity is higher. Although work crews will not be present overnight, most potential bycatch species are visual feeders that will not feed at night.

This gill-netting effort will continue until the end of June 2017. Nets will be secured to trees, rocks or any other secure structure along the shore. Gill-netting will recommence in September (after Labor Day) and continue until November/December 2017. Additional netting may continue under the ice during the winter of 2017-2018 if all salmonids were not removed during the first year of the project.

A 14 foot aluminum boat with an electric trolling motor will be used to set, check and retrieve the nets. Nets will be checked by two personnel for safety and efficiency. Gill-netting can occur any time during the open water period, but as air and water temperatures decrease in the fall it will become difficult to maintain hand dexterity when removing fish. Nets can be anchored to shore or can be placed at any depth within the lake and marked with a buoy.

Concurrent with this open-water gill-netting effort (spring and late summer efforts), two crew members will back-pack electrofish the inflow channel and upstream wetland to remove any fishes. A block net will be placed at the western outlet of Johnson Lake to prevent immigration of fishes from downstream sources. This net will remain in place until a permanent fish barrier is built in October of 2017, prior to dewatering efforts commencing. The small amount of flow from the eastern outlet exits Johnson Lake through a small man-made passage in the earthen dam. This passage is spanned by a foot bridge which can be closed using stop-logs. In May 2017 stop-logs will be put in place to direct all flow out of Johnson Lake to the western outlet to stop flow and facilitate fish removal from the wetted portion of the eastern outflow.

For a 5 to 10 day period during the late spring, a gas-powered electrofishing boat will be used to supplement the gill netting and back-pack electrofishing fish removal efforts. Staging from the Johnson Lake parking lot and launching from the beach area, the three person crew will remove as many fish from the lake as possible. Depending upon the success of this effort, the electrofishing boat may remain on site for an additional 2 to 3 weeks assisting the fish removal efforts. The boat electrofishing crew may also return in the late summer to continue with removal efforts depending upon the success in the spring.

An in-stream fence and funnel trap may be deployed in the inflow creek between the inflow stream and the reservoir to: a) block spring spawning, and b) capture adult fish moving upstream to spawn. If this approach is employed, the trap portion will be secured to prevent tampering, and checked and emptied frequently to prevent potential wildlife issues. This effort will only be utilized during times when the area closure is in effect.

Fish will be weighed and measured and a subset of fish captured will undergo more detailed investigations which may include muscle tissue dissection for future DNA analysis and otolith removal

for aging. The gill-net mesh size associated with each capture will also be recorded to determine the optimal mesh size for future removal projects.

Live fish removed from nets or electrofished will be humanely euthanized. Different options, all consistent with Canadian Animal Care Guidelines, exist depending on the size of fish. Larger fish will be given a stunning blow to the head followed by cervical dislocation or pithing. Small fish will be euthanized by cervical dislocation. Any fish captured throughout the gill-netting/electrofishing portion of the project will be collected and frozen in the walk-in freezer at the Banff Warden Compound. The fish will be handled and stored so as to prevent spread of whirling disease through contamination with other equipment or workspaces. Once all fish have been acquired, we will dispose of them through incineration or landfilling within the affected zone, in consultation with the Canadian Food Inspection Agency.

Any on-site storage of nets will be inside bear proof storage containers.

5.4.1.2 Temporary Bridge Construction Western Outlet, October 2017

In mid-October 2017, a temporary bridge will be positioned across the western outlet of Johnson Lake (Figure 4). The bridge will be large enough to accommodate a large flat-bed truck which will transport the dewatering pumps to the staging area at the south-west corner of Johnson Lake. The bridge will be similar to those used to cross Forty Mile Creek during the Forty Mile Dam removal project, and installed in a similar fashion (rolled off a flat-bed truck). The existing wooden bridge will be removed and placed aside until the completion of the project at which point it will be reinstalled.

5.4.1.2 Western Outlet Fish Barrier Construction, October 2017

Parks Canada does not intend to eradicate fishes from either the eastern or western outlet streams. The eastern outlet channel remains dry during the majority of the year and thus holds no fish. It was deemed too difficult to remove all fish from the western outlet stream due to the complex nature of the channel downstream of Johnson Lake. Brown trout and brook trout from these outlet streams have tested positive for whirling disease. Therefore, it is imperative that these fish do not re-invade Johnson Lake. Given this, Parks Canada will install a full barrier on the western outlet stream.

A barrier is not required on the eastern outlet as this outlet will become dry during the dewatering process. Any puddles that remain in the channel following the dewatering will be electrofished and likely frozen as the winter progresses and the dewatering continues.

Although the type of barrier on the western outlet has not yet been determined (design currently in progress), the barrier will contain natural materials and will be constructed by hand or small equipment. Regardless of what type of fish barrier is used, a small excavator will be required to prepare the outlet channel bed surface in order to properly position the barrier. This channel bed preparation can be conducted in October 2017 after the pumping of Johnson Lake has begun in order for the construction to take place in a dry stream bed. As the water level of Johnson Lake drops, flow out the western outlet will stop. Water will be pumped from the upstream wetland and inflow channel out the western outlet, but there will be an upper section of the western outlet that will be dry during the Johnson Lake

pumping period. The fish barrier will be installed during this dry period to reduce any impact to fish or fish habitat downstream of the western outlet.

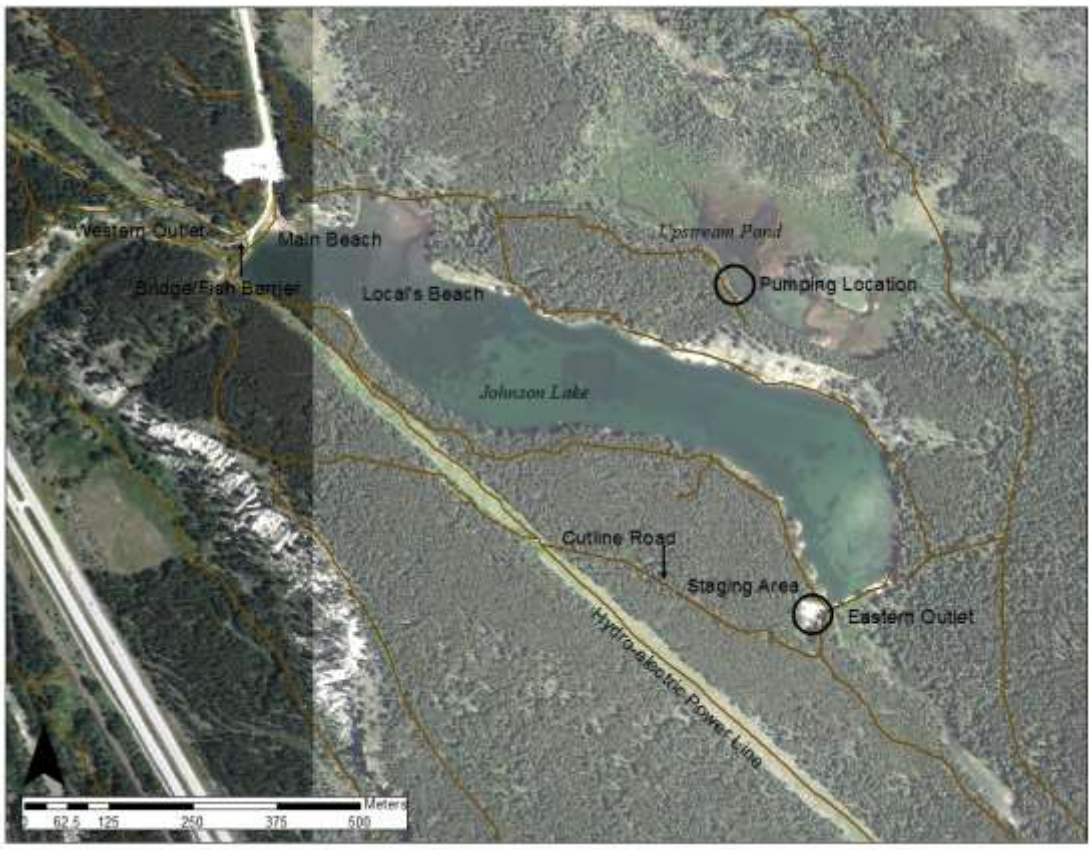


Figure 4: Detailed image of Johnson Lake and pertinent locations regarding the fish eradication. Brown lines indicate the existing trail network.

5.4.1.3 Inflow Channel Bridge Widening, October 2017

In order to access the upstream wetland area to deliver fuel to power the pumps, ATV's will need to cross the Johnson Lake inflow channel. There is an existing bridge which may accommodate the width of an ATV. However, if an ATV is too wide for the bridge, additional planking (8' x 2" x 10" lumber laid across the bridge) may be secured to the existing bridge surface to widen the bridge allowing for ATV traffic.

5.4.1.4 Johnson Lake/Upstream Wetland Dewatering, October to December 2017

Beginning on October 15, 2017, pumping equipment will be deployed to pump water from the wetland, along the Johnson Lake inflow channel to the western outlet of Johnson Lake. It is unknown what type and how many pumps will be required to pump the upstream wetland and inflow channel. As water is drawn down in the upstream wetland, a temporary sump pit in the wetland bed may be required to pool the remaining water. The intake of the pumps will be fitted with an appropriate sized screen based on

direction from the Department of Fisheries and Oceans Freshwater Intake End-of-Pipe Fish Screen Guideline manual (1995).

The discharge through this outlet during the pumping operations will increase from 0.05 m^3/s to 0.09 m^3/s. The pumping of the upstream wetland will continue until mid-December (approximately two months of pumping). The purpose of this prolonged pumping operation is to allow any remaining shallow pockets of water within the upstream wetland, inflow channel, eastern outlet channel, or Johnson Lake itself to freeze. The goal of this freeze is to kill any potential remaining fish that may have evaded capture during the gill-netting/electrofishing efforts.

Water pumping equipment will also be deployed at the south-eastern corner of Johnson Lake. Water from Johnson Lake will be pumped out the eastern outlet of Johnson Lake. Three J205 submersible pumps, each with a maximum pumping capacity of 1220 m^3/h will be used to drain Johnson Lake (Figure 5). The intake of the pumps will be fitted with an appropriate sized screen based on direction from the Department of Fisheries and Oceans Freshwater Intake End-of-Pipe Fish Screen Guideline manual (1995).

The channel below the eastern outlet of Johnson Lake will receive ~300,000 m^3 of water over 12 to 14 days during the pumping operations. The pumping operations should not exceed 0.25 m^3/s. At this pumping rate, the lake will drain in 14 days. The water that is pumped from Johnson Lake will flow down the eastern outlet channel for ~500 m. The channel then becomes an indistinct relic channel before it reaches the Cascade River (Figure 6). During the flood of 2013, this eastern dam was breeched with high discharge (>1 m^3/s). Water flowed out the eastern outlet overland until it reached the power-line. It was then absorbed into the water table. It did not reach the Cascade River even under such high flows.

A Bell 407 helicopter (maximum lifting capacity, 1800 lbs.) will be required to deploy and remove the pumps, cage, and cable/hose (total of 1320 lbs.) from the bed of the flat-deck truck to the sites within Johnson Lake.

Once the lake has been pumped down, the large J205 pumps will stop pumping. Pumping of the upstream wetland and the inflow channel will continue until there has been a significant freeze. Once any remaining pockets of water have frozen solid the pumping will stop and the lake and wetland will be allowed to refill. Estimated refill time, at a discharge of 0.04 m^3/s, is approximately 87 days. This refill time is certainly not exact and will vary depending on variation in discharge throughout the winter of 2017-2018.

During the pumping operations and bridge installation, turbidity will be monitored downstream in accordance with the methods outlined in the Parks Canada Sediment Monitoring for In-stream Works Protocol (Carli and Dickinson 2014) to confirm that mitigation strategies for preventing sedimentation are functioning as intended and guide adjustments as required. Standard methodologies to prevent erosions on the downstream end of the pumps outflows will be used such as ground surface deflectors and/or aerators on the outflow ends.

Figure 5: Floating cage used to house J205 submersible pumps. Three such pumps will be deployed in Johnson Lake in October 2017.

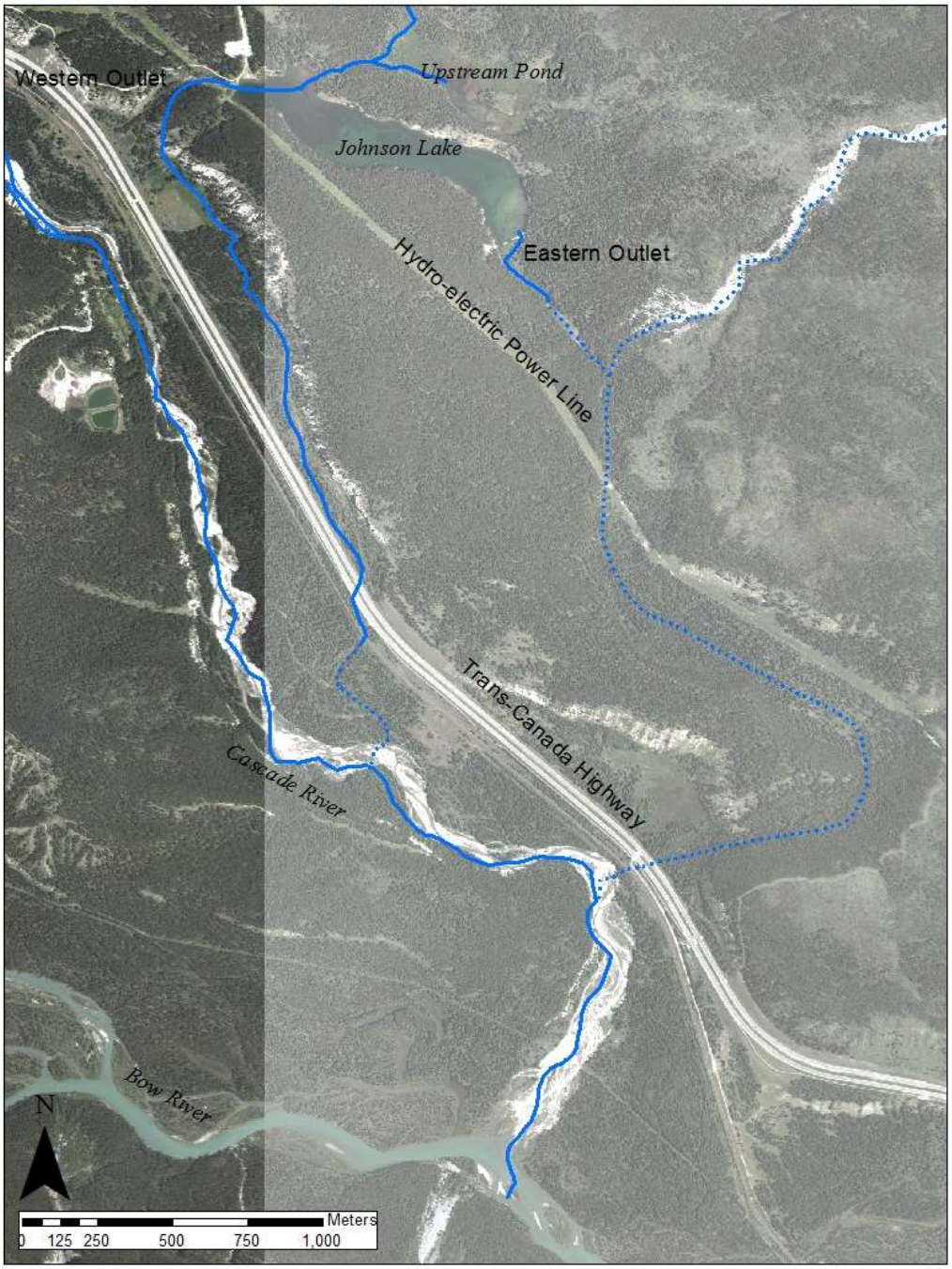


Figure 6: Johnson Lake drainage area. The dashed blue lines of the Eastern Outlet and bottom reaches of the Western Outlet indicate ephemeral streams that are dry throughout the year.

5.4.2 Johnson Lake Shoreline Infrastructure (See Attachment 1).

5.4.2.1 Gravel and Beach Sand

Approximately 400 m^2 of gravel, at a depth of 100 mm, will be placed below the high water line slowly to avoid disturbing the water and natural sediments. The gravel will be placed beneath the docks, but not unnecessarily beyond as field-fit. Silt curtains may be placed in the water to provide containment for disturbed sediment, if needed. Clean, washed gravel and clean sand will be sourced from an approved quarry. The contractor will provide the source information to Parks Canada prior to purchase. Granular materials may be stockpiled in the parking lot area. . After the gravel is placed, then sand may by dumped on the beach area for distribution (mechanical or hand).

Imported clean sand will be placed over the existing sand above the water line and meeting with the natural vegetation line in a horseshoe shape, opening to the lake. Four-hundred and fifteen square meters of sand, at a depth of 200 mm will be placed by an excavator.

At the "local's beach" riprap and informal stone steps will be placed in substitute of a dock to provide access to water and mitigate erosion due to user traffic. The stone steps will be placed by hand into the water to reduce risk of disturbing sediments. Rock is then placed from the toe of slope, working up the bank. Each rock overlapping the previous to create a stable egress. Maximum 200 mm depth gravel leveling course will be needed to ensure stones are stable on the embankment. All material will be barged to the site. All equipment will be washed and decontaminated prior and after use in Johnson Lake.

5.4.2.2 Docks and Dock Abutments

Note: the material used for the docks must comply with the Parks Canada guidelines for the use of treated wood (See Attachment 5 and 6).

Two "L" shaped docks will be installed at the main beach area. The docks consist of a 1.83 m x 3.66 m ramp which will be hinged to the abutment and a 1.83 m x 6.1 m floating dock installed perpendicular to the abutment and parallel to shore. The docks and ramps will be pre-fabricated modules that will be delivered to site and launched at the beach area, along with their associated moorings and anchors. The dock support structures will be constructed of steel or wood, and will have a life expectancy of 10 years. The structures will be non-visible and cladded with cedar decking (prefabricated wood frame that will be bolted onto structure on site). The docks and ramps will be installed with the assistance of an aluminium work skiff on a calm day without wind or waves. Anchors and moorings will also be installed from the work skiff. Typically, the anchor is lowered into place and the lines are then pulled to the float attachments and tensioned. There are two anchors for each dock, one that will be lowered into the water and one that will be located on shore. The anchor on shore will be a boulder with an eye hook installed on the side. Boulders will be brought to the site and placed using an excavator. The specific methodology will be defined by the contractor as they are bidding on a performance specification.

Exact dock abutment location will be field located by a Parks Canada representative to minimize the impacts to the bank and the vegetation. An excavator, located on the current disturbed beach area, will excavate between 3-5 m^3 of soil to allow abutment foot print. Excavation depths will range between

400 – 600 mm depending on location. A 7.5 m^2, 150 mm deep gravel leveling course will be installed as an abutment base. Gravel will be placed by an excavator and nominally compacted. A 2.55 m x 3.0 m cedar wood abutment will be constructed on site. All wood will be dimensionally cut off site. The abutments will be built using manual labour and power tools (hand drill). Backfill of the abutments will consist of native material removed during excavation. The specific methodology will be defined by the contractor as they are bidding on a performance specification.

Riprap will be placed around the sides and atop the abutments to protect them from erosion and pedestrian traffic. Once the riprap has been placed, informal stone steps will be laid atop the riprap to provide safe egress from the water and access to the docks. The riprap and informal stone steps will be placed by hand into the water to reduce risk of disturbing sediments. Rock is then placed from the toe of slope, working up the bank. Maximum 200 mm depth gravel leveling course will be needed to ensure stones are stable on the embankment.

5.4.2.3 Wash Station

The wash station is a stand-alone unit located adjacent to the existing washrooms in the Johnson Lake parking lot with easy access for delivery of materials and construction equipment. The wash station is a 1250 gallon rain water cistern that will be delivered to site on a flatbed truck and placed with onsite equipment. The cistern will sit on a 15 m^2 compacted 200 mm depth pad of 25 mm diameter crushed aggregate delivered by truck to the parking lot and compacted to 90% Standard Proctor Maximum Dry Density. The cistern will be filled as needed by local water truck. A cedar screen fence will be installed to mask the cistern. The 2.6 m x3.0 m cedar fence panels will be fabricated off-site and delivered by truck. The panels will be screwed into fence posts that will be anchored to precast concrete blocks that sit above ground (no footings below ground).

The cistern will gravity feed a 1.5-2.0 m wash hose for cleaning of water toys, feet, pets, etc. The wash water will drain into a 1.5 m x 3.0 m x 0.5 m deep drain rock pit so it cannot drain or erode back to the lake. The wash station is bid based on a performance specification, so the specific details of its construction will not be known until a bid is selected. However, the anticipated construction methodology involves an excavator to dig out and backfill the drain rock pit and the granular foundation. All materials will be fabricated offsite and assembled onsite.

5.5 Project Schedule

May 2017: Close Johnson Lake to the public. Install block nets downstream of western and eastern outlets of Johnson Lake.

May 2017 to July 1, 2017: Gill-netting of Johnson Lake (open-water), back-pack electrofishing of inflow channel and upstream wetland, boat electrofishing of Johnson Lake.

July 1, 2017: Remove all nets from Johnson Lake, stop electrofishing efforts in the inflow channel, Johnson Lake and upstream wetland. Re-open Johnson Lake to the public.

September 4, 2017: Close Johnson Lake to the public.

September 4, 2017-December 15, 2017: Gill-netting of Johnson Lake, back-pack electrofishing of inflow channel and upstream wetland, boat electrofishing of Johnson Lake (if necessary).

October 2017: Bridge construction across western outlet of Johnson Lake to allow transport of pumps to staging area at the south-eastern corner of Johnson Lake. Alternatively, use the informal crossing to access the staging area.

October 15, 2017: Begin dewatering of upstream wetland, inflow channel and Johnson Lake. Total estimated time to dewater the lake is 12 to 14 days.

October 1, 2017 to December 15, 2017: Maintain dewatered wetland until sufficient time has passed allowing for any remaining pockets of water to freeze thus killing any remnant fish that may have eluded capture by electrofishing or gill-netting efforts. Johnson Lake will be allowed to re-fill immediately following the draining.

October 2017: Barrier construction across dewatered western outlet of Johnson Lake to prevent fish passage upstream.

November 1, 2017 to December 15, 2017: Gill-net/electrofish the isolated basins of Johnson Lake, wetland and inflow channel to remove any stranded fish.

Late December 2017: Once all fish have been removed from the 3 locations (wetland, inflow channel and Johnson Lake), pumping will stop and water will be allowed to flow from upstream wetland down the inflow channel and refill Johnson Lake. Estimated re-fill time at 0.04 m^3/s is approximately 3 months. This refill time may vary depending on the variation in discharge throughout the winter of 2017-2018.

Late December 2017: Demobilization of the 2 pumping locations, and bridge crossing the western outlet creek. Return original bridge if necessary.

2018: Continue gill netting and electrofishing to validate that all salmonids are indeed eradicated.

2021: Restock native suckers into Johnson Lake once it has been confirmed that the population of tubifex worms has died off.

5.6 Project Personnel and Access Requirements

5.6.1 Fish Eradication

5.6.1.1 Johnson Lake and Upstream Wetland Gill-netting and Electrofishing

Three full time teams of two people will perform all gill-netting and back-pack electrofishing duties mentioned above in accordance with the mitigation measures set out in McLean et al. (2008) (Attachment 3) that apply to these activities. All gear requirements, (gill-nets, floats, electrofishers, aluminum boat, oars, etc.) will be staged from the parking lot at Johnson Lake.

A separate crew will be contracted by Parks Canada to perform the boat electrofishing phase of the fish removal in the late spring of 2017. They will also be staged from the Johnson Lake parking lot and launch

their boat from the existing beach area. The boat will be removed from the lake each night and kept on a trailer in the Johnson Lake parking lot.

5.6.1.2 Dewatering

Parks Canada will contract the dewatering phase of the removal project to an experienced dewatering company capable of completing the objectives of the project within the proposed timelines. The number of personnel necessary to complete this task will be decided upon by the project manager of that company.

For the dewatering of Johnson Lake, large submersible pumps need to be floated into the deepest point in the basin, and tethered to shore. This deep location is at the eastern end of Johnson Lake. Approximately 300m south of this point, at the south-west corner of Johnson Lake, is an existing staging area. The staging area was used during the dam restoration activities at Johnson Lake during the summer of 2013. The earthen dam along the eastern shore was breeched following extensive flooding. Access for this project will follow the same access road that was created in 2013. Launching of the pumps into Johnson Lake can take place from this staging area.

To access the staging area at the south-west corner of Johnson Lake a temporary bridge (similar to those used during the Forty Mile Dam removal) that can accommodate large flat-bed trucks will be positioned across the western outlet channel of Johnson Lake. The current bridge will be removed and replaced once the project is complete. Once across the western outlet, the access road turns south-east and follows a hydro-electric power line for ~650m, then follows a cutline road through the forest for ~400 m to the staging area (Figure 4).

To drain the upstream wetland and flume water to the western outlet of Johnson Lake, pumps will be flown into the upstream wetland area by helicopter. As the water levels are drawn down, the pumps will be moved closer to the remaining pools of water via helicopter. Pumps will be placed in the dry wetland bed on spill proof trays when applicable. In situations where the wetland bed is not dry, long extensions of the intake hoses will be employed to prevent extensive travel into the wetlands by pumping personnel. Fuel will be delivered to the pumps using All-terrain Vehicles (ATVs). All ATV traffic will remain on the existing formal trail surfaces.

In order to access the upstream wetland, ATV's will need to cross the Johnson Lake inflow channel. There is an existing bridge which may accommodate the width of an ATV. However, if an ATV is too wide for the bridge, additional planking may be attached to the existing bridge surface to widen the bridge to allow for ATV traffic.

5.6.2 Johnson Lake Shoreline Infrastructure

Access will be limited to the work area shown on the drawings if possible (See Attachment 1). Launching into the lake is planned from the beach area. If necessary boards can be laid to enable the launching over the sand. Access to the Wash Station and Main Beach Area are direct from the parking lot and the shore. Access to Area 2 (the "local's beach") is primarily by water due to lack of vehicle access trail. Therefore, infrastructure constructed at Area 2 will be done primarily by hand and from a work skiff.

All personal on site will be briefed on the sensitivity of the environment they are working in and the whirling disease preventative spreading measures by Parks Canada staff.

Machinery on site will probably include excavator, tamper for cistern gravel pad compaction, work skiff, and skid steer.

Wood work will require some power tools. Mostly drills, and possible skill saw for onsite modifications (all cutting will occur in parking lot).

6. VALUED COMPONENTS LIKELY TO BE AFFECTED

6.1 Landforms and Soils

Based on Holland and Coen (1983), Johnson Lake and surroundings are found within the PT1/5c ecosite. The PT1 ecosite is named for the "Patricia" ecosection. The 5c is the slope class. The 5 represents 5-15% slope and the "c" denotes a complex slope.

This montane ecosite occurs on ridged or hummocky morainal blankets overlying ridged bedrock. Topographically, the PT1 ecosite is found on broad valley floor benchlands throughout the montane ecoregion. This is the case for Johnson Lake. Orthic and eluviated eutric brunisols and brunisolic gray luvisols dominate the PT1 ecosite, and are characterized by thin soil development under well drained conditions.

6.2 Vegetation

The dominant vegetation species found within the PT1/5c ecosite include: lodgepole pine (*Pinus contorta*), buffaloberry (*Shepherdia canadensis*), showy aster (*Aster conspicuous*), and twin flower (*Linnaea borealis*).

Submerged vegetation within Johnson Lake is dominated by Richardson's pondweed (*Potomogeton richardsonii*) and the stonewort *Chara* spp. Submerged vegetation within the upstream wetland is entirely *Chara* spp.

As the trails and staging area surrounding Johnson Lake are highly disturbed the probability of rare plant species existing in these locations is very low. No rare plant surveys will be conducted in these locations. However, as the upstream wetland area has relatively low human use, there is some potential for rare plant species to exist here and an appropriate survey will be conducted.

Non-native vegetation species found within the work site include: meadow hawkweed (*Hieracium caespitosum*) at the western outlet, spotted knapweed (*Centaurea maculosa*) at the western outlet, Canada thistle (*Cirsium arvense*) at the eastern outlet, and tall buttercup (*Ranunculus acris*) at the main beach area.

6.3 Waterfowl/Piscivorous Birds

Waterfowl and piscivorous raptor species most likely to be found at Johnson Lake during the ice-off season include but are not limited to: common goldeneye, blue-winged teal (*Anas discors*), common

loon (*Gavia immer*), common merganser (*Mergus merganser*) and osprey (*Pandion haliaetus*) (B. Hunt, pers. comms. 2015). None of the waterfowl species that generally nest at or use montane lakes are listed as Canadian federal species at risk. The Alberta provincial species at risk list does include numerous "sensitive" waterfowl species that inhabit Banff National Park and could possibly land on Johnson Lake. These include: northern pintail (*Anas acuta*), lesser scaup (*Aythya affinis*), harlequin duck (*Histrionicus histrionicus*), and white-winged scooter (*Melanitta fusca*).

6.4 Upland and songbirds

A high number of species at high densities occur in the PT1 ecosite. The ecosite is important to: Sharp-shinned hawk (*Accipiter striatus*), common raven (*Corvus corax*), solitary vireo (*Vireo cassinii*) and yellow-rumped warbler (*Setophaga coronata*).

6.5 Aquatic mammals

Both beaver (*Castor canadensis*) and muskrat (*Ondatra zibethicus*) have been found in high densities within the PT1 ecosite.

6.6 Ungulates

The PT1 ecosite is moderately important to ungulates in summer, and highly important in winter. Low snow accumulation and abundant forage make this ecosite important to deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*) year-round. Forage use has been recorded on willows (*Salix* spp.), buffaloberry (*Shepherdia Canadensis*), and aspen (*Populus tremuloides*).

6.7 Carnivores/bears

This ecosite is highly important to coyote, cougar and wolf year-round. All other species of carnivores, such as grizzly and black bears, have been found here.

6.8 Small mammals

A high number of species occur here. Bushy-tailed wood rats (Neotoma cinerea) and numerous species of bats have been recorded here. Red-squirrels (*Sciurus vulgaris*) and red-backed voles (*Myodes* spp.) occur in high densities. Numerous species of bat including: big-brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), and western small-footed bat (*Myotis ciliolabrum*) are found within this ecosite (Holland and Coen 1983).

Little brown bat (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*), both listed as Endangered under Schedule 1 of the *Species at Risk Act*, have the potential to occur in the vicinity of Johnson Lake.

6.9 Amphibians and Reptiles

At least one life stage of all four species of amphibians living in Banff National Park can be found at Johnson Lake at some point during the year. Western toad (*Anaxyrus boreas*), long-toed salamander (*Ambystoma macrodactylum*), Columbia spotted frog (*Rana luteiventris*), and wood frog (*Lithobates*

sylvatica) all utilize Johnson Lake for breeding in the early spring. While the other amphibian species are more terrestrial outside of the breeding season, Columbia spotted frogs likely both feed and hibernate in Johnson Lake. During the winter, Columbia spotted frogs bury themselves in the muddy bottom of wetlands and lakes that do not freeze to the bottom.

6.10 Aquatic Resources

Fish species within Johnson Lake include: non-native brook trout, rainbow trout, and brown trout, as well as native longnose sucker. All life stages of these fish are found within Johnson Lake. It is unknown what the abundances of these species are. Determination of fish species was achieved by angling, electrofishing, spawning surveys (visual and electrofishing) and direct observation. The same fish species found in Johnson Lake are assumed to be in the upstream wetland. All life stages of these fish are assumed to be found within the upstream wetland. It is unknown what the abundance of these species is within the upstream wetland.

Zooplankton communities in Johnson Lake are dominated by small bodied Daphnia and cyclopoid copepods.

The inflow channel that connects the upstream wetland to Johnson Lake is ~430 m long and has a discharge of 0.04 m^3/s into Johnson Lake. Rainbow trout use the inflow channel as a spawning location in the spring and brook trout use the channel in the fall to spawn.

6.11 Cultural Resources

The project area overlaps with pre-contact archaeological site 20R (Johnson Lake Campsite), and historic archaeological site 52R (Anthracite Townsite), and is in close proximity to other known archaeological sites (350R, and 352R) (See Attachment 7, Osicki 2017).

Site 20R consists of a diffuse scattering of pre-contact artifacts lithic flakes, Fire Cracked Rock (FCR), faunal remains, and lithic tools (pre-contact Prairie Side-notched style point, end scraper, and utilized flakes). Site 20R is situated on a moraine terrace overlooking the west side of Johnson Lake (Figure 3). Artifacts associated with the site have been found scattered from the beach edge of the lake to the upper extent of the moraine terrace and into the parking area (where the current washrooms are located) (Osicki 2017, Attachment 7).

7. EFFECTS ANALYSIS & MITIGATION MEASURES

7.1 Landforms and Soils

7.1.1 Potential Effects

Potential impacts to soils include:

- Soil compaction from repeated walking along the shoreline of Johnson Lake, the inflow channel and the upstream wetland.
- Soil compaction and rutting from equipment access and operations (ATVs, flatbed trucks, excavators).
- Soil downstream of the eastern outlet will become saturated during the dewatering process.

- Soil erosion may occur in both the eastern and western outlets during dewatering due to potential erosive forces of heightened discharge.

Repeated foot traffic around the lake, inflow channel and wetland may result in new areas of surface soil disturbance surrounding these water-bodies. At the staging area, soil compaction from repeated trampling can alter the soil structure, affecting the substrate's water holding capacity, levels of aeration, microbial diversity, productivity, as well as future vegetation growth and site recovery.

As water is discharged into the eastern outlet channel and the surrounding forest, the ground will become saturated and susceptible to human disturbance. Currently, the discharge out the eastern outlet is ~0.04 m^3/s. During the dewatering operations, discharge is expected to increase to 0.25 m^3/s. This increase in discharge may cause soil erosion within the existing outlet channel. However, the eastern outlet channel does not connect with any downstream water course, so the turbidity will eventually settle out on the terrestrial landscape.

Water drained from the upstream wetland and the Johnson Lake inflow channel will be pumped over the existing beaver dam (at the outlet of the upstream wetland), down the inflow channel, and downstream to the western outlet of Johnson Lake. This additional flow (0.04 m^3/s) out the western outlet is unlikely to have a significant erosive impact on the stream channel, as the discharge through this outlet during the pumping operations will increase from 0.05 m^3/s to 0.09 m^3/s.

7.1.2 Mitigation Measures

- Project personnel will use the existing maintained trail network surrounding Johnson Lake, the inflow channel and the upstream wetland.
- Where formal trails are not present (e.g., wetland shoreline), informal trails clearly marked with flagging will be used. Use of these trails will be monitored and if ruts are being formed use will stop, and low impact matting will be deployed along impacted areas.
- Where no formal or informal trails are present (the north side of the upstream wetland), rocky areas will be used for access where possible. Access to the north and east side of the upstream wetland can be accessed by crossing the wetland in chest waders or floating across on a small boat. Low impact matting may also be used to access the centre of the wetland complex to avoid wading through deep flocculent substrate.
- Trucks, ATVs, and large equipment (e.g. bobcat excavator for delivering materials for the construction of downstream fish barrier) will be restricted to using existing formal trails, access roads, and staging areas. No equipment access will be permitted in riparian, shoreline and wetland areas.
- Each contractor will be required to prepare an Environmental Protection Plan (EPP) that includes an Erosion and Sediment Control (ESC) plan for their portion of the work, to be submitted to the Environmental Assessment Office for review a minimum of one week in advance of commencing work.
- The saturated area downstream of the eastern outlet will be closed to prevent any human disturbance to the susceptible saturated soils during the pumping process.

- The effects of the increased discharge out the eastern outlet will be mitigated by placing a 90° elbow at the end of the pumping hose to dissipate the water into the forest and eliminate the erosive power of a direct stream of water.
- Parks Canada is committed to overall site restoration as required (e.g. soil compaction and/or scarification, seeding and/or planting with native species where warranted as a result of disturbance during the project). A Restoration Plan will be completed by the Banff Field Unit Fire/Vegetation specialists upon demobilization (2018 growing season) and restoration activities will be conducted until successful restoration has occurred.

7.1.3 Residual Effects

The above mitigation measures will help to minimize the expansion and creation of new soil disturbance as a result of project activities. Some soil compaction is unavoidable given the work and access requirements. Provided the above mitigation measures are implemented, residual impacts to soils due to compaction from project activities are expected to be localized, short-term, and reversible and are rated as low in magnitude.

7.2 Vegetation

7.2.1 Potential Effects

Potential impacts to vegetation from project activities include:

- Loss of or damage to native vegetation due to trampling, equipment access and operation, and directly downstream of eastern outlet due to flooding.
- Import and/or spread of non-native invasive vegetation due to equipment access and ground disturbance—especially at the eastern staging area.
- North of Johnson Lake along the south shore of the upstream wetland, where there is little disturbance (compared to the south where there is the hydro line, cutline road, and existing staging area), there is the possibility that ATV use and establishing a staging area where none existed previously may damage rare vegetation species.

Directly downstream of the eastern outlet, the topography of the landscape is relatively flat. Water currently being discharged from Johnson Lake pools after ~50m of exiting the lake. There is a possibility that additional water discharged from Johnson Lake will pool here before entering the outlet channel. Small terrestrial vegetation including willow (*Salix* spp.), white spruce (*Picea glauca*), and cottonwood (*Populus balsamifera*) may be damaged or killed. The movement of equipment (e.g. trucks, pumps and personal protective equipment) may import some nonnative plants. However, this is a concern with any development project in Banff National Park and there are existing procedures in place to ensure equipment comes into Banff National Park clean and free of non-native species.

7.2.2 Mitigation Measures

- Equipment access will be kept to existing formal trails and roads, minimizing disturbance footprint and avoiding sensitive riparian, shoreline and wetland areas to minimizing damage and loss of native vegetation.
- By lengthening the outlet hose to the eastern outlet channel during dewatering, the wetland will be bypassed and water can be discharged directed into the rocky relic channel.
- All equipment must arrive on-site clean and free of soil or vegetative matter that could contain weed seeds.
- During the summer of 2017, prior to work beginning, staff from Parks Canada Fire and Vegetation staff will survey the project area (access route) and aggressively control species as found. All individual non-native plants within 10m of the edge of disturbance (staging area) should be cut at ground level, bagged and removed from the site as per the Parks Canada Non-native Vegetation Control Guide.
- Construction non-native vegetation spread mitigations still need to be followed. Any staging that occurs directly on infestations should be matted to ensure vectors (soil, seeds, and debris) do not get transmitted to other areas.
- A Rare Vegetation Survey will be completed along the southern shore of the upstream wetland to identify any rare species that may be affected by project activities for the upstream wetland. This survey will be completed during the growing season to provide the optimal opportunity to identify rare species.
- Parks Canada is committed to overall site restoration as required (e.g. soil compaction and/or scarification, seeding and/or planting with native species where warranted as a result of disturbance during the project).
- If rare plant species are found, they will be flagged so that these areas will be avoided by on-site operations. If rare plant species cannot be avoided by active operations, transplant measures will be taken if appropriate unaffected habitat is identified in the surrounding area. If alternative habitat is unavailable, disturbed rare plant species will be replanted following completion of the project.

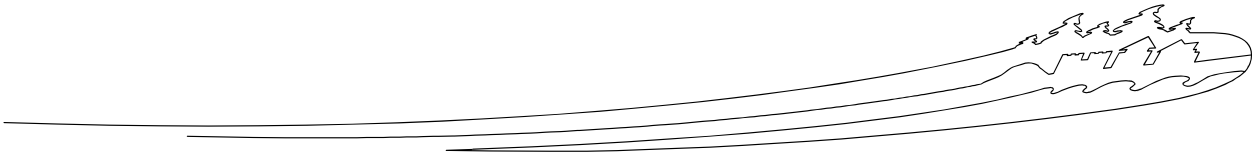
7.2.3 Residual Effects

The prescribed mitigation measure will help to minimize damage and loss of native vegetation as a result of project activities. Some damage and loss will still occur. Residual impacts to vegetation are expected to be localized, short-term, and reversible and are rated as low in magnitude.

7.3 Waterfowl/Piscivorous Birds

7.3.1 Potential Effects

- Lethal bycatch of waterfowl and piscivorous birds/raptors.
- Drowning of loon nests if water levels are still rising in spring after nesting.
- Spring gill-netting may reduce osprey activity.



There is a possibility that waterfowl may become accidentally ensnared in the gill-nets when landing on the lake. Diving ducks may also become tangled in the gill-nets when diving for food.

During the Devon Lakes removal project (2002-2010), two Barrows Goldeneye ducks were ensnared in gills-nets and killed. During the Rainbow Lake project (2011-2015), five suspected Common Goldeneye ducks were ensnared in gill-nets and killed. Both of these bycatch events happened in the autumn, after the majority or all of the fish had been removed. Both species are diving ducks and were likely feeding on large amphipods (*Gammarus* spp.). These amphipods are generally absent in high densities when fish are present (Wilhelm 1999). Once the fish were removed from both Devon and Rainbow Lakes, the density of amphipods and large bodied zooplankton increased providing ideal forage for these diving ducks. However, the number of waterfowl caught by the nets was remarkably low considering the amount of time the gill nets were deployed unattended.

The Johnson Lake project requires more intensive netting for a much shorter period of time. Also, the final stages of the project (when bycatch is most likely) will occur during winter 2017/2018, further reducing the potential for bycatch. Furthermore, the likelihood of a species at risk becoming bycatch is very low simply because there are no waterfowl species at risk occupying BNP.

If water levels in Johnson Lake do not return to normal (level prior to dewatering) by spring of 2018, the loon nest that is regularly built on the shore of the northern bay of Johnson Lake may be inundated with rising water as the lake return to normal water levels.

7.3.2 Mitigation Measures

- To prevent any waterfowl entrapment in the gill-nets, crews will only have nets deployed when they are present on the lake. The simple presence of people on the lake may help deter waterfowl. If not, they will be immediately hazed from the area.
- Considering that most potential bycatch species are visual feeders, a different strategy may be to deploy nets overnight. Crews would set the nets in the evening and retrieve them in the morning. Both daytime and nighttime netting will be attempted to determine which technique demonstrates the least potential to cause bycatch.
- A known loon nesting site will be removed early in the spring of 2017, to encourage the female loon to nest elsewhere and a man-made nesting platform will be installed on the shore of nearby Two Jack Lake to further increase her chances relocating. Because the lake will be fishless in the foreseeable future and the nets present a mortality risk to her and her chicks, this is the most humane approach. This man-made nest will remain on Two Jack Lake for the loon to utilize again in the spring of 2018-2021. This prolonged mitigation effort will encourage the loon from nesting on Johnson Lake and thus reducing the potential for capture within the gill-nets and also acting as an avain vector of whirling disease to adjacent waterbodies.
- Failing the success of one of the mitigations above, mechanical methods for deterring waterfowl will be used (e.g. sonic deterrents, laser deterrents). However, previous experience with fish removal projects resulted in a low bycatch, therefore, we are not anticipating bycatch will be a problem.

- Some amount of netting may be performed during the winter of 2017/2018, under the ice. There are no anticipated concerns with bycatch. Furthermore, by conducting gill-netting in the winter, much of the food source, and thus attractant for waterfowl, will be removed by ice-off in the spring. Gill netting under the ice is much more time-consuming and therefore will not be used as the main mitigation.
- When not in use, gill-nets will be stored in locked, bear proof containers overnight to contain any fish odor and prevent wildlife from entangling themselves in the nets.

7.3.3 Residual Effects

Based on Parks Canada's experience with fish removal projects in the past, the likelihood of waterfowl bycatch is very low. Mitigation measures are in place to further reduce the potential for bycatch. The likelihood of loon nest drowning in the spring of 2018 is also expected to be low due to the placement and maintenance of the man-made nest site on Two Jack Lake from 2017-2021. By removing much of the biomass of fish early in the summer, osprey activity at Johnson Lake and the upstream wetland may be reduced, thus eliminating an avian vector and reducing the risk of entanglement in the gill-nets. Although considered unlikely, if bycatch were to occur the residual effect would be a localized and irreversible effect with a short-term, negligible impact on waterfowl species populations.

7.4 Upland Songbirds

7.4.1 Potential Effects

- Increased noise associated with equipment access and operating pumps may disturb upland songbird populations. However, songbirds that may be disturbed by these operations are mobile enough to fly to adjacent forests for relief until the pumping operations stop.

7.4.2 Mitigation Measures

- No mitigation measures are planned.
- The equipment access and pumping operations are proposed to occur between September and December 2017, outside of the breeding bird season (April through August).

7.4.3 Residual Effects

It is unlikely that there will be any negative residual effects on the bird communities as a result of fish being removed from Johnson Lake.

Disturbance to upland and song birds in the vicinity of Johnson Lake is anticipated during equipment and pumping operations, however this is anticipated to be localized, short-term, reversible, and based on timing outside of the breeding season for most bird species, negligible in magnitude.

7.5 Aquatic Mammals

7.5.1 Potential Effects

- Aquatic mammals may become ensnared in gill nets and drown.
- Temporary loss of habitat for aquatic mammals.

There is no evidence of a beaver lodge on either Johnson Lake or the upstream wetland. Also, there are no recently fallen trees or shrubs atop the beaver dam blocking the outlet of the upstream wetland. Shrubs (*Salix* spp.) are growing along the full length of the dam making it reasonable to assume that the dam is not being maintained and that the upstream wetland area is historic beaver habitat and that there are no beavers living in the wetland presently. Furthermore, unlike fish or waterfowl, aquatic mammals have the ability to chew through the nets to free themselves should they become trapped.

Muskrats may be displaced as a result of the dewatering activities.

7.5.2 Mitigation Measures

- To prevent any aquatic mammals getting entrapped in gill nets, crews will deploy nets when they are present on the lakes. The simple presence of people on the lake will deter aquatic mammals. If not, aquatic mammals will be immediately hazed from the area.
- Considering that most aquatic mammal species are visual feeders, an alternate strategy may be to deploy gill-nets during the night. Crews would set the nets in the evening and retrieve them in the morning. Crews will test both daytime and nighttime netting to determine which technique demonstrates the least potential to cause bycatch.
- When not in use, gill-nets will be stored in locked, bear proof containers to contain any fish odor and prevent wildlife from entangling themselves in the nets.
- Any muskrats that may be displaced due to the dewatering of Johnson Lake will be quickly replaced by others from surrounding populations. The breeding season extends from March to August. The gestation period is ~28 days. Females bear 1-4 litters/year and each litter can contain on average 6-7 young (Saunders 1988).

7.5.3 Residual Effects

Based on Parks Canada's experience with fish removal projects in the past, we do not anticipate aquatic mammal bycatch. Mitigation measures are in place to further reduce the potential for bycatch. Although considered unlikely, if bycatch were to occur the residual effect would be a localized and irreversible effect with a short-term, negligible impact on aquatic mammal species populations.

7.6 Ungulates

7.6.1 Potential Effects

- Pumping operations in the late summer/early fall may disturb deer and elk during the fall rut.

During the pumping operations, Johnson Lake and the surrounding area and access roads and trails will be closed to the public. Although the short term pumping may result in localized sensory disturbance to some elk during the rut period, overall disturbance and human presence within the Johnson Lake area may be reduced due to the closure at this time.

7.6.2 Mitigation Measures

- No mitigation measures are proposed.

7.6.3 Residual Effects

Closures to the public may result in reduced disturbance to elk in the spring (calving time) and in the fall (rutting season). The residual effect of increased sensory disturbance during fall pumping operations is anticipated to be short term, localized, reversible and negligible in magnitude.

7.7 Carnivores/Bears

7.7.1 Potential Effects

- Increased attraction of carnivores/bears to Johnson Lake area due to concentrated fish odor during gill-netting operations.

Based on previous fish removal projects, we do not anticipate that carnivores and bears will be attracted to Johnson Lake any more than natural rates of use in that area. There is no evidence from Parks Canada's previous fish removal projects that bears or carnivores can detect fish in gill nets under water. Therefore, the real potential effects are related to storage of gill nets and fish carcasses. Gill-nets will be stored in bear-proof containers when not being used and fish carcasses will be stored in the Banff warden office. We do not believe that our gill netting operations will cause any impact to carnivores or bears.

7.7.2 Mitigation Effects

- At the end of the work day, the gill nets will be removed from the lake and stored in locked, bear-proof containers.
- All fish that are captured will be securely packaged to prevent potential spread of WD, and transported back to the Parks Canada Warden Office and frozen in a walk-in freezer.
- All crew members and contractors will be fully briefed on keeping all personal food and food waste securely stored and removed from site daily.
- All large carnivore observations (wolves, cougars and bears) will be reported immediately to Banff Dispatch via radio or phone (403 762-1470).

7.7.3 Residual Effects

Provided the above mitigation measures are implemented, there should be no increase in carnivore/bears encounters as a result of fish removal or dewatering efforts at Johnson Lake. Therefore, no residual adverse environmental effects are anticipated.

7.8 Small Mammals

7.8.1 Potential Effects

- Pumping noise may disturb small forest dwelling mammals like red squirrels (*Tamiasciurus hudsonicus*), red-backed voles (*Myodes* spp.), and numerous species of bats.
- Pooling water at the eastern outlet may flood squirrel middens and vole burrows.

However, the above species are all highly mobile and can move to adjacent forest for the duration of the pumping operations. Pumping operations will occur outside of the bat breeding season (15 April to 01 September). The natural reproductive strategy of squirrels and voles would also mitigate against potential effects. Voles become sexually mature in one month and can have 2 or 3 litters of 5-10 voles in a year. Squirrels become sexually mature at one year and can have one to two litters per year with three to four offspring per litter (Lair 1985). If there is any incidental mortality of ground-dwelling small mammals, the residual effect is anticipated to be localized and short-term, with population recovery within a year.

7.8.2 Mitigation Measures

- By lengthening the dewatering outlet hose to the eastern outlet channel, discharge can be directed away from any flat forested areas potentially containing squirrel middens or vole burrows.

7.8.3 Residual Effects

Due the short duration of this project, the mobility of small mammals that could be affected and the life histories of small mammals, the effects of pumping water onto potential mammal habitat is completely reversible. Should any incidental mortality occur the residual effect is anticipated to be localized, short term, reversible and negligible in magnitude.

7.9 Amphibians and Reptiles

7.9.1 Potential Effects

No amphibian or reptile has ever been captured in a gill-net as a result of gill netting efforts in the Banff Field Unit. Below, the potential effects for individual species are identified. The effects are related specifically to the life history of each species and the dewatering of Johnson Lake and the upper wetland.

Additionally, if Johnson Lake does not refill by the early spring of 2018, there is a possibility that any species of amphibian seeking a place to breed may not find suitable habitat at Johnson Lake.

7.9.1.1 Columbia Spotted Frog

Columbia spotted frogs may not be able to hibernate in Johnson Lake or the upstream wetland during dewatering (winter 2017/2018).

Due to their low reproductive potential, these frogs may be sensitive to disturbances resulting from habitat loss (Ovaska et. al. 2014). There is the possibility that once Johnson Lake is drained in the fall, it will not refill before Columbia spotted frogs seek out hibernation locations. In fact, it is our goal to prevent the lake from refilling until there has been a significant freeze (mid-December).

However, Columbia Spotted Frogs may migrate seasonally, using different water-bodies for breeding, summer feeding and over-wintering (Ovaska et. al. 2014). This willingness to migrate may benefit those frogs residing in Johnson Lake. Once the draining of the lake and upstream wetland begins (October 15), some of these frogs may seek nearby wetland habitat for the winter months. There are numerous small wetlands north of Johnson Lake ranging in distance from 0.5-2.7 km away.

7.9.1.2 Long-toed Salamander

Another amphibian that may potentially be affected by the dewatering is the long-toed salamander (listed as “Special Concern” in Alberta (2000)). These salamanders spend most of their lives in terrestrial habitat, but breed in water early in the spring. The juvenile salamanders leave the breeding wetlands for burrowing sites on land in late summer or early fall (Russell and Bauer 2000). Therefore, given their life history and the timing of the dewatering, we do not anticipate any adverse effects on their populations.

7.9.1.3 Western Toad

The only federally listed species at risk that utilizes Johnson Lake is the Western toad (*Anaxyrus boreas*). Listed in the Species at Risk Act as “Special Concern”, the Western Toad has used Johnson Lake as a breeding location. Breeding occurs in March to April and in 6 to 8 weeks the migration from the aquatic environment to the terrestrial begins (Ovaska et. al. 2014). The toads will remain in the terrestrial environment for 2 to 3 years until they return to the aquatic environment to breed (COSEWIC 2012). Given their life history and the timing of the dewatering, we do not anticipate any adverse effects on their populations.

7.9.1.4 Wood Frogs

Wood frogs are highly terrestrial, feeding and hibernating on land. Eggs are laid in the early spring and are able to transform in 45 to 80 days even at low temperatures. Given their life history characteristics and the timing of the dewatering, we do not anticipate any adverse effects on their populations.

7.9.1.5 Terrestrial Garter Snake

Despite its name, this snake does spend much of its time around water during the summer. Adults hibernate in rocky, south facing sites and travel to the aquatic environment to mate in the spring and hunt for the duration of the summer (Ovaska et. al. 2014). Given their life history characteristics and the timing of the dewatering, there should not be any adverse effects to their population.

7.9.2 Mitigation Measures

7.9.2.1 Columbia Spotted Frog

- Dewatering will not occur during the spring. This timing was chosen to avoid interfering with amphibian reproduction.
- Despite not interfering with Columbia spotted frog reproduction, dewatering may reduce the available over-wintering sites. An occupancy survey for all amphibians at Johnson Lake and the upstream wetland was carried out in the spring of 2016. A second survey will be carried out in the spring of 2017 providing two years of pre-dewatering amphibian surveys. An occupancy survey in 2018 will then provide information about possible population losses due to the lake draining.
- If necessary, amphibians or tadpoles can be taken from nearby sources in the Minnewanka Loop area (e.g.: Quiet Pond, Vernal Pond, Osprey Pond, Amphibian World) and restocked into Johnson Lake and the upstream wetland to replenish populations (Figure 7). A more detailed reintroduction plan will be developed in 2018 if the need arises.

Figure 7: Potential re-stocking sources of Columbia spotted frog.

7.9.2.2 Long-toed salamanders

- Given the timing of the dewatering and the life history of the Long-toed salamander, no additional mitigation measures are needed.

7.9.2.3 Western Toad

- Given the timing of the dewatering and the life history of the Western Toad, no additional mitigation measures are needed.

7.9.1.4 Wood Frogs

- Given the timing of the dewatering and the life history of the Wood Frog, no additional mitigation measures are needed.

7.9.1.5 Terrestrial Garter Snake

- Given the timing of the dewatering and the life history of the Terrestrial Garter Snake, no additional mitigation measures are needed.

It is unlikely that Johnson Lake will not refill in time for amphibian breeding in the spring of 2018. However, if this does occur, there are numerous smaller wetlands adjacent to Johnson Lake (within 0.5-2.7 km) that may be used as a substitute breeding location for amphibians (Figure 7).

7.9.3 Residual Effects

By performing the dewatering operation in the fall, most residual impacts to amphibians can be avoided. Similar to songbird populations at Johnson Lake, the stocking of non-native trout may have had detrimental impacts to herpetofauna at Johnson Lake. In California, stocked non-native trout have predated upon amphibians and their offspring inhabiting mountainous lakes (Knapp 2005, Knapp and Matthews 2000). With the removal of non-native, predatory fish, yellow legged frogs (*Rana muscosa*) showed a significant increase in population (Knapp *et. al.* 2007). Populations of amphibians which use Johnson Lake may benefit from the removal of non-native trout from the lake.

7.9.3.1 Columbia Spotted Frog

By performing the dewatering operation in the fall, all residual impacts to amphibians can be avoided with the exception of Columbia Spotted Frogs due to their life history strategy. It is likely that a significant number of Columbia spotted frogs may be displaced from Johnson Lake during the winter of 2017/2018.

Due to the migratory behavior of the Columbia Spotted Frog, it is likely that any short-term population depletion will be replaced by the higher fecundity of remaining individuals or higher emigration rates. We will conduct annual occupancy surveys at Johnson Lake and the upstream wetland to determine if an effect on Columbia Spotted Frog populations has occurred as a result of the project. If so, monitor the population recovery. If natural dispersal does not allow for rapid re-colonization of Johnson Lake and/or the upstream wetland, we will re-introduce these animals from a local population. A temporary

reduction in population levels of Columbia Spotted Frog is anticipated in Johnson Lake. This residual effect is anticipated to be a localized, short-term, reversible and low magnitude.

7.9.3.2 Long-toed salamanders

No residual adverse effects are expected.

7.9.3.3 Western Toad

No residual adverse effects are expected.

7.9.1.4 Wood Frogs

No residual adverse effects are expected.

7.9.1.5 Terrestrial Garter Snake

No residual adverse effects are expected.

7.10 Aquatic Resources

7.10.1 Potential Effects

- Alteration of plankton species (phytoplankton, zooplankton) composition in Johnson Lake as a result of fish eradication.
- Increased turbidity within the western outlet creek due to barrier construction.
- Increased turbidity from the outlet hoses during pumping operations at both Johnson Lake and the upstream wetland. As the wetland and lake are drained of water, and the pump intake gets closer to the wetland/lake bed, pump management will be critical to avoid pumping sediment through the pump.
- While electrofishing crews are operating in the waters that are being pumped – especially as water levels draw down, the water is likely to get very turbid.
- Complete removal of non-native salmonids from Johnson Lake.
- Native fish species living in Johnson Lake (e.g., longnose sucker) will be killed during the fish removal operations in the spring and/or the dewatering operations in the fall.
- Potential for spread of WD if any contaminated equipment (from excavators through to rubber boots) are used elsewhere.
- Gravel placed below the high water mark may bury aquatic vegetation.

The objective of the project is the complete removal of fish from Johnson Lake, the inflow channel and the upstream wetland. Known fish species in Johnson Lake include nonnative species: brook trout, brown trout, and rainbow trout. However, one native fish still exists in Johnson Lake, the longnose sucker. Unfortunately, it is impossible to remove all the non-native fish without also removing the native suckers.

7.10.2 Mitigation Measures

- Whirling disease decontamination procedures will be applied to all equipment used throughout the course of this project from rubber boots through to excavators and pumps. All personnel will be fully briefed and frequently reminded of these procedures throughout the course of the project.
- There are no mitigations needed to prevent the indirect changes to plankton species. Because salmonids did not inhabit Johnson Lake historically, it is likely that the plankton community will become more similar to historic conditions (Parker and Schindler 2006).
- Each contractor will be required to prepare an Environmental Protection Plan (EPP) that includes an Erosion and Sediment Control Plan (ESC) for their portion of the work, to be submitted to the Environmental Assessment Office for review a minimum of one week in advance of commencing work.
- A comprehensive turbidity monitoring program will be implemented in the western outlet throughout the pumping operations, temporary bridge installation/removal and fish barrier installation and commissioning.
- Channel bed preparation during barrier installation in the western outlet stream will be conducted after dewatering Johnson Lake so construction will take place in a dry stream bed.
- The EPP and ESC plan prepared by the contractor that will be installing the fish barrier must include measures to minimize removal and damage to the stream banks and riparian vegetation and specifications for only clean, washed rock to be used for lining the channel during finishing work.
- Re-introduction of flows into the western outlet channel following installation of the fish barrier will be conducted in a slow and controlled manner with downstream monitoring of turbidity throughout.
- During the pumping process, as the pump intake approaches the sediment, the pumps will be shut off and electrofishing crews will remove any remaining fish from the basin.
- Due to the potential for electrofishing crews to stir up sediment as they work, pumping operations and electrofishing crews will be kept as separated as possible. Sediment curtains may also be used to separate crews from pumping equipment.
- Contingency planning will be in place in case of turbid waters entering the pumps, such as pump shut-offs and re-directing pump outflows into stable vegetated areas where overland flow will not reach surface waters.
- The intake of the pumps will be fitted with an appropriate sized screen based on direction from the Department of Fisheries and Oceans Freshwater Intake End-of-Pipe Fish Screen Guideline manual (1995).
- Live fish removed from nets or electrofished will be humanely euthanized. Different options, all consistent with Canadian Animal Care Guidelines and McLean et al (2008) (Attachment 3) exist depending on the size of fish.

- Once the project is complete and all the non-native salmonids are removed from Johnson Lake, native longnose suckers from near-by Lake Minnewanka will be restocked back into Johnson Lake once it has been confirmed that the tubifex worm population has died off (approximately 3 years).
- Longnose sucker populations/biomass will be monitored for success once the restocking is complete. A series of transects will be established on Johnson Lake and a Biosonics DT-X hydroacoustic echosounder will be used to measure longnose sucker abundance.
- Extend closure of the area until water levels return to normal in 2018 – to avoid trampling of exposed littoral areas.
- The area which the gravel will be placed below the high water line has already been disturbed through the migration of sand from the existing beach into Johnson Lake over many years.
- Parks Canada will provide Fisheries and Oceans Canada with required reporting as per Section 5.2 of the Authorization for this project (Attachment 2).

The goal of the project is to eliminate all salmonids from Johnson Lake, the inflow channel and the upstream wetland. By removing salmonids from these waterbodies, the risk of spreading myxospores and triactinomyxon spores to Lake Minnewanka and Cascade River watershed (critical westslope cutthroat trout habitat) is significantly reduced.

A Request for Review was submitted to Fisheries and Oceans Canada in December 2016, and an Application for Authorization was submitted in April 2017. A Paragraph 35(2)(b) Fisheries Act Authorization was received by Parks Canada from Fisheries and Oceans Canada on May 1, 2017.

7.10.3 Residual Effects

The purpose of this project is the permanent removal of salmonids from Johnson Lake. The removal of non-native fish species is consistent with Parks Canada fisheries management objectives. This is considered a high priority objective at this location in order to eliminate a potential source of WD that, by virtue of its close proximity and human use patterns in the area, has a high risk of spreading the disease into the Cascade River watershed, which is home to 4 of 10 core populations for the threatened WSCT.

Positive residual effects are expected for Johnson Lake's plankton community because it will become more similar to its historical conditions.

Given the above mitigation measures, the only residual effect anticipated is the complete loss of the longnose sucker population in Johnson Lake. This effect will only be temporary until suckers are re-introduced from an adjacent population in 2021. This residual effect is considered to be a localized, short term reversible and low magnitude effect.

7.11 Cultural Resources

7.11.1 Potential Effects

The primary risk of project impacts to archaeological resources is likely to be associated with construction activities and equipment access, rather than final infrastructure developments and footprints. Figure 1 in Osicki (2017, Attachment 7) shows the proposed construction footprint/access limits and Area 2 access path (heavy dashed lines). Those locations where ground disturbance could potentially occur (e.g. the dock abutments, stepping stone installation, mooring post footings, and wash station) are generally taking place within low potential areas or previously disturbed areas, and are being proposed with minimal/limited disturbance footprints.

7.11.2 Mitigation Measures

- Construction access should be confined to existing roads and pathways
- All construction related activities around the main beach should remain confined to existing access road disturbance and exposed beach, where the new sand is proposed to be added.
- There may be cultural resources present in the project area that have not yet been discovered (even after an archaeological assessment has been carried out or no assessment was deemed necessary for the project). If staff observe any significant cultural resources while working, they should stop work in the immediate area, and contact the Department Representative, ESO or a Parks Canada archaeologist or cultural resource advisor, to discuss any protective measures that might be needed. Significant resources that could be considered grounds for work stoppage include, but are not limited to, human remains, unique or diagnostic artifacts, and/or artifacts directly associated with known sites and/or unidentified sites in the area. In all cases, cultural managers must be made aware of the finds, and these finds must be communicated back to Parks Canada Archaeologists.
- Any additional scope and/or project footprint changes should be reviewed by Parks Canada Archaeology as they may affect project requirements.

7.11.3 Residual Effects

No residual effects are expected.

8. PUBLIC/STAKEHOLDER ENGAGEMENT & ABORIGINAL CONSULTATION

8 a) Indicate whether public/stakeholder engagement was undertaken in relation to potential adverse effects of the proposed project:

☐ No

☒ Yes (describe the process to involve relevant parties and indicate how comments were taken into consideration).

1. Bow Valley Naturalists Presentation-November 22, 2016
Dr. Mark Taylor, Aquatic Ecologist for Banff National Park, gave a one hour long presentation to approximately 100 Bow valley community members and media personnel regarding the

proposed project at Johnson Lake. The overall project proposal was positively accepted, and no major concerns were raised.

2. Annual Parks Canada Public Forum-February 9, 2017
The project was presented at the Annual Parks Canada Public Forum in February 2017. Community members, media personnel, local politicians, and Parks Canada staff were informed about the proposed project at Johnson Lake over the course of the evening. The event resulted in a full page article in the local Bow Valley newspapers and the media coverage was very positive as the rationale for this project was well explained.

3. Conference Calls with both Fisheries and Oceans Canada and the Province of Alberta on the line at the same time.

1. March 14, 2017-DFO update on Johnson Lake file with Parks Canada and Alberta
2. April 21, 2017-DFO update on Johnson Lake file with Parks Canada and Alberta

8 b) Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed project:
☒ No
☒ Yes (describe the process to involve relevant parties and how the results were taken into consideration).

9. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

Overall, with implementation of the mitigation measures listed in this report, including those re-iterated in the Surveillance and Follow-up Monitoring sections below, residual adverse effects from the project are anticipated to be negligible to low in magnitude. No significant adverse environmental effects are anticipated.

10. SURVEILLANCE

☐ Surveillance is not required
☒☐ Surveillance is required (provide details such as the proposed schedule and the focus of inspections)

<u>Pre-construction Surveys</u>

- Prior to work beginning, Parks Canada Fire and Vegetation staff will survey the project area (access route) and aggressively control any non-native invasive species. All individual non-native plants within 10m of the edge of disturbance (staging area) should be cut at ground level, bagged and removed from the site as per the Parks Canada Non-native Vegetation Control Guide.
- A rare plant survey will be conducted along the southern shore of the upstream wetland to identify any rare species that may be affected by the project activities. This survey will be completed during the growing season (July) to provide the optimal opportunity to identify rare species.

Turbidity Monitoring

A comprehensive turbidity monitoring program will be implemented in the western outlet throughout the pumping operations, temporary bridge installation/removal and fish barrier installation and commissioning. During the pumping operations and bridge installation, turbidity will be monitored downstream in accordance with the methods outlined in the Parks Canada Sediment Monitoring for In-stream Works Protocol (Carli and Dickinson 2014) to confirm that mitigation strategies for preventing sedimentation are functioning as intended and guide adjustments as required.

Environmental Surveillance

Standard monitoring inspections will be conducted by Parks Canada Environmental Surveillance Officers throughout the project and during follow-up measures. Surveillance visits by the Department of Fisheries and Oceans officers may also occur.

11. FOLLOW-UP MONITORING

Follow-up monitoring is:

- ☒ not required
- ☐ legally required (e.g. under the *Species at Risk Act* or *Fisheries Act)*
- ☐ required in accordance with the *Parks Canada Cultural Resource Management Policy*

While follow-up monitoring is not required, it is Parks Canada's practice to assess any new active management project through a formal process of Management Effectiveness Monitoring. This approach will be applied to this project to determine if successful and any lessons learned.

Longnose Sucker Re-introduction

Longnose sucker populations/biomass will be monitored for success in the spring and fall of 2018 and 2019. A series of transects will be established on Johnson Lake and a Biosonics DT-X hydroacoustic echosounder will be used to measure longnose sucker abundance.

Amphibian Surveys

Despite not interfering with Columbia spotted frog reproduction, dewatering may reduce the available over-wintering sites. An occupancy survey for all amphibians at Johnson Lake and the upstream wetland was carried out in the spring of 2016. A second survey will be carried out in the spring of 2017 providing two years of pre-dewatering amphibian surveys. An occupancy survey in 2018 will then provide information about possible population losses due to the lake draining and any necessary follow-up actions will be determined at that time.

Site Restoration

A Restoration Plan will be completed by the Banff Field Unit Fire/Vegetation specialists upon demobilization (2018 growing season) and any necessary restoration activities (e.g., de-compaction, scarification, native plant seeding and/or plantings) will be conducted until successful restoration has occurred.

12. SARA NOTIFICATION

Notification is:

☒ not required

☐ required under the *Species at Risk Act* (outline the nature of and response to any notification).

13. EXPERTS CONSULTED

Include Parks Canada experts. Add as many entries as necessary for the project.

Department/Agency/Institution: Parks Canada	Date of Request: 2017-04-19
Expert's Name & Contact Information: Brian Yakiwchuk brian.yakiwchuk@pc.gc.ca	Title: Resource Management Officer II
Expertise Requested: Where should we conduct a rare vegetation survey?	
Response: 1.a South of JL: Considering the already disturbed nature of the paths, staging area and dormant season no rare veg survey will be required. 1. b North of JL: As operations are occurring on non-frozen ground (presumably in October), in wetland/low-lying areas (higher likelihood of rare plants) and these areas are less disturbed (walking trails), a rare veg survey should occur on all areas where used is expected to be larger than the current trail (where the width of an ATV is wider than the trail and any staging near the upstream pond.	

Department/Agency/Institution: Parks Canada	Date of Request: 2017-04-19
Expert's Name & Contact Information: Brian Yakiwchuk brian.yakiwchuk@pc.gc.ca	Title: Resource Management Officer II
Expertise Requested: How should we control for invasive weeds?	
Response: 1. All individual plants within 10m of edge of disturbance (staging, trails, roads and water flow from project) should be cut at ground level, bagged, and removed from site (as per control guide). 2. Any staging that occurs directly on infestations should be matted (to ensure vectors (soil (seeds) and debris (vegetative reproduction)) do not get transmitted to other areas. 3. Any infestation area that are being driven through also requires matting.	

Department/Agency/Institution: Fisheries and Oceans Canada	Date of Request: 2017-04-20
Expert's Name & Contact Information: Kyle Antonchuk Kyle.Antonchuk@DFO-mpo.gc.ca	Title: Fisheries Protection Biologist
Expertise Requested: Should we restock suckers soon after removal?	
Response: Restock suckers once it has been confirmed that the population of tubifex worms has died off. By maintaining a fish free lake for the complete life cycle of the remaining tubifex worms (~3 years), piscivorous birds will not utilize Johnson Lake as a food source. As a result, the possibility of moving TAMs that may be attached to suckers or to waterfowl/piscivorous bird's feathers is eliminated.	

Department/Agency/Institution: Parks Canada	Date of Request: 2017-04-12
Expert's Name & Contact Information: Aaron Osicki, aaron.osicki@pc.gc.ca	Title: Archaeologist, Parks Canada
Expertise Requested: Are there any archaeological concerns regarding this project?	
Response: Attachment 7. Osicki. A. 2017. Archaeological Overview Assessment Johnson Lake Whirling Disease Mitigation – VE Infrastructure, Banff Field Unit, Banff National Park. Parks Canada. 17pp.	

14. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

☒ not likely to cause significant adverse environmental effects.

☐ likely to cause significant adverse environmental effects.

NOTE: If the project is identified as likely to cause significant adverse effects, CEAA 2012 prohibits approval of the project unless the Governor in Council (Cabinet) determines that the effects are justified in the circumstances. A finding of significant effects therefore means the project CANNOT go ahead as proposed.

FOR SARA REQUIREMENTS:

☒ There are no residual adverse effects to species at risk and therefore the SARA-Compliant Authorization Decision Tool was not required

OR, the SARA-Compliant Authorization Decision Tool (Appendix 2) was used and determined:

☐ There is no contravention of SARA prohibitions

☐ Project activities contravene a SARA prohibition and CAN be authorized under SARA

☐ Project activities contravene a SARA prohibition and CANNOT be authorized

15. RECOMMENDATION AND APPROVAL

(Add additional blocks as required)

Prepared by: EIA author (name & position): Chris Carli, Resource Management Officer II (Aquatics)	Date: YYYY-MM-DD
Recommended by: Functional manager of the project (name): Mark Taylor, Aquatic Ecologist	Date: YYYY-MM-DD
Approved by: Name & position: (*Field Unit Superintendent, Director of a Waterway)*:	Date: YYYY-MM-DD
Signature:	

16. ATTACHMENTS

1. Johnson Lake Docks and Beach Rehabilitation Engineering Drawings. 2017. Project Number 36161. Visitor Experience, Banff National Park, Parks Canada. 7pp.

2. Fisheries and Oceans Canada, Paragraph 35(2)(b) Fisheries Act Authorization. PATH No: 16-HCAA-01612.

3. McLean C, Humphries S, Cooke S. and M Taylor. 2008. Best practices: the capture and handling of fishes for aquatics resource management in the mountain national parks. Updated 2015. M. Taylor and S. Cooke. Project #2008-0014L, CEAR#08-01-39627. Parks Canada Agency. 48pp.

4. Parks Canada Agency. 2017. A Decontamination Protocol for Parks Canada Resource Conservation Management and External Consultants. Aquatics, Banff Field Unit, Banff National Park. 15pp.

5. Parks Canada Agency. 2015. Parks Canada Treated Wood Management Standard. Environmental Management, Parks Canada. 9pp.

6. Parks Canada Agency. 2015. Parks Canada Treated Wood Management Guide. Environmental Management, Parks Canada. 17pp.

7. Osicki. A. 2017. Archaeological Overview Assessment Johnson Lake Whirling Disease Mitigation – VE Infrastructure, Banff Field Unit, Banff National Park. Parks Canada. 17pp.

17. NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM

☒ Project registered in tracking system

☐ Not yet registered *(CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system **by the end of April** to enable reporting.*

18. REFERENCES

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*****Ensure that all required mitigation measures and conditions (e.g. follow-up monitoring requirements) are included in project permits and authorizations*****

Attachment 1

Johnson Lake Docks and Beach Rehabilitation Engineering Drawings

Parks Canada
Agency

Western and
Northern Region

L'Agence Parcs
Canada

Ouest et Nord
du Canada

BANFF NATIONAL PARK, ALBERTA.

ISSUED FOR TENDER

JOHNSON LAKE DOCKS
AND BEACH REHABILITATION

Proj. No.: 36161
April 28, 2017

Canada

LIST OF DRAWINGS

SITE

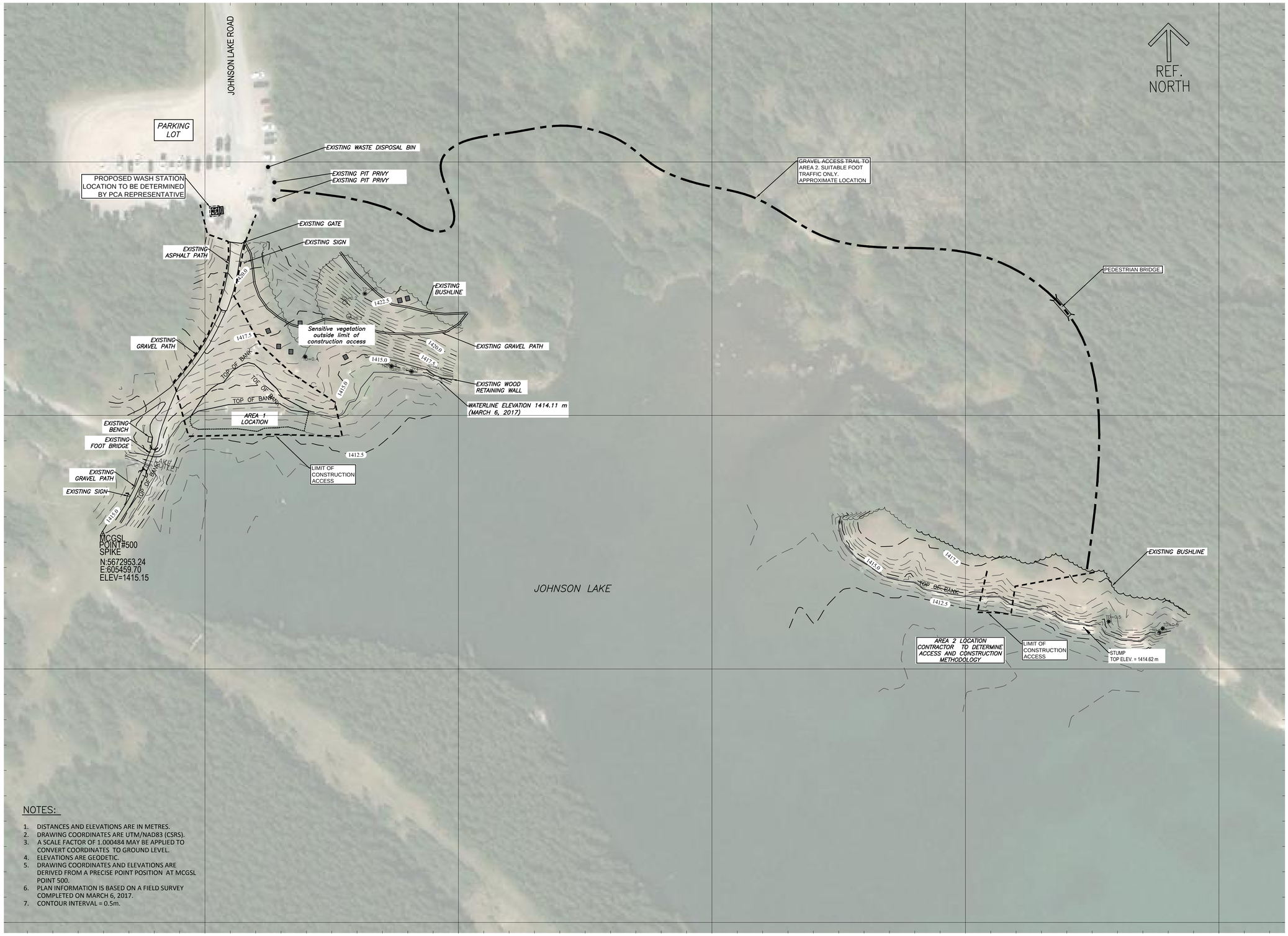
STRUCTURAL

SITE LOCATION MAP

KLA ENGINEERING LTD.

P.O. BOX 21115, 102 – 22441 DEWDNEY TRUNK ROAD, MAPLE RIDGE, BC V2X 1P7
T: 604.380.3552 |

WATERS EDGE
ENGINEERING LTD.
*"Quality * Value * Innovation"*



NOTES:

1. DISTANCES AND ELEVATIONS ARE IN METRES.
2. DRAWING COORDINATES ARE UTM/NAD83 (CSRS).
3. A SCALE FACTOR OF 1.000484 MAY BE APPLIED TO CONVERT COORDINATES TO GROUND LEVEL.
4. ELEVATIONS ARE GEODETIC.
5. DRAWING COORDINATES AND ELEVATIONS ARE DERIVED FROM A PRECISE POINT POSITION AT MCGSL POINT 500.
6. PLAN INFORMATION IS BASED ON A FIELD SURVEY COMPLETED ON MARCH 6, 2017.
7. CONTOUR INTERVAL = 0.5m.

Canada

Parks Canada
Parcs Canada

LEGEND:

- DECIDUOUS TREE
- SPRUCE TREE
- PINE TREE
- SHRUB/BUSH
- TRUNK DIAMETER ..... TD=0.2
- BUSHLINE
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- MAJOR CONTOUR ELEVATION (m) 1420.0
- PICNIC TABLE (EXISTING)

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

REV0	Issued for Tender	17/04/28
revisions	description	date

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

drawing / dessin

SITE PLAN
EXISTING SITE CONDITIONS

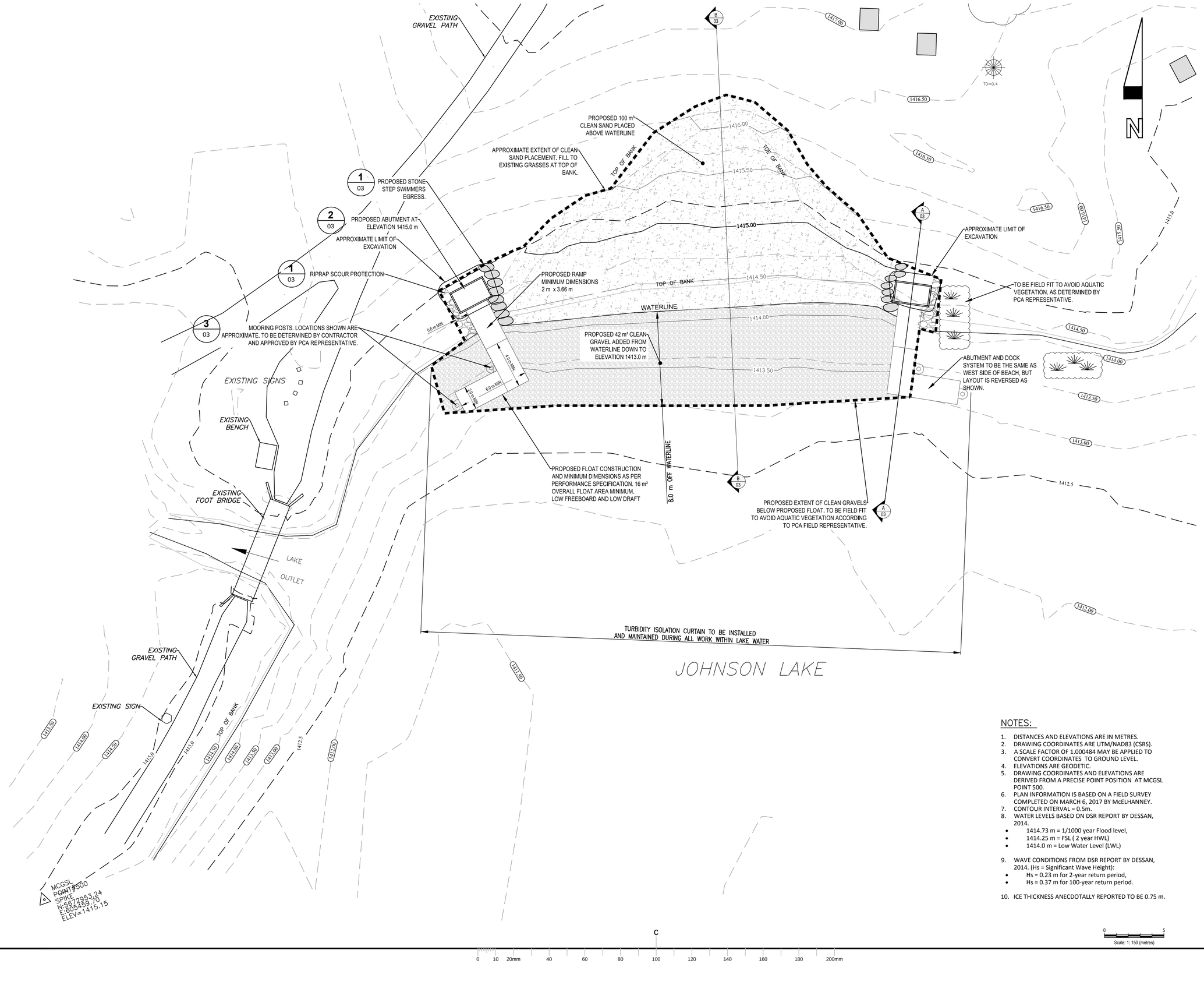
Designed By	T.HIRSEKORN	Conçu par
Date	2017/04/27	(yyyy/mm/dd)
Drawn By	R.HALLEY	Dessiné par
Date	2017/04/27	(yyyy/mm/dd)
Reviewed By	R. EVERTS	Examiné par
Date	2017/04/27	(yyyy/mm/dd)
Approved By	T.HIRSEKORN	Approuvé par
Date	2017/04/28	(yyyy/mm/dd)
Tender	C.MORTSON	Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

36161

Drawing no. / No. du dessin: C-01

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm



Canada

Parks Canada
Parcs Canada

LEGEND:

- DECIDUOUS TREE
- SPRUCE TREE
- PINE TREE
- SHRUB/BUSH
- TRUNK DIAMETER ..... TD=0.2
- BUSHLINE
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- EXISTING CONTOUR ELEVATION (m) 1420.0
- MAJOR CONTOUR (PROPOSED)
- CONTOUR ELEVATION (PROPOSED) 1420.00
- PICNIC TABLE (EXISTING)

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

revisions	description	date
REV0	Issued for Tender	17/04/28

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B location drawing no. / sur dessin no.
C drawing no. / dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

drawing / dessin

AREA 1 PLAN SWIM DOCK AND BEACH REHABILITATION

Designed By	T.HIRSEKORN	Conçu par
Date	2017/04/27	(yyyy/mm/dd)
Drawn By	R.HALLEY	Dessiné par
Date	2017/04/27	(yyyy/mm/dd)
Reviewed By	R. EVERTS	Examiné par
Date	2017/04/27	(yyyy/mm/dd)
Approved By	T.HIRSEKORN	Approuvé par
Date	2017/04/28	(yyyy/mm/dd)
Tender	C.MORTSON	Soumission
Project Manager		Administrateur de projets

Project no. / No. du projet: 36161

Drawing no. / No. du dessin: C-02

NOTES:

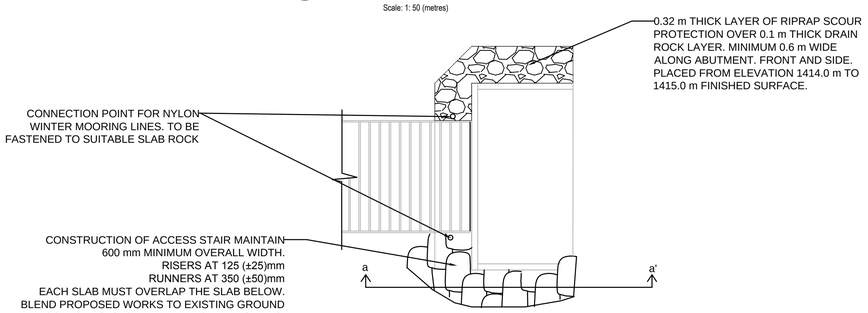
1. DISTANCES AND ELEVATIONS ARE IN METRES.
2. DRAWING COORDINATES ARE UTM/NAD83 (CSRS).
3. A SCALE FACTOR OF 1.000484 MAY BE APPLIED TO CONVERT COORDINATES TO GROUND LEVEL.
4. ELEVATIONS ARE GEODETIC.
5. DRAWING COORDINATES AND ELEVATIONS ARE DERIVED FROM A PRECISE POINT POSITION AT MCGSL POINT 500.
6. PLAN INFORMATION IS BASED ON A FIELD SURVEY COMPLETED ON MARCH 6, 2017 BY McELHANNEY.
7. CONTOUR INTERVAL = 0.5m.
8. WATER LEVELS BASED ON DSR REPORT BY DESSAN, 2014.
   - 1414.73 m = 1/1000 year Flood level,
   - 1414.25 m = FSL (2 year HWL)
   - 1414.0 m = Low Water Level (LWL)
9. WAVE CONDITIONS FROM DSR REPORT BY DESSAN, 2014. (Hs = Significant Wave Height):
   - Hs = 0.23 m for 2-year return period,
   - Hs = 0.37 m for 100-year return period.
10. ICE THICKNESS ANECDOTALLY REPORTED TO BE 0.75 m.

0 5
Scale: 1: 150 (metres)

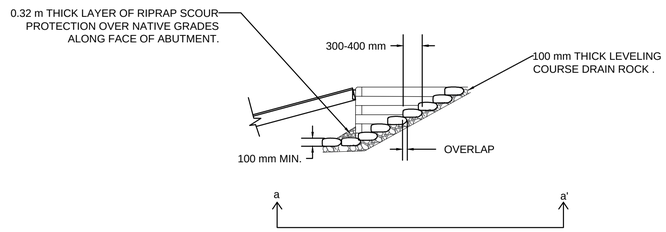
C
0 10 20mm 40 60 80 100 120 140 160 180 200mm

1 02 STONE STEP SWIMMERS EGRESS TYPICAL

Scale: 1: 50 (metres)



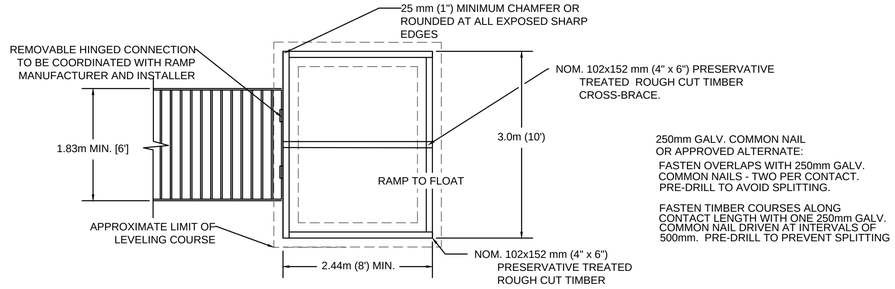
PLAN



SECTION

2 02 TIMBER ABUTMENT TYPICAL

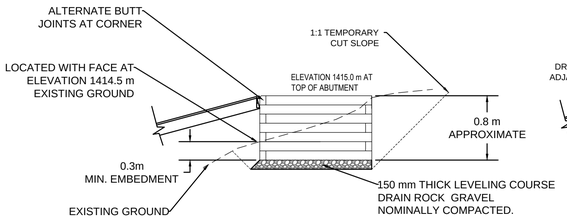
Scale: 1: 50 (metres)



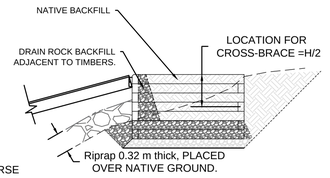
250mm GALV. COMMON NAIL OR APPROVED ALTERNATE:
FASTEN OVERLAPS WITH 250mm GALV. COMMON NAILS - TWO PER CONTACT. PRE-DRILL TO AVOID SPLITTING.

FASTEN TIMBER COURSES ALONG CONTACT LENGTH WITH ONE 250mm GALV. COMMON NAIL DRIVEN AT INTERVALS OF 500mm. PRE-DRILL TO PREVENT SPLITTING

PLAN



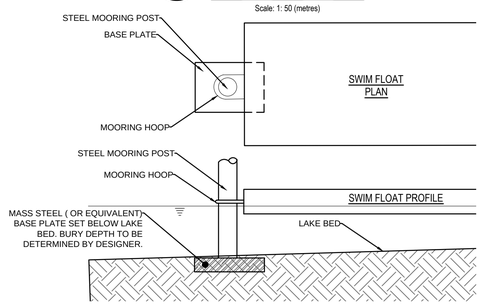
EXCAVATION AND FOUNDATION

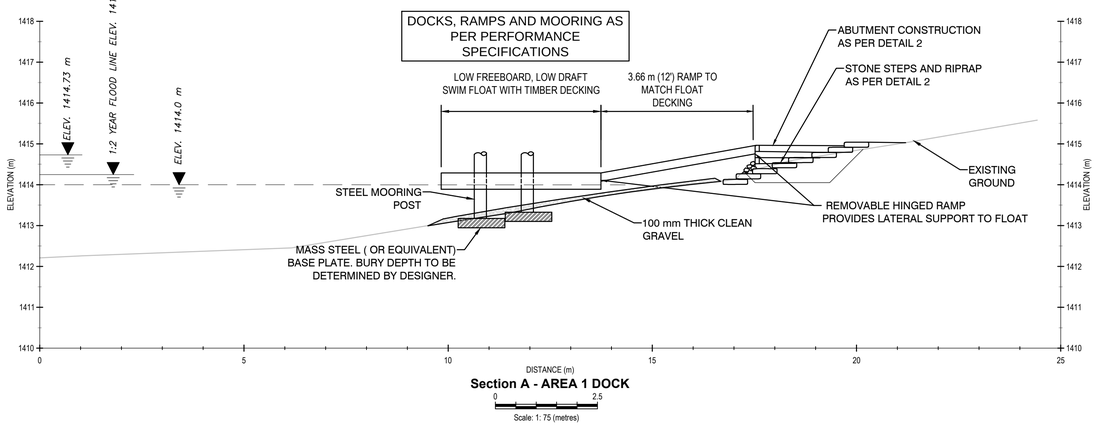


SCOUR/EROSION PROTECTION

3 02 MOORING POST CONCEPT

Scale: 1: 50 (metres)

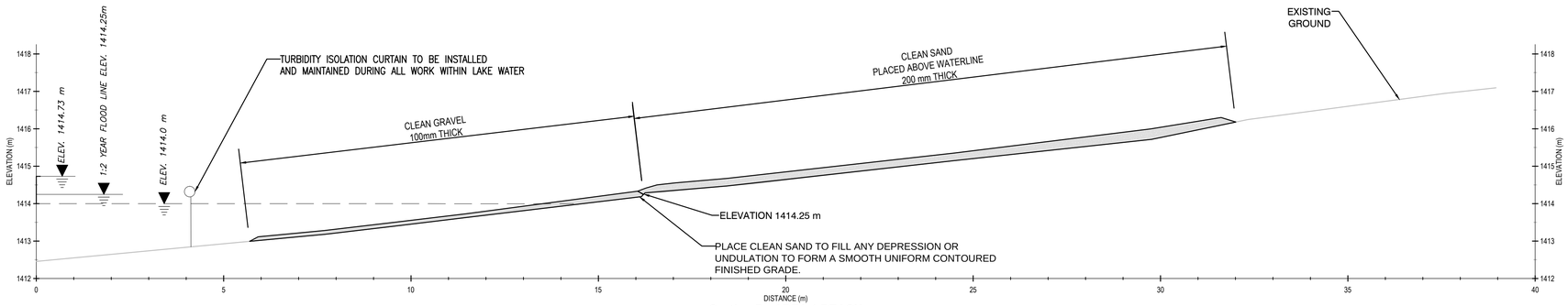




Section A - AREA 1 DOCK

0 2,5

Scale: 1: 75 (metres)



Section B - AREA 1 BEACH

0 2,5

Scale: 1: 75 (metres)

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm

Canada

Parks Canada
Parcs Canada

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

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revisions	description	date

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

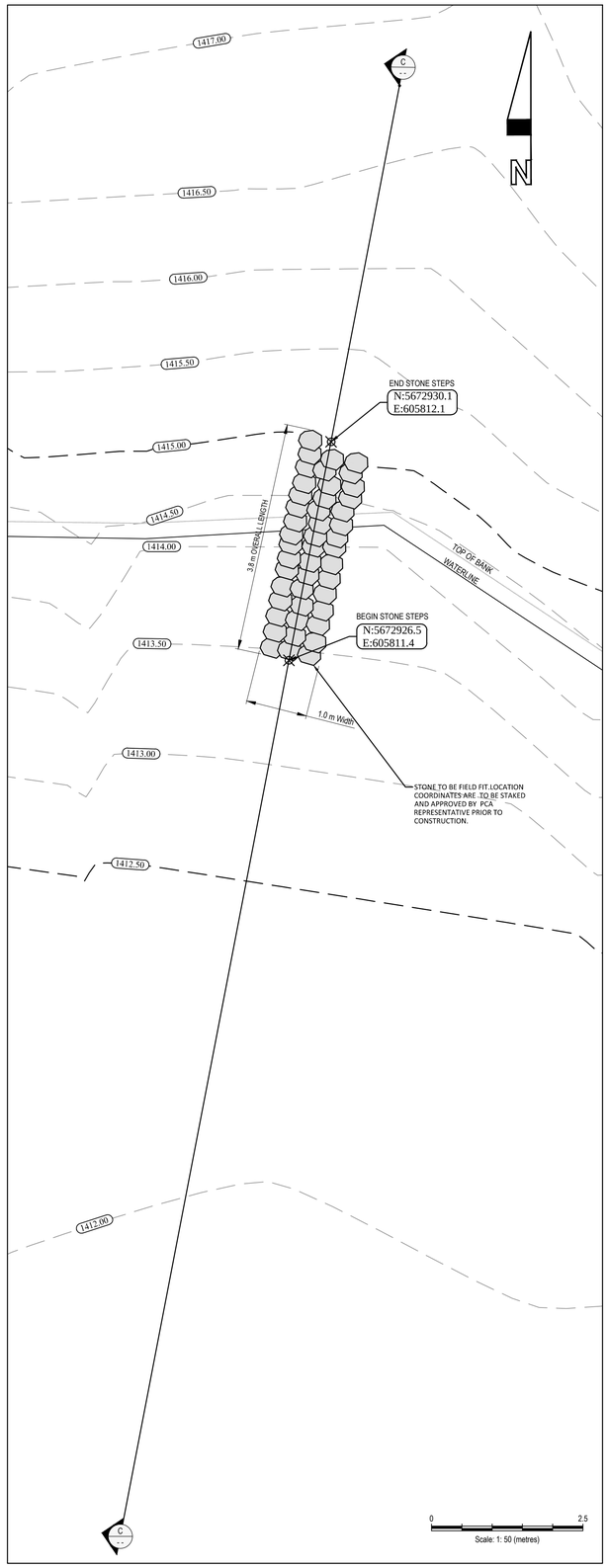
JOHNSON LAKE DOCKS AND BEACH REHABILITATION

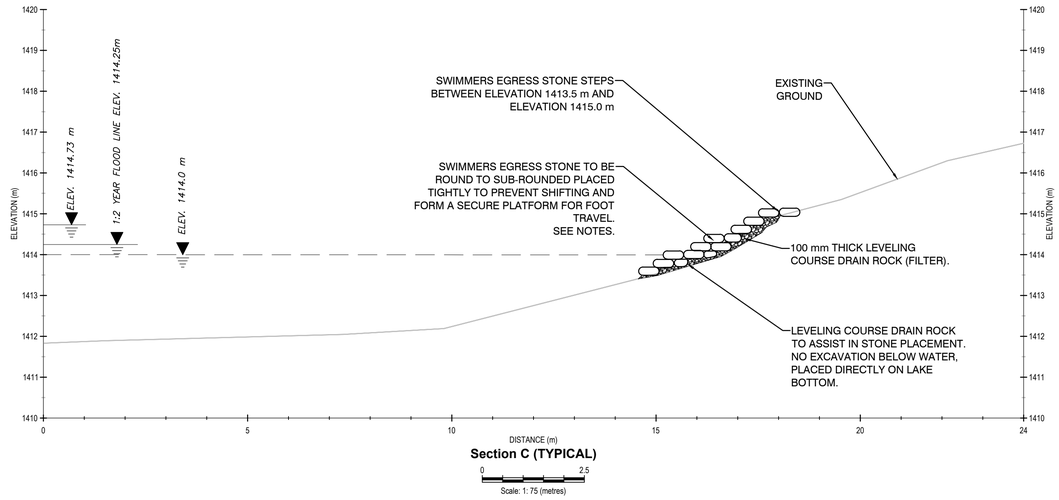
BANFF NATIONAL PARK

drawing / dessin

AREA 1 TYPICAL SECTIONS AND ABUTMENT DETAILS

Designed By / Conçu par	T.HIRSEKORN	
Date	2017/04/27	(yyyy/mm/dd)
Drawn By / Dessiné par	R.HALLEY	
Date	2017/04/27	(yyyy/mm/dd)
Reviewed By / Examiné par	R. EVERTS	
Date	2017/04/27	(yyyy/mm/dd)
Approved By / Approuvé par	T.HIRSEKORN	
Date	2017/04/28	(yyyy/mm/dd)
Tender / Soumission	C.MORTSON	
Project Manager	Administrateur de projets	
Project no. / No. du projet	36161	
Drawing no. / No. du dessin	C-03	





Section C (TYPICAL)

0 2.5

Scale: 1: 75 (metres)

NOTES:

1. STONES WILL BE 100 mm THICK MINIMUM. HORIZONTALLY 350 mm X 350 mm ± 50 mm ON AVERAGE, BUT NOT UNIFORMLY SMALLER. PLACE EACH STONE WITH THE LONGEST AXIS PERPENDICULAR TO THE SHORE AND OVER LAPPING THE STONE BELOW.
2. VEHICLE ACCESS IS NOT AVAILABLE. ACCESS BY FOOT FROM PARKING LOT. TRAIL HAS STEPS AND A SMALL BRIDGE.
3. CONTRACTOR SHALL DETERMINE THE BEST METHOD FOR BRINGING MATERIALS TO SITE AND CONSTRUCTION METHODOLOGY.
4. LOCATION COORDINATES ARE APPROXIMATE. PCA REPRESENTATIVE SHALL SELECT THE LOCATION CLOSE TO PROVIDED COORDINATES.

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm

Canada

Parks Canada
Parcs Canada

LEGEND:

- DECIDUOUS TREE
- SPRUCE TREE
- PINE TREE
- SHRUB/BUSH
- TRUNK DIAMETER ..... TD=0.2
- BUSHLINE
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- MAJOR CONTOUR ELEVATION (m) 1420.0
- MAJOR CONTOUR (PROPOSED)
- CONTOUR ELEVATION (PROPOSED) 1420.00
- PICNIC TABLE (EXISTING)

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

REV0	Issued for Tender	17/04/28
revisions	description	date

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

drawing / dessin

AREA 2
SWIMMERS EGRESS
PLAN VIEW AND
TYPICAL SECTION

Designed By / Date	T.HIRSEKORN 2017/04/27	Conçu par (yyyy/mm/dd)
Drawn By / Date	R.HALLEY 2017/24/27	Dessiné par (yyyy/mm/dd)
Reviewed By / Date	R. EVERTS 2017/04/27	Examiné par (yyyy/mm/dd)
Approved By / Date	T.HIRSEKORN 2017/04/28	Approuvé par (yyyy/mm/dd)
Tender / Project Manager	C.MORTSON	Soumission / Administrateur de projets
Project no.	36161	No. du projet
Drawing no.	C-04	No. du dessin

UNDERGROUND UTILITIES HAVE NOT BEEN SHOWN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND PROTECT ALL EXISTING SERVICES DURING CONSTRUCTION.

CONTRACTOR MUST SATISFY ALL REQUIREMENTS OF GOVERNMENT AGENCIES FOR WORKS IN THE AQUATIC ENVIRONMENT.

OWNER MAY HAVE A REPRESENTATIVE/ENGINEER ON SITE AT ANY TIME TO INSPECT THE WORK. OWNER'S REPRESENTATIVE MAY REJECT WORKS AND APPROVE CHANGES AS NECESSARY.

REPORT ANY DISCREPANCIES IN CONDITIONS OR PROBLEMS WITH CONSTRUCTION TO THE OWNER'S REPRESENTATIVE /ENGINEER IMMEDIATELY.

CONTRACTOR MUST KEEP SITE CLEAN AND FREE OF POTENTIAL HAZARDS.

1. EXCAVATION

1.1. EXCAVATED MATERIAL SHALL BE STOCKPILED FOR REUSE ON SITE.

2. FILL AND BACKFILL PLACEMENT

2.1. PLACEMENT SHALL BE DONE USING METHODS WHICH DO NOT LEAD TO SEGREGATION OR DEGRADATION OF AGGREGATE.

2.2. PLACEMENT OF BEACH SAND IS TO BE PLACED FROM WATERS EDGE PROGRESSING UP SLOPE TO A MINIMUM DEPTH OF 200mm. FILL ANY DEPRESSIONS TO FORM A SMOOTH CONTINUOUS CONTOUR.

2.3. PLACEMENT OF CLEAN GRAVEL IS TO BE PLACED FROM WATERS EDGE PROGRESSING INTO LAKE BOTTOM BY 8.0 M HORIZONTALLY MAINTAINING A MINIMUM DEPTH OF 100mm. FILL ANY DEPRESSIONS TO FORM A SMOOTH CONTINUOUS CONTOUR.

2.4. SHAPE EACH LAYER TO SMOOTH CONTOUR AND COMPACT (IF REQUIRED) TO SPECIFIED PERFORMANCE CRITERIA BEFORE SUCCEEDING LAYER IS PLACED.

2.5. REMOVE AND REPLACE PORTION OF ANY LAYER IN WHICH MATERIAL HAS BECOME SEGREGATED DURING SPREADING.

2.6. FILL PLACEMENT LIFTS SHALL NOT EXCEED 200 MM IN THICKNESS.

2.7. FILL MATERIAL REQUIRING COMPACTIVE EFFORT SHALL BE MOISTURE CONDITIONED TO 5 - 7 % MOISTURE CONTENT AND COMPACTED WITH A MINIMUM 91 KG (200 LB) PLATE COMPACTOR.

2.8. COMPACTOR SHALL BE ALLOWED SUFFICIENT TIME TO EXECUTE A MINIMUM OF SIX (6) COMPLETE PASSES. WITH ONE PASS BEING DEFINED AS ONE COMPLETE FORWARD MOTION AND ONE COMPLETE REVERSE MOTION ALONG THE SAME PATH OF TRAVEL.

2.9. COMPACTION TO BE COMPLETED FOR THE ENTIRE FOOTPRINT OF PLACED FILL AND APPROVED BY A PCA REPRESENTATIVE PRIOR TO PLACEMENT OF THE NEXT LIFT.

2.10. AREAS OF COMPLETED COMPACTION SHALL HAVE NO RUTTING OR OBSERVED DEFLECTION GREATER THAN 10 mm. ANY IDENTIFIED SOFT AREAS MAY REQUIRE FURTHER COMPACTION OR REMOVAL AND REPLACEMENT OF FILL WITHIN IMPACTED AREA.

2.11. MOISTURE CONTENT DETERMINATION IS TO BE CONDUCTED ON A BY MASS PERCENTAGE METHOD USING THE FOLLOWING EQUATION:

MC = ((MASS OF SAMPLE WET - MASS OF SAMPLE DRIED)/ MASS OF SAMPLE DRIED)X100

3. MATERIALS

3.1. ALL FILL AND SPECIFIED MATERIALS INTENDED FOR USE ON SITE SHALL BE SAMPLED AND TESTED, AND RESULTS SUBMITTED FOR ACCEPTANCE BY THE ENGINEER PRIOR TO DELIVERY ON-SITE.

3.2. AGGREGATE SHALL BE DURABLE QUARRIED STONE, HARD, PH NEUTRAL, FREE FROM DIRT, SAND, CLAY AND DEBRIS, AND FREE FROM WEAK JOINTS.

3.3. WHERE THERE IS A DOUBT TO SUITABILITY, DURABILITY WILL BE DETERMINED BY ONE OR MORE OF THE FOLLOWING TESTS AT AN EXPENSE BORNE BY THE CONTRACTOR:

3.3.1. LOS ANGELES ABRASION (ASTM TEST C-535) WITH LOSS OF NOT MORE THAN 15% AFTER 500 REVOLUTIONS.

3.3.2. THE FREEZE/THAW TEST (AASHTO TEST 103 FOR LEDGE ROCK PROCEDURE A) WITH A LOSS NOT EXCEEDING 10% AFTER 12 CYCLES OF FREEZING AND THAWING.

3.3.3. THE SPECIFIC GRAVITY (BULK SATURATED-SURFACE-DRY BASIS, ASTM TEST C127) SHALL BE AT LEAST 2.60.

4. CLEAN GRAVEL (BEACH IN WATER) SHALL CONSIST OF CLEAN ROUND STONE CONFORM TO THE FOLLOWING GRADATION LIMITS:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
75	100
50	70 – 100
25	50 – 90
4.75	22 – 80
2.36	5 – 35
0.075	0 – 2

5. BEACH SAND (BEACH DRY) SHALL CONFORM TO THE FOLLOWING GRADATION LIMITS:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
19	100
4.75	80 – 100
0.6	30 – 85
0.42	10 – 75
0.15	0 – 40
0.074	0 – 4

6. 25 MM MINUS CRUSHED GRAVEL AND SAND (STRUCTURAL FILL) SHALL CONFORM TO THE FOLLOWING GRADATION LIMITS:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
25	100
19	80 – 100
9.5	50 – 85
4.75	35 – 70
2.36	25 – 50
1.18	15 – 35
0.3	5 – 20
0.075	0 – 5

7. DRAIN ROCK TO CONSIST OF CLEAN ANGULAR STONE CONFORMING TO THE FOLLOWING GRADATION LIMITS:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
25	100
19	0 – 100
9.5	0 – 40
4.75	0– 5

8. INFORMAL STONE FACIA AND PATHS;

8.1. STONE MASS TO BE NO LESS THAN, 32 KG.

8.2. THICKNESS OF ANY INDIVIDUAL PIECE OF STONE IS TO BE NO LESS THAN 100 mm (4").

8.3. IN AREAS STONES ARE TO BE USED AS STEPS THE PLATFORM OF EACH STONE IS TO BE NO LESS THAN 300 mm (12") ALONG PATH WITH AN OVER ALL PATH WIDTH WIDTH OF NO LESS THAN 600 mm (24").

8.4. STONE FOR THE PROJECT SHALL BE STOCKPILED AT THE SOURCE OR ON THE SITE FOR INSPECTION PRIOR TO PLACEMENT. STOCKPILE FOR INSPECTION NOT TO CONTAIN LESS THAN THE REQUIRED VOLUME FOR PROJECT.

8.5. STONE NOT CONFORMING TO THE REQUIREMENTS STATED HERE, SHALL BE REMOVED FROM THE PROJECT SITE AT THE EXPENSE OF THE CONTRACTOR.

8.6. DO NOT DROP MATERIAL FROM A HEIGHT GREATER THAN 1.0 m VERTICALLY FROM ITS FINAL POSITION.

8.7. PLACE MATERIAL FROM THE TOE OF SLOPE AND PROCEED UP THE SLOPE.

8.8. THE CONTRACTOR SHALL ENSURE THAT THE FINISHED SURFACE IS COMPRISED OF THE FULL SPECTRUM OF PARTICLE SIZES CONTINUOUSLY THROUGHOUT ITS LENGTH AND BREADTH.

8.9. DRESS ALL VOIDS SO THAT THE FINAL SURFACE IS WELL KEYED, DENSELY PLACED AND UNIFORM. THE ENGINEER WILL REQUIRE THE FILLING OF ALL SURFACE VOIDS INTO WHICH A ROCK HAVING A MASS EQUAL OR GREATER THAN 25% OF THE MAXIMUM STONE MASS CAN BE PLACED.

9. RIPRAP SHALL CONFORM TO THE FOLLOWING GRADATION LIMITS, FROM DSR REPORT BY DESSAU, 2014:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
250	100
230	50 – 100
150	0 – 20

9.1. NEITHER THE BREADTH NOR THE THICKNESS OF ANY INDIVIDUAL PIECE OF RIPRAP IS TO BE LESS THAN 50 PERCENT OF ITS LENGTH.

9.2. RIPRAP FOR THE PROJECT SHALL BE STOCKPILED AT THE SOURCE OR ON THE SITE FOR INSPECTION PRIOR TO PLACEMENT. STOCKPILE FOR INSPECTION NOT TO CONTAIN LESS THAN 13 TONNES OF MATERIAL.

9.3. RIPRAP NOT CONFORMING WITH THE REQUIREMENTS STATED HERE SHALL BE REMOVED FROM THE PROJECT SITE AT THE EXPENSE OF THE CONTRACTOR.

9.4. DO NOT DROP MATERIAL FROM A HEIGHT GREATER THAN 1.0 M VERTICALLY FROM ITS FINAL POSITION.

9.5. PLACE MATERIAL FROM THE TOE OF SLOPE AND PROCEED UP THE SLOPE.

9.6. PLACE MATERIAL SO THAT TO FORM SMOOTH CONTOURING WITH NO PROMINENT LOW AREAS OR HIGH AREAS.

9.7. THE CONTRACTOR SHALL ENSURE THAT THE FINISHED SURFACE IS COMPRISED OF THE FULL SPECTRUM OF PARTICLE SIZES CONTINUOUSLY THROUGHOUT THE LENGTH AN THE BREADTH.

10.NON-WOVEN GEOTEXTILE;

10.1. GEOTEXTILE SHALL BE A NON-WOVEN SYNTHETIC FIBRE FABRIC, SUPPLIED IN ROLLS. NILEX 4510E OR PRE-APPROVED EQUIVALENT.

10.1.1. WIDTH: 3.5 M MINIMUM.

10.1.2. LENGTH: 50 M MINIMUM.

10.1.3. COMPOSED OF:

10.1.3.1. MINIMUM 85% BY MASS OF POLYESTER WITH INHIBITORS ADDED TO BASE PLASTIC TO RESIST DETERIORATION BY ULTRA-VIOLET AND HEAT EXPOSURE FOR 60 DAYS.

10.2. PHYSICAL PROPERTIES:

10.2.1. TENSILE STRENGTH AND ELONGATION (IN ANY PRINCIPAL DIRECTION): TO ASTM D4595.

10.2.2. TENSILE STRENGTH: MINIMUM 1000 N, WET CONDITION.

10.2.3. ELONGATION AT BREAK: MINIMUM 50%.

10.2.4. SEAM STRENGTH: EQUAL TO OR GREATER THAN TENSILE STRENGTH OF FABRIC.

10.3. HYDRAULIC PROPERTIES:

10.3.1. APPARENT OPENING SIZE (AOS): TO ASTM D4751, 0.150 MICROMETRES.

11. ENVIRONMENTAL REQUIREMENTS:

11.1. TURBIDITY ISOLATION CURTAIN TO BE INSTALLED AS PER PCA ENVIRONMENTAL REQUIREMENTS.

11.2. PROVIDE TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES TO PREVENT SOIL EROSION AND DISCHARGE OF SOIL-BEARING WATER RUNOFF OR AIRBORNE DUST TO ADJACENT PROPERTIES AND WALKWAYS, ACCORDING TO PCA ENVIRONMENTAL PROCEDURES.

11.3. INSPECT, REPAIR, AND MAINTAIN EROSION AND SEDIMENTATION CONTROL MEASURES DURING CONSTRUCTION

11.4. REMOVE EROSION AND SEDIMENTATION CONTROLS AND RESTORE AND STABILIZE AREAS DISTURBED DURING REMOVAL.

12.TIMBER FABRICATION AND INSTALLATION

12.1. MATERIALS

12.1.1. TREATED TIMBER AND LUMBER SHALL BE IMPREGNATED WITH PRESERVATIVE SUITABLE FOR SPECIFIED CONSTRUCTION TYPE AND LOCATION.

12.1.2. UNLESS OTHERWISE SPECIFIED, STRUCTURAL STEEL SHAPES, PLATES, AND RODS SHALL NOT BE GALVANIZED. NUTS, DRIFTBOLTS, DOWELS, AND SCREWS SHALL BE EITHER WROUGHT IRON OR STEEL.

12.2. WORKMANSHIP

12.2.1. ALL FRAMING SHALL BE TRUE AND EXACT. TIMBER AND LUMBER SHALL BE ACCURATELY CUT AND ASSEMBLED TO A CLOSE FIT AND SHALL HAVE EVEN BEARING OVER THE ENTIRE CONTACT SURFACE. NO OPEN OR SHIMMED JOINTS WILL BE ACCEPTED. NAILS AND SPIKES SHALL BE DRIVEN WITH JUST SUFFICIENT FORCE TO SET THE HEADS FLUSH WITH THE SURFACE OF THE WOOD. DEEP HAMMER MARKS IN WOOD SURFACES SHALL BE CONSIDERED EVIDENCE OF POOR WORKMANSHIP AND MAY BE SUFFICIENT CAUSE FOR REJECTION OF THE WORK.

12.2.2. HOLES FOR ROUND DRIFTPINS AND DOWELS SHALL BE BORED WITH A BIT 1/16 INCH SMALLER IN DIAMETER THAN THAT OF THE DRIFTPIN OR DOWEL TO BE INSTALLED. THE DIAMETER OF HOLES FOR SQUARE DRIFTPINS OR DOWELS SHALL BE EQUAL TO ONE SIDE OF THE DRIFTPIN OR DOWEL. HOLES FOR LAG SCREWS SHALL BE BORED WITH A BIT NOT LARGER THAN THE BODY OF THE SCREW AT THE BASE OF THE THREAD.

12.2.3. WASHERS SHALL BE USED IN CONTACT WITH ALL BOLT HEADS AND NUTS THAT WOULD OTHERWISE BE IN CONTACT WITH WOOD. CAST IRON WASHERS SHALL BE USED WHEN THE BOLT WILL BE IN CONTACT WITH EARTH. ALL NUTS SHALL BE CHECKED OR BURRED EFFECTIVELY WITH A POINTED TOOL AFTER FINALLY TIGHTENED.

12.2.4. UNLESS OTHERWISE SPECIFIED, SURFACING, CUTTING, AND BORING OF TIMBER AND LUMBER SHALL BE COMPLETED BEFORE TREATMENT. IF FIELD CUTTING OR FIELD REPAIR OF TREATED TIMBER AND LUMBER IS APPROVED, ALL CUTS AND ABRASIONS SHALL BE CAREFULLY TRIMMED AND COATED WITH APPROVED PRESERVATIVE. THE TREATMENT PRESERVATIVE SHALL BE APPLIED ACCORDING TO THE PRODUCT LABEL. ANY EXCESS PRESERVATIVE NOT ABSORBED BY THE WOOD MEMBER SHALL BE CLEANED FROM THE SURFACE PRIOR TO THE USE OF THE MEMBER. AFTER TIMBER ASSEMBLY, ANY UNFILLED HOLES SHALL BE PLUGGED WITH TIGHTLY FITTING WOODEN PLUGS THAT HAVE BEEN TREATED WITH PRESERVATIVE AS SPECIFIED.

12.3. HANDLING AND STORING MATERIAL

ALL TIMBER AND LUMBER STORED AT THE SITE OF THE WORK SHALL BE NEATLY STACKED ON SUPPORTS A MINIMUM OF 12 INCHES ABOVE THE GROUND SURFACE AND PROTECTED FROM THE WEATHER BY SUITABLE COVERING(S). UNTREATED MATERIAL SHALL BE STAKED AND STRIPPED TO PERMIT FREE CIRCULATION OF AIR BETWEEN THE TIERS AND COURSES. TREATED TIMBER MAY BE CLOSE-STAKED. THE GROUND SURFACE FOR THE STOCKPILE OF TIMBER AND LUMBER SHALL BE FREE OF WEEDS AND RUBBISH. THE USE OF CANT HOOKS, PEAVIES, OR OTHER POINTED TOOLS EXCEPT END HOOKS IS NOT PERMITTED IN THE HANDLING OF STRUCTURAL TIMBER AND/OR LUMBER. TREATED TIMBER SHALL BE HANDLED WITH ROPE SLINGS OR BY OTHER METHODS THAT PREVENT THE BREAKING OR BRUISING OF OUTER FIBERS OR PENETRATION OF THE SURFACE IN ANY MANNER.

13. ACCESS DEVELOPMENT

13.1. THE CONTRACTOR SHALL DEVELOP ACCESS TO THE SITE TO FACILITATE CONSTRUCTION AS INDICATED IN THESE SPECIFICATIONS AND ON THE CONTRACT DRAWINGS. THE CONTRACTOR IS FULLY RESPONSIBLE FOR THE SELECTION AND IMPLEMENTATION OF ALL METHODS TO ACCOMPLISH THIS REQUIREMENT. THE CONTRACTOR IS REQUIRED TO DEVELOP ACCESS TO THE SITE WITHIN THE ZONES INDICATED ON THE CONTRACT DRAWINGS. THE LOCATIONS AND METHODS USED TO DEVELOP ACCESS SHALL BE REVIEWED AND ACCEPTED BY THE PCA REPRESENTATIVE PRIOR TO IMPLEMENTATION.

13.2. THE CONTRACT DRAWINGS INCLUDE CONCEPTUAL ACCESS POINTS, RAMPS AND ROADS ALONG WITH MAXIMUM LIMITS. THIS INFORMATION HAS BEEN REVIEWED BY THE PCA BUT PROVIDED TO THE CONTRACTOR FOR CONSIDERATION ONLY. THE CONTRACTOR MAY CHOOSE TO ADOPT THIS APPROACH OR ALTER AS DEEMED APPROPRIATE. REGARDLESS OF THE APPROACH TAKEN, THE CONTRACTOR REMAINS RESPONSIBLE FOR ACHIEVING THE STATED OBJECTIVES FOUND IN THE PROJECTS - ENVIRONMENTAL PROTECTION AND SHALL COMPLY WITH ALL APPROVAL REQUIREMENTS OF THE REGULATORY AGENCIES.

13.3. THE COMPLETION OF THE WORKS WILL LIKELY CAUSE DISTURBANCE OF SOME EXISTING TREES AND BRUSH. THE INTENT IS TO NOT REMOVE ANY TREES AND BRUSH IN ORDER TO FACILITATE THE WORK. PRIOR TO STARTING WORK, CONTRACTOR IS TO REVIEW SITE WITH PCA REPRESENTATIVE TO IDENTIFY ANY POSSIBLE DAMAGE THAT MAY BE CAUSED TO NATIVE VEGETATION AND PROPOSE MEASURES TO MITIGATE POSSIBLE DAMAGE. THESE MEASURE ARE TO BE APPROVED BY THE PCA REPRESENTATIVE PRIOR TO COMMENCEMENT OF WORK.

13.4. KEEP PAVEMENT AND AREA ADJACENT TO SITE CLEAN AND FREE FROM EXCESSIVE MUD, DIRT, AND DEBRIS AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CLEANUP.

14.RESTORATION

14.1. REMOVE ACCESS POINTS, ROADS, PADS, AND ALL OTHER WORKS INSTALLED DURING ACCESS DEVELOPMENT (INCLUDING THOSE SHOWN ON CONTRACT DRAWINGS). RE-INSTATE THE WORK SITE TO A CONDITION EQUAL TO OR BETTER THAN THE SITE CONDITION PRIOR TO CONSTRUCTION BY:

14.1.1. RESTORING ORGANIC SOILS (IF REMOVED DURING ACCESS DEVELOPMENT).

14.1.2. ELIMINATING UNEVEN AREAS AND LOW SPOTS.

14.1.3. RESTORING DRAINAGE PATTERNS.

14.1.4. REMOVAL OF ALL GRAVELS, OTHER MATERIALS, OR STRUCTURES PLACED TO CREATE ACCESS POINTS, ROADS OR PADS. DISPOSE OF GRAVELS, OTHER MATERIALS, OR STRUCTURES AT AND OFF-SITE DISPOSAL FACILITY ACCEPTABLE TO THE PCA REPRESENTATIVE.

14.1.5. REPLACEMENT OF ALL TEMPORARY EXCAVATED MATERIALS INCLUDING STRIPPING. RETURN GROUND BACK TO ORIGINAL CONTOUR ELEVATIONS OR AS PRE-APPROVED BY THE DEPARTMENTAL REPRESENTATIVE.

14.1.6. LEVELING AND SEEDING ALL DISTURBED AREAS WITH NATIVE GRASS SEED SPECIES MIXTURE IN ACCORDANCE WITH BANFF NATIONAL PARK, AND APPROVED BY PCA REPRESENTATIVE.

Canada

Parks Canada
Parcs Canada

LEGEND:

DECIDUOUS TREE

SPRUCE TREE

PINE TREE

SHRUB/BUSH

TRUNK DIAMETER TD=0.2

BUSHLINE

MAJOR CONTOUR (EXISTING)

MINOR CONTOUR (EXISTING)

MAJOR CONTOUR ELEVATION (m) 1420.0

MAJOR CONTOUR (PROPOSED)

CONTOUR ELEVATION (PROPOSED) 1420.00

PICNIC TABLE (EXISTING)

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

REV0	Issued for Tender	17/04/28
revisions	description	date

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

drawing / dessin

CONSTRUCTION NOTES AND SPECIFICATIONS

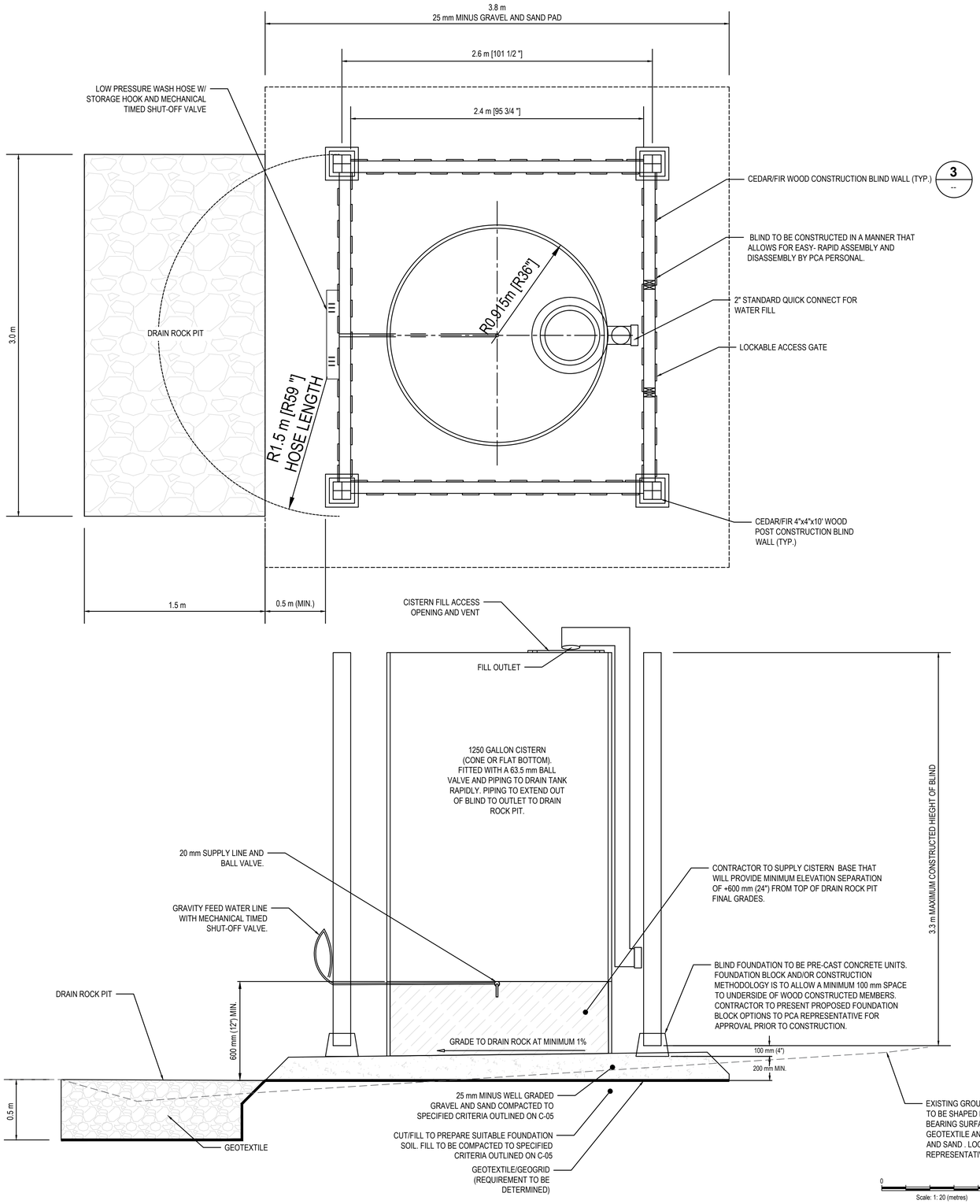
Designed By	T.HIRSEKORN	Conçu par
Date	2017/04/27	(yyyy/mm/dd)
Drawn By	R.HALLEY	Dessiné par
Date	2017/04/27	(yyyy/mm/dd)
Reviewed By	R. EVERTS	Examiné par
Date	2017/04/27	(yyyy/mm/dd)
Approved By	T.HIRSEKORN	Approuvé par
Date	2017/04/28	(yyyy/mm/dd)
Tender	C.MORTSON	Soumission
Project Manager		Administrateur de projets

Project no. / No. du projet: 36161

Drawing no. / No. du dessin: C-05

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm



3 BLIND TEXTURE
N.T.S.

NOTES:

1. DISTANCES AND ELEVATIONS ARE IN METRES.
2. ALL ELEMENTS OF THE COMPLETE WASH STATION SHOWN ON THIS SHEET, SUCH AS THE CISTERN, STRUCTURAL SUPPORTS, HOSE, TIMED SHUT OFF VALVE, EARTHWORKS AND BLIND WALL COMPONENTS, ARE TO BE PROPOSED AS A COMPLETE, FUNCTIONING PACKAGE BY THE CONTRACTOR AS PER PERFORMANCE SPECIFICATIONS.

Canada

Parks Canada
Parcs Canada

LEGEND:

- DECIDUOUS TREE
- SPRUCE TREE
- PINE TREE
- SHRUB/BUSH
- TRUNK DIAMETER ..... TD=0.2
- BUSHLINE
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- MAJOR CONTOUR ELEVATION (m) 1420.0
- MAJOR CONTOUR (PROPOSED)
- CONTOUR ELEVATION (PROPOSED) 1420.00
- PICNIC TABLE (EXISTING)

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

REV0	Issued for Tender Review	17/04/28
revisions	description	date

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

drawing / dessin

PARKING AREA
WASH STATION
PLAN AND ELEVATION

Designed By / Date	T.HIRSEKORN 2017/04/27	Conçu par (yyyy/mm/dd)
Drawn By / Date	R.HALLEY 2017/04/27	Dessiné par (yyyy/mm/dd)
Reviewed By / Date	R. EVERTS 2017/04/27	Examiné par (yyyy/mm/dd)
Approved By / Date	T.HIRSEKORN 2017/04/28	Approuvé par (yyyy/mm/dd)
Tender / Project Manager	C.MORTSON	Soumission / Administrateur de projets

Project no. / No. du projet: 36161

Drawing no. / No. du dessin: S-01

Attachment 2

Fisheries and Oceans Canada, Paragraph 35(2)(b) Fisheries Act Authorization

PARAGRAPH 35(2)(*b*) *FISHERIES ACT* AUTHORIZATION

Authorization issued to
Parks Canada Agency (PCA) (*hereafter referred to as the "Proponent"*)

Attention to: Bill Hunt
Box 900,
Banff AB, T1L 1K2

Location of Proposed Project
[*Information provided by the proponent, as required in their application for authorization*]

Nearest community (city, town, village): Banff
Municipality, district, township, county:
Province: Alberta
Name of watercourse, waterbody: Johnson Lake
Longitude and latitude, UTM Coordinates: 11U 605978E, 5672974N

Description of Proposed Project

The proposed project of which the work, undertaking or activity authorized is a part involves:

The complete removal of fish from Johnson Lake, the Johnson Lake inflow stream, and the upstream pond using gillnets, electrofishing and mechanical dewatering for the purpose of managing Whirling disease (*Myxobolus cerebralis*is) within Banff National Park.

Description of Authorized work(s), undertaking(s) or activity(ies) likely to result in serious harm to fish

The work(s), undertaking(s), or activity(ies) associated with the proposed project described above, that are likely to result in serious harm to fish, are:

The humane destruction of all fish in Johnson Lake, the temporary dewatering of the lake by surface pumping and bypassing of the inflow stream to the western outlet channel by means of a temporary diversion channel or flume.

The placement of sand on the public beaches and below the highwater mark to prevent visitors from contacting muddy sediment and transporting it from the lake.

The serious harm to fish likely to result from the proposed work(s), undertaking(s), or activity(ies), and covered by this authorization includes:

- The permanent alteration of this project will be limited to the full extent of Johnson Lake (15.6 ha) and the upstream pond (2.9 ha) for the fall and winter of 2017-18;
- Permanent alteration of 420m^2 from the placement of sand on the public beaches below the highwater mark.
- Death of fish of all fish within Johnson Lake and the upstream pond; and

- Construction of a fish barrier on the western outflow of Johnson Lake to prevent the recolonization of Johnson Lake by fish from the Cascade River downstream.

Conditions of Authorization

The above described work, undertaking or activity that is likely to result in serious harm to fish must be carried on in accordance with the following conditions.

1. **Conditions that relate to the period during which the work, undertaking or activity that will result in serious harm to fish can be carried on**

   The work, undertaking or activity that results in serious harm to fish is authorized to be carried on during the following period:

   From: Date of Issuance to May 1, 2018.

   If the Proponent cannot complete the work, undertaking or activity during this period, Fisheries and Oceans Canada (DFO) must be notified in advance of the expiration of the above time period. DFO may, where appropriate, provide written notice that the period to carry on the work, undertaking or activity has been extended.

   The periods during which other conditions of this authorization must be complied with are provided in their respective sections below. DFO may, where appropriate, provide written notice that these periods have been extended, in order to correspond to the extension of the period to carry on a work, undertaking, or activity.

2. **Conditions that relate to measures and standards to avoid and mitigate serious harm to fish**

2.1 Sediment and erosion control: Sediment and erosion control measures must be in place and shall be upgraded and maintained, such that release of sediment is avoided at the location of the authorized work, undertaking, or activity as per Parks Canada's Environmental Impact Assessment.

2.2 List of measures and standards to avoid and mitigate serious harm to fish:

2.2.1 The intake of the pumps will be fitted with an appropriate sized screen based on direction from the Department of Fisheries and Oceans Freshwater Intake End-of-Pipe Fish Screen Guideline manual (1995).

2.2.2 Standard methodologies to prevent erosions on the downstream end of the pumps outflows will be used such as ground surface deflectors and/or aerators on the outflow ends.

2.2.3 Live fish removed from nets or electrofished will be humanely euthanized. Different options, all consistent with Canadian Animal Care Guidelines and the Best Practices: for the Capture and Handling of Fishes for Aquatic Resource Management in the Mountain National Parks exist depending on the size of fish.

2.2.4 Johnson Lake will be allowed to refill naturally in spring of 2018.

2.2.5 As the objective of the project is the complete removal and destruction of fish from Johnson Lake no additional mitigation measures are required other than standard mitigation measures for the protection of fish habitat.

2.3 Contingency measures: Work stoppages and cessation of pumping activities shall be put in place if monitoring required in condition 3 below indicates that the measures and standards to avoid and mitigate serious harm to fish are not successful.

2.4 Dates by which these measures and standards shall be implemented: Measures and standards to avoid and mitigate serious harm to fish shall be implemented by: May 1, 2018.

3. **Conditions that relate to monitoring and reporting of measures and standards to avoid and mitigate serious harm to fish**

3.1 Monitoring of avoidance and mitigation measures: The Proponent shall monitor the implementation of avoidance and mitigation measures referred to in section 2 of this authorization and report to DFO, by April 1, 2018 and indicate whether the measures and standards to avoid and mitigate serious harm to fish were conducted according to the conditions of this authorization. This shall be done, by:

3.1.1 Demonstration of effective implementation and functioning: Providing dated photographs and inspection reports to demonstrate effective implementation and functioning of mitigation measures and standards described above to limit the serious harm to fish to what is covered by this authorization.

3.1.2 Contingency measures: Providing details of any contingency measures that were followed, to prevent impacts greater than those covered by this authorization in the event that mitigation measures did not function as described.

3.2 Other monitoring and reporting conditions: During the pumping operations and bridge installation, turbidity will be monitored downstream in accordance with the methods outlined in the Parks Canada Sediment Monitoring for In-stream Works Protocol (Carli and Dickinson 2014) to confirm that mitigation strategies for preventing sedimentation are functioning as intended and guide adjustments as required.

4. **Conditions that relate to the offsetting of the serious harm to fish likely to result from the authorized work, undertaking or activity**

4.1 Letter of credit: N/A

4.2 Scale and description of offsetting measures: Parks Canada Agency shall stock Longnose Sucker in Johnson Lake once Parks Canada Agency has determined Whirling disease (*Myxobolus cerebralis*is) is no longer present in the lake.

4.3 Offsetting criteria to assess the implementation and effectiveness of the offsetting measures: All fish habitat offsetting measures shall be completed and functioning according to the criteria below; Longnose sucker populations/biomass will be monitored for success. A series of transects will be established on Johnson Lake and a Biosonics DT-X hydroacoustic echosounder will be used to measure longnose sucker abundance.

4.4 Contingency measures: If the results of monitoring as required in condition 5 indicate that the offsetting measures are not completed by the date specified and/or are not functioning according to the above criteria in 4.3, the Proponent shall give written notice to DFO and shall implement the contingency measures and associated monitoring measures, as contained within the approved offsetting plan (attached to this authorization or referenced in section 4.2), to ensure the implementation of the offsetting measures is completed and/or functioning as required by this authorization.

4.5 Scale and description of contingency measures: Stocking of Longnose Sucker shall continue until the conditions in condition 4.3 are met.

4.6 Monitoring measures to ensure offsetting contingency is completed and/or functioning as required: See condition 4.3.

4.7 The Proponent shall not carry on any work, undertaking or activity that will adversely disturb or impact the offsetting measures.
4.8 Other conditions related to offsetting: N/A

5. **Conditions that relate to monitoring and reporting of implementation of offsetting measures (described above in section 4):**

5.1 Schedule(s) and criteria: The Proponent shall conduct monitoring of the implementation of offsetting measures according to the approved timeline and criteria below:

5.1.1 List of timeline(s) and monitoring and reporting criteria:

5.1.1.1 A record of the death of fish shall be kept by the proponent and shall document: the numbers of individuals of each life stage of each species; the lengths, and weights of fish; aging data; and water quality data.
5.1.1.2 Stocking of Longnose Sucker (*Catostomus catostomus*) shall be undertaken at Johnson Lake once Parks Canada Agency has determined Whirling disease (*Myxobolus cerebralisis*) no longer present in the lake.

5.2 List of reports to be provided to DFO: The Proponent shall report to DFO on whether the offsetting measures were conducted according to the conditions of this authorization by providing the following:
5.2.1.1 A written report documenting the death of fish as described in condition 5.1.1.1 is to be submitted to DFO on or before December 31, 2018.
5.2.1.2 A written report documenting the offsetting criteria to assess the implementation and effectiveness of the offsetting measures as described under condition 5.1.1.2 is to be provided to DFO annually following the commencement of the stocking program until such a time as the criteria under condition 4.3 are met as determined by DFO.
5.2.1.3 The proponent shall report to DFO on whether offsetting measures were conducted according to the conditions of this Authorization on or before December 31, of each year until the offsetting requirements have been suitably met as per condition 5.2.2.
5.2.1.4 Other monitoring and reporting conditions for offsetting: N/A

Authorization Limitations and Application Conditions

The Proponent is solely responsible for plans and specifications relating to this authorization and for all design, safety and workmanship aspects of all the works associated with this authorization.

The holder of this authorization is hereby authorized under the authority of Paragraph 35(2)(*b*) of the *Fisheries Act*. R.S.C., 1985, c.F. 14 to carry on the work(s), undertaking(s) and/or activity(ies) that are likely to result in serious harm to fish as described herein. This authorization does not purport to release the applicant from any obligation to obtain permission from or to comply with the requirements of any other regulatory agencies.

This authorization does <u>not</u> permit the deposit of a deleterious substance in water frequented by fish. Subsection 36(3) of the *Fisheries Act* prohibits the deposit of any deleterious substances into waters frequented by fish unless authorized by regulations made by Governor in Council.

This authorization does not permit the killing, harming, harassment, capture or taking of individuals of any aquatic species listed under the *Species at Risk Act* (SARA) (s. 32 of the SARA), or the damage or destruction of residence of individuals of such species (s. 33 of the SARA) or the destruction of the critical habitat of any such species (s. 58 of the SARA).]

At the date of issuance of this authorization, no individuals of aquatic species listed under the *Species at Risk Act* (SARA) were identified in the vicinity of the authorized works, undertakings or activities.

The failure to comply with any condition of this authorization constitutes an offence under Paragraph 40(3)(*a*) of the *Fisheries Act* and may result in charges being laid under the *Fisheries Act*.
This authorization must be held on site and work crews must be made familiar with the conditions attached.

This authorization cannot be transferred or assigned to another party. If the work(s), undertaking(s) or activity(ies) authorized to be conducted pursuant to this authorization are expected to be sold or transferred, or other circumstances arise that are expected to result in a new Proponent taking over the work(s), undertaking(s) or activity(ies), the Proponent named in this authorization shall advise DFO in advance.

Date of Issuance: 1 May 2017

Approved by:
Dale Nicholson
Regional Director General
Central and Arctic Region
Fisheries and Oceans Canada

Attachment 3

Best practices: the capture and handling of fishes for aquatics resource management in the mountain national parks

Attachment 4

Whirling Disease Decontamination Protocol for Parks Canada Resource Conservation Management and External Consultants

Banff
National Park

Whirling Disease in Banff National Park, Alberta

A Decontamination Protocol for Parks Canada Resource Conservation Management and External Consultants

Approved by:

_____

Date: updated 08 May 2017

Bill Hunt
Resource Conservation Manager, Banff Field Unit, Parks Canada.

Contents

Whirling Disease in Banff National Park, Alberta

A Decontamination Protocol for Parks Canada Resource Conservation Management and External Consultants

This decontamination protocol has been developed to prevent the spread of aquatic invasive species (AIS), with special consideration to Myxobolus cerebralis, the causative agent for whirling disease. This protocol has been adopted by all resource officers and external aquatic resource technicians working in Banff National Park.

1.0 Background

Whirling disease is caused by the non-native parasite *Myxobolus cerebralis*. It can cause significant declines in salmonid populations due to deformation, reduced fitness, and/or death of infected fish. Several important salmonid populations exist in Banff National Park (BNP) including westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) which is listed as threatened by the *Species at Risk Act* (SARA). Native bull trout (*Salvelinus confluentus*) are also listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Whirling disease has been detected in various locations throughout the Bow River watershed. To prevent the spread of the disease, an effective decontamination protocol must be implemented.

2.0 Sampling strategy

When sampling multiple sites in one day, sample locations must always be completed in an upstream to downstream manner. If the upper most sites are already infected with an AIS it will likely spread downstream on its own. However, if the upper most reaches are not infected, starting with clean equipment will maintain that status.

All waters within BNP have been delineated into distinct decontamination zones. When sampling multiple sites within a decontamination zone, the decontamination of equipment is not required between sites if sampling within the same day. However, the decontamination protocol must be followed if sampling between multiple decontamination zones within the same day. Furthermore, the decontamination protocol must be followed at the completion of each day regardless of where sampling will occur the following day. The purpose of decontaminating each day, regardless of the following days objectives, is to eliminate subjective decision making by technicians on the ground.

Each decontamination zone will be comprised of a third-order stream and its associated tributaries. Fourth and fifth order streams, including their respective first and second order tributaries, will be considered their own decontamination zone. A separate decontamination zone will apply to all isolated water bodies. See map below for an example. More information available in Appendices F and G.

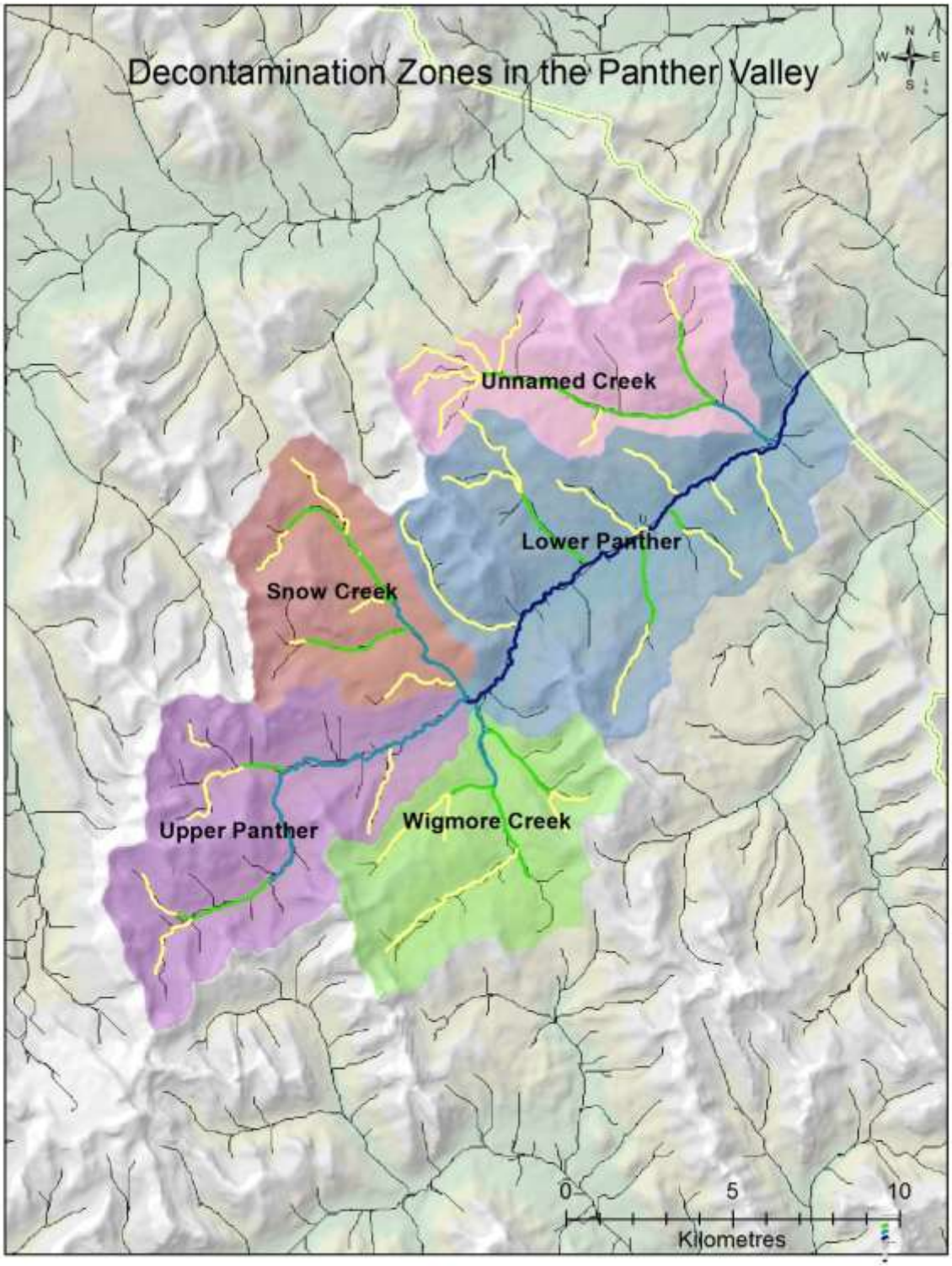


Figure 1. Third order streams, Upper Panther River, Snow Creek, Wigmore Creek, and Unnamed Creek, are broken up into separate decontamination zones. The Lower Panther River, a fourth order stream and its associated first and second order tributaries, are a separate decontamination zone.

3.0 Protocols

3.1 Waders and wading boots

When moving between decontamination zones within the same day and following each day in the field:

1. Rinse waders and wading boots in the water course to remove any organic material or mud upon completion of sampling. If no clean water is available on site:
    a. Use clean water back at base to rinse and/or scrub gear. This water MUST be decontaminated with a 2000ppm QAC solution after use.
    b. Do not rinse potentially contaminated gear in the sink, rather, use a large Rubbermaid tote.
2. Place rinsed waders and wading boots inside a sealed plastic bag or plastic tote. NEVER place waders or wading boots inside the vehicle as floor mats can become contaminated.
3. Once back at the compound, remove waders and wading boots from sealed bag/tote and place in a tub of **2000ppm Quaternary Ammonia Compounds (QAC) solution for 10min**. (See Appendix for QAC mixing concentrations).
4. Thoroughly rinse waders and wading boots in a clean water bath or sink.
5. Hang waders and wading boots to dry in a well-ventilated area. Wading boots may also be placed on boot drying racks to help ensure thorough drying. Once dry, they must be kept dry for at least **48 hours** before being used again.

A single pair of waders or wading boots must NOT be used on consecutive sampling days. They will be rotated to allow sufficient drying time.

3.2 YSI or equivalent sondes

When moving between decontamination zones within the same day and following each day in the field:

1. Rinse YSI sondes in the water course to remove any organic material upon completion of sampling.
2. Place rinsed YSI in a sealed plastic bag or plastic tote.
3. Once back at the compound, remove YSI from sealed bag/tote and place entire sonde and cord (connected to unit) in a tub of **2% bleach for 10min**. Be sure to remove calibration cup to expose probes.
4. Thoroughly rinse YSI in a clean water bath or sink.
5. Replace calibration cup with clean pH 4 solution (ProDSS, ProPlus), water (EXO), or damp sponge (6-series) and reinstall on YSI.

Sondes may be used the following day after decontamination without extended drying.

3.3 Electrofishers

When moving between decontamination zones within the same day and following each day in the field:

1. Rinse all electrofishing equipment in the watercourse to remove all organic material upon completion of sampling.
2. The cathode and anode will be removed from the main electrofisher unit and placed in a sealed plastic tote along with any gloves or nets that were used in the water.
3. Once back at the compound, remove cathode and anode from sealed tote and place in a tub of **2000ppm QAC solution for 10min**. Ensure that the electrical connections at the ends of both the cathode and anode are NOT exposed to QAC solution. If main electrofisher unit was immersed in water, wipe thoroughly with a 2000ppm QAC solution.
4. Thoroughly rinse all electrofishing equipment in a clean water bath or sink.
5. Dry all electrofishing equipment overnight.

Electrofishers may be used the following day after decontamination without extended drying.

3.4 Electrofishing nets

When moving between decontamination zones within the same day and following each day in the field:

1. Rinse all electrofishing nets in the watercourse to remove all organic material upon completion of sampling.
2. Place rinsed electrofishing nets in a sealed plastic bag or plastic tote.
3. Once back at the compound, remove electrofishing nets from sealed bag/tote and place in a tub of **2000ppm QAC solution for 10min.**
4. Thoroughly rinse electrofishing nets in a clean water bath or sink.
5. Electrofishing nets will be hung to dry. Once dry, they must be kept dry for at least **48 hours** before being used again.

Electrofishing nets must NOT be used on consecutive days of sampling (i.e. replicate items are needed).

3.5 Electrofishing gloves

When moving between decontamination zones within the same day and following each day in the field:

1. Electrofishing gloves are unable to withstand chemical disinfectant or hot wash. Extra diligence must be used to ensure thorough drying of all electrofishing gloves.
2. Rinse all electrofishing gloves in the watercourse to remove all organic material upon completion of sampling.
3. Place rinsed electrofishing gloves in a sealed plastic bag or plastic tote.
4. Due to chemical degradation of rubber, **do NOT place electrofishing gloves in QAC solution. Hang all gloves to dry.**

5. Once dry, they must be kept dry for at least **48 hours** before being used again.

Electrofishing gloves must NOT be used on consecutive days of sampling (i.e. replicate items are needed).

3.6 CABIN/invertebrate sampling equipment (dip-nets, velocity meter, sieve, zooplankton nets)

When moving between decontamination zones within the same day and following each day in the field:

1. Rinse all CABIN/invertebrate sampling equipment in the watercourse to remove all organic material upon completion of sampling.
2. Place rinsed CABIN/invertebrate sampling equipment in a sealed plastic bag or plastic tote.
3. Once back at the compound, remove CABIN/invertebrate sampling equipment from sealed bag/tote and place in a tub of **2000ppm QAC solution for 10min**.
4. Thoroughly rinse all CABIN/invertebrate sampling equipment in a clean water bath or sink.
5. CABIN/invertebrate sampling equipment will be hung to dry. Once dry, they must be kept dry for at least **48 hours** before being used again.

CABIN/invertebrate sampling equipment must NOT be used on consecutive days of sampling (i.e. replicate items are needed).

3.7 Sediment coring equipment (Glew-corer, extruding stands, tubes)

When moving between decontamination zones within the same day and following each day in the field:

1. Rinse all sediment coring equipment in the watercourse to remove all organic material, upon completion of sampling.
2. Place rinsed sediment coring equipment in a sealed plastic bag or plastic tote.
3. Once back at the compound, remove sediment coring equipment from sealed bag/tote and place in a tub of **2000ppm QAC solution for 10min**.
4. Thoroughly rinse all sediment coring equipment in a clean water bath or sink.
5. Dry all sediment coring equipment overnight.

Sediment coring equipment may be used the following day after decontamination.

3.8 Metal/fiberglass watercraft

When moving between decontamination zones within the same day and following each day in the field:

1. Metal/fiberglass watercraft will be scrubbed to remove all organic material, upon completion of sampling.
2. Once back at the compound, hot-wash metal/fiberglass watercraft with **90°C water for 15min**. Expose all surfaces to the hot water, including propellers, engines, oars, etc.

3. Dry all metal/fiberglass watercraft. Once dry, they must be kept dry for at least **48 hours** before being used again.

Metal/fiberglass watercraft does NOT need to be decontaminated daily if it is used at the same location and stored on-site.

3.9 Inflatable rafts (Alpacka rafts, Zodiacs, etc.)

When moving between decontamination zones within the same day and following each day in the field:

1. Rinse inflatable rafts in the water course to remove any organic material, upon completion of sampling.
2. Place rinsed inflatable raft in a sealed plastic bag or tote.
3. Once back at the compound, remove inflatable raft from sealed bag/tote and place in a tub of **2000ppm QAC solution for 10min**.
4. Thoroughly rinse inflatable raft in a clean water bath or sink.
5. Inflate raft, hang, and allow to dry. Once dry, they must be kept dry for at least **48 hours** before being used again.

Inflatable rafts must not be used on consecutive sampling days (replicate items are needed).

3.10 Gill netting equipment (gill nets, SPIN nets, rope)

When moving between decontamination zones within the same day and following each day in the field:

1. Rinse gill netting equipment in the water course to remove any organic material, upon completion of sampling.
2. Place rinsed gill netting equipment in a sealed plastic bag or plastic tote.
3. Remove gillnet equipment from sealed tote and place in a tub of **2000ppm QAC solution for 10min.**
4. Thoroughly rinse all gill net equipment in a clean water bath or sink.
5. Gillnet equipment will be hung to dry. Once dry, gillnetting equipment must be kept dry for at least **48 hours** before being used again.

Metal/fiberglass watercraft does NOT need to be decontaminated daily if it is used at the same location and stored on-site.

APPENDIX A: Interim Alternative to QAC

If QACs are unavailable or if disposal of QACs poses a problem for local wastewater departments, a 2% Bleach solution for 10min can be substituted. Due to reduced effectiveness of bleach on aquatic invasive organisms relative to QACs, gear and equipment must be dry for a minimum of **72 hours** before being used again**.**

APPENDIX B: How to determine dilution of quaternary ammonium compounds (QAC)

Quat Plus- 4.8% active QAC concentration
4.8%*10000ppm/%= 48000ppm active QAC concentration
C1V1=C2V2
C1=initial concentration
V1=initial volume
C2=final concentration
V2=final volume

$$\frac{C1V2}{C2} = V1$$

$$\frac{(48000ppm)*V1}{} = (2000ppm)*1.0L$$

$$\frac{(2000ppm)*(1.0L)}{(48000ppm)} = V1$$

0.042L or 42mL of stock solution = V1
Pour 42mL of Quat Plus into 958mL of water for a final volume of 1000mL of 2000ppm QAC solution.
A 2000ppm QAC solution will remain stable for a one week period, depending on organic load. **REPLACE** solution every week and test QAC concentrations using extra high level QAC test strips.

Appendix C: Disposal of used QACs

Frontcountry Locations- Contact wastewater treatment plant to see if it is possible to dispose of used QACs down the sink.
For Banff: 150L of QACs per day may be disposed through the municipal wastewater treatment plant. **Do Not** pour sediment down the drain. If mud accumulates in any of the containers, it should be treated as hazardous waste. Water can be decanted and disposed of as per municipal wastewater treatment plant guidelines and the mud reserved for future disposal.
Backcountry Locations- 200L plastic drums will be located at backcountry cabins. Used QACs will be placed in the plastic drum upon completion of each backcountry trip. **NEVER dispose of QACs in the environment.**
When 200L plastic drums are filled, they will be flown out with a helicopter and disposed of as hazardous waste.

APPENDIX D: CFIA permits/guidelines for sending samples Outside Impacted Areas

The CFIA have declared the Bow River watershed as an infected area for whirling disease. More watersheds may be added as new information becomes available. Accepting facilities located outside of declared areas are required to obtain a domestic movement permit to obtain the following items from declared watersheds:
Live finfish
Dead finfish
Frozen finfish
Live *Tubifex tubifex*
Dead *Tubifex tubifex*
Frozen *Tubifiex tubifex*
Freshwater sediments

Contact the accepting facility to ensure that they have secured a domestic movement permit BEFORE shipping samples

A domestic movement permit is NOT required to transport:
Water samples
Preserved finfish
Preserved *Tubifex tubifex*
Preserved freshwater sediments

APPENDIX E: SUPPLIERS

QAC Suppliers

Apple Cleaning Supplies
Calgary, Ab
(403) 569-6969

ARME Supply
Calgary, Ab
(403) 243-6662 ext. 1100

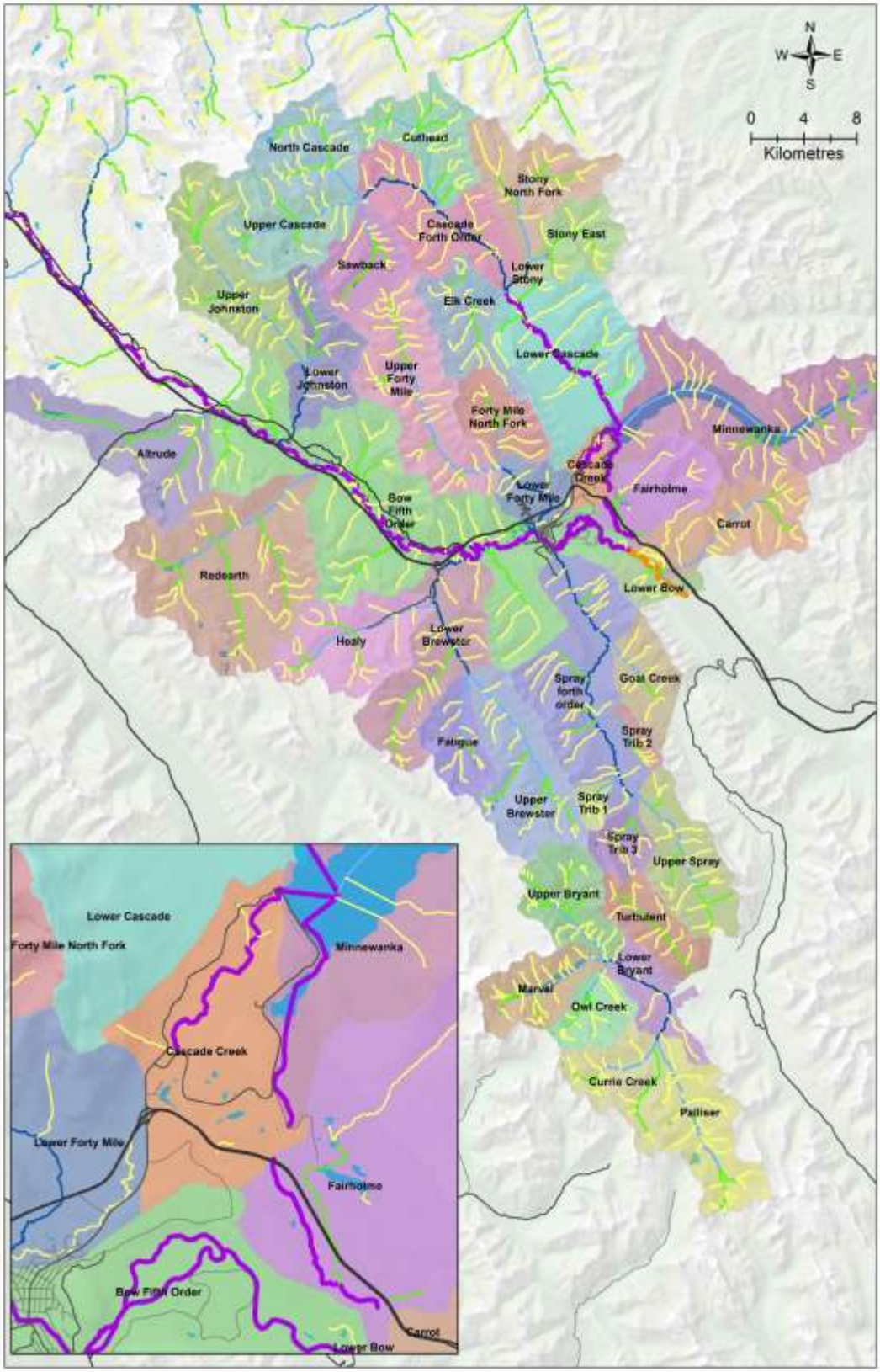
Quat Test Strip Supplier

Indigo Instruments
Waterloo, ON
(519) 746-4761

APPENDIX E: SAFETY

Always consult with the manufacturer's SDS (safety data sheets) prior to using any substance in the workplace. As with most safety data sheets, the information provided is intended for general knowledge with regards to health and safety and additional information from reputable sources may be consulted to provide further specifications.

APPENDIX F: Bow River Watershed Decontamination Zones



APPENDIX G: Bow Valley Wetland Decontamination Zones

See table below for decontamination zones for frequented wetlands in the Bow Valley corridor.

Site_ID	Name_of_selected_site	UTM Easting	UTM Northing	Elevation	Decontamination Zone
202	Altrude South	566396	5675820	1643	1
1	Boom Lake Trailhead	568261	5677950	1729	2
26	Vista Lake	568413	5676982	1576	1
5	Copper Lake	575080	5679378	1423	3
98	Ali's Pond	574999	5678590	1523	4
207	Lower Smith Pond	574657	5679150	1435	5
208	Upper Smith Pond	574736	5678806	1513	4
209	Smith Lake	574938	5678291	1552	6
10	Barenaked Pond	579655	5677784	1396	100
201	Moose Cutline	578166	5679150	1421	100
203	Turquoise Pond	579477	5677858	1401	100
66	Prism Springs	582000	5676514	1400	7
130	Frog Hollow	583222	5676037	1404	8
158	Lizard Lake	582820	5676024	1410	9
200	AltaLink Pond	582978	5675584	1403	100
211	Rainy Pond	581164	5676224	1391	100
212	North of Redearth Trailhead	583464	5675231	1399	100
16	Massive	584994	5675110	1386	100
17	Ranger Crk Beaver	587102	5673160	1389	100
25	Goose Pond	588853	5671190	1389	10
63	Primrose Pond	588840	5670710	1385	100
64	Hole in the Wall	589556	5670203	1370	100
69	Muleshoe Pond	589486	5670481	1392	100
77	Stunted Spruce	588900	5671574	1375	10
9	W4	591996	5668710	1386	11
30	Backswamp Channel	590719	5668707	1381	100
76	Sunshine 1	590724	5668375	1386	100
33	VL3 West	595096	5670005	1388	100
60	Five Mile Pond	593287	5668938	1400	13
74	Fingers Vermilion	595281	5669873	1378	100
75	Cory Pond	592944	5669281	1384	12
123	5-Mile Riverbend	594228	5669093	1393	100
146	Blue Sedge Pond	593947	5669323	1384	100
50	Rathole North	596860	5670227	1378	100
79	Healy Fireroad	595609	5668552	1417	14

Site_ID	Name_of_selected_site	UTM Easting	UTM Northing	Elevation	Decontamination Zone
85	VL99	596203	5670019	1378	100
90	Hayfield Pond	597316	5669916	1376	100
204	Sundance Swamp	597595	5669557	1389	100
71	CP Pond	598940	5670733	1372	100
113	Sundance Pond E	598862	5669963	1374	15
142	Railside Pond	598257	5670280	1378	100
206	Sundance Pond W	598404	5669943	1392	100
138	Norquay Channel	599307	5671862	1438	16
3	Devil's Cauldron	603170	5669724	1343	17
11	Amphibian World	603840	5674021	1442	18
40	Cold Pond	605765	5673620	1402	22
84	Quicksand Pond	605504	5673547	1426	23
99	Osprey Pond	604466	5673737	1428	19
111	Johnson Lake	605717	5673058	1405	21
147	Quiet Pond	603461	5674784	1459	20
32	TCH Hoodoos	605775	5671594	1335	21
120	Johnson Pond	606137	5673000	1404	21
7	Deadfall Pond	608599	5670152	1389	24
100	Wolf Willow	607477	5669220	1342	101
122	Cathy's Pond	609608	5668597	1376	26
135	Hidden Pond	610083	5669114	1397	27
210	Burnt Timber Pond	608322	5670188	1421	25
8	Rundleview	611050	5667098	1396	28
47	Busy	611586	5667275	1396	29
128	Lily Pond	609290	5668001	1312	101

Attachment 5

Parks Canada Treated Wood Management Standard

Parks Canada Parcs Canada

Parks Canada
Treated Wood Management Standard

December 2015

Canada

NAME: Parks Canada Treated Wood Management Standard

APPROVAL DATE:

EFFECTIVE DATE:

RESCINDED DOCUMENT(S):
Guidelines for the Use, Handling and Disposal of Treated Wood, 2009

CONTACT:

Parks Canada:

Alexandre Ferland Chief, Environmental Management 819-420-9111 alexandre.ferland@pc.gc.ca	Mikaïlou Sy Manager, Environmental Management 819-420-5176 mikailou.sy@pc.gc.ca
Intranet Site: http://intranet2/our-work/environmental-and-fleet-management/environmental-management/treated-wood-bois-traité/	

REVIEW: This standard will be reviewed by the Chief, Environmental Management every 5 years, and updated as necessary.

AMENDMENTS:

CHANGE	DATE	APPROVAL

Table of Contents

1 Context

Wood preservation with duly registered pesticides is meant to protect the wood against insects, fungi, marine borers, mold and early decay. Such wood is commonly referred to as "treated wood" and is used in a variety of operational applications on Parks Canada lands and waters such as building construction, decking, retaining walls, outdoor furniture, playground equipment, bulkheads, piers, pilings, utility poles and many other uses.

While the wood preservatives are legislated under *Pest Control Products Act (2006)* (PCPA 2006), the industrial process for wood preservation is legislated under *Canadian Environmental Protection Act (1999)* (CEPA 1999). The Canadian Standards Association has also issued industrial standards (CSA 080 Series of standards) aimed at certifying that treatments were performed in compliance with applicable regulations and standardizing product groups and use categories.

Nine wood preservatives are currently registered in Canada: (i) ACQ, (ii) ACZA, (iii) CA (CA-B), (iv) Copper Naphthenate, (v) Creosote, (vi) Chromated Copper Arsenate (CCA), (vii) Pentachlorophenol (PCP), (viii) Borate, and (ix) Zinc Naphthenate. The Canadian Ammoniacal Copper Arsenate (ACA) registration was discontinued in 2004. The active ingredients of four of these wood preservatives are also listed as toxic substances under Schedule 1 of CEPA 1999[1]: CCA, ACZA, Creosote (PAH) and Pentachlorophenol (PCP).

This *Parks Canada Treated Wood Management Standard* is meant to be used in conjunction with the *Parks Canada Treated Wood Management Guide* and will help increase awareness, compliance with applicable legislation and code of practice, and consistency across the Agency. It builds both on the Agency's mandated responsibilities of protection of natural and cultural heritage resources, public education and provision of quality visitor experience for present and future generations, and on current science, technology and regulatory status for wood preservatives in Canada.

2 Definitions

Pesticide: Generic term referring to any chemical substance or product capable of destroying or limiting the growth of living organisms (micro-organisms, animals or plants) that are considered harmful, including herbicides, insecticides, fungicides, bactericides, rodenticides, etc.

Treated Wood: Wood that is impregnated with a pesticide that is a wood preservative duly registered in Canada, as required under the *Pest Control Products Act 2006* (PCPA 2006). The preservation process requires (i) a pesticide (the active ingredient), (ii) a carrier (water or oil) and a treatment method (heat, manual application or pressure).

[1] Note that treated wood from contaminated sites is also listed on Schedule 1 of CEPA 1999 and should be considered as contaminated.

3 Purpose

This standard provides direction and promotes awareness to operators on Parks Canada lands and waters on the management of treated wood to reduce risk to human health and the environment.

4 Scope

This Standard and related Management Guide apply to the use of treated wood in new construction and renovations on lands and waters administered by Parks Canada.

Existing treated wood structures and facilities are exempt from this Standard.

This Standard does not apply to wood treated for the sole purpose of meeting phytosanitary requirements under *Plant Protection Act (1990)* (PPA 1999) or fire retardation requirements under the *National Fire Code of Canada (2010)* (NFCC 2010).

5 Expected Results

Adherence to and application of this Standard will ensure consistency across the Agency, and: (i) increase awareness and stewardship; (ii) compliance with applicable legislation and codes of practice; (iii) increase employee, visitor and public safety; and (iv) reduce risk to human health and the environment.

6 Related Authorities

- *Pest Control Products Act* (PCPA 2006) and regulations made under this act
- *National Building Code of Canada* (NBCC 2010)
- *Canadian Environmental Protection Act (*CEPA 1999*)*
- *Hazardous Products Act* (1985)
- *Canada Labour Code Act* (1985) and regulations:
  - *Occupational Health and Safety* (Part II of Canada Labour Code)
  - *Canadian Occupational Health and Safety (OSH) Regulations(1986) (Part X), Hazardous Substances*
  - *Parks Canada Policy and Procedures on Hazardous Occurrence Reporting and Recording*
- *Canadian National Parks Act* (CNPA 2000) and regulations made under this act
- Parks Canada *Cultural Resource Management Policy* (2013)
- *Federal Sustainable Development Act* (2008)
  - PWGSC *Policy on Green Procurement* (2006)

7 Roles and Responsibilities

7.1 Field Unit Superintendent/ Director (or delegate)

1. Ensure that the direction set out in this Standard is followed;
2. Notify the Chief, Environmental Management of any law enforcement actions and notifications pertaining to treated wood within the Field Unit.

7.2 Chief, Environmental Management (Strategy and Plans)

1. Provide functional leadership in the development and dissemination of policy instruments and tools pertaining to the management of treated wood;
2. Identify and disseminate best practices and training opportunities on the management of treated wood through an ongoing liaison with central agencies, other government departments and industry, and in collaboration with the Asset Management and Occupational Health and Safety functions;

7.3 Director, Asset Management Services (Strategy and Plans)

1. Provide functional leadership and engineering support for consistent implementation of this Standard across Field Units;
2. Monitor compliance with this Standard using existing asset management processes and systems.

7.4 Manager, Occupational Health and Safety (Human Resources)

1. Provide functional leadership and guidance on occupational health and safety matters pertaining to treated wood;
2. Monitor employee training and hazardous occurrence records pertaining to treated wood through existing human resource management processes and systems.

7.5 Manager, Cultural Resource Conservation (Heritage Conservation and Commemoration)

1. Provide functional leadership and guidance on the management of treated wood for heritage buildings and sites.

7.6 Director, Procurement, Contracting and Contributions (Chief Financial Officer)

1. Provide functional leadership and guidance on procurement and contracting that involves the management of treated wood.
2. Reference this Standard and related Management Guide in all procurement and contracting documents that involve the use or management of treated wood.

8 Requirements

1) Permitted products (non-aquatic): Wood treated with ACQ, Borate, CA-B, Copper Naphthenate and/or Zinc Naphthenate is permitted under the following conditions:
   a. documented rationale that there are no viable alternatives to the use of treated wood;
      - See Appendix 2 in the Treated Wood Management Guide for a template
   b. the use is permissible under the Pest Control Product Act 2006 (i.e. full compliance with the current relevant pesticide labels issued under the act);
   c. the treatment and use are compliant with the CSA O80 series of standards;
      - Refer to section 5.3 of the Treated Wood Management Guide for example certification end tags and CSA O80 use categories.
   d. risk mitigation measures to minimize the leaching of the preservative are implemented.
      - Section 5.5 of the Treated Wood Management Guide provides guidance on this subject.

2) Aquatic Environments: Use no treated wood that will, once installed, may be permanently or seasonally in direct contact with any body of water. While the aquatic use of treated wood that is based on these preservatives may be legally permitted, they are known or suspected to be toxic to certain forms of aquatic life.

3) Prohibitions: Wood treated with a preservative that is listed as a toxic substance under Schedule 1 of CEPA 1999 such as wood treated with ACZA, CCA, Creosote or PCP-based is prohibited.

4) Minimize Use of Treated Wood: Minimize the use of treated wood by reducing, reusing and recycling treated wood to the extent possible[2], as legally permitted and where economically feasible. Always refer to the relevant MSDS or related wood preservative label to validate legally permitted recycling[3] options.
   - See section 5.1 of the Treated Wood Management Guide for various alternatives to treated wood.

5) Third Party Projects: Review all construction/renovation plans submitted by third parties operating on Parks Canada lands and waters in accordance with this Standard.

[2] Note that treated wood from contaminated sites is listed on Schedule 1 of CEPA 1999 and should be considered as contaminated.
[3] Industrial recycling facilities for treated wood currently exist in Quebec and in Ontario.

6) **Ground and near-ground use in buildings** (NBCC 2010[4] requirement): Use treated wood in near-ground and ground-contact structural residential applications as required under the NBCC 2010.

7) **Safe Use and Storage of Treated Wood** (PCPA 2006 requirement)**:** Follow precautionary measures specified in the MSDS that accompanies any treated wood or the related wood preservative label, including the use of personal protective equipment, for storage[5], handling, sawing, sanding or shaping treated wood.
   - See Section 4.4 of the Treated Wood Management Guide for more information.

8) **Disposal of Treated Wood** (PCPA 2006 requirement): Dispose of treated wood or parts thereof as permitted in the MSDS that accompanies the material or as per wood preservative label. Deliberate burning, composting or mulching of treated wood or parts thereof is not permitted.
   - See Section 4.6 of the Treated Wood Management Guide.

9) **Training and Certification**[6] (PCPA 2006 requirement): When using restricted or commercial class wood preservatives ensure that field-applicators (staff or contracted applicators) of wood preservatives (e.g. treating cut ends) have adequate training and certification or training and permit.
   - See Section 5.5 (#5) of the Treated Wood Management Guide for more information.

10) **Hazardous Incident Reporting** (Canadian OHS Regulations 1986 requirement): Report hazardous incidents involving the use of treated wood and potentially posing risk to human or environmental health (e.g. fire, intoxication or on-site release) and keep related records for a period of thirty (30) years.
   - See Section 5.4 of the Treated Wood Management Guide for more information.

9 Enforcement and Related Notifications

The use of treated wood is subject to regulations made under PCPA 2006, which are enforced by designated Enforcement Officers from Health Canada – PMRA. If notified by an Enforcement Officer for an upcoming inspection or following an inspection, please notify the Chief, Environmental Management.

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[4] The NBCC 2010 requires the use of treated wood where any residential structural element is: (i) in contact with the ground; (ii) within 450 mm of the ground in places known to have termites; (iii) within 150 mm of ground and supported on moisture permeable materials; (iv) subject to prolonged exposure to moisture; (v) used in permanent wood foundations; or (vi) used in retaining walls that contribute to the stability of the foundation or that are greater than 1.2 m in height.

[5] Technical guidelines for safe storage of treated wood vary according to duration (90 days as a threshold) and volume (55 m^3 as a threshold) and are detailed in the Treated Wood Management Guide.

[6] As per PCPA 2006, ensure that field applicators meet the requirements of the "*Standard for Pesticide Education, Training and Certification in Canada*" established by the *Federal/Provincial/Territorial Pesticide Education, Training and Certification Working Group* (WGPETC)).

10 Monitoring, Audit and Evaluation

The Office of Internal Audit and Evaluation may periodically conduct audits or evaluations as deemed appropriate. The Chief, Environmental Management, in collaboration with the Director, Asset Management Services, the Manager, OHS, and the Field Units will also monitor the application of this standard using existing systems, procedures, and practices.

Attachment 6

Parks Canada Treated Wood Management Guide

Parks Canada Parcs Canada

Parks Canada
Treated Wood Management Guide

December 2015

Canada

Contents

NAME: Parks Canada Treated Wood Management Guide

APPROVAL DATE:
EFFECTIVE DATE:

CONTACT: Environmental Management, Strategy & Plans

Alexandre Ferland Chief, Environmental Management 819-420-9111 alexandre.ferland@pc.gc.ca	Mikaïlou Sy Manager, Environmental Management 819-420-5176 mikailou.sy@pc.gc.ca

Parks Canada Intranet Site: http://intranet2/our-work/environmental-and-fleet-management/environmental-management/treated-wood-bois-traité/

RESCINDED DOCUMENT: Guidelines for the Use, Handling and Disposal of Treated Wood, 2009

REVIEW: This Guide will be reviewed on a five year basis, and updated/revised as necessary.

AMENDMENTS:

CHANGE / RATIONALE	DATE	APPROVAL

1 PURPOSE

This Management Guide provides operators on Parks Canada lands and waters with detailed information on, management procedures for, alternatives to and Best Practices for use, storage, handling and disposal of treated wood.

2 INTRODUCTION

This guide is developed to complement the Parks Canada Treated Wood Management Standard, which aims at increasing awareness, compliance with applicable legislation and code of practice, and consistency across the Agency, while reducing potential risk to human health and the environment. While the requirements of the standard are to be complied with, these guidelines are only recommended for consideration when working with treated wood across the Agency. Types of wood preservatives legally registered in Canada (see Appendix 1 for list and explanation) and best practices for managing treated wood, including alternatives to treated wood, are discussed with further references provided. A template to rationalize for use of treated wood within each Field Unit, as required under the Parks Canada Treated Wood Management Standard, is also provided, so as to promote consistency across the Agency and facilitate audit, evaluation and monitoring activities.

3 DEFINITIONS

Borate	Natural water-soluble mineral, harmless to humans and animals, yet effective in protecting wood against rot and insects.
Fixation	Industrial chemical process by which the metals in a waterborne wood preservative solution react with and bond to the wood fiber molecules.
Fungus	Organism (plant-like) that lacks chlorophyll and that must obtain its food by microscopic, root-like filaments that penetrate wood tissue and absorb its energy-rich chemicals.
Marine Borer	Xylophagous bivalve mollusc of the *Teredinidae* family that uses tooted rings on its shell as drills to bore tunnels in submerged wood in marine environments.
On-Site Release	Discharge of a pollutant, from within the boundaries of a facility, to the environment, including (i) emissions to air, (ii) discharges to surface waters, (iii) discharges to land and (iv) deep-well underground injections.
Sealer	Water repellent chemical that is impregnated into the wood along with the preservative optimum appearance and durability.

Toxic Substance	Substance listed under Schedule 1 of the *Canadian Environmental Protection Act 1999* (CEPA 1999).
Treated Wood	Wood that is impregnated with a pesticide that is a wood preservative duly registered in Canada, as required under the *Pest Control Products Act 2006* (PCPA 2006). The preservation process requires (i) a pesticide (the active ingredient), (ii) a carrier (water or oil) and a treatment method (heat, manual application or pressure).

4 LIST OF ACRONYMS

ACA	Ammoniacal copper arsenate
ACQ	Alkaline copper quaternary
ACZA	Ammoniacal copper zinc arsenate
CA	Copper azole
CCA	Chromated copper arsenate
CuN	Copper naphthenate
PAH	Polycyclic aromatic hydrocarbon
PCP	Pentachlorophenol
PE	Polyethylene
ZnN	Zinc naphthenate

5 BEST PRACTICES

5.1 Alternatives to Treated Wood

The use of treated wood should be minimized. The following are some examples of possible alternatives.

5.1.1 Composites (Recycled-Plastic Lumber)

Composites are made of wood fibres and recycled grocery bags/milk jugs. They do not warp, split, chip or rot and do not require sealing or staining. They tend to be durable, stable and weather resistant. Composites are more expensive than treated wood, are not for structural use and can be vulnerable to mold and colour fading (U.S. EPA 2005a).

5.1.2 Virgin Polymer Plastic Lumber

Virgin polymer plastic lumber is the use of virgin polypropylene and/or polystyrene instead of recycled plastics. It has a higher flex modulus and flexural strength than recycled plastic lumber (EPIC & CSR, 2003). It is durable, stable and weather resistant. It also does not warp, split, chip or rot and does not require sealing or staining. It is more expensive than treated wood and is not for structural use.

5.1.3 Rubber Lumber

Rubber lumber is made of 50% plastic and 50% recycled tires (U.S. EPA, 2005a). It is durable, impermeable, and resistant to insects. It is not for structural use and the colour tends to fade.

5.1.4 Native Durable Wood

Some native trees of North America produce wood that is naturally more durable than others. The hardwood of white oak (*Quercus alba*) or burr oak (*Quercus macrocarpa*), and the softwood of Northern white cedar (*Thuja occidentalis*) may naturally resist to decay and pests for 5 to 15 years. The softwood of the Eastern red cedar (*Juniperus virginiana*), the Western red cedar (*Thuja plicata*) and the redwood (*Sequoia spp.*) may exhibit such resistance for 10 to 30 years (Hoffman et al., 2002). Redwood, for instance, on top of being aesthetically pleasant, does not usually need sealing or staining and is easy to nail and saw. However, the worldwide supply of Redwood is depleting, bringing the price even higher and raising sustainability concerns, aside from being vulnerable to scratching and denting (U.S. EPA 2005a).

5.1.5 Exotic Durable Wood

Exotic durable hardwoods include the wood of Mahogany (*Swietenia spp., Entandrophragma spp., Khaya spp.,* etc.) and several Ironwood species (*Tabebuia serratifolia, Krugiodendron ferreum, Diospyros spp.,* etc.). They are naturally durable, resistant to decay and insects, do not usually need sealing or staining and are relatively impermeable to water. Unfortunately their worldwide supplies are depleting, raising sustainability concerns and maintaining high prices.

5.2 Existing Treated Wood Structures and Facilities

Many structures and facilities built with treated wood can be found in sites managed by Parks Canada. These structures and facilities should be handled as follows:

1. If they are in good condition, existing structures and facilities built with any type of treated wood should not be replaced, unless they may be in direct contact with drinking water.

2. The surfaces of all structures and facilities that have been treated with a CCA or ACZA wood preservative and that may be touched regularly by visitors (e.g. handrails, picnic tables, etc.) should be completely covered with a penetrating, oil-based sealer. In addition to waterproofing the wood, the application of such sealers reduces the release of chemicals contained in CCA-treated wood by 80% to 95% (Stilwell and Musante, 2003). Another coat of penetrating oil-based sealer should be applied when the current finish begins to show signs of deterioration.

3. The use of non-penetrating finishes, such as paint or urethane, is not recommended because peeling and flaking can increase exposure to preservatives contained in the wood (U.S.EPA, 2005b).

4. It may not be justifiable to add a coat of preservative to a structure made from old treated wood. This practice would not extend the structure's durability. Instead, the replacement of the existing structure should be considered if it has reached the end of its useful life.

5. For treated wood structures that are in place in aquatic environments polyethylene (PE) wear strips should be used to prevent abrasion (Environment Canada, 2004).

5.3 New Treated Wood Structures and Facilities

In order to use treated wood in accordance with the Parks Canada Treated Wood Management Standards, the following Best Practices should be considered in the design of new structures and facilities.

1. Mixtures of several active ingredients for multipurpose wood preservation contexts are becoming more common and intracellular[1] impregnation of the wood with active ingredients is deemed to significantly reduce leaching and increase durability.

2. A wide array of environmental certification programs exist for treated wood. It is recommended to thoroughly review the scope of the technological and environmental certification claims as part of the rationale for use of treated wood on Parks Canada lands and waters, on a case per case basis. For assistance with this please contact Environmental Management.

3. Treated wood should only be used when it is important that the wood be protected (risk of decay, attack by insects or contact with water or damp soil), in accordance with *the National Building Code of Canada* or where it is necessary to maintain the heritage value of a historic place or asset. Wood treatment should not be a substitute for good construction design.

4. Project proponents should be able to determine the most appropriate products and should be able to justify their use. A template can be found in Appendix 1 as well as on the Parks Canada Intranet to document the rationale for the use of treated wood.

5. No treated wood should be used in the construction of items that may come in direct contact with food/ drinking water or that may introduce chemicals into the food chain: feeders, picnic tables, silos and other feed storage structures, hives, drinking troughs, compost bins and wood chip mulch.

6. Purchased treated wood should be marked with an end tag to show it was produced under the national certification program and that it has been treated to the applicable CSA treatment standard. The end tag should show the preservative used, the use category, the product group and a plant identification number. Below is an example of an end tag.

Figure 1: End tag certification mark (modified from Canadian Wood Council, date NA c)

[1] A copper-based wood preservation technology is currently marketed in Canada and USA.

7. Choose wood that has been treated in accordance to the CSA O80 Standard Product Group and Use Category system that corresponds to the planned use. There are four residential product groups: A (members 25 mm or thinner for use where decay is unlikely), B (members between 25 mm and 40 mm and less than 150 mm wide, where potential for decay is low or that are not used for structural purposes), C (structural lumber thinner than 40 mm used for supports in exterior applications) and D (members used for posts and timbers in ground contact). The Use Categories are as follows:

Table 1: Treated Wood Use Categories (modified from: Wood Preservation Canada, 2012)

Category	Conditions
UC1	Wood that is to be used in interior construction in dry conditions (no ground contact)
UC2	Wood that is to be used in interior construction with potentially damp conditions (no ground contact)
UC3.1	Wood to be used in exterior construction that are coated and exposed to weather but have rapid water run-off (no ground contact)
UC3.2	Wood to be used in exterior construction that are uncoated or have poor water run-off (no ground contact)
UC4.1	Wood to be used in ground contact (non-critical components)
UC4.2	Wood to be used in ground contact (critical structural components or difficult replacement)
UC5A	Wood to be exposed to coastal waters
UCF.1	Fire protection

5.4 Storage and Safe Handling of Treated Wood

1. Treated wood should be visually inspected before and after installation to ensure that it appears clean and its surface is free of preservative residues. Otherwise, the lumber should not be used and should be disposed of in accordance with the manufacturer's guidelines, as specified in the treated wood MSDS.

2. Anyone who handles treated wood should wear gloves and a long-sleeve shirt. When sawing, sanding and shaping treated wood, workers should also wear dust masks and goggles to avoid touching or inhaling sawdust.

3. Workers must always cut and work with treated wood outdoors or in an adequately ventilated area.

4. Anyone who works with treated wood should wash their hands immediately after finishing their work, and especially before eating, drinking or smoking.

5. Hazardous incidents involving treated wood may occur through direct handling of treated wood or during the treatment process (ex. in-field treatment of cut ends). In all cases of hazardous incidents the Policy and Procedures on Hazardous Occurrence Reporting and

Recording should be followed. Any related records should be kept for a period of thirty (30) years. For more information please contact ohs-sst@pc.gc.ca
The contact listed on the MSDS or pesticide label should also be informed in cases of incidents involving treated wood.

6. If treated wood is to be stored on site prior to installation or post use the following table provides recommended instructions:

Table 3: Storage Recommendations (modified from Environment Canada, 2004)

Time Period	Volume of Storage	Factors
90 Days or Less	55 m^3 or less	-Store on flat ground (slope less than 10%) and a minimum of 10 m from environmentally sensitive area -If possible elevate to avoid contact with water runoff -provide absorbent base (ex. wood chips) -minimize on site storage time -inspect wood upon delivery -place tarpaulin or weather resistant material over wood -inspect storage area for evidence of leaching treatment chemicals
	More than 55 m^3	-Store on flat ground (slope less than 10%) and a minimum of 30 m from environmentally sensitive area -If possible elevate to avoid contact with water runoff -provide absorbent base (ex. wood chips) -minimize on site storage time -inspect wood upon delivery -place tarpaulin or weather resistant material over wood -inspect storage area for evidence of leaching treatment chemicals
More than 90 days	55 m^3 or less	-Store on flat ground (slope less than 10%), a minimum of 10 m from environmentally sensitive area and a minimum of 3 m from drainage ditches -If possible store on surfaces with limited permeability (ex. clay or concrete) and elevate to avoid contact with water runoff -Provide absorbent base (ex. wood chips) -Provide emergency response information and fire protection equipment -Limit access to the storage area -Minimize on site storage time - place tarpaulin or weather resistant material over wood -inspect storage area for evidence of leaching treatment chemicals
	More than 55 m^3	-Store on flat ground (slope less than 10%), a minimum of 30 m from environmentally sensitive area and a minimum of 3 m from drainage ditches -store at least 30 m from potable water supply and outside of 100-year flood plain where possible -Store at least 30 m from forested area and clear storage area of combustible ground vegetation. -If possible store on surfaces with limited permeability (ex. clay or concrete) and elevate to avoid contact with water runoff

		-Provide absorbent base (ex. wood chips) and choose a storage area where runoff can be captured/ managed -Provide emergency response information and fire protection equipment -Limit access to the storage area, and provide fencing/ signage around area -Minimize on site storage time -inspect storage area for evidence of leaching treatment chemicals

5.5 Installation, Field Treatment and Maintenance of Treated Wood

1. In order to mitigate risk it is recommended that a sealer be used to reduce leaching potential. Wood treated with borate preservatives should also not be used in locations where it will be subject to heavy rains or ground contact to reduce leaching.

2. The use of cleaning and bleaching products containing sodium hypochlorite, sodium hydroxide, sodium percarbonate or citric or oxalic acid on treated wood should be avoided because these products can cause the wood to release toxic chemicals (PTW-SafetyInfo Website, date NA).

3. In order to minimize the need for in-field treatment it is recommended that framing, sawing, cutting and drilling should be done before treatment to the maximum degree possible. Although it may require more engineering it will insure a more efficient installation.

4. Exposed cut ends and drill holes should be field-treated[2] with a preservative (along with a sealer) in accordance with the manufacturer's and the preservative label instructions, preferably well away from water, in a protected cutting area and prior to the assembly of the wooden structure.

5. If the preservative used for field treatment (i.e. cut ends) is a commercial or restricted class pesticide, training and certification or training and permit may be required for the field applicator. This training is provided provincially to meet the "*Standard for Pesticide Education, Training and Certification in Canada"* established by Health Canada – Pest Management Regulatory Agency (PMRA). The following table provides links for more information on training for each province and territory.

British Columbia	http://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management/pesticide-use/pesticide-certification
Alberta	http://esrd.alberta.ca/lands-forests/land-industrial/programs-and-services/pesticide-management/pesticide-use/applicator-certification/pesticide-applicator-certification-program.aspx
Saskatchewan	http://www.agriculture.gov.sk.ca/Pesticide-Applicator

[2] Ensure that field applicators (using commercial or restricted class pesticides) meet the requirements of the "*Standard for Pesticide Education, Training and Certification in Canada"* established by Health Canada – Pest Management Regulatory Agency (PMRA).

Manitoba	https://www.gov.mb.ca/agriculture/permits-and-licences/pesticide-and-manure/pesticide-applicator-licence.html
Ontario	http://www.ontariopesticide.com/
Quebec	http://www.mddelcc.gouv.qc.ca/pesticides/permis-en/
New Brunswick	http://www2.gnb.ca/content/gnb/en/services/services_renderer.2915.Pesticide_Applicator_Certificate.html
Nova Scotia	http://www.novascotia.ca/nse/pests/applicator.asp
Prince Edward Island	http://www.gov.pe.ca/environment/pesticide-applicator-certificate
Newfoundland and Labrador	http://www.env.gov.nl.ca/env/env_protection/pesticides/business/training.html
Yukon	http://www.env.gov.yk.ca/air-water-waste/pesticides_regs.php
Northwest Territories	http://services.exec.gov.nt.ca/service/208
Nunavut	http://gov.nu.ca/sites/default/files/gnjustice2/justicedocuments/Consolidated%20Law/Original/PESTICIDE%20ACT/633409249303125000-5932574-Reg277.pdf

6. If the chemical solution is accidentally spilled while ends are being field-treated, the spill should be contained with a disposable absorbent substance (soil, sawdust, forest litter or rags) and cleaned up immediately. Dispose of the contaminated absorbent material safely, in accordance with the pesticide (preservative) label.

5.6 Disposal of Treated Wood

1. Never dispose of treated wood by burning.

2. Do not compost scraps, wood chips or sawdust from treated wood.

3. All remaining scraps, cuttings, wood chips and sawdust must be collected efficiently and in a timely matter.

4. Refer to the treated wood MSDS for appropriate disposal of the materials.

5.7 Recommended Hardware for Treated Wood

5.7.1 Connectors

1. Connectors used for ACQ- or CA-treated wood should be manufactured from steel and be either galvanized in accordance with ASTM A653, G185 designation, or be galvanized after manufacture in accordance with ASTM A123.

2. For borate-treated wood used inside buildings, the same connectors can be used as for untreated wood.

5.7.2 Fasteners

1. Fasteners for ACQ-, CA-, treated wood should be galvanized in accordance with ASTM A153. Stainless steel may be used for maximum service life or severe applications. Where appropriate, copper fasteners may also be used.

2. Corrosion-resistant fastenings should be used to minimize moisture damage.

3. Fasteners used in combination with metal connectors must be the same type of metal to avoid galvanic corrosion caused by dissimilar metals.

4. For borate-treated wood used inside buildings, the same fasteners can be used as for untreated wood.

5.7.3 Flashing

1. Flashing used in contact with treated wood must be compatible with the treated wood.

2. Copper and stainless steel are the most durable metals for flashing. Galvanized steel, in accordance with ASTM A653, G185 designation, is also suitable for use as flashing. Fasteners should be compatible to avoid galvanic corrosion.

5.7.4 Other Hardware

1. There may be additional products such as polymer or ceramic coatings, or vinyl or plastic flashings that are suitable for use with treated wood products. Consult the individual fastener, connector or flashing manufacturer for recommendations for use of their products with treated wood.

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Appendix 1: VARIOUS TYPES OF WOOD PRESERVATIVES

Wood preservatives have been used around the world for many years and across Canada for more than a hundred years. During that time, wood preservatives have proven to be an effective treatment against natural wood degradation agents such as fungi and insects. The following section describes the most common types of wood preservatives.

1.0 Waterborne Wood Preservatives

Chromated copper arsenate (CCA), alkaline copper quaternary compounds (ACQ), copper azole (CA), and ammoniacal copper zinc arsenate (ACZA) are common waterborne preservatives. These react with or precipitate in the wood substrate and become "fixed" to prevent leaching. Waterborne preservatives are often used in residential applications because they have a dry paintable surface. These preservatives are primarily used to treat softwood species and are very effective for this application. However, because their cellular structure is different, hardwoods treated with waterborne preservatives may not be adequately protected in some types of exposures or environments (Lebow and Tippie, 2001). Waterborne wood preservatives may increase corrosion of unprotected metal, and so all metal fasteners used with treated wood should be hot-dipped galvanized or stainless steel. Although, not all stainless steel fasteners are acceptable for use with treated wood (Simpson, 2005).

1.1 Alkaline Copper Quaternary (ACQ)

Alkaline copper quaternary (ACQ) prevents decay from fungi and insects and was developed because of environmental and safety concerns with CCA. This preservative contains copper and a quaternary ammonium compound (quat). Multiple variations of ACQ have already been standardized allowing flexibility to work with different wood species and end use applications. Currently there are three types, ACQ-A, ACQ-C and ACQ-D, registered for use in Canada. Type ACQ-A has 50% copper oxide and 50% quat. ACQ-C and-D both have 2:1 ratios of copper oxide to quat but different forms of quat (Environment Canada, 2013). It is not for use in critical infrastructure such as utility poles, railway ties or foundations (Environment Canada, 2013).

1.2 Copper Azole (CA)

Copper azole (CA) is another developed wood preservative that contains copper, boric acid, and tenuconazole. These three active ingredients work together to protect against decay fungi and insects. CA is able to provide good treatment for southern pine and hemlock/fir species groups (Lebow and Tippie, 2001). It can be used in residential, general construction and agricultural uses, but is not to be used as a treatment for utility poles and pilings (Environment Canada, 2013).

1.3 Borate-Based Preservatives

Borate preservatives are salts such as sodium octaborate (disodium octaborate tetrahydrate – DOT), sodium tetraborate and sodium pentaborate that are dissolved in water. Borate preservatives remain water-soluble and readily leach out in soil or rainwater (Lebow and Tippie, 2001).

1.4 Chromated Copper Arsenate (CCA)

Chromated copper arsenate (CCA) is a waterborne preservative containing arsenic, chromium and copper. This type of preservative is used for the long-term protection of wood against attack by fungi, insects and marine borers. CCA-treated wood typically has a light green color but it may also be factory stained or dyed to various shades of brown. A water-repellent treatment is sometimes applied to help prevent checking and splitting when the wood is used on a flat surface, such as decking. CCA-treated wood has little or no odour associate to it (Lebow and Tippie, 2001).

Until January 2004, CCA was the most widely used wood preservative in North America (Health Canada, 2005), however it was voluntarily phased out from use in residential applications in 2003 and now is only allowed for industrial use (Environment Canada, 2013). In Canada type C oxide is the only formulation currently used. Use of CCA treated wood is prohibited in Parks Canada operations due to the presence of inorganic arsenic and chromium VI, which are listed as toxic substances under CEPA 1999.

1.5 Ammoniacal Copper Zinc Arsenate (ACZA)

Ammoniacal copper zinc arsenate (ACZA) contains copper, zinc, and arsenic. It protects against attack by decay fungi, insects and most types of marine borers. Its uses are very similar to those of CCA and include treatment of poles, pilings and timbers. Because of its ability to penetrate Douglas fir and other difficult–to-treat wood species, it is most widely used on the west coast. The colour tends to be dark brown to bluish green. The wood initially has a slight ammonia odour, but soon dissipates after treatment as the wood dries (Lebow and Tippie, 2001). The Pest Management Regulatory Agency updated the label to prohibit use in residential applications in 2011. Use of ACZA treated wood is prohibited in Parks Canada operations due to the presence of inorganic arsenic which is listed as a toxic substance under CEPA 1999.

2.0 Oilborne Wood Preservatives

Creosote, pentachlorophenol (PCP), copper naphthenate and zinc naphthenate are common oilborne preservatives that are used for applications such as utility poles, bridge timbers, railroad ties, pilings and laminated means. They tend to have a strong odour and can be oily, they therefore are generally not used for purposes that may have frequent human skin contact or inside dwellings. These preservatives also act as water repellants because of their oily nature, and can help to prevent the checking and splitting of wood (Lebow and Tippie, 2001).

2.1 Creosote

Although Creosote differs from other oilborne preservatives because it is not usually dissolved in oil it still maintains properties that make it look and feel oily. It is a distillate of coal tar (a byproduct of the carbonization of coal during coke production) (Lebow and Tippie, 2001). Creosote contains a chemically complex mixture of organic molecules, up to 80% of which are polycyclic aromatic hydrocarbons (PAHs) (Brooks, 2004). Use of Creosote treated wood is prohibited in Parks Canada operations because Polycyclic Aromatic Hydrocarbons (PAHs) and creosote-impregnated waste materials are listed as toxic substances under CEPA 1999.

2.2 Pentachlorophenol (PCP)

Pentachlorophenol (PCP) is a crystalline solid that can be dissolved in various types of oils. Petroleum oils are generally used as carriers of PCP (NEIA, 1993). Although this type of

preservative does not protect well against ocean marine borers, it is commonly used due to its effectiveness against fungi and insects. The type of oil used as a carrier solvent determines that appearance of wood treated with PCP: a very light brown color and dry surface if a light oil is used or a dark brown color and somewhat oily surface if a heavy oil is used (Lebow and Tippie, 2001). PCP itself is odourless, but the carrier solvent may have a distinct odour that can be noticed when approaching this type of treated wood. There are two types of PCP treatments; Pressure Pentachlorophenol (PCPP) and Thermal Pentachlorophenol (PCPT).
Use of PCP treated wood is prohibited in Parks Canada operations due to the presence of dioxins, furans and hexachlorobenzene, which are listed as toxic substances under CEPA 1999.

2.3 Copper Naphthenate (CuN)

Copper naphthenate (CuN) is the reaction product of naphthenic acids and copper salts dissolved in oil. CuN is used for the treatment of utility poles, highway construction (Lebow and Tippie, 2001) bridges and is commonly available in retail lumberyards for use in fencing and decking (Hutton and Samis, 2000). Like PCP, the properties of CuN are dependent on the type of oil used as the carrier. The oils that are most commonly used as carrier solvents are fuel oil and mineral spirits. The color of the CuN-treated wood varies from light brown to dark green, depending on the type of carrier solvent and the applied treating process. The carrier solvents for CuN-treated wood give it a distinct odour. Wood that is treated using CuN in light oil is easier to paint or stain than wood treated with CuN in dark oil. CuN is widely applied for hand dressing on end cuts or holes bored into treated wood during construction (Lebow and Tippie, 2001).

2.4 Zinc Naphthenate

Zinc Naphthenate is used to protect cut ends of treated wood. It can be applied with a brush as a component of a ready-to-use product. It is only for exterior above ground use. It can be colourless or matched to the colour of treated wood with a greenish tint (Canadian Wood Council, date NA b.)

APPENDIX 2 Rationale for Use of Treated Wood in Parks Canada Operations

Field Unit:
Project and Location:
Quantity (m^3):

Part 1: Are there applicable alternatives to treated wood?

	YES	NO	Explanation
Untreated Wood	☐	☐	
Composites	☐	☐	
Plastic	☐	☐	
Metal	☐	☐	
Concrete	☐	☐	

Part 2: Treatment / Use Compliance

	YES	NO
CSA Stamped:	☐	☐
Intended use consistent with preservative label:	☐	☐
MSDS obtained and reviewed:	☐	☐

Please Select Preservative Type:

ACQ	☐	
Borate	☐	
CA-B	☐	
Copper Naphthenate	☐	
Zinc Naphthenate	☐	
Other	☐	Explain:

Part 3: Best Practices

	YES	NO	
Recommended hardware will be used:	☐	☐	
Other Best Practices Followed:	☐	☐	Explain:

Part 4: Conclusion[3][4]

The use of treated wood is acceptable based on the above rationale: YES ☐ NO ☐	Project Manager:
	Signature:
	Date:

[3] Only use treated wood when all boxes in Part 1 are checked "NO" and all boxes in Part 2 are checked "YES"; It is also preferable that "YES" be chosen for Part 3 statements.

[4] Keep the signed copy of this rationale with project file

Attachment 7

Archaeological Overview Assessment Johnson Lake Whirling Disease Mitigation – VE Infrastructure

Parks Canada Parcs Canada

Archaeological Overview Assessment
Johnson Lake Whirling Disease Mitigation – VE Infrastructure, Banff Field Unit, Banff National Park

Prepared by Aaron Osicki, Terrestrial Archaeology, IACHD, Parks Canada
April 28, 2017

Purpose

The purpose of this report is to conduct an Archaeological Overview Assessment (AOA) for the Banff Field Unit (BFU), of the Johnson Lake Whirling Disease Mitigation – VE Infrastructure Project (the Project) in Banff National Park, AB – see Figure 1. This overview will identify possible impacts to archaeological resources, and detail the actions required to further assess and/or mitigate these impacts.

Project Background

Whirling disease was detected in Johnson Lake in 2016. BNP will maintain public access to this popular swimming lake while actions for eliminating the parasite are pursued. This project will install visitor experience infrastructure to prevent the spread of contaminated lake mud to other water bodies.

The three Visitor Experience components of the Whirling Disease mitigation plan are:

- Adding a clean course sand cap to the Johnson Lake main beach to cover mud and prevent contact and transfer away from the lake. Sand to cover existing beach area down to water depth of approximately 1 metre. Depth of new sand to be 150 to 200 mm. No ground disturbance proposed.
- Installation of floating docks with swim ladders to keep swimmers away from muddy littoral zone at “Main Beach” and “Local’s Beach”. Proposed concrete anchors on lake bottom and shore for minimal or no ground disturbance, depending on final design options by contract engineers.
- Installation of a temporary unheated water wash station for visitors to voluntarily rinse of mud from themselves, children, pets, lifejackets, etc. Includes a clear gravel drain pit to prevent surface drainage towards lake. Proposed to be located in southeast corner of parking lot, immediately west of dam access road gate.

Design drawings for the project are provided in Appendix A (April 28, 2017). This overview incorporates the specifics of these drawings in its review. Should any changes to these drawings and/or the intended work plan occur, they would need to be reviewed by Parks Archaeology as they could have a potential effect on the archaeological assessment and requirements associated with this Project.

Proposed Project Start: Winter 2017 (Design); Spring 2017 (Build)

Archaeological Overview Assessment

The project area overlaps with pre-contact archaeological site 20R (Johnson Lake Campsite), and historic archaeological site 52R (Anthracite Townsite), and is in close proximity to other known archaeological sites (350R, and 352R). See Figure 2 for an illustration known site locations and boundaries in and around the proposed project area.

Based on the above scope, and Project design details provided in Appendix A, the general surface and subsurface disturbance characteristics of the Project are low. The bulk of the proposed infrastructure is planned to have minimal to no ground disturbance – e.g. the adding of sand/gravels on top of existing soils and the installation of floating docks. These elements have little to no archaeological concerns. That said, the source location of the sand/gravel is unknown. It is therefore assumed that the sand/gravel is being sources from an area that is known to have no impacts to archaeological resources. If this is not the case then an archaeological assessment/review of the source location should also be carried out in conjunction with this Project.

Those locations where ground disturbance could potentially occur (e.g. the dock abutments, stepping stone installation, mooring post footings, and wash station) are generally taking place within low potential areas or previously disturbed areas, and are being proposed with minimal/limited disturbance footprints. The installation of the wash station is proposed to be fully contained within existing parking lot disturbance. Parking lot disturbance is extensive in this area, and therefore has little to no potential for intact archaeological resource. Mooring post footing installations are proposed to be placed underwater, where archaeological potential for intact resources is low. Infrastructure development in Area 2 ("Local's Beach" – Figure 2; Appendix A) has been scaled back significantly from earlier plans where twin docks were being proposed. Current plans in Area 2 consist of the construction of a small stepping stone feature for water access, located along a steep slope away from any known archaeological resources, resulting in low archaeological impact potential. The dock abutments proposed in Area 1 are located within the boundaries of a known site (20R). Based on their design, these abutments have a small footprint and are to be located on the edge of existing beach exposure/disturbance thus limiting their potential impact to intact portions of the site. Project specific requirements related to this site are addressed in greater detail below.

The primary risk of project impacts to archaeological resources is likely to be associated with construction activities and equipment access, rather than final infrastructure developments and footprints. Figure 1 shows the proposed construction footprint/access limits and Area 2 access path (heavy dashed lines).

In terms of minimizing impacts to known and unknown archaeological sites and resources, **access and other construction activities should be limited to existing paths, roads, and disturbance as much as possible.** In following, access to Area 1 should be confined to the existing asphalt/gravel access path, only accessing the site from the far west end adjacent to the proposed western dock – Figure 3. The construction footprint for all construction related activities should also be reduced from what is being proposed and confined to existing disturbance associated with

the maximum extent of the currently exposed beach sands – see Figure 3. Comments on the construction drawings suggest that an access plan to Area 2 has not been finalized – "*Area 2 Location Contractor to determine access and construction methodology*". To minimize potential impacts to unknown resources, access to Area 2 should be confined to existing pathways, and a shortest path/least disturbance access should be taken to access the actual stone step feature location away from the existing path. Some ambiguity exists in the limits of the actual construction footprint in Area 2, as it has not been fully delineated in the design drawings. If the construction footprint associated with Area 2 is to be significantly larger than the actual feature footprint (i.e. greater than a 5-10 m buffet around the proposed stone step feature, then plans should be reviewed by Parks archaeology as the surrounding area has potential for unknown intact resources, and may require additional assessment and/or testing prior to construction. **If a more extensive, or alternant, project footprint is needed outside of existing pathways and construction footprints detailed above, Parks Archaeologist should be informed as additional field assessment and/or construction monitoring may be required.**

Although risk of impacts to known archaeological resources is low, sites in close proximity to the project area and/or directly within the project areas will require additional attention and protection/mitigation requirements. These requirements are summarized in Table 1, and are covered in greater detail below.

Archaeological Site	Site Number	Location to Project Area	Site Specific Requirements
Pre-Contact Campsite (Johnson Lake Campsite)	20R	Partially within Area 1 of Project	**Limit Construction Footprint and Access to existing disturbance areas**
Historic Mining Complex (Anthracite Townsite)	52R	In close proximity to W end of Area 1 of Project	None
Pre-Contact Campsite (Johnson Lake Sunbathing Site)	350R	~150+ m Se of Area 2 of Project	None
Pre-Contact Campsite and Minor Historic Refuse Scatter	352R	~150 m SW of Project	None

Table 1. Overview of known archaeological site and site specific requirements associated with the proposed Project.

Previous archaeological work has resulted in a basic understanding and identification of the archaeological resources present in and around the project areas (see Langemann and Perry 2002 for an overview of this work). As a result of this previous work, chance finds and unanticipated discoveries should be reduced. That said, the discovery and identification of unknown resources is still possible, and some of the sites in proximity to the proposed Project are still relatively poorly

understood in terms of their spatial extent and intact artifacts and features, and therefore the general precautionary measure of adhering to the **Accidental Finds protocol (see below) should be applied to the project as a whole.**

Archaeological Sites

20R – Pre-Contact Campsite (Johnson Lake Campsite)

Site 20R consists of a diffuse scattering of pre-contact artifacts lithic flakes, Fire Cracked Rock (FCR), faunal remains, and lithic tools (pre-contact Prairie Side-notched style point, end scraper, and utilized flakes). Site 20R is situated on a moraine terrace overlooking the west side of Johnson Lake (Figure 3). Artifacts associated with the site have been found scattered from the beach edge of the lake to the upper extent of the moraine terrace and into the parking area (where the current washrooms are located).

Based on past findings, the western extent of the site extends into the construction footprint. **To minimize potential impacts to the site it is required that all construction related activities remain confined to existing access road disturbance and the exposed beach (i.e. where the new sand/gravel is proposed to be added) as detailed in Figure 3.**

52R – Pre-Contact Campsite and Minor Historic Refuse Scatter (Anthracite Townsite)

Site 52R consists primarily of a broad scattering of historic artifacts, refuse dumps, structural remains, and possible grave locations associated with the historic mining town of Anthracite, which was inhabited from the 1880s to the 1970s. Some pre-contact artifacts (flakes and a middle precontact Pelican Lake style Point) were also found in association with the site, however the bulk of the site pertains to the historic mining activities associated with Anthracite. The site area is fairly expansive, encompassing an area from Johnson Lake to the lower valley surrounding Cascade Creek/River. Various portions of the site have received a range of survey and assessment, however in general direct spatial information and extent to the site is still very basic and not well delineated.

The current eastern extent of the site extends to the western edge of Johnson Lake (Figure 2). That said, assuming that construction activities and access stays east of the existing asphalt/gravel access road the chances of impacting site artifacts and/or features is highly unlikely. Due to this low site impact potential, there are no archaeological requirement for this site**.**

350R – Pre-Contact Campsite (Johnson Lake Sunbathing Site)

Site 350R consists of a light scattering of lithic debitage, bone, FCR on a slight promontory near the existing lake trail. The site is located approximately 150+ m SE of Area 2 of the proposed development, along the terrace edge overlooking the NE side of Johnson Lake (Figure 3).

As the site is located well away from the proposed Project development there are no archaeological requirements for this site.

352R – Pre-Contact Campsite and Minor Historic Refuse Scatter

Site 352R consists of a scattering of lithic debitage, bone, FCR, and historic ceramics and glass. The site is located approximately 100+ m SW of the proposed development, along the terrace edge

overlooking the south side of Johnson Lake and its western outlet creek (Chinaman Creek) (Figure 3).

As the site is located well away from the proposed Project development there are no archaeological requirements for this site.

Requirements

Based on the details presented in the above overview assessment, the following requirements should be followed:

- Construction access should be confined to existing roads and pathways.
- All construction related activities in Area 1 should remain confined to existing access road disturbance and the exposed beach (i.e. where the new sand/gravel is proposed to be added) as detailed in Figure 3.
- The accidental Finds Protocol (see below) should be applied throughout the Project.
- Any additional scope and/or project footprint changes should be review by Parks Archaeology as they may affect Project requirements.

Accidental Finds Protocol

In the event that items are found when archaeologists or cultural resource managers are not present on site during construction activities.

There may be cultural resources present in the project area that have not yet been discovered (even after an archaeological assessment has been carried out or no assessment was deemed necessary for the project). **If staff observe any significant cultural resources while working, they should stop work in the immediate area, and contact the project manager, or a Parks Canada archaeologist or cultural resource advisor, to discuss any protective measures that might be needed.**

Significant resources that could be considered grounds for work stoppage include, but are not limited to, human remains, unique or diagnostic artifacts, and/or artifacts directly associated with known sites and/or unidentified sites in the area. In all cases, cultural managers must be made aware of the finds, and these finds must be communicated back to Parks Archaeologists.

References

Langemann, E. G., and W. Perry. 2002. *Banff National Park Archaeological Resource Description and Analysis*. Cultural Resource Services, Western Canada Service Centre, Parks Canada, Calgary.

Contacts

Aaron Osicki
Archaeologist, Archaeology and History Branch,
Heritage Conservation and Commemoration Directorate
Parks Canada, Calgary
Aaron.Osicki@pc.gc.ca
Tel 403-292-4692
Cell 403-689-3992

Bill Perry
Archaeologist, Archaeology and History Branch,
Heritage Conservation and Commemoration Directorate
Parks Canada, Calgary
Bill.perry@pc.gc.ca
Cell 403-701-0614

Figures

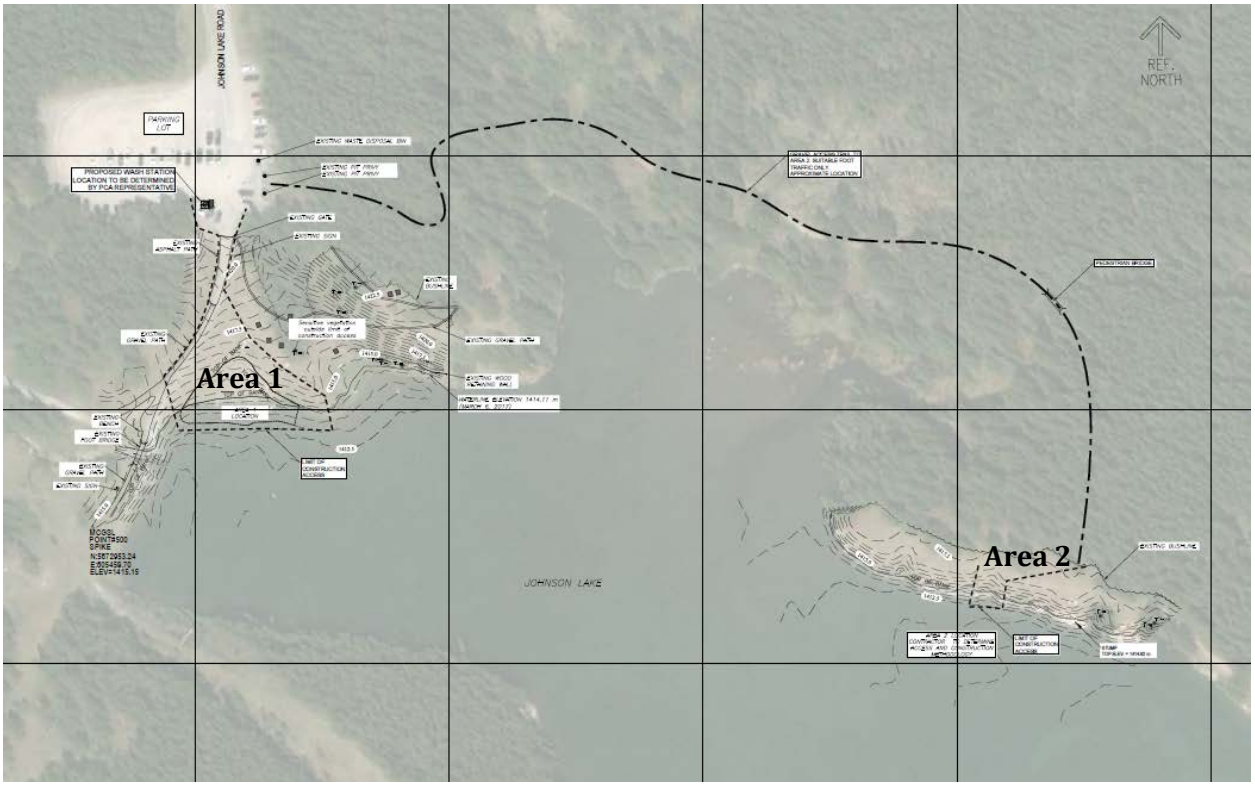


Figure 1. Design drawing of the Johnson Lake Whirling Disease Mitigation – VE Infrastructure Project. Area 1 identifies the "Main Beach" location and Area 2 identifies the "Local's Beach" location (adapted from C-01 in Appendix A).

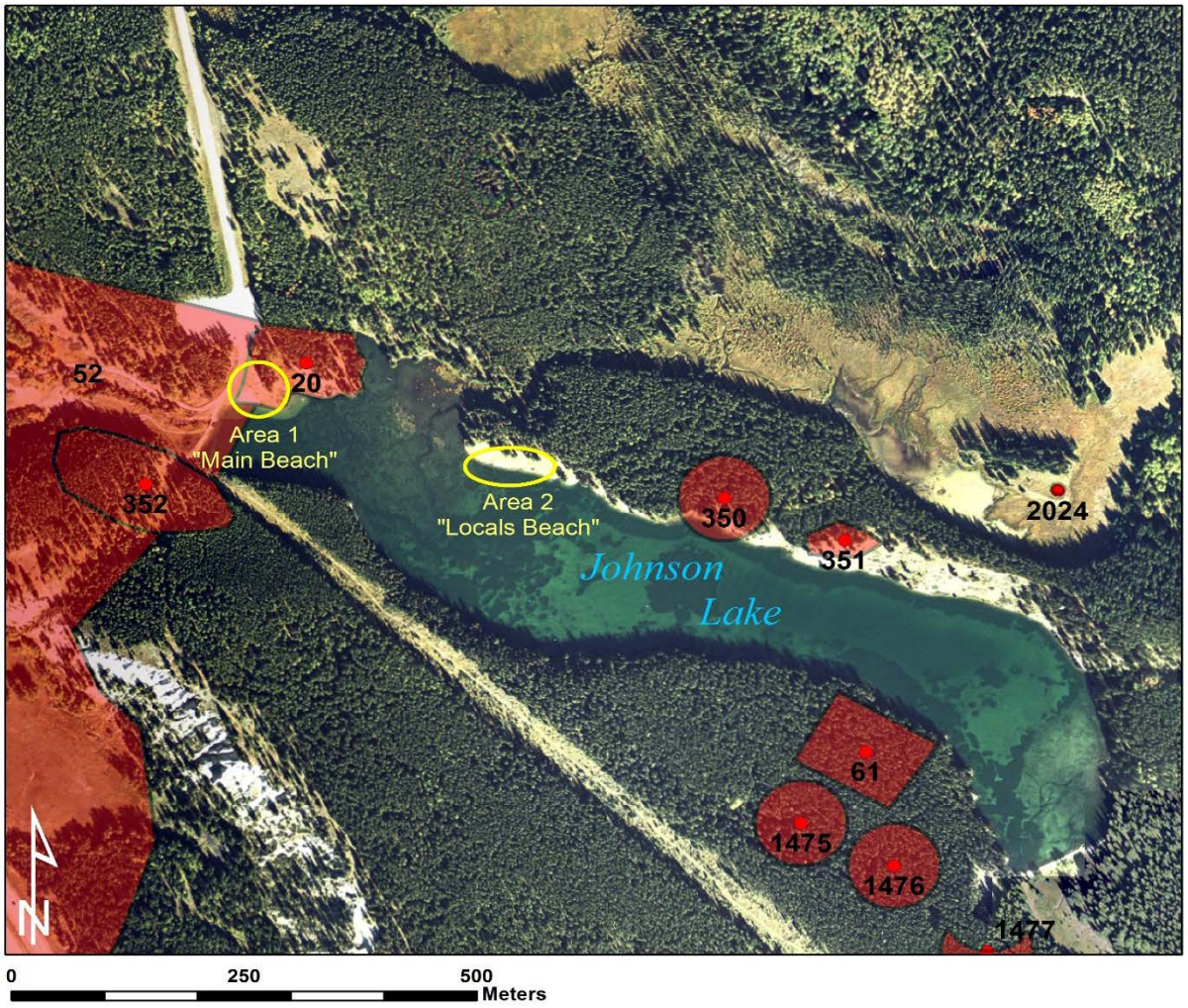


Figure 2. Location of known archaeological sites in and around the Johnson Lake Whirling Disease Mitigation – VE Infrastructure Project.

Figure 3. Proposed access and construction footprint/disturbance impact limitations for Area 1 (denoted by red area).

Appendix A

Johnson Lake Docks and Beach Rehabilitation Drawings (April 28, 2017)

Parks Canada
Agency

Western and
Northern Region

L'Agence Parcs
Canada

Ouest et Nord
du Canada

BANFF NATIONAL PARK, ALBERTA.

ISSUED FOR TENDER

JOHNSON LAKE DOCKS
AND BEACH REHABILITATION

Proj. No.: 36161
April 28, 2017

Canada

LIST OF DRAWINGS

SITE

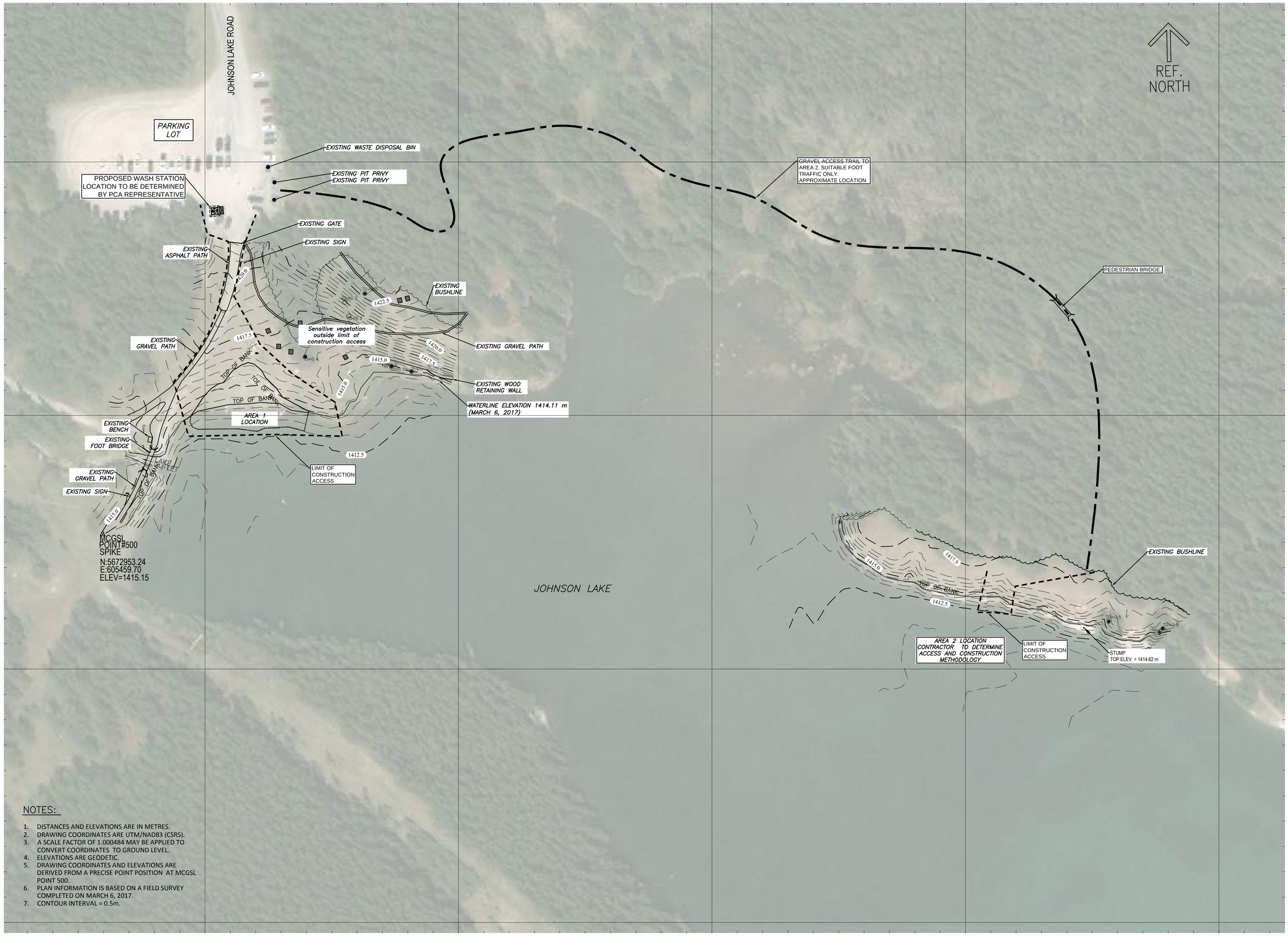
STRUCTURAL

SITE LOCATION MAP

KLA ENGINEERING LTD.

P.O. BOX 21115, 102 – 22441 DEWDNEY TRUNK ROAD, MAPLE RIDGE, BC V2X 1P7
T: 604.380.3552 |

WATERS EDGE
ENGINEERING LTD.
*"Quality * Value * Innovation"*



NOTES:

1. DISTANCES AND ELEVATIONS ARE IN METRES.
2. DRAWING COORDINATES ARE UTM/NAD83 (CSRS).
3. A SCALE FACTOR OF 1.000484 MAY BE APPLIED TO CONVERT COORDINATES TO GROUND LEVEL.
4. ELEVATIONS ARE GEODETIC.
5. DRAWING COORDINATES AND ELEVATIONS ARE DERIVED FROM A PRECISE POINT POSITION AT MCGSL POINT 500.
6. PLAN INFORMATION IS BASED ON A FIELD SURVEY COMPLETED ON MARCH 6, 2017.
7. CONTOUR INTERVAL = 0.5m.

Canada

Parks Canada
Parcs Canada

LEGEND:

- DECIDUOUS TREE
- SPRUCE TREE
- PINE TREE
- SHRUB/BUSH
- TRUNK DIAMETER ..... TD=0.2
- BUSHLINE
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- MAJOR CONTOUR ELEVATION (m) 1420.0
- PICNIC TABLE (EXISTING)

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

REV0	Issued for Tender	17/04/28
revisions	description	date

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

drawing / dessin

SITE PLAN
EXISTING SITE CONDITIONS

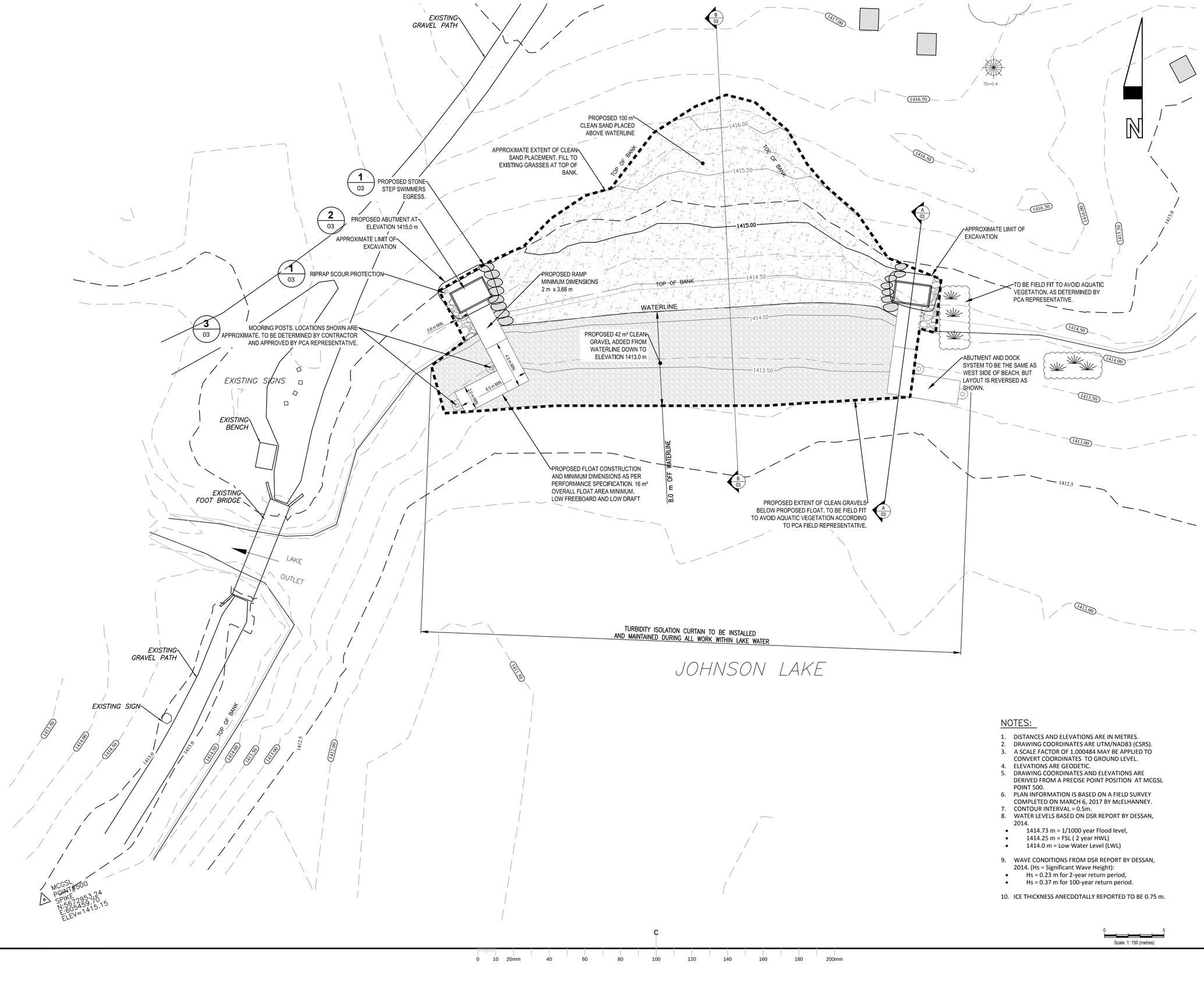
Designed By	T.HIRSEKORN	Conçu par
Date	2017/04/27	(yyyy/mm/dd)
Drawn By	R.HALLEY	Dessiné par
Date	2017/04/27	(yyyy/mm/dd)
Reviewed By	R. EVERTS	Examiné par
Date	2017/04/27	(yyyy/mm/dd)
Approved By	T.HIRSEKORN	Approuvé par
Date	2017/04/28	(yyyy/mm/dd)
Tender	C.MORTSON	Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

36161

Drawing no. / No. du dessin: C-01

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm



Canada

Parks Canada
Parcs Canada

LEGEND:

- DECIDUOUS TREE
- SPRUCE TREE
- PINE TREE
- SHRUB/BUSH
- TRUNK DIAMETER ..... TD=0.2
- BUSHLINE
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- EXISTING CONTOUR ELEVATION (m) 1420.0
- MAJOR CONTOUR (PROPOSED)
- CONTOUR ELEVATION (PROPOSED) 1420.00
- PICNIC TABLE (EXISTING)

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

revisions	description	date
REV0	Issued for Tender	17/04/28

A detail no. / no. du detail
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C drawing no. / dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

drawing / dessin

AREA 1 PLAN SWIM DOCK AND BEACH REHABILITATION

Designed By	T.HIRSEKORN	Conçu par
Date	2017/04/27	(yyyy/mm/dd)
Drawn By	R.HALLEY	Dessiné par
Date	2017/04/27	(yyyy/mm/dd)
Reviewed By	R. EVERTS	Examiné par
Date	2017/04/27	(yyyy/mm/dd)
Approved By	T.HIRSEKORN	Approuvé par
Date	2017/04/28	(yyyy/mm/dd)
Tender	C.MORTSON	Soumission
Project Manager		Administrateur de projets

Project no. / No. du projet: 36161

Drawing no. / No. du dessin: C-02

NOTES:

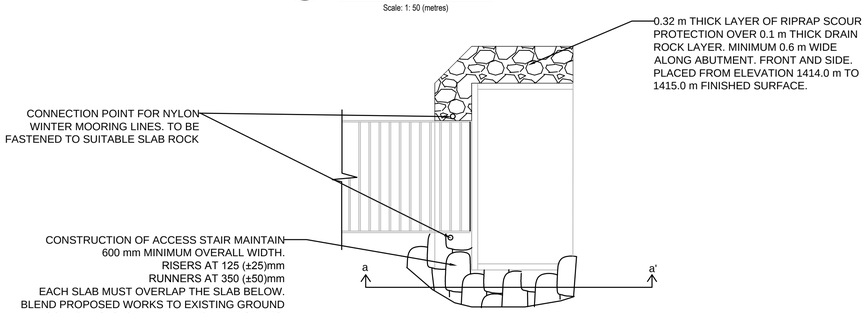
1. DISTANCES AND ELEVATIONS ARE IN METRES.
2. DRAWING COORDINATES ARE UTM/NAD83 (CSRS).
3. A SCALE FACTOR OF 1.000484 MAY BE APPLIED TO CONVERT COORDINATES TO GROUND LEVEL.
4. ELEVATIONS ARE GEODETIC.
5. DRAWING COORDINATES AND ELEVATIONS ARE DERIVED FROM A PRECISE POINT POSITION AT MCGSL POINT 500.
6. PLAN INFORMATION IS BASED ON A FIELD SURVEY COMPLETED ON MARCH 6, 2017 BY McELHANNEY.
7. CONTOUR INTERVAL = 0.5m.
8. WATER LEVELS BASED ON DSR REPORT BY DESSAN, 2014.
   - 1414.73 m = 1/1000 year Flood level,
   - 1414.25 m = FSL (2 year HWL)
   - 1414.0 m = Low Water Level (LWL)
9. WAVE CONDITIONS FROM DSR REPORT BY DESSAN, 2014. (Hs = Significant Wave Height):
   - Hs = 0.23 m for 2-year return period,
   - Hs = 0.37 m for 100-year return period.
10. ICE THICKNESS ANECDOTALLY REPORTED TO BE 0.75 m.

0 5
Scale: 1: 150 (metres)

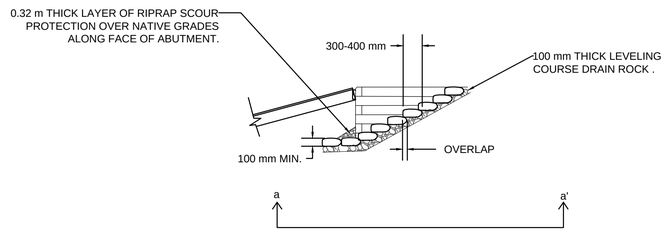
C
0 10 20mm 40 60 80 100 120 140 160 180 200mm

1 02 STONE STEP SWIMMERS EGRESS TYPICAL

Scale: 1: 50 (metres)



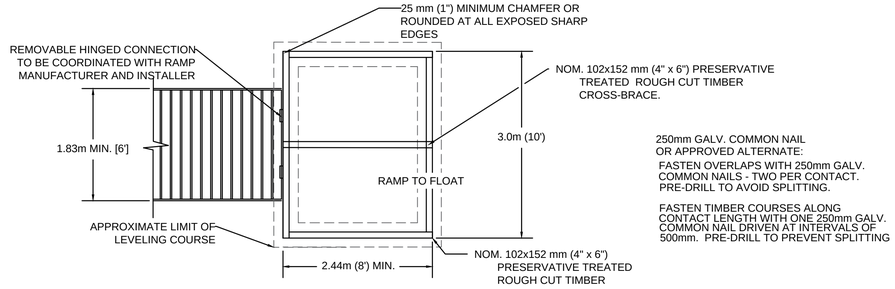
PLAN



SECTION

2 02 TIMBER ABUTMENT TYPICAL

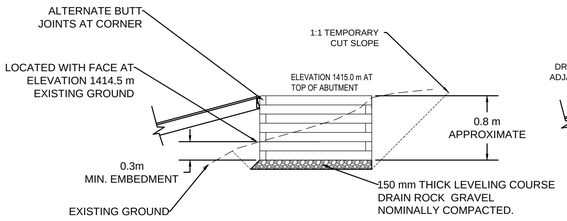
Scale: 1: 50 (metres)



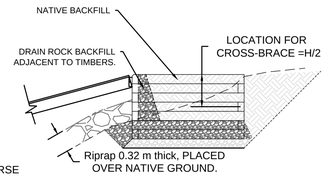
250mm GALV. COMMON NAIL OR APPROVED ALTERNATE:
FASTEN OVERLAPS WITH 250mm GALV. COMMON NAILS - TWO PER CONTACT. PRE-DRILL TO AVOID SPLITTING.

FASTEN TIMBER COURSES ALONG CONTACT LENGTH WITH ONE 250mm GALV. COMMON NAIL DRIVEN AT INTERVALS OF 500mm. PRE-DRILL TO PREVENT SPLITTING

PLAN



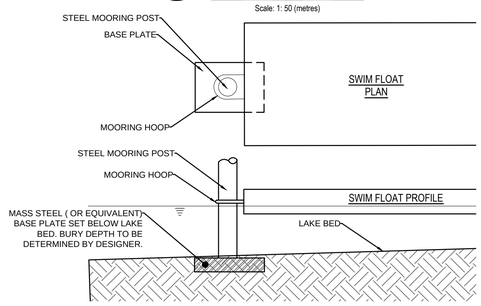
EXCAVATION AND FOUNDATION

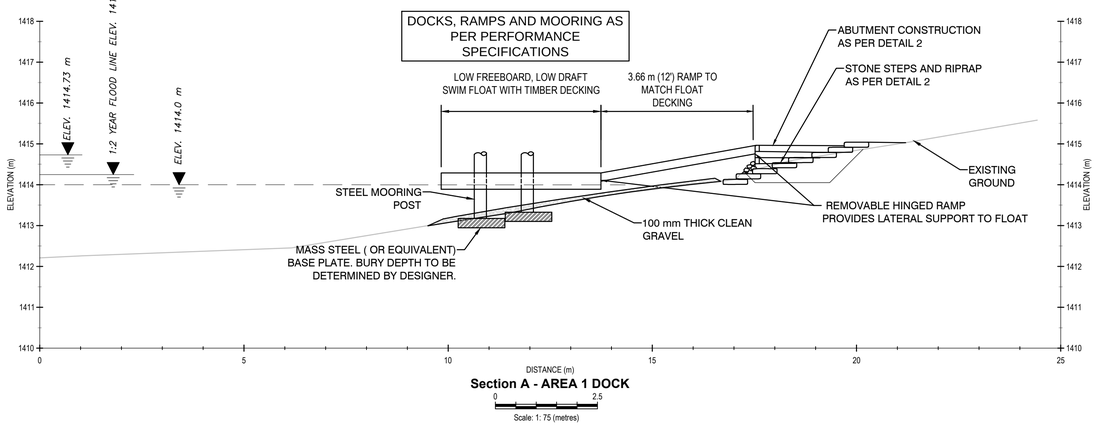


SCOUR/EROSION PROTECTION

3 02 MOORING POST CONCEPT

Scale: 1: 50 (metres)

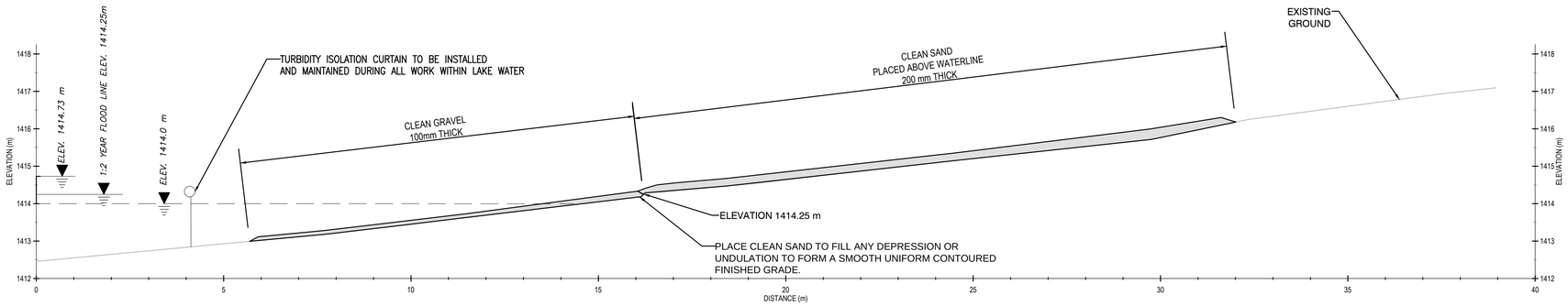




Section A - AREA 1 DOCK

0 2,5

Scale: 1: 75 (metres)



Section B - AREA 1 BEACH

0 2,5

Scale: 1: 75 (metres)

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm

Canada

Parks Canada
Parcs Canada

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

REV0	Issued for Tender	17/04/28
revisions	description	date

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

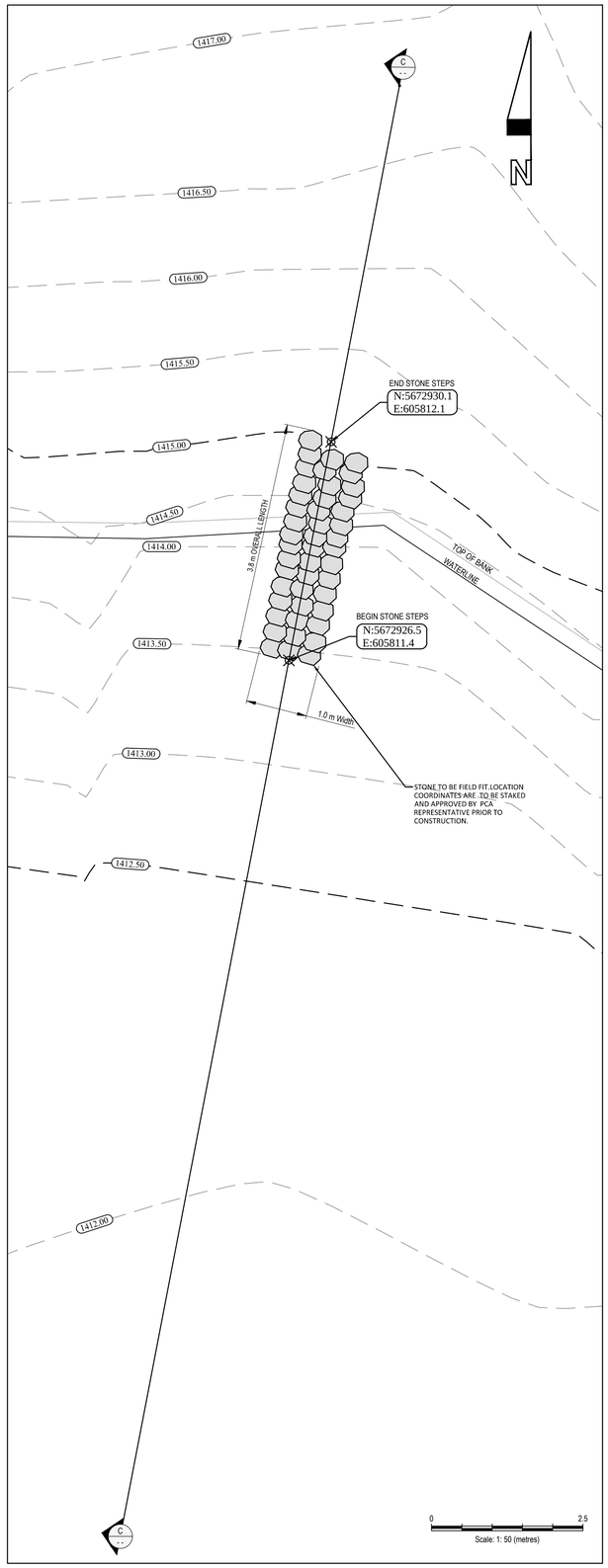
JOHNSON LAKE DOCKS AND BEACH REHABILITATION

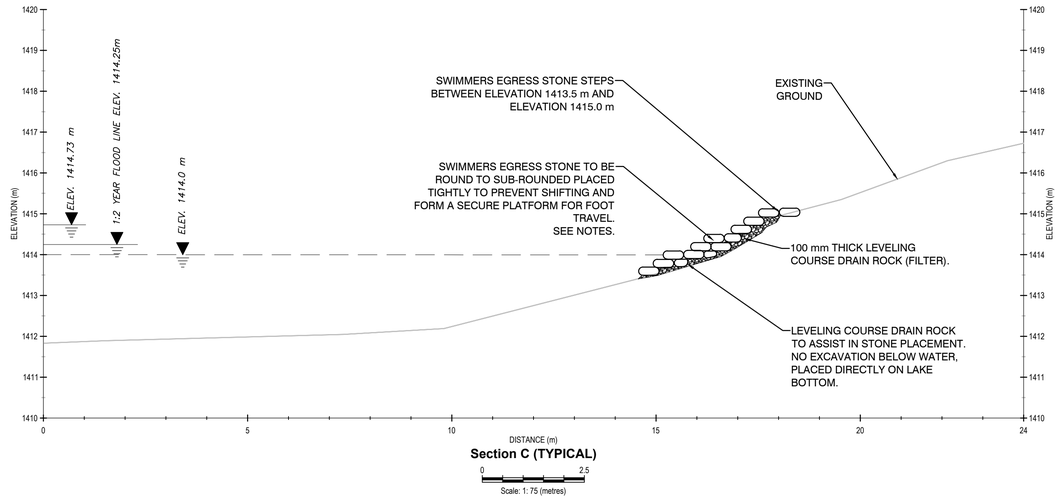
BANFF NATIONAL PARK

drawing / dessin

AREA 1 TYPICAL SECTIONS AND ABUTMENT DETAILS

Designed By / Conçu par	T.HIRSEKORN	
Date	2017/04/27	(yyyy/mm/dd)
Drawn By / Dessiné par	R.HALLEY	
Date	2017/04/27	(yyyy/mm/dd)
Reviewed By / Examiné par	R. EVERTS	
Date	2017/04/27	(yyyy/mm/dd)
Approved By / Approuvé par	T.HIRSEKORN	
Date	2017/04/28	(yyyy/mm/dd)
Tender / Soumission	C.MORTSON	
Project Manager	Administrateur de projets	
Project no. / No. du projet	36161	
Drawing no. / No. du dessin	C-03	





Section C (TYPICAL)

0 2.5

Scale: 1: 75 (metres)

NOTES:

1. STONES WILL BE 100 mm THICK MINIMUM. HORIZONTALLY 350 mm X 350 mm ± 50 mm ON AVERAGE, BUT NOT UNIFORMLY SMALLER. PLACE EACH STONE WITH THE LONGEST AXIS PERPENDICULAR TO THE SHORE AND OVER LAPPING THE STONE BELOW.
2. VEHICLE ACCESS IS NOT AVAILABLE. ACCESS BY FOOT FROM PARKING LOT. TRAIL HAS STEPS AND A SMALL BRIDGE.
3. CONTRACTOR SHALL DETERMINE THE BEST METHOD FOR BRINGING MATERIALS TO SITE AND CONSTRUCTION METHODOLOGY.
4. LOCATION COORDINATES ARE APPROXIMATE. PCA REPRESENTATIVE SHALL SELECT THE LOCATION CLOSE TO PROVIDED COORDINATES.

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm

Canada

Parks Canada
Parcs Canada

LEGEND:

- DECIDUOUS TREE
- SPRUCE TREE
- PINE TREE
- SHRUB/BUSH
- TRUNK DIAMETER ..... TD=0.2
- BUSHLINE
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- MAJOR CONTOUR ELEVATION (m) 1420.0
- MAJOR CONTOUR (PROPOSED)
- CONTOUR ELEVATION (PROPOSED) 1420.00
- PICNIC TABLE (EXISTING)

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

REV0	Issued for Tender	17/04/28
revisions	description	date

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

drawing / dessin

AREA 2
SWIMMERS EGRESS
PLAN VIEW AND
TYPICAL SECTION

Designed By / Date	T.HIRSEKORN 2017/04/27	Conçu par (yyyy/mm/dd)
Drawn By / Date	R.HALLEY 2017/24/27	Dessiné par (yyyy/mm/dd)
Reviewed By / Date	R. EVERTS 2017/04/27	Examiné par (yyyy/mm/dd)
Approved By / Date	T.HIRSEKORN 2017/04/28	Approuvé par (yyyy/mm/dd)
Tender / Project Manager	C.MORTSON	Soumission / Administrateur de projets
Project no.	36161	No. du projet
Drawing no.	C-04	No. du dessin

UNDERGROUND UTILITIES HAVE NOT BEEN SHOWN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND PROTECT ALL EXISTING SERVICES DURING CONSTRUCTION.

CONTRACTOR MUST SATISFY ALL REQUIREMENTS OF GOVERNMENT AGENCIES FOR WORKS IN THE AQUATIC ENVIRONMENT.

OWNER MAY HAVE A REPRESENTATIVE/ENGINEER ON SITE AT ANY TIME TO INSPECT THE WORK. OWNER'S REPRESENTATIVE MAY REJECT WORKS AND APPROVE CHANGES AS NECESSARY.

REPORT ANY DISCREPANCIES IN CONDITIONS OR PROBLEMS WITH CONSTRUCTION TO THE OWNER'S REPRESENTATIVE /ENGINEER IMMEDIATELY.

CONTRACTOR MUST KEEP SITE CLEAN AND FREE OF POTENTIAL HAZARDS.

1. EXCAVATION

1.1. EXCAVATED MATERIAL SHALL BE STOCKPILED FOR REUSE ON SITE.

2. FILL AND BACKFILL PLACEMENT

2.1. PLACEMENT SHALL BE DONE USING METHODS WHICH DO NOT LEAD TO SEGREGATION OR DEGRADATION OF AGGREGATE.

2.2. PLACEMENT OF BEACH SAND IS TO BE PLACED FROM WATERS EDGE PROGRESSING UP SLOPE TO A MINIMUM DEPTH OF 200mm. FILL ANY DEPRESSIONS TO FORM A SMOOTH CONTINUOUS CONTOUR.

2.3. PLACEMENT OF CLEAN GRAVEL IS TO BE PLACED FROM WATERS EDGE PROGRESSING INTO LAKE BOTTOM BY 8.0 M HORIZONTALLY MAINTAINING A MINIMUM DEPTH OF 100mm. FILL ANY DEPRESSIONS TO FORM A SMOOTH CONTINUOUS CONTOUR.

2.4. SHAPE EACH LAYER TO SMOOTH CONTOUR AND COMPACT (IF REQUIRED) TO SPECIFIED PERFORMANCE CRITERIA BEFORE SUCCEEDING LAYER IS PLACED.

2.5. REMOVE AND REPLACE PORTION OF ANY LAYER IN WHICH MATERIAL HAS BECOME SEGREGATED DURING SPREADING.

2.6. FILL PLACEMENT LIFTS SHALL NOT EXCEED 200 MM IN THICKNESS.

2.7. FILL MATERIAL REQUIRING COMPACTIVE EFFORT SHALL BE MOISTURE CONDITIONED TO 5 - 7 % MOISTURE CONTENT AND COMPACTED WITH A MINIMUM 91 KG (200 LB) PLATE COMPACTOR.

2.8. COMPACTOR SHALL BE ALLOWED SUFFICIENT TIME TO EXECUTE A MINIMUM OF SIX (6) COMPLETE PASSES. WITH ONE PASS BEING DEFINED AS ONE COMPLETE FORWARD MOTION AND ONE COMPLETE REVERSE MOTION ALONG THE SAME PATH OF TRAVEL.

2.9. COMPACTION TO BE COMPLETED FOR THE ENTIRE FOOTPRINT OF PLACED FILL AND APPROVED BY A PCA REPRESENTATIVE PRIOR TO PLACEMENT OF THE NEXT LIFT.

2.10. AREAS OF COMPLETED COMPACTION SHALL HAVE NO RUTTING OR OBSERVED DEFLECTION GREATER THAN 10 mm. ANY IDENTIFIED SOFT AREAS MAY REQUIRE FURTHER COMPACTION OR REMOVAL AND REPLACEMENT OF FILL WITHIN IMPACTED AREA.

2.11. MOISTURE CONTENT DETERMINATION IS TO BE CONDUCTED ON A BY MASS PERCENTAGE METHOD USING THE FOLLOWING EQUATION:

MC = ((MASS OF SAMPLE WET - MASS OF SAMPLE DRIED)/ MASS OF SAMPLE DRIED)X100

3. MATERIALS

3.1. ALL FILL AND SPECIFIED MATERIALS INTENDED FOR USE ON SITE SHALL BE SAMPLED AND TESTED, AND RESULTS SUBMITTED FOR ACCEPTANCE BY THE ENGINEER PRIOR TO DELIVERY ON-SITE.

3.2. AGGREGATE SHALL BE DURABLE QUARRIED STONE, HARD, ANGULAR, PH NEUTRAL, FREE FROM DIRT, SAND, CLAY AND DEBRIS, AND FREE FROM WEAK JOINTS.

3.3. WHERE THERE IS A DOUBT TO SUITABILITY, DURABILITY WILL BE DETERMINED BY ONE OR MORE OF THE FOLLOWING TESTS AT AN EXPENSE BORNE BY THE CONTRACTOR:

3.3.1. LOS ANGELES ABRASION (ASTM TEST C-535) WITH LOSS OF NOT MORE THAN 15% AFTER 500 REVOLUTIONS.

3.3.2. THE FREEZE/THAW TEST (AASHTO TEST 103 FOR LEDGE ROCK PROCEDURE A) WITH A LOSS NOT EXCEEDING 10% AFTER 12 CYCLES OF FREEZING AND THAWING.

3.3.3. THE SPECIFIC GRAVITY (BULK SATURATED-SURFACE-DRY BASIS, ASTM TEST C127) SHALL BE AT LEAST 2.60.

4. CLEAN GRAVEL (BEACH IN WATER) SHALL CONFORM TO THE FOLLOWING GRADATION LIMITS:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
75	100
50	70 – 100
25	50 – 90
4.75	22 – 80
2.36	5 – 35
0.075	0 – 2

5. BEACH SAND (BEACH DRY) SHALL CONFORM TO THE FOLLOWING GRADATION LIMITS:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
19	100
4.75	80 – 100
0.6	30 – 85
0.42	10 – 75
0.15	0 – 40
0.074	0 – 4

6. 25 MM MINUS CRUSHED GRAVEL AND SAND (STRUCTURAL FILL) SHALL CONFORM TO THE FOLLOWING GRADATION LIMITS:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
25	100
19	80 – 100
9.5	50 – 85
4.75	35 – 70
2.36	25 – 50
1.18	15 – 35
0.3	5 – 20
0.075	0 – 5

7. DRAIN ROCK TO CONSIST OF CLEAN ROUND STONE CONFORMING TO THE FOLLOWING GRADATION LIMITS:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
25	100
19	0 – 100
9.5	0 – 40
4.75	0– 5

8. INFORMAL STONE FACIA AND PATHS;

8.1. STONE MASS TO BE NO LESS THAN, 32 KG.

8.2. THICKNESS OF ANY INDIVIDUAL PIECE OF STONE IS TO BE NO LESS THAN 100 mm (4").

8.3. IN AREAS STONES ARE TO BE USED AS STEPS THE PLATFORM OF EACH STONE IS TO BE NO LESS THAN 300 mm (12") ALONG PATH WITH AN OVER ALL PATH WIDTH WIDTH OF NO LESS THAN 600 mm (24").

8.4. STONE FOR THE PROJECT SHALL BE STOCKPILED AT THE SOURCE OR ON THE SITE FOR INSPECTION PRIOR TO PLACEMENT. STOCKPILE FOR INSPECTION NOT TO CONTAIN LESS THAN THE REQUIRED VOLUME FOR PROJECT.

8.5. STONE NOT CONFORMING TO THE REQUIREMENTS STATED HERE, SHALL BE REMOVED FROM THE PROJECT SITE AT THE EXPENSE OF THE CONTRACTOR.

8.6. DO NOT DROP MATERIAL FROM A HEIGHT GREATER THAN 1.0 m VERTICALLY FROM ITS FINAL POSITION.

8.7. PLACE MATERIAL FROM THE TOE OF SLOPE AND PROCEED UP THE SLOPE.

8.8. THE CONTRACTOR SHALL ENSURE THAT THE FINISHED SURFACE IS COMPRISED OF THE FULL SPECTRUM OF PARTICLE SIZES CONTINUOUSLY THROUGHOUT ITS LENGTH AND BREADTH.

8.9. DRESS ALL VOIDS SO THAT THE FINAL SURFACE IS WELL KEYED, DENSELY PLACED AND UNIFORM. THE ENGINEER WILL REQUIRE THE FILLING OF ALL SURFACE VOIDS INTO WHICH A ROCK HAVING A MASS EQUAL OR GREATER THAN 25% OF THE MAXIMUM STONE MASS CAN BE PLACED.

9. RIPRAP SHALL CONFORM TO THE FOLLOWING GRADATION LIMITS, FROM DSR REPORT BY DESSAU, 2014:

NOMINAL SIZE (mm)	PERCENT TOTAL WEIGHT LESS THAN GIVEN SIZE
250	100
230	50 – 100
150	0 – 20

9.1. NEITHER THE BREADTH NOR THE THICKNESS OF ANY INDIVIDUAL PIECE OF RIPRAP IS TO BE LESS THAN 50 PERCENT OF ITS LENGTH.

9.2. RIPRAP FOR THE PROJECT SHALL BE STOCKPILED AT THE SOURCE OR ON THE SITE FOR INSPECTION

PRIOR TO PLACEMENT. STOCKPILE FOR INSPECTION NOT TO CONTAIN LESS THAN 1000 TONNES OF MATERIAL.

9.3. RIPRAP NOT CONFORMING WITH THE REQUIREMENTS STATED HERE SHALL BE REMOVED FROM THE PROJECT SITE AT THE EXPENSE OF THE CONTRACTOR.

9.4. DO NOT DROP MATERIAL FROM A HEIGHT GREATER THAN 1.0 M VERTICALLY FROM ITS FINAL POSITION.

9.5. PLACE MATERIAL FROM THE TOE OF SLOPE AND PROCEED UP THE SLOPE.

9.6. PLACE MATERIAL SO THAT TO FORM SMOOTH CONTOURING WITH NO PROMINENT LOW AREAS OR HIGH AREAS.

9.7. THE CONTRACTOR SHALL ENSURE THAT THE FINISHED SURFACE IS COMPRISED OF THE FULL SPECTRUM OF PARTICLE SIZES CONTINUOUSLY THROUGHOUT THE LENGTH AN THE BREADTH.

10.NON-WOVEN GEOTEXTILE;

10.1. GEOTEXTILE SHALL BE A NON-WOVEN SYNTHETIC FIBRE FABRIC, SUPPLIED IN ROLLS. NILEX 4510E OR PRE-APPROVED EQUIVALENT.

10.1.1. WIDTH: 3.5 M MINIMUM.

10.1.2. LENGTH: 50 M MINIMUM.

10.1.3. COMPOSED OF:

10.1.3.1. MINIMUM 85% BY MASS OF POLYESTER WITH INHIBITORS ADDED TO BASE PLASTIC TO RESIST DETERIORATION BY ULTRA-VIOLET AND HEAT EXPOSURE FOR 60 DAYS.

10.2. PHYSICAL PROPERTIES:

10.2.1. TENSILE STRENGTH AND ELONGATION (IN ANY PRINCIPAL DIRECTION): TO ASTM D4595.

10.2.2. TENSILE STRENGTH: MINIMUM 1000 N, WET CONDITION.

10.2.3. ELONGATION AT BREAK: MINIMUM 50%.

10.2.4. SEAM STRENGTH: EQUAL TO OR GREATER THAN TENSILE STRENGTH OF FABRIC.

10.3. HYDRAULIC PROPERTIES:

10.3.1. APPARENT OPENING SIZE (AOS): TO ASTM D4751, 0.150 MICROMETRES.

11. ENVIRONMENTAL REQUIREMENTS:

11.1. TURBIDITY ISOLATION CURTAIN TO BE INSTALLED AS PER PCA ENVIRONMENTAL REQUIREMENTS.

11.2. PROVIDE TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES TO PREVENT SOIL EROSION AND DISCHARGE OF SOIL-BEARING WATER RUNOFF OR AIRBORNE DUST TO ADJACENT PROPERTIES AND WALKWAYS, ACCORDING TO PCA ENVIRONMENTAL PROCEDURES.

11.3. INSPECT, REPAIR, AND MAINTAIN EROSION AND SEDIMENTATION CONTROL MEASURES DURING CONSTRUCTION

11.4. REMOVE EROSION AND SEDIMENTATION CONTROLS AND RESTORE AND STABILIZE AREAS DISTURBED DURING REMOVAL.

12.TIMBER FABRICATION AND INSTALLATION

12.1. MATERIALS

12.1.1. TREATED TIMBER AND LUMBER SHALL BE IMPREGNATED WITH PRESERVATIVE SUITABLE FOR SPECIFIED CONSTRUCTION TYPE AND LOCATION.

12.1.2. UNLESS OTHERWISE SPECIFIED, STRUCTURAL STEEL SHAPES, PLATES, AND RODS SHALL NOT BE GALVANIZED. NUTS, DRIFTBOLTS, DOWELS, AND SCREWS SHALL BE EITHER WROUGHT IRON OR STEEL.

12.2. WORKMANSHIP

12.2.1. ALL FRAMING SHALL BE TRUE AND EXACT. TIMBER AND LUMBER SHALL BE ACCURATELY CUT AND ASSEMBLED TO A CLOSE FIT AND SHALL HAVE EVEN BEARING OVER THE ENTIRE CONTACT SURFACE. NO OPEN OR SHIMMED JOINTS WILL BE ACCEPTED. NAILS AND SPIKES SHALL BE DRIVEN WITH JUST SUFFICIENT FORCE TO SET THE HEADS FLUSH WITH THE SURFACE OF THE WOOD. DEEP HAMMER MARKS IN WOOD SURFACES SHALL BE CONSIDERED EVIDENCE OF POOR WORKMANSHIP AND MAY BE SUFFICIENT CAUSE FOR REJECTION OF THE WORK.

12.2.2. HOLES FOR ROUND DRIFTPINS AND DOWELS SHALL BE BORED WITH A BIT 1/16 INCH SMALLER IN DIAMETER THAN THAT OF THE DRIFTPIN OR DOWEL TO BE INSTALLED. THE DIAMETER OF HOLES FOR SQUARE DRIFTPINS OR DOWELS SHALL BE EQUAL TO ONE SIDE OF THE DRIFTPIN OR DOWEL. HOLES FOR LAG SCREWS SHALL BE BORED WITH A BIT NOT LARGER THAN THE BODY OF THE SCREW AT THE BASE OF THE THREAD.

12.2.3. WASHERS SHALL BE USED IN CONTACT WITH ALL BOLT HEADS AND NUTS THAT WOULD OTHERWISE BE IN CONTACT WITH WOOD. CAST IRON WASHERS SHALL BE USED WHEN THE BOLT WILL BE IN CONTACT WITH EARTH. ALL NUTS SHALL BE CHECKED OR BURRED EFFECTIVELY WITH A POINTED TOOL AFTER FINALLY TIGHTENED.

12.2.4. UNLESS OTHERWISE SPECIFIED, SURFACING, CUTTING, AND BORING OF TIMBER AND LUMBER SHALL BE COMPLETED BEFORE TREATMENT. IF FIELD CUTTING OR FIELD REPAIR OF TREATED TIMBER AND LUMBER IS APPROVED, ALL CUTS AND ABRASIONS SHALL BE CAREFULLY TRIMMED AND COATED WITH APPROVED PRESERVATIVE. THE TREATMENT PRESERVATIVE SHALL BE APPLIED ACCORDING TO THE PRODUCT LABEL. ANY EXCESS PRESERVATIVE NOT ABSORBED BY THE WOOD MEMBER SHALL BE CLEANED FROM THE SURFACE PRIOR TO THE USE OF THE MEMBER. AFTER TIMBER ASSEMBLY, ANY UNFILLED HOLES SHALL BE PLUGGED WITH TIGHTLY FITTING WOODEN PLUGS THAT HAVE BEEN TREATED WITH PRESERVATIVE AS SPECIFIED.

12.3. HANDLING AND STORING MATERIAL

ALL TIMBER AND LUMBER STORED AT THE SITE OF THE WORK SHALL BE NEATLY STACKED ON SUPPORTS A MINIMUM OF 12 INCHES ABOVE THE GROUND SURFACE AND PROTECTED FROM THE WEATHER BY SUITABLE COVERING(S). UNTREATED MATERIAL SHALL BE STAKED AND STRIPPED TO PERMIT FREE CIRCULATION OF AIR BETWEEN THE TIERS AND COURSES. TREATED TIMBER MAY BE CLOSE-STAKED. THE GROUND SURFACE FOR THE STOCKPILE OF TIMBER AND LUMBER SHALL BE FREE OF WEEDS AND RUBBISH. THE USE OF CANT HOOKS, PEAVIES, OR OTHER POINTED TOOLS EXCEPT END HOOKS IS NOT PERMITTED IN THE HANDLING OF STRUCTURAL TIMBER AND/OR LUMBER. TREATED TIMBER SHALL BE HANDLED WITH ROPE SLINGS OR BY OTHER METHODS THAT PREVENT THE BREAKING OR BRUISING OF OUTER FIBERS OR PENETRATION OF THE SURFACE IN ANY MANNER.

13. ACCESS DEVELOPMENT

13.1. THE CONTRACTOR SHALL DEVELOP ACCESS TO THE SITE TO FACILITATE CONSTRUCTION AS INDICATED IN THESE SPECIFICATIONS AND ON THE CONTRACT DRAWINGS. THE CONTRACTOR IS FULLY RESPONSIBLE FOR THE SELECTION AND IMPLEMENTATION OF ALL METHODS TO ACCOMPLISH THIS REQUIREMENT. THE CONTRACTOR IS REQUIRED TO DEVELOP ACCESS TO THE SITE WITHIN THE ZONES INDICATED ON THE CONTRACT DRAWINGS. THE LOCATIONS AND METHODS USED TO DEVELOP ACCESS SHALL BE REVIEWED AND ACCEPTED BY THE PCA REPRESENTATIVE PRIOR TO IMPLEMENTATION.

13.2. THE CONTRACT DRAWINGS INCLUDE CONCEPTUAL ACCESS POINTS, RAMPS AND ROADS ALONG WITH MAXIMUM LIMITS. THIS INFORMATION HAS BEEN REVIEWED BY THE PCA BUT PROVIDED TO THE CONTRACTOR FOR CONSIDERATION ONLY. THE CONTRACTOR MAY CHOOSE TO ADOPT THIS APPROACH OR ALTER AS DEEMED APPROPRIATE. REGARDLESS OF THE APPROACH TAKEN, THE CONTRACTOR REMAINS RESPONSIBLE FOR ACHIEVING THE STATED OBJECTIVES FOUND IN THE PROJECTS - ENVIRONMENTAL PROTECTION AND SHALL COMPLY WITH ALL APPROVAL REQUIREMENTS OF THE REGULATORY AGENCIES.

13.3. THE COMPLETION OF THE WORKS WILL LIKELY CAUSE DISTURBANCE OF SOME EXISTING TREES AND BRUSH. THE INTENT IS TO NOT REMOVE ANY TREES AND BRUSH IN ORDER TO FACILITATE THE WORK. PRIOR TO STARTING WORK, CONTRACTOR IS TO REVIEW SITE WITH PCA REPRESENTATIVE TO IDENTIFY ANY POSSIBLE DAMAGE THAT MAY BE CAUSED TO NATIVE VEGETATION AND PROPOSE MEASURES TO MITIGATE POSSIBLE DAMAGE. THESE MEASURE ARE TO BE APPROVED BY THE PCA REPRESENTATIVE PRIOR TO COMMENCEMENT OF WORK.

13.4. KEEP PAVEMENT AND AREA ADJACENT TO SITE CLEAN AND FREE FROM EXCESSIVE MUD, DIRT, AND DEBRIS AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CLEANUP.

14.RESTORATION

14.1. REMOVE ACCESS POINTS, ROADS, PADS, AND ALL OTHER WORKS INSTALLED DURING ACCESS DEVELOPMENT (INCLUDING THOSE SHOWN ON CONTRACT DRAWINGS). RE-INSTATE THE WORK SITE TO A CONDITION EQUAL TO OR BETTER THAN THE SITE CONDITION PRIOR TO CONSTRUCTION BY:

14.1.1. RESTORING ORGANIC SOILS (IF REMOVED DURING ACCESS DEVELOPMENT).

14.1.2. ELIMINATING UNEVEN AREAS AND LOW SPOTS.

14.1.3. RESTORING DRAINAGE PATTERNS.

14.1.4. REMOVAL OF ALL GRAVELS, OTHER MATERIALS, OR STRUCTURES PLACED TO CREATE ACCESS POINTS, ROADS OR PADS. DISPOSE OF GRAVELS, OTHER MATERIALS, OR STRUCTURES AT AND OFF-SITE DISPOSAL FACILITY ACCEPTABLE TO THE PCA REPRESENTATIVE.

14.1.5. REPLACEMENT OF ALL TEMPORARY EXCAVATED MATERIALS INCLUDING STRIPPING. RETURN GROUND BACK TO ORIGINAL CONTOUR ELEVATIONS OR AS PRE-APPROVED BY THE DEPARTMENTAL REPRESENTATIVE.

14.1.6. LEVELING AND SEEDING ALL DISTURBED AREAS WITH NATIVE GRASS SEED SPECIES MIXTURE IN ACCORDANCE WITH BANFF NATIONAL PARK, AND APPROVED BY PCA REPRESENTATIVE.

C

0 10 20mm 40 60 80 100 120 140 160 180 200mm

Canada

Parks Canada
Parcs Canada

LEGEND:

DECIDUOUS TREE .....

SPRUCE TREE .....

PINE TREE .....

SHRUB/BUSH .....

TRUNK DIAMETER ..... TD=0.2

BUSHLINE .....

MAJOR CONTOUR (EXISTING).....

MINOR CONTOUR (EXISTING).....

MAJOR CONTOUR ELEVATION (m) 1420.0

MAJOR CONTOUR (PROPOSED) .....

CONTOUR ELEVATION (PROPOSED) 1420.00

PICNIC TABLE (EXISTING).....

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

REV0	Issued for Tender	17/04/28
revisions	description	date

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

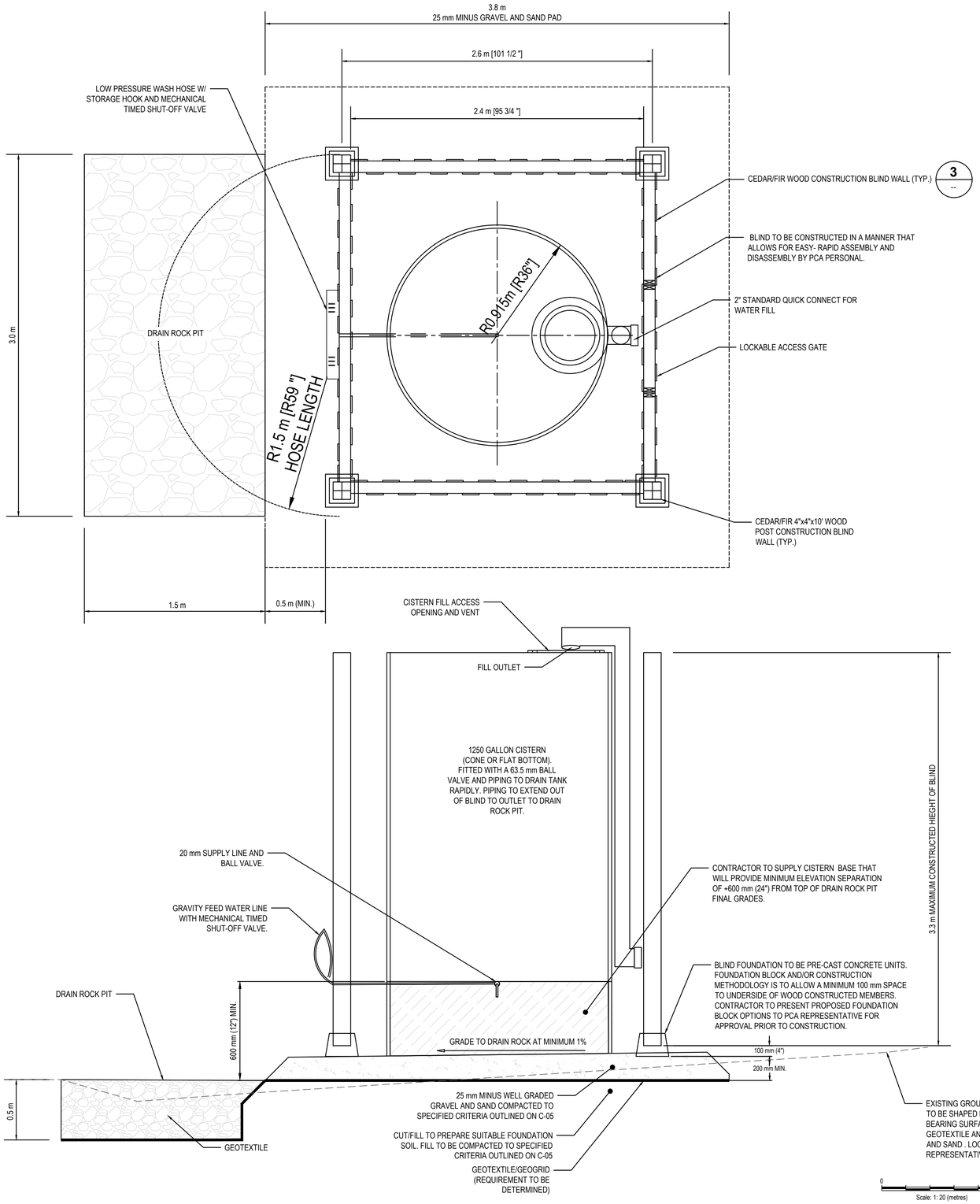
drawing / dessin

CONSTRUCTION NOTES AND SPECIFICATIONS

Designed By / Date	T.HIRSEKORN 2017/04/27	Conçu par (yyyy/mm/dd)
Drawn By / Date	R.HALLEY 2017/04/27	Dessiné par (yyyy/mm/dd)
Reviewed By / Date	R. EVERTS 2017/04/27	Examiné par (yyyy/mm/dd)
Approved By / Date	T.HIRSEKORN 2017/04/28	Approuvé par (yyyy/mm/dd)
Tender / Project Manager	C.MORTSON	Soumission / Administrateur de projets

Project no. / No. du projet: 36161

Drawing no. / No. du dessin: C-05



3 BLIND TEXTURE
N.T.S.

NOTES:

1. DISTANCES AND ELEVATIONS ARE IN METRES.
2. ALL ELEMENTS OF THE COMPLETE WASH STATION SHOWN ON THIS SHEET, SUCH AS THE CISTERN, STRUCTURAL SUPPORTS, HOSE, TIMED SHUT OFF VALVE, EARTHWORKS AND BLIND WALL COMPONENTS, ARE TO BE PROPOSED AS A COMPLETE, FUNCTIONING PACKAGE BY THE CONTRACTOR AS PER PERFORMANCE SPECIFICATIONS.

Canada

Parks Canada
Parcs Canada

LEGEND:

- DECIDUOUS TREE
- SPRUCE TREE
- PINE TREE
- SHRUB/BUSH
- TRUNK DIAMETER ..... TD=0.2
- BUSHLINE
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- MAJOR CONTOUR ELEVATION (m) 1420.0
- MAJOR CONTOUR (PROPOSED)
- CONTOUR ELEVATION (PROPOSED) 1420.00
- PICNIC TABLE (EXISTING)

Contractor to verify all dimensions & conditions on site and immediately notify the departmental representative of all discrepancies.

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C drawing no. dessin no.

project / projet

JOHNSON LAKE DOCKS AND BEACH REHABILITATION

BANFF NATIONAL PARK

drawing / dessin

PARKING AREA
WASH STATION
PLAN AND ELEVATION

Designed By / Date	T.HIRSEKORN 2017/04/27	Conçu par (yyyy/mm/dd)
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Approved By / Date	T.HIRSEKORN 2017/04/28	Approuvé par (yyyy/mm/dd)
Tender / Project Manager	C.MORTSON	Soumission / Administrateur de projets

Project no. / No. du projet: 36161

Drawing no. / No. du dessin: S-01