Detailed Impact Analysis

Dam Rehabilitation
Port Severn Main Dam & Blind Dam D

Trent-Severn Waterway
District Municipality of Muskoka
Port Severn Road (Muskoka Road 5)
Port Severn, Ontario, Ontario

August 2018

Environmental Impact Assessment Version Control

This section serves to control the development and distribution of revisions to the Environmental Assessment.

Version Number	Amendment Number	Date	Brief Description of Change
1		September 21 2018	Final Signed

1. PROJECT TITLE & LOCATION

Port Severn Main Dam and Blind Dam D Rehabilitation
Trent Severn Waterway
District Municipality of Muskoka
175 Port Severn Road (Muskoka Road 5), Port Severn
Honey Harbour, ON P0E 1N0
44° 48’ 13” N Latitude and 79° 43’ 21” W Longitude

The Port Severn structures are part of The Trent-Severn Waterway (TSW), which meanders 386 km along Central Ontario and consists of many locks, bridges and dams. The dam that is the subject of this assessment is located on the outflow of the Severn River into Georgian Bay. The Port Severn dams and lock were originally constructed in 1915-16. The bridges are located on Muskoka Road 5 in Port Severn, Ontario, are the main access into Port Severn and accommodate local, commercial and tourist traffic. Currently.

As Parks Canada owns property around these structures, this Environmental Impact Assessment is being conducted under s.67 of the Canadian Environmental Assessment Act (CEAA) 2012, to meet Parks Canada’s legal and mandated obligations to protect Canada’s natural and cultural heritage.

As works will be conducted on federally-owned land, this Impact Assessment addresses requirements related to the protection of the environment and wildlife as regulated by the following legislation:

- The Species at Risk Act, 2002 (SARA);
- The Fisheries Act;
- The Migratory Birds Convention Act, 1994 (MBCA); and
- The Canadian Environmental Protection Act, 1999.

As part of PCA’s good neighbour policy, any and all stipulations of federal, provincial, or municipal authorities and/or their officers must be followed. As a best practice, the most stringent standards must be used where applicable. As such, wildlife at the site may also be protected by the following provincial legislation:

- The Ontario Endangered Species Act, 2007 (ESA); and
- The Fish and Wildlife Conservation Act, 1997 (FWCA).

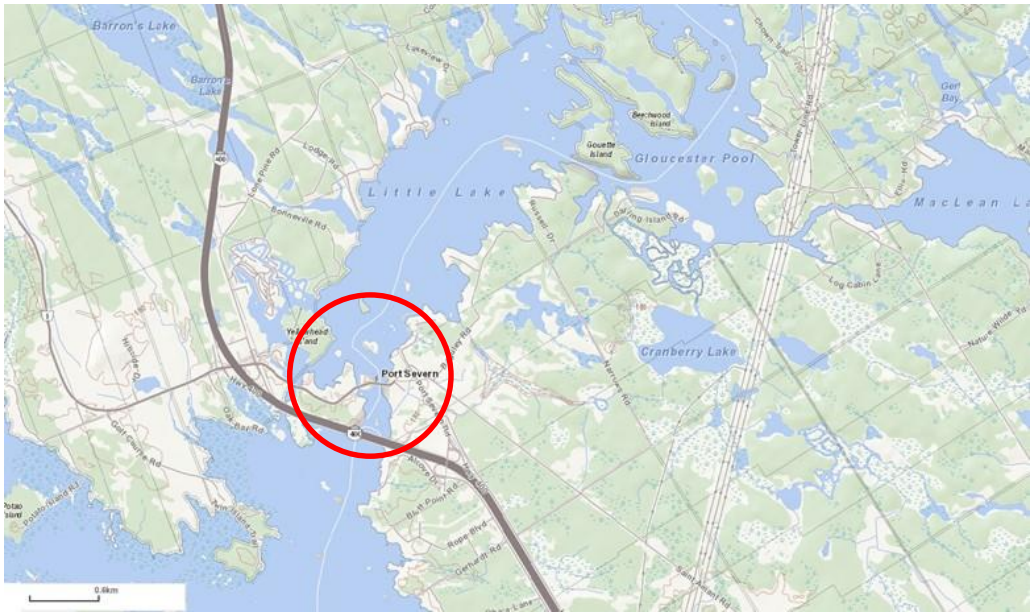


Figure 1. Location of the Dam in Port Severn (Ontario Ministry of Natural Resources and Forestry) with Little Lake and Gloucester Pool upstream.

Figure 2. Port Severn Dams and Project areas

2. PROPONENT INFORMATION

Parks Canada, Trent-Severn Waterway National Historic Site
P.O. Box 567, 2155 Ashburnham Drive
Peterborough, ON K9J 6Z6

3. PROPOSED PROJECT DATES

Planned commencement: October 2018
Planned completion: April 2021

4. INTERNAL PROJECT FILE # IA: TSW-2018-006 (I); I/O: 30025772

5. PROJECT DESCRIPTION

Main Dam, Lock and Fixed Bridge

The Port Severn Main Dam is a concrete gravity structure completed, along with the associated Lock 45, in 1915. It has an overall length of 71.32m with a surveyed elevation of 10.55m from top of deck to bedrock, upon which it is built. There are nine (9) sluiceways with timber stop logs that are operated with a hydraulic log lifter. Each sluice is 6.1m wide with piers that are 1.83m wide. Although there are nine sluiceways, only sluices # 2 through 6 are operated on a regular basis. Other sluices would be operated only under extreme flood conditions. Sluice # 1, which is the most westerly sluice located next to the Lock, can only be operated with a manual winch. Sluices #7 to 9 are located over non-submerged ground and operating these sluices would result in flooding of land immediately downstream. A hydro pole is located on the downstream side of Sluice # 9.

Figure 3. Landsat (spring) image of the dams (Ontario Ministry of Natural Resources and Forestry)

The sluices sit on concrete sills, which are higher than the bedrock substrate below. Sluices 2 and 3 can hold up to 12 logs, while all others hold 10. The wooden stoplogs are 305mm (12”) high and 6.63m (21’ 9”) long. The dam deck is made of reinforced concrete. The downstream section of the dam deck acts as a bridge for Port Severn Road. The upstream section acts as an operation area on which three parallel steel rails run along the dam deck to convey the hydraulic log lifter and the manual winches.

The fixed bridge consists of a concrete deck with nine equal spans, integrated with four concrete beams. The total length of the fixed bridge is 69.5m between the outside faces of the west abutment and east abutment (Pier 1 and 10, respectively). The roadway deck has an exposed concrete surface and a clear width of 4.67m that carries a single lane of bi-directional traffic over the Dam. 1.2m high cast in- place barriers are on each side of the bridge. There is no sidewalk on the fixed bridge. The bridge deck is supported on the dam piers. The Port Severn Road is classified as a two lane undivided rural collector road with a posted speed of 50km/h and an on-bridge posting of 20km/h.

Water leaving the TSW and flowing to Georgian Bay is managed through 6 sites – the main dam, Bayview Dam ‘E’, Little Chute Dam ‘G’ and Little Go Home Bay, Hungry Bay and Crooked Bay dams on the west side of Six Mile Lake. The highest discharge through Swift Rapids was 275 m^3/s in April 1960 since recording started in 1953; the highest water level recorded on Gloucester Pool was 180.72 in 1948. Estimated total discharge of the Main Dam is between 89 m^3/s and 133 m^3/s.

The Lock is located at the west end of the main dam and shares a common wall just downstream of the lock gate with the first pier of the main dam. Lock 45 is a non-reinforced, mass concrete gravity structure with an overall 25.6m length, 3.76m depth and a guaranteed 1.64m draft.

Port Severn Main Dam, Lock 45 and the Fixed Bridge are classified as Level 2 Cultural Resources. As stated, the structures were constructed in 1915. No major rehabilitation of the dam has taken place since then. There were investigations and repairs to the lock walls as well as a new Lock Building and extensions to the lock approach walls in 1985.

Blind Dam D

Blind Dam D (Dam D), located about 195m northeast of the Main Port Severn Dam (Figure 3), is a concrete structure built around the same time as the other Port Severn dams. It is a 119m long retaining wall of concrete founded on bedrock with an earth embankment. The height of the structure is around 2.4m. Dam C (along with Dam A and C) functions as a retaining wall to manage the water elevations and prevent flooding of adjacent lands, which are a mixture of residential properties, restaurants, parking lots and marinas. Since its construction, the area behind this dam (as the case with the other blind dams A, B, C, and F, Figure 5), has been developed and landscaped, which serves to obscure the original function.

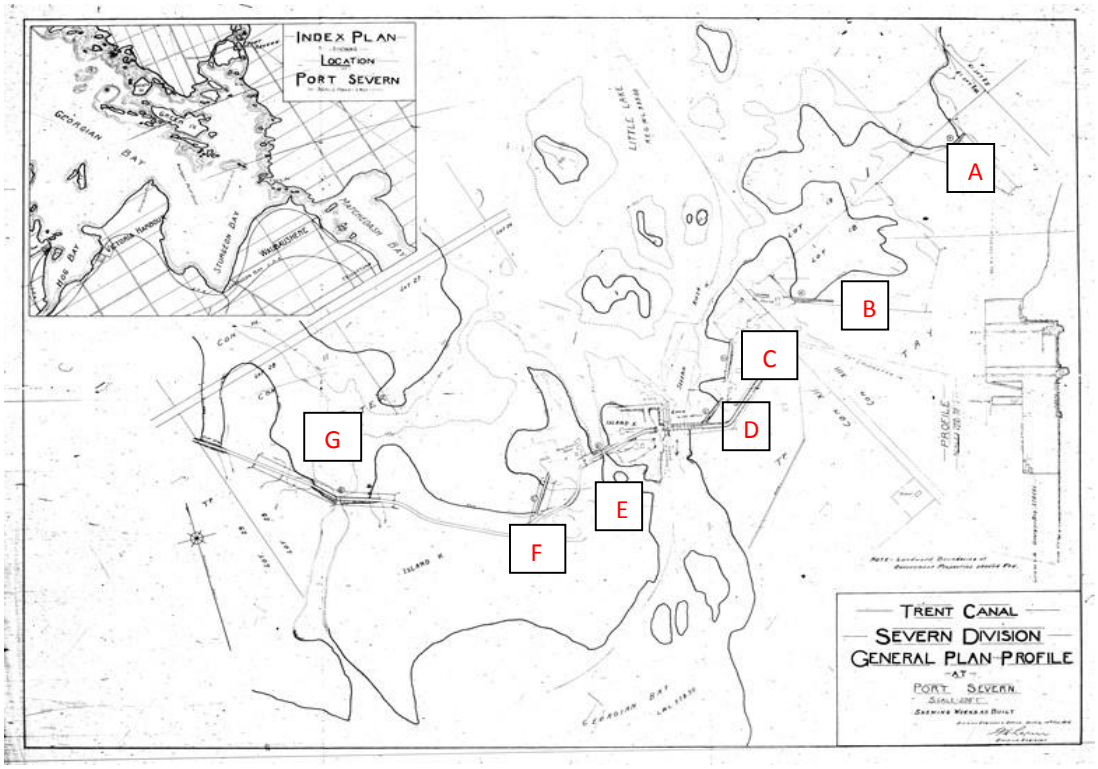
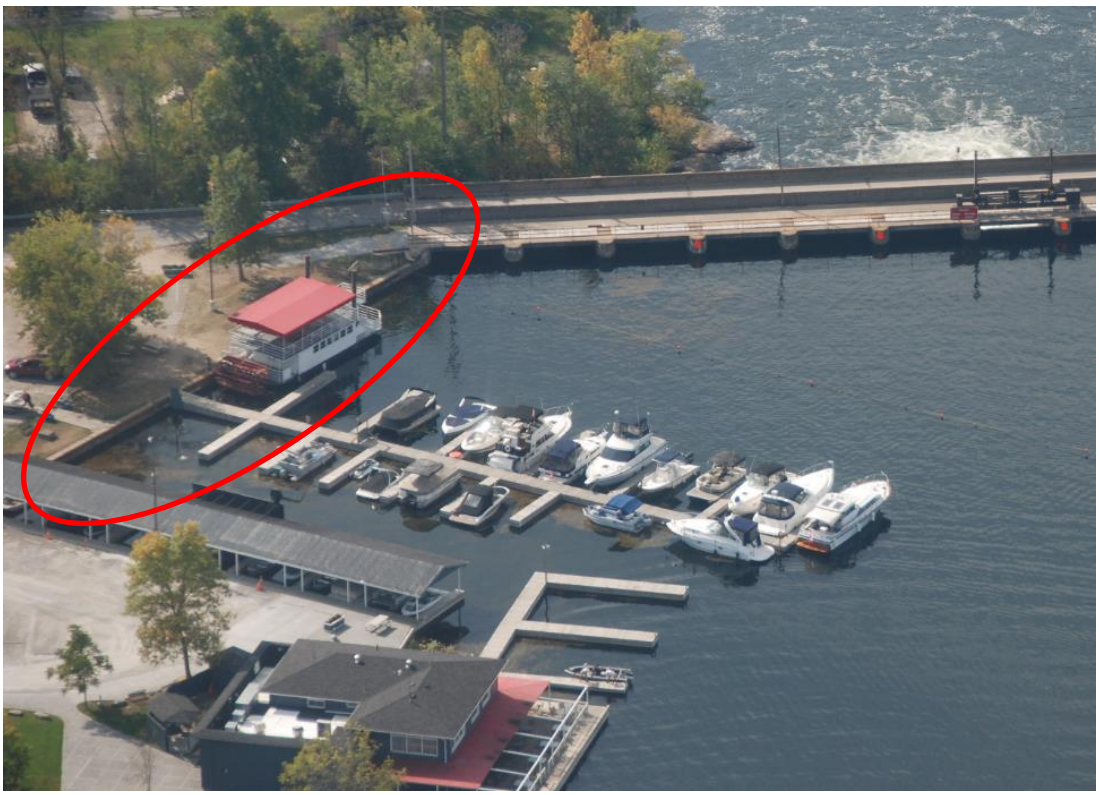


Figure 4. Historical Site Plan of Port Severn showing the location of the dams



Blind Dam D (Parks Canada photo taken September 2017)

Figure 5. Aerial view of dam showing the features of the dams.

Scope of Work

Port Severn Main Dam

- mechanize Sluices 1-6 with 6.1M vertical gates
- Slight footprint increase upstream to accommodate gates
- Same # sluices
- Same sluice widths
- All sluices to have same elevation (as opposed to current configuration)
- Addition of pedestrian walkway between the operational deck and the bridge
- Roadway to remain as is

New building extension required to Visitor Center to house Mechanical Control equipment for mechanized dam

- Initial Building footprint estimate is 8m x 6m or 16m x 3m.
- Ancillary Building is 8m x 3m
- Generator on concrete pad - 8m x 3m

Blind Dam D

- Re-facing of the concrete structure (or depending on degree of deterioration, re-build) with no change in dimensions or elevation

Physical Works, Stages and Activities

- Site preparation - mobilization, set-up of temporary facilities, laydown area
- Closure of Port Severn Road (January 2019)
- Phase 1 (Gates 1-3, partial gate 4, Lock 45 and Upper Approach Walls)
    - Installation of turbidity curtains
    - Install Cofferdam, Dewatering
    - Demo Fixed Bridge. Piers, Slab, and Gates
    - Repair Upper Approach Walls
    - Repair Common Wall and Replace Stairs
    - Control Building Construction
    - Rebuild Fixed Bridge and Install Gates
    - Commissioning - Gates 1-3
    - Remove Cofferdam
- Phase 2 (Gates 4-9, Dam D)
    - Installation of turbidity curtains
    - Install Cofferdam, Dewatering
    - Demo Fixed Bridge. Piers, Slab, and Gates
    - Rebuild Fixed Bridge and Install Gates
    - Dam D Reconstruction
    - Commissioning - Gates 4-9
    - Open Port Severn Road (November 2020)
    - Remove Cofferdam
    - Final Landscaping (Deferred to spring of 2021)
    - Demobilization & Substantial Completion

Associated Project activities

- Waste management;
- Topsoil and excavated material storage;
- Fueling/fuel storage;
- Equipment operation/maintenance/storage;
- Equipment cleaning and washout.

<u>Project Timing</u>

Total Construction Phase - October 2018 to August 2021 (563 days)

- Dam Phase 1 (Gates 1-3) – end of October 2018 to September 2019 (220 days)
- Dam Phase 2 (Gates 4-9, Dam D) - September 2019 to January 2021 (333 days)
- Landscaping final demobilization - August 2021

6. VALUED COMPONENTS POTENTIALLY AFFECTED

A Valued Environmental Component (VEC) is an element of the environment that has scientific, economic, social, or cultural significance. The VECs chosen to be included in the effects assessment are those considered to be most likely potentially affected by construction based on the scope and scale of the projects and their timing.

VECs identified for the projects include:

- Fish, aquatic habitat and surface water quality;
- Recreation/local business;
- Species at Risk (SAR);
- Air quality/noise; and
- Cultural and archaeological resources.

Baseline studies were conducted in the Port Severn area in order to characterize the existing environment and define these VECs. A summary of those findings is presented below. The SAR Summary is located in Appendix 4; the baseline study report in Appendix 5.

<u>Fish, Aquatic Habitat and Surface Water Quality</u>

Port Severn is located at the outflow of the Severn River Watershed. The watershed drains an area of over 6,000km². Included in this watershed are the Canal Lake – Talbot River system, the Holland River, the Lake Simcoe-Couchiching basin, the Black River and the channels of the Severn River below the hamlet of Washago. The principal tributary of the Severn River is the Black River which flows into the Severn a short distance from the outlet of Lake Simcoe-Couchiching. Downstream of the confluence of the Black and Severn rivers lies the Lower Severn sub-basin, which has a drainage area of 824km².

A fish habitat assessment of portions of the entire TSW was completed by the consultant company Arcadis during summer/fall 2016 to help further define fish habitat conditions and likelihood of species presence and use at future project sites (*Fish Habitat Assessment of Various Sites Along the Trent-Severn Waterway (TSW) & The Rideau Canal Waterway (RCW)-Port Severn Dams,* March 2017). This was supplemented in July 2017 with a more targeted site assessment at Port Severn by Niblett Environmental (NEA) (*Environmental Constraints and Mitigation Report for the Rehabilitation Of Port Severn Dams, Trent Severn Waterway,* December 2017).

Upstream – Little Lake

The Port Severn Main Dam and D are disturbed sites characterized by mixed substrates, hardened concrete shoreline and moderate submergent and floating vegetation. At its south end, Dam D meets the Main Dam and the dammed pool forms part of Little Lake. The water around Dam D consists primarily of a marina and dock network and although it may provide cover for fish, it is regularly disturbed. The dam upstream habitat is a deep run with no riffle features, an average water depth of 4m and dominated by a granite bedrock substrate. The water is shallower at dam D, with a mean depth of 0.75m. The shoreline is developed and open; aquatic and riparian vegetation are absent. With all the in-water modifications, boat traffic, watercraft pollution and human disturbance, fish habitat is marginal. No sensitive aquatic features are identified upstream or downstream within the site.

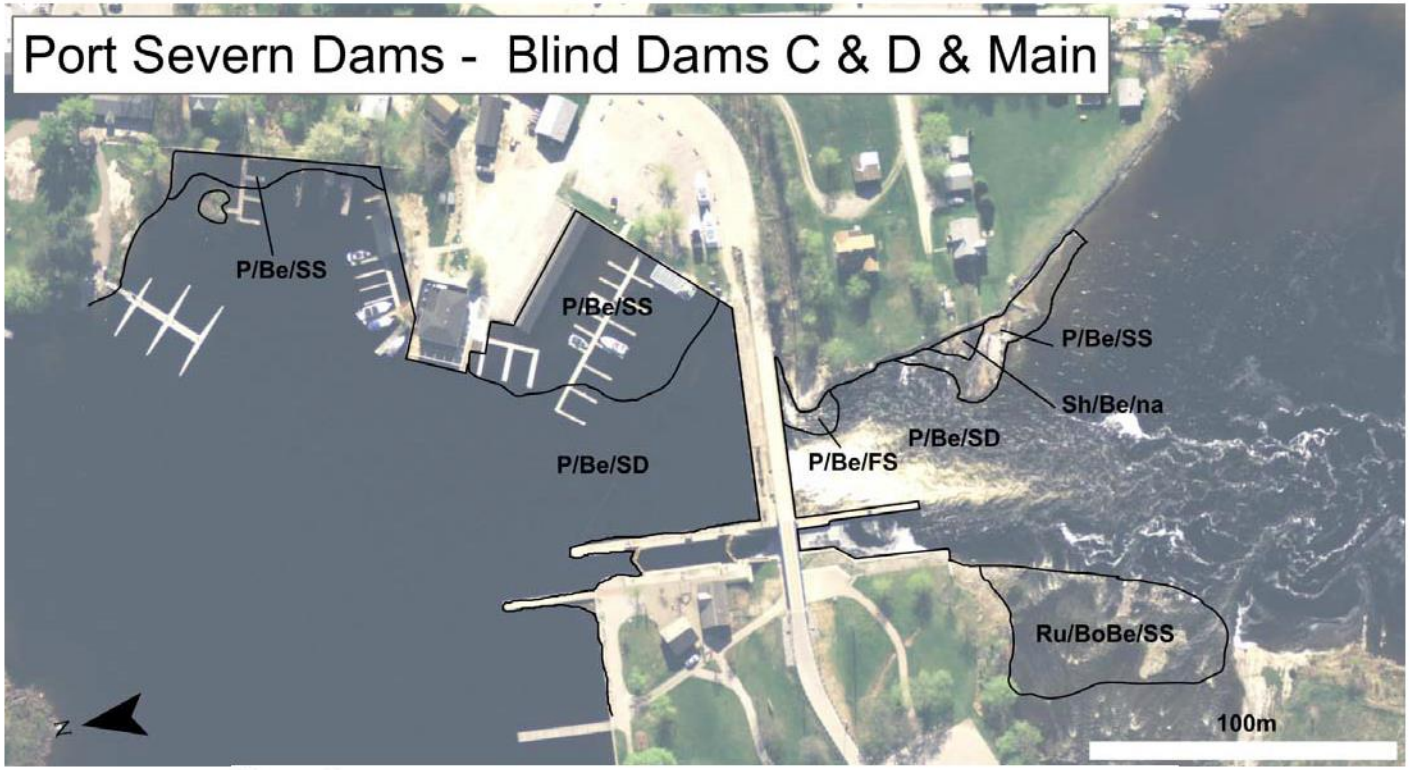
A number of species are present in Little Lake, the impounded waterbody upstream of the dams. The following table lists the most prevalent by name, scientific name, preferred thermal regime and general spawning period.

Table 1. Fish species in Little Lake (upstream) by name, scientific name, preferred thermal regime and general spawning period.

Common Name	Scientific Name	Preferred Thermal Regime	Spawning Season
White Sucker	*Catostomus commersonii*	Coolwater	Spring (April-June)
Largemouth Bass	*Micropterus salmoides*	Warmwater	Spring (May-June)
Pumpkinseed	*Lepomis gibbosus*	Warmwater	Spring-Summer (May-August)
Rock Bass	*Ambloplites rupestris*	Coolwater	Spring (May-June)
Smallmouth Bass	*Micropterus dolomieu*	Coolwater	Spring (May-June)
Common Carp	*Cyprinus carpio*	Warmwater	Spring-Summer (May-August)
Bluntnose Minnow	*Pimephales notatus*	Warmwater	Summer (June-August)
Alewife	*Alosa pseudoharengus*	Coldwater	Summer (June-August)
Northern Pike	*Esox lucius*	Coolwater	Spring (March-May)
Muskellunge	*Esox masquinongy*	Coolwater	Spring (March to May)
Brown Bullhead	*Ameiurus nebulosus*	Warmwater	Spring (May-June)
Johnny Darter/ Tesselated Darter	*Etheostoma nigrum*	Coolwater	Spring (May-June)
Walleye	*Sander vitreus*	Coolwater	Spring (April-June)
Yellow Perch	*Perca flavescens*	Coolwater	Spring (April-May)

Dam D area hosts pumpkinseed spawning habitat for all stages (spawning, incubation, rearing and feeding). Pumpkinseed redds were observed by NEA on July 5 2017 at dam D around the docks, approximately 1-3m from the blind dam and approximately 30m from the Main Dam. There were three active redds. Pumpkinseed typically spawn between May and August when water temperatures are between 17 - 26°C. The male constructs pit nests that are approximately 0.10 to 0.40m in diameter in shallow (0.1 to 0.3 m) waters of lakes, pond or slow-moving streams. The nests are found in areas of submerged aquatic vegetation; there is often multiple nests very close together. The substrate preferred can be clay, sand, gravel and rock, the male typically only sweeps down to expose a hard bottom. The male guards and fans the eggs and will stay with the newly hatched eggs for approximately 11 days to protect them from predators.

The invasive Round Goby (*Neogobius melanostomus*) and Zebra mussels (*Dreissena polymorpha*) are present and were observed during field reconnaissance by NEA.



Legend

Habitat Type		Substrate Type		Velocity/Depth	
Pool	P	Bedrock	Be	Slow/Deep	SD
Run	Ru	Boulder	Bo	Fast/Deep	FD
Riffle	Ri	Cobble	Co	Slow/Shallow	SS
Shoal/Shore/Bar	Sh	Gravel	Gr	Fast/Shallow	FS
Exposed	Ex	Sand	Sa	no flow/depth	na
Shoal/Shore Bar		Silt	Si		
Riparian Zone	RZ	Mud	Mu		
Step Pool	SP	Aquatic Vegetation	Aq		

Figure 6. Diagram of site depicting substrates, velocities and depths (Arcadis 2016)

Downstream - Lake Huron/Georgian Bay

The downstream habitat is dominated by fast flowing white water and a granite bedrock and boulder substrate. The substrate and riparian habitat are hardened by Lock 45 on the west side and by manicured lawn over bedrock on the east. Shorelines are developed and open, primarily paved or covered by grasses. The lower pool is fast and deep and is dominated by the dam outflow. No sensitive aquatic features were identified downstream. Lake Huron/Georgian Bay has a mixture of warm, cool and cold water fish species. The following table lists the most abundant by name, scientific name and general spawning period.

Table 2. Lake Huron/Georgian Bay fish species by name, scientific name and general spawning period.

Common Name	Scientific Name	Preferred Thermal Regime	Spawning Season
Bowfin	*Amia calva*	Warmwater	Spring (May-June)
Brook Silverside	*Labidesthes sicculus*	Warmwater	Spring-summer (May-August)
White Sucker	*Catostomus commersonii*	Coolwater	Spring (April-June)
Black Crappie	*Pomoxis nigromaculatus*	Coolwater	Spring (May-June)
Largemouth Bass	*Micropterus salmoides*	Warmwater	Spring (May-June)
Pumpkinseed	*Lepomis gibbosus*	Warmwater	Spring-Summer (May-August)
Rock Bass	*Ambloplites rupestris*	Coolwater	Spring (May-June)
Smallmouth Bass	*Micropterus dolomieu*	Coolwater	Spring (May-June)
Blackchin Shiner	*Notropis heterodon*	Coolwater	Summer (June-August)
Blacknose Shiner	*Notropis heterolepis*	Coolwater	Summer (June-July)
Bluntnose Minnow	*Pimephales notatus*	Warmwater	Summer (June-August)
Mimic Shiner	*Notropis volucellus*	Warmwater	Summer (June-July)
Spottail Shiner	*Notropis hudsonius*	Coolwater	Spring (May-June)
Muskellunge	*Esox masquinongy*	Warmwater	Spring (April-May)
Northern Pike	*Esox lucius*	Coolwater	Spring (March-May)
Lake Sturgeon	*Acipenser fulvescens*	Coolwater	Spring (May – July)
Banded Killifish	*Fundulus diaphanus*	Coolwater	Summer (June-August)
Brown Bullhead	*Ameiurus nebulosus*	Warmwater	Spring (May-June)
Longnose Gar	*Lepisosteus osseus*	Warmwater	Spring (May-June)
Iowa Darter	*Etheostoma exile*	Coolwater	Spring (April-June)
Johnny/ Tesselated Darter	*Etheostoma nigrum*	Coolwater	Spring (May-June)
Walleye	*Sander vitreus*	Coolwater	Spring (April-June)
Yellow Perch	*Perca flavescens*	Coolwater	Spring (April-May)

Other species reported in Georgian Bay include cold-water species Lake Trout, Lake Whitefish, Round Whitefish, Brook Trout, Atlantic salmon, Cisco, Lake Herring and non-natives such as Chinook Salmon, Rainbow Trout, Coho Salmon, Pink Salmon and Brown Trout.

Aquatic Invasive Species

Along with the two aquatic invasive species previously mentioned -Round Goby and Zebra Mussels - Sea Lamprey (*Petromyzon marinus*) are also reported in Georgian Bay. Other invasive species in Georgian Bay are alewife (*Alosa pseudoharengus*), rainbow smelt (*Osmerus mordax*), ruffe (*Gymnocephalus cernua*), spiny water flea (*Bythotrephes longimanus*) and a pathogen (*Myxobolus cerebralis*). The potential spread of Asian Carps - Silver Carp (*Hypophthalmichthys molitrix*), Bighead Carp (*Hypophthalmichthys nobilis*), Grass Carp (*Ctenopharyngodon idella*) and Black Carp (*Mylopharyngodon piceus*) - are a current threat to Ontario waters. To date, only a few occurrences of Bighead Carp and Grass Carp have been confirmed in the Great Lakes (not in Lake Huron). Silver Carp and Black Carp remain absent from Ontario waters. Bighead Carp and Silver Carp are the biggest potential threat due to their large body size and density of schools. The potential spread of Asian Carps and Sea Lamprey are management challenges for Parks Canada, OMNRF and DFO.

Walleye & *Lake Sturgeon*

The Bayview dam to the west of the Main dam is considered important habitat for a variety of fish species, especially for Walleye and potentially *SARA* listed (Threatened) Lake Sturgeon. According to the OMNRF, Upper Great Lakes Management Unit (UGLMU), for these two species, the Bayview Dam and spillway to the west provide the most important spawning habitat in all of Severn Sound. The channel below that dam is the only feature that has all the habitat attributes (substrate size, composition, velocity, depth) needed for spawning Walleye and Lake Sturgeon; there are no other such habitat features in proximity. The Main Dam, while not directly important for these species itself, generates outflow that may act as a trigger for Walleye and Sturgeon to move to shore towards the Bayview Dam in the spring when flows are highest. No suitable habitat for Walleye, Sturgeon, or other species have been identified at the Main Dam.

Cobble and gravel substrates are optimum spawning habitat for these fish. Preferred riverine depth is anywhere from 0.5 to 1.3m in water velocities ranging from 0.3 to 1.0m/s. Migration spawning periods are in early April (sometimes early as mid-late March) to late May depending on water temperatures. Walleye spawning occurs at night and the fish leave the shallow spawning areas as morning approaches. Walleye are broadcast spawners. The eggs fall to the bottom, where they adhere to the gravel and later may sink into crevices as they become water-hardened and lose their stickiness. Walleye eggs require from 4 to 10 days to hatch, depending on water temperature and (to do best if they grow on clean, firm gravel substrates with adequate oxygen. Wind action, current, low oxygen levels (in muddy areas), stranding and predation may cause mortality. High mortalities at this stage are a major cause of year strength fluctuation. Once the yolk sac is used up, fry move away into deeper water. Walleye that hatch in rivers are carried downstream to lakes.

Lake Sturgeon spawning within rivers occurs over large clean cobble and boulders in swift or rapidly moving water 0.3 to 6m deep. Spawning on the downstream side of impassable barriers and dams in approximately 1 to 5m depth is common. Optimal flows are 0.6 to 2.5m/s with a median flow velocity of 1.5m/s, although flows during spawning may be as low as 0.15 to 0.7m/s. Eggs are usually not found in water velocity of less than 0.1m/s. Spawning generally occurs in late May and continues until late June, with actual timing highly dependent on water temperature. Spawning activity is highly variable and may occur between 8.5 and 18°C with optimal spawning temperatures reported between 12 and

16°C. Eggs incubate for 8 to 14 days and upon hatching are nourished by a large yolk sac up to approximately 18 days old. Newly hatched larvae are pelagic and move about actively in search of suitable hiding places within the interstitial spaces of the rocky substrates where they were spawned.

Water Quality

The waterway, including its tributary lakes and rivers, provides water for municipal water supplies and agriculture and supports a tremendous variety of fish and wildlife. A major focus during construction will be maintaining water quality in areas upstream and particularly, downstream of the project site. Port Severn is part of the South Georgian Bay/Lake Simcoe Source Water Protection Region – Black-Severn River District. The site is located within an Intake Protection Zone 1 and upstream of a second (Figure 8). This is the zone closest to the intake with the highest concern for vulnerability to source water. The Port Severn Water Treatment Plant serves a population of approximately 500 people in the Community of Port Severn. The plant draws its water from a point in Little Lake approximately 825m upstream from the project sites and has a rated water production capacity of 1900m^3/day. There is also a potable water intake at Tug Channel, downstream from the work area (Figure 7).

As part of the fish habitat survey, water quality was measured to assess quality. Surface water was collected by NEA in July upstream of the Main Dam to obtain baseline conditions for the purpose of construction monitoring. Measured parameters included dissolved oxygen (8.42mg/L), conductivity (247.4us/cm), total dissolved solids (169mg/L), pH (7.32) and turbidity (0.50 NTU). A higher turbidity value of 1.97 was recorded upstream at Dam A. Late summer (August 17) parameters recorded around Lock 45 were pH 7.51 and turbidity 0.91 upstream and downstream. As reference, ideal water quality parameters are: pH 6.5-9.0 and dissolved oxygen >5m/L. Water quality is considered good and all parameters within ranges that support aquatic life.

Potential Sediment Contamination

A contaminated sediment risk potential assessment was conducted (Site Prioritization Tool for Sediment Assessments at Trent-Severn Waterway and Rideau Canal PCA Infrastructure Sites, Royal Military College Of Canada, Environmental Sciences Group for Blumetric Environmental Inc., May 2017) based on factors that include land use, proximity to potential contamination sources, types of known or suspected contaminates, methods of transport, workers exposure, fish habitat and sensitivity of aquatic habitat. The assessment ranked the potential for contaminated sediment and impact on the environment as moderate based on the presence of small marinas in the area and historic sawmilling. In response, a follow-up sediment sampling was conducted for the Port-Severn Area Assets (Trent-Severn Waterway Sediment Assessment in Support of Construction Activities, SNC Lavalin, 2018). As a result, localized or limited sediment deposits were encountered east of the main dam at Dam D. Where deposits were encountered, substrate materials generally consisted of coarse sediment deposits, often interspersed with surficial cobbles or boulders. The substrate was littered with a discontinuous layer of aquatic vegetation, decaying leaves and other terrestrial vegetation and shells. There were a few exceedances of PAHs (polycyclic aromatic hydrocarbons – by products of combustion), of the CCME Federal Sediment Quality Guidelines (ISQG) in a sample taken at the corner where the Main Dam meets Dam D.

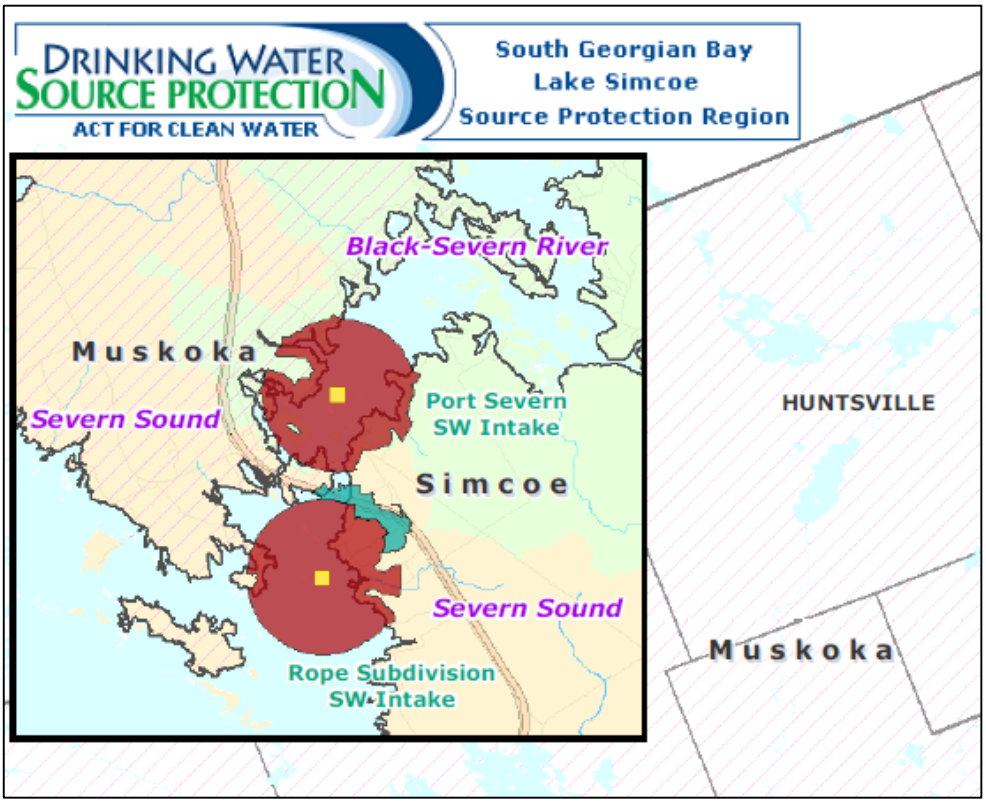


Figure 7. From Severn Sound Source Protection Area Report. Yellow squares denote water intakes and the red circle 1000m radius marking the Intake Protection Zones.

Recreational Use/Navigation

The waterway is an important economic, environmental and recreational resource used by thousands of boaters, shoreline residents, businesses and vacationers every year. Both summer and winter tourism traffic is important to the economy of Township of Severn, Township of Georgian Bay and the District of Muskoka. A high degree of emphasis is placed on ensuring work is completed in a manner and timing that will lessen the impact and allow businesses to continue to operate and tourism not impeded to the extent possible.

The primary business impacted will be Bush's Marina, which is located adjacent to, and operates from, Dam D. This business hosts a marina, a grill and a floating craft that serves as a shop and eatery. Each fall the vessel Serendipity Princess docks for several weeks at Lock 45 for its 'Fall Colours Tour' – a riverboat trip to Big Chute Marine Railway.

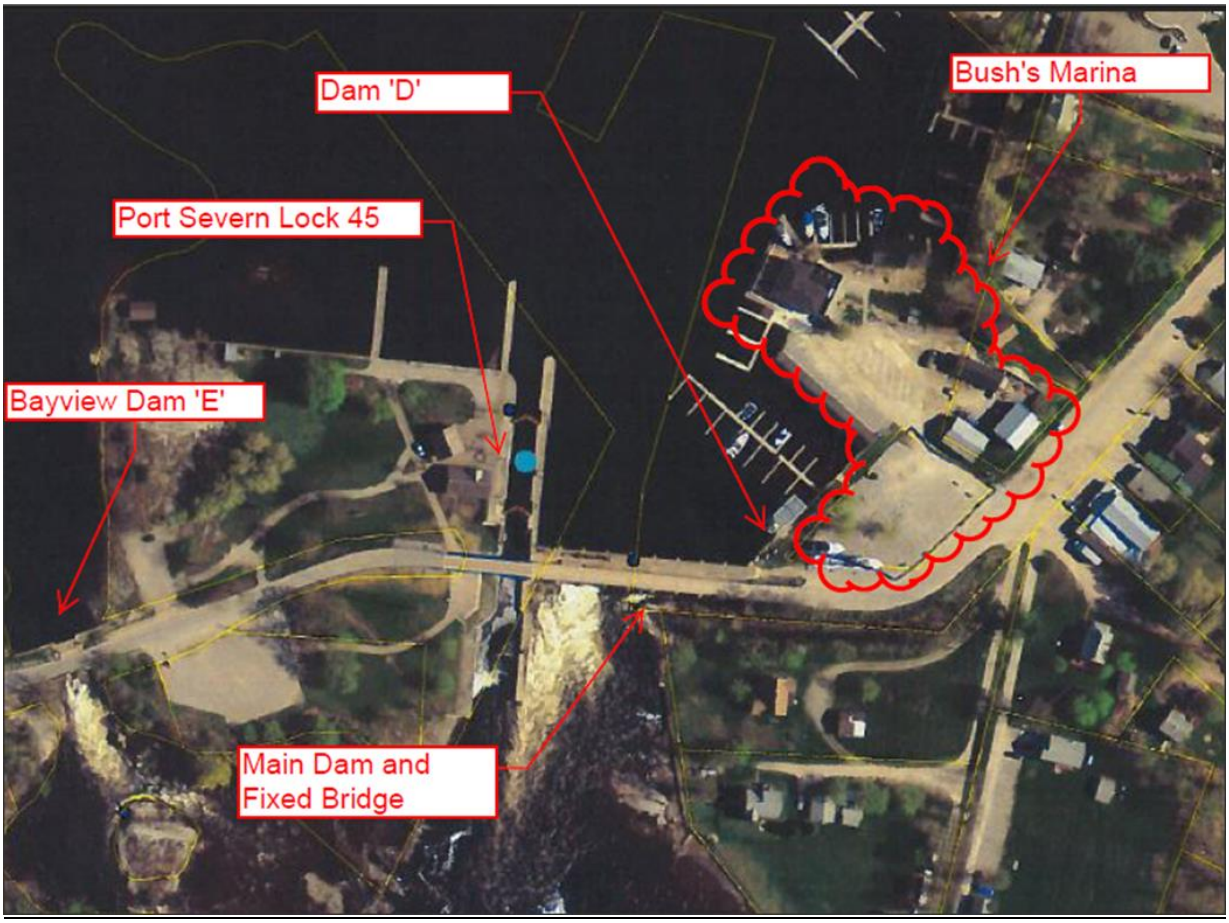


Figure 8

Species at Risk

Species at Risk (SAR) and any activities within their Critical Habitat are regulated by the federal *Species at Risk Act* (SARA), providing protection to all SAR listed under Schedule 1 of the Act. Species at risk that may be found in the study area, either federally listed species and/or species listed under the *Ontario Endangered Species Act* (ESA), have been identified using the Natural Heritage Information Centre (NHIC) database, the Atlas of Breeding Birds of Ontario, the Ontario Reptile and Amphibian Atlas and Parks Canada's occurrence data. Table 3 lists federally and provincially ranked species whose range encompasses the Port Severn Area and descriptions of their habitats.

Due to the relatively high number of notable SAR reptiles in the project area, SLR Consulting was hired through to do field surveys in the Port Severn area in order to assess suitable habitat potential for reptiles with applicable habitat ranges and/or occurrence information (*Reptile Species at Risk Survey – Rideau Canal and Severn Waterways*, May 2017). Potential suitable habitat for all reptile SAR in and around PCA sites was assessed with emphasis on over-wintering potential adjacent to structures. These were not detailed or targeted species surveys nor meant to confirm habitat use through field investigations. The objective was to determine if SAR habitat features were present or absent based on the evaluation of habitat by experienced ecologists.

Table 3. Federally and Provincially-Ranked Species whose range encompasses the Port Severn Area and Descriptions of their Habitats.

Common Name	Scientific Name	SARA Status	ESA Status	Preferred Habitat
Blanding's Turtle	*Emydoidea blandingii*	Threatened	Threatened	Blanding's Turtles can be found in several types of freshwater environments, including lakes, permanent or temporary pools, slow-flowing streams, marshes and swamps. They will travel long distances overland (>410m) for basking and nesting sites.
Eastern Musk Turtle	*Sternotherus odoratus*	Threatened	Special Concern	Eastern Musk Turtle require shallow water with little or no current, and soft earth to bury into when they hibernate. Nesting habitat is variable, but it must be close to the water and exposed to direct sunlight.
Snapping Turtle	*Chelydra serpentina*	Special Concern	Special Concern	Usually found in large bodies of water, but will sometimes inhabit small ponds. Rarely leave water except to nest and migrate to overwintering habitat.
Northern Map Turtle	*Graptemys geographica*	Special Concern	Special Concern	Inhabits both lakes and rivers, showing a preference for slow moving currents, muddy bottoms and abundant aquatic vegetation. Potentially present where the river is slow moving such as canal and impoundments.
Midland Painted Turtle	*Chrysemys picta marginata*	No Status (COSEWIC Special Concern)	Not Listed	Inhabit water bodies, such as ponds, marshes, lakes and slow-moving creeks, that have a soft bottom and provide abundant basking sites and aquatic vegetation; often bask on shorelines or on logs and rocks that protrude from the water; hibernates on the bottom of water bodies.
Eastern Foxsnake	*Pantherophis gloydi*	Endangered	Threatened	Use non-forested areas, such as old fields, marshes and hedgerows bordering riparian zones along drainage features. Brush piles, rocks, tree stumps and driftwood are used for basking within their habitat. In the winter they hibernate in limestone fissures, small mammal burrows, wells and building foundations Uses oviposition sites (deposits eggs)
Massasauga Rattlesnake	*Sistrurus catenatus*	Threatened	Threatened	This venomous snake species uses different habitats across their range but all include sufficient protection from predators, areas where they can get warm to digest food and reproduce. Rock based structures are key to identify gestation habitat are common spots to bask. Sufficient moisture in the hibernacula is key in surviving the winter and often associated with wetlands or small, wet depressions in the terrain. Uses gestation sites (bears live young)
Eastern Milksnake	*Lampropeltis triangulum triangulum*	Special Concern	Special Concern	Various habitats including rural areas that have suitable locations for basking and egg-laying -prairie, pastures and hayfields, rocky hillsides and a wide variety of forest types. Often in close proximity to water

Common Name	Scientific Name	SARA Status	ESA Status	Preferred Habitat
Northern Ribbonsnake	*Thamnophis sauritus septentrionalis*	Special Concern	Special Concern	Usually found close to water, especially in marshes, where it hunts for frogs and small fish. Will dive in shallow water. At the onset of cold weather, these snakes congregate in underground burrows or rock crevices to hibernate. Uses oviposition sites (deposits eggs)
Eastern Hognose Snake	*Heterodon platirhinos*	Threatened	Threatened	Open sandy soil close to water including open woods, brushland, forest edge, shorelines and disturbed sites.
Common Five-lined Skink	*Plestiodon fasciatus*	Special Concern	Special Concern	Rocky outcrops, dunes, fields, and deciduous forests. This species is generally associated with relatively clear areas where sunlight can reach the ground
Western Chorus Frog	*Pseudacris triseriata*	Threatened	Not Listed	marshes or wooded wetland areas; it is found on the ground or in low shrubs and grass
Lake Sturgeon	*Acipenser fulvescens*	No status (COSEWIC – Threatened)	Threatened	Bottom dwelling fish that are found in large lakes and rivers; prefer water depths that range from 5 to 10 m. Spawning occurs in the spring in large rivers usually below waterfalls, with velocities of 0.5 to 1.3 m/s, water depths of 0.1 to 2m and substrate that consists of course gravel, boulder, cobble, hardpan clay and sand. Sturgeon typically abandon spawning locations immediately after spawning.
Deepwater Sculpin	*Myoxocephalus thompsonii*	Special Concern	Not Listed	Bottom dwelling fish that prefer cold water less than 7ºC in deep lakes. In the Great Lakes adults, usually in-habitat waters that are 60 to 150m deep, for this reason not much information about their biology and their reproduction cycle is unknown (DFO, 2016).
Grass Pickerel	*Esox americanus vermiculatus*	Special Concern	Special Concern	They typically inhabit warm, slow moving streams, ponds and shallow bays of larger lakes with clear to tea-colored water with abundant aquatic vegetation. The substrate that is preferred is mud but can also be present over Rock and gravel. Spawning typically occurs in the spring when water temperatures are between 4˚ C to 12 ˚C. Grass Pickerel do not construct nests, there eggs are dispersed; adhere to aquatic vegetation.
Northern Brook Lamprey	*Ichthyomyzon fossor*	Special Concern	Special Concern	Eel like appearance, typically found in clear streams of varying sizes. Adults only live for six months before they spawn and die. Preferred spawning habitat is swift current and substrates of coarse gravel and rock, the male will construct an inconspicuous nest
Barn Swallow	*Hirundo rustica*	No Status	Threatened	Nest almost exclusively on man-made structures (bridges, culverts, barns); these swallows nest on dam structures with ledges under the deck.

Common Name	Scientific Name	SARA Status	ESA Status	Preferred Habitat
Little Brown Myotis	*Myotis lucifugus*	Endangered	Endangered	Hibernate from October or November to March or April, most often in caves or abandoned mines that are humid and remain above freezing. In summer they forage at night and roost in trees and buildings during the day.
Northern Myotis	*Myotis septentrionalis*	Endangered	Endangered	Similar habitat preferences to Little Brown Myotis - hibernate from October or November to March or April, most often in caves or abandoned mines. Northern Myotis often roost under loose bark or in tree cavities.
Tri-coloured Bat	*Perimyotis subflavus*	Endangered	Endangered	Often found hibernating in same locations as Little Brown Myotis and Northern Myotis – abandoned mines and caves. Relatively rare species in Canada.
Butternut	*Juglans cinerea*	Endangered	Endangered	Rich, moist, and well- drained soils often found along streams. The property is within the range for this species but it has not been found within the project location.

Potentially found on site

Critical Habitat

Based on the background research and a compilation of specific habitat features that support SAR, investigators screened the sites on foot to record attributes of importance to the life cycles of reptile SAR. Attributes were screened to identify features such as tableland rocks for gestation; large woody debris for nest sites; escape routes in rotten tree roots with underground linkages. The surveys were conducted during appropriate weather and time of day in September and early October when SAR could be expected to be moving to or potentially already near over-wintering sites. In addition, field surveys occurred on warm days following cold nights – conditions that are known to promote reptile SAR activity. OMNRF guidelines for conducting reptile searches were adapted to this project given the project scope. Efforts were also made to locate predated turtle nests (indicators of nest sites). Basic habitat characteristics for SAR species were given an assessment as to the likelihood of that species using habitat within the project areas and are depicted in **Figure 9**.

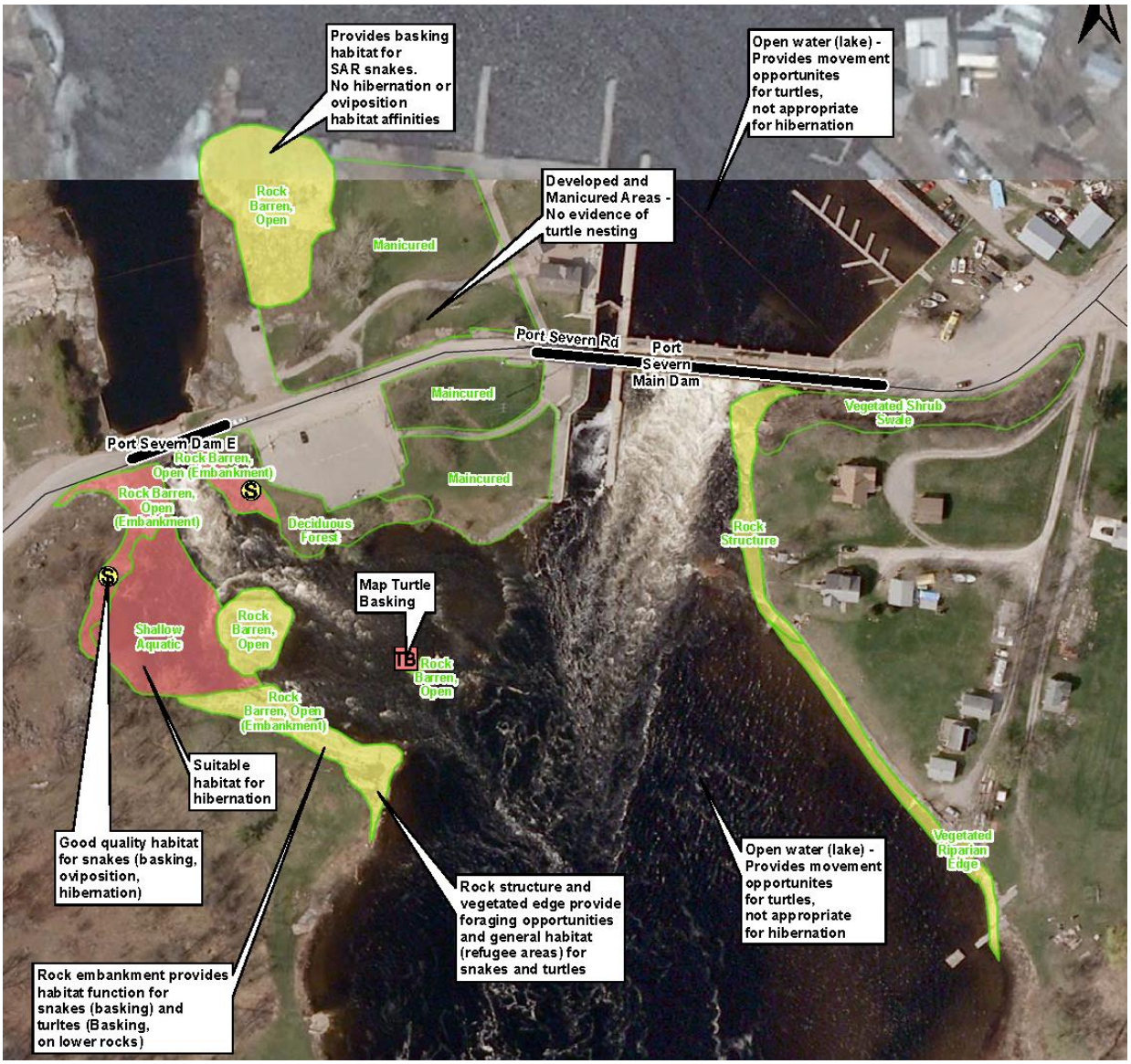


Figure 9. SAR Habitat Features at Port Severn identified by SLR consulting

Key habitat features include cultivated and developed areas (parking lot, adjacent marina), riparian rock barrens and large rock structures (a result of the original dam construction). This area also has several informal trails and is frequently used by the public. Species of Interest are Eastern Foxsnake, Eastern Massassauga Rattlesnake, Hognose Snake and Blanding's Turtle. These species are known to occur in the broader area, and the project is within the bounding zones of identified Critical Habitat for these three species. However, suitable habitat (hibernation, gestation, nest sites) are not found within the Dam project area.

Oviposition (Snakes) sites are limited. Forest inclusions, rock barren habitats (open and shrub) do not have good rotting logs, vegetation present. Anthropogenic features of adjacent residences may provide opportunities (i.e. woodpiles, refuse, compost piles).

No known turtles nesting areas within manicured lawns or areas near locks or buildings. No documented evidence to date.

The habitat meets the biophysical attributes of Critical Habitat for both Massasauga Rattlesnake and Eastern Foxsnake. Massasaugas are habitat generalists; open and edge habitat, large rocks and dense ground cover or shrubbery (retreat sites); bedrock barrens and shoreline habitats. These habitats exist adjacent to the dam. Foxsnake utilize field, prairie, marsh, riparian zones along drainage canals and open coastal rock barrens and meadow marsh habitats along shorelines. These species are known to occur in the broader area, however hibernation, gestation, nest sites were not identified at the dam.

For Blanding's Turtle, the project area meets some of the biophysical attributes of Critical Habitat. Suitable basking sites are those where the turtle can remove itself from the water and gain access to direct sunlight. However, winter features are absent. Overwintering sites are generally located within permanent wetlands (e.g., bogs, fens, marshes) and other habitats with unfrozen shallow water. Prior to overwintering, the species prefers shallow water - open or partially vegetated sites and areas that contain thick aquatic vegetation. This condition does not exist in the project area.

The primary habitat feature the area provides - all developed areas, rock shorelines and river channels and Lake Environs is for seasonal /movement for snakes and turtles as well as basking sites on the rocks downstream.

Lake Sturgeon

Lake Sturgeon is indigenous to North America and was once considered highly abundant throughout its native range. Over fishing and mismanagement of the resource along with cumulative effects of habitat loss, fragmentation and degradation have ultimately all contributed to the decline of this species. Today, the abundance of Lake Sturgeon has decline significantly throughout North America to the point where the species is considered to be at risk in many regions of Canada and United States. Habitat requirements for Lake Sturgeon were previously addressed.

Table 4. Species at Risk Site Observation and Habitat Features identified by SLR/NEA

Common Name	Individuals Observed On-Site	Potential Habitat on Site	Habitat Features
Blanding's Turtle	No	No	Habitat not present around locks due to deep water and boat traffic, no nesting sites accessible
Northern Map Turtle	Yes, SLR Observation	Yes	Locks not expected to provide hibernation habitat. Open water habitat immediately upstream of dam and downstream marginal due to currents. Turtles recorded further downstream in calmer waters
Common Snapping Turtle	Yes, SLR Observation	Yes	Locks not expected to provide hibernation habitat. Open water habitat immediately upstream of dam and downstream marginal due to currents. Turtles recorded further downstream in calmer waters
Eastern Musk Turtle	No	Yes	Locks not expected to provide hibernation habitat. Open water habitat immediately upstream of dam and downstream marginal due to currents
Eastern Foxsnake	No	Yes	Basking habitat present on dam and adjacent land
Eastern Milksnake	No	Yes	Basking habitat present on dam and adjacent land
Massasauga Rattlesnake	No	Yes	Basking habitat present on dam and adjacent land
Eastern Hog-nosed snake	No	Yes	Basking habitat present on dam and adjacent land
Northern Ribbonsnake	No	Yes	Basking habitat present on dam and adjacent land
Five-lined Skink	No	No	Habitat not present
Lake Sturgeon	No	Yes	Habitat present downstream
Deepwater Sculpin	No	Unlikely	Habitat not present
Grass Pickerel	No	Unlikely	Habitat not present
Northern Brook Lamprey	No	Unlikely	Habitat not present
Butternut	No	Unlikely	Species not present
Barn swallow	No	Unlikely	No nests or individuals observed
Western Chorus Frog	No	Unlikely	Habitat not present
Little Brown Myotis	No	No	Habitat not present
Northern Myotis	No	No	Habitat not present
Tri-coloured Bat	No	No	Habitat not present

Air/Noise

The Port Severn Area is a relatively quiet, rural environment that thrives on tourism and outdoor recreational activities. The project site is located within a residential neighbourhood bordered primarily by natural, undeveloped landscapes. There is no industrial land use in close proximity. Air quality in the area is assumed to be good based on the large percentage of natural land cover and limited known sources of air pollution.

Cultural Resources

A Statement of Cultural Resource Impact Analysis (SCRIA) describes the Port Severn Dam, Fixed Bridge, Lock and Side Dams as cultural resources of other heritage value (OHV) for their role in in-land water transportation, water management and the evolutionary development of the TSW. The lock station is thematically associated with the second construction phase of the canal (1910), and several former construction-related structures with potential yet unconfirmed vestiges have been identified by the Terrestrial Archaeology Team.

Main Dam and Bridge; photo taken November 23 1915

Archeology

Parks Canada's Archaeology Section will complete an Archaeological Overview Assessment (AOA) to determine whether an Archaeological Impact Assessment and/or mitigation measures will be required for the Project. The recommendations from the AOA, or subsequent assessments, will be compiled in a Cultural Resource Impact Assessment for this project. One identified resource is an old school house foundation which would lay along Dam D (Figure X). This school house and associated yard would have existed near the river. The condition of the foundation or the presence of any remnants is unknown.

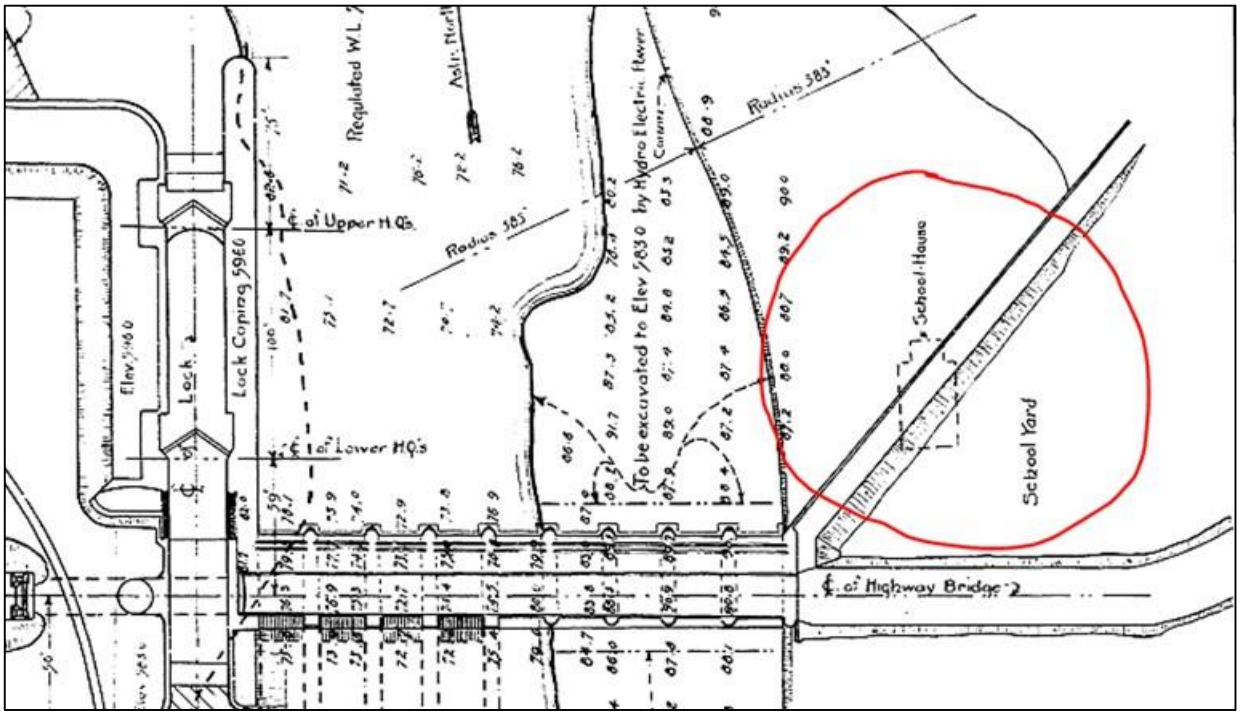


Figure 10. Identified location of a former schoolhouse and school yard along the old river bank.

Note on Flora and Wildlife

This is a highly manicured and heavily used site with little native habitat. The area adjacent to the dams consists of mainly mown turf and isolated individual trees. Vegetation communities in the surrounding area have been highly disturbed, consisting of mainly non-native species. The adjacent lands are a mixture of residential properties, restaurants, parking lots and marinas. The little amount of vegetation growing near the dam includes common dandelion, Kentucky blue grass, broad-leaved plantain and spotted jewelweed. A small parking lot is located at the eastern end of the dam which is dominated by Kentucky blue grass and dandelion with a few large Manitoba maple trees. Wetland habitat is minimal, persisting near shore with some cattail, bulrush and bur-reed. No rare or SAR plants are present.

The project involves very little vegetation removal. Trees can be cut in the winter or early spring prior to April 1. Therefore, there would be no expected negative effects on birds. The project involves little disturbance to features that would be considered aquatic mammal habitat and the construction is largely localized around the dam and bridge. There are no expected negative impacts on native flora or wildlife and these VECs have not been analyzed.

7. EFFECTS ANALYSIS

Fish, Aquatic Habitat and Surface Water Quality

The analyses of effects on the aquatic environment covers 1) the potential impact of the construction activity itself (e.g. coffer dams, dewatering and maintenance flows) and 2) potential effects of the design change of the dam (e.g. operational flow, dam footprint).

1) Effects of Construction Activity

Effects on fish and other aquatic organisms may occur through construction activities - introduction of, and/or suspension of sediment in the water when installing and removing coffer dams and turbidity curtains, as well as from concrete pours and tremie concrete or grout (if necessary for sealing coffer dams), initial coffer dam de-watering, maintenance pumping and accidental sediment release to name a few. Other sources are ineffective erosion and sediment control methods, poorly maintained erosion and sediment control and/or heavy precipitation.

Cofferdam Construction

During construction, work will need to be done in dry conditions, which means that cofferdams will be installed. Because the dam will be built in the same location as the present one, dewatering, demolition and construction are staged such that water can continue to flow through part of the structure at all times. During initial construction, the water will continue to flow through sluices 4 (partial), 5, 6 and 7. When the first half of the dam is complete, the second half will be constructed and water will flow through the 3 new gates on the west side.

The phase 1 coffer dam will cover sluices 1-3 and partial #4 (dam west/lock side). Installation would start mid to late October 2018, finishing mid-December, a construction period of approximately 8 weeks. Demolition and construction work on the main dam would start thereafter until finished late summer 2019. With roughly 4 weeks for coffer dam removal, the west side construction would be finished by mid-September. The total period the west side coffer dam would be in place is 220 days, from mid-October 2018 to mid-September 2019.

The second phase coffer dam (sluice 4 to 9) would start after the first is over in mid-September 2019, after gates 1-3 are in operation. The coffer dam would be completed mid-December, when work would begin on the rest of the main dam. This work would last to December 2020, when the coffer dam removal would being. This structure would be removed by end-January 2021. The total period the east side coffer dam would be in place is 333 days, from mid-September 2019 to end-January 2021. In water works would be finalized prior to March 15 of that year.

The degree of impact depends on the size of the structure. Large coffer dams that extend upstream and downstream from the dam would have greater chance to impact habitat. With respect to coffer dam footprint, the intent will be to keep the structure as small as possible (Figure 11a and b) to complete the work and to avoid impact on fish. The proposed dimensions are:

- Stage 1: Upstream Cofferdam: 306m²; Downstream Cofferdam: 139m² = 445m²
- Stage 2:Upstream Cofferdam: 620m²; Downstream Cofferdam: 144m² = 764m²
- Total Main Dam = 1209m²
- Dam D, Cofferdam Area: 280m²

Placing temporary cofferdams may directly impact fish through exclusion if they are normally present at the project site. However, fish are rarely present immediately upstream or downstream of operating dam sluices/spillways, particularly in spring when dams are open and flows are high. Above the Main Dam, there is no natural shoreline (concrete walls), no suitable substrate and no aquatic vegetation, thus no available spawning habitat. Therefore impacts to fish upstream of the main dam will be limited to exclusion from movement/corridor areas during low flow periods. The OMNRF GLMU has identified the reach below the smaller Bayview Dam to the west as being more important for Walleye and Sturgeon; the Main Dam is not important habitat for those species. Regardless, in water work occurs after July 15 and prior to March 15.

Another impact from coffer dam construction could be suspension and movement of sediment. However, investigations there found only localized or limited deposits east of the main dam at Dam D. Where sediment deposits were encountered, substrate materials generally consisted of coarse sediment deposits, often interspersed with surficial cobbles or boulders. Sampling attempts and visual observations confirmed the absence of significant sediment accumulations overlying the concrete floor of the lock at Dam D and the presence of a hard, rocky bottom along shorelines. The hard bottom encountered consisted of piled rocks or sloped rip-rap with moss / algae growth. Given the volume and flow rates of water passing through the Port Severn dams, the areas surrounding the flood gates are expected to be scoured with no appreciable sediment accumulation. Additionally, cofferdams will be comprised of sheet steel with no loose granular material, further reducing the potential for suspended sediments. Mitigation measures to further reduce the impacts of suspended sediments have been included as part of this assessment. Thus the risk of suspending large volumes of fine sediments due to construction is low, particularly during the installation and removal of temporary coffer dams if mitigation measures are implemented.

Late winter flow downstream of the Main Dam (February photo). This condition prevails through March, April and early May in most years, until logs are placed for navigation.

There is a higher likelihood of finding fish around Dam D, where flows are not so strong. In fact, pumpkinseed nests were observed adjacent to the structure in the vicinity of the docks (Figure 11). The second stage coffer dam will not extend to this zone (Figure 12b). Additionally, Installation of the cofferdam after July 15 means work activity will not negatively impact spawning in this upstream area. Having the cofferdam in place in fall and winter is less likely to affect fish once they retreat to deeper, warmer water. Regardless, a fish salvage program for the dewatered areas will be a requirement of the work. Fish will be transferred live immediately outside of the coffer dam. Any invasive fish species captured, such as Goby, will be euthanized and instead of being returned to the system. The work program will require the involvement of a fisheries biologist to ensure the proper identification, capture and handling of fish.

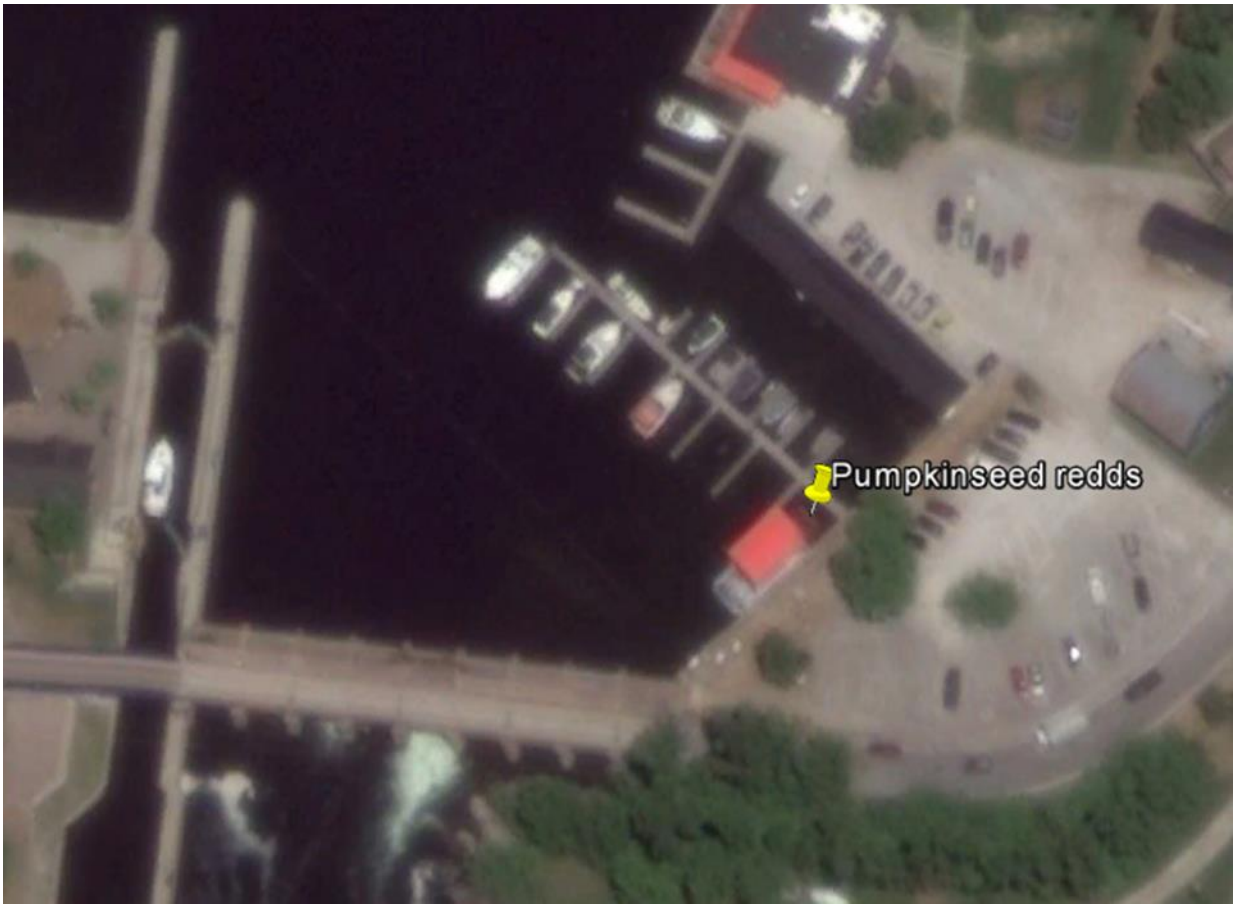


Figure 11. Location of observed pumpkinseed redds at Dam D (Niblett Environmental, 2017)

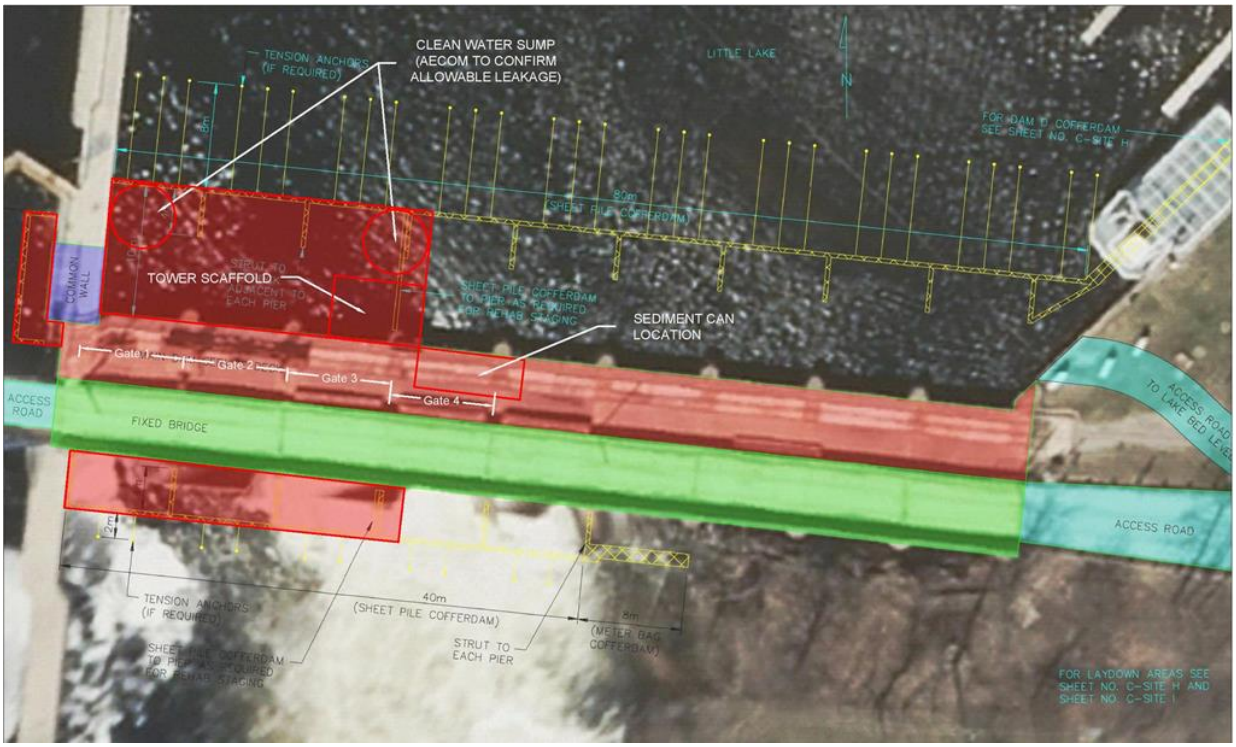


Figure 12a. Cofferdam Phase 1

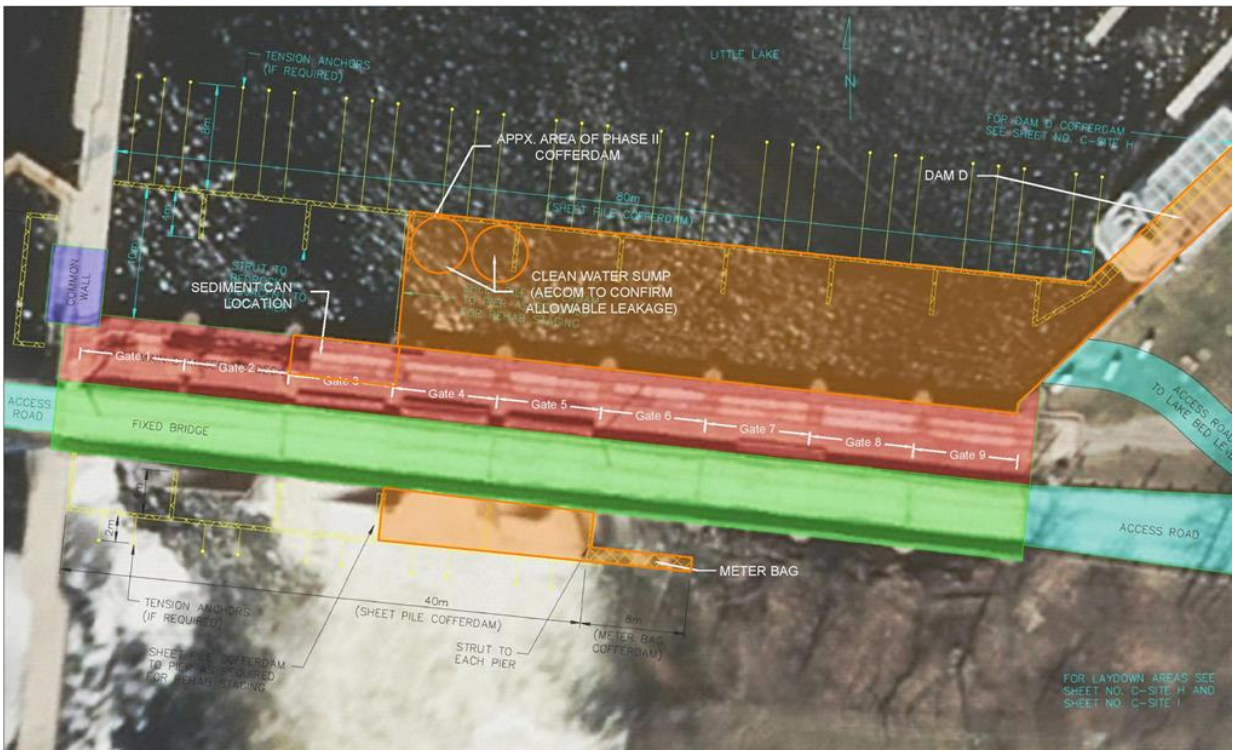


Figure 12b. Cofferdam Phase 2

Dewatering and Maintenance Pumping

Once the cofferdams are completed, initial dewatering will be necessary through the use of pumps. This step is to be undertaken prior to any work within. Generally, this water can be pumped cleanly back into the upstream area, particularly with pumps taking water from the surface. As this initial dewatering takes place, it will be necessary to manage the increasing infiltration flow.

Once initial dewatering is complete and infiltrations are controlled, the remaining sediment laden water of the river bottom must be pumped out. If infiltrations flows are low, this may be accomplished by passing the pumped water through sedimentation basins prior to releasing it back into the lake or river. However, previous dam projects have consistently demonstrated that it is difficult, if not impossible to completely eliminate leakage into cofferdams; continued removal of accumulated water from the work area will be necessary. Therefore there is some risk to releasing turbidity outside the construction zone during these activities.

Excavation may need to occur below the existing groundwater table and excavation areas may collect surface water runoff, especially during storm events. In both instances, it is necessary for the contractor to remove water on a continuous basis, to facilitate construction in the dry. If this infiltration is isolated and collected at the source, before the water is mixed with the construction contaminated water (water that meets all environmental requirements for turbidity), then it may also be pumped back with no negative impact to water quality. Otherwise, it will require treatment prior to release. In these instances, this water will be pumped into the sedimentation basins, filtration systems, or treated by other means, before being put back into the lake.

The contractor will be required to submit to Parks Canada an Environmental Management Plan (EMP) that outlines all the measures to be implemented on to eliminate or reduce these environmental effects.

The EMP will list high-risk construction activities, potential environmental impacts associated with each activity and detail the frequency of monitoring. Best practices and mitigations listed in this Impact Assessment for managing water will diminish impacts of dewatering.

Maintenance of Flow during Construction

Water leaving the Severn River system and flowing to Georgian Bay is managed through 6 sites – the Main Dam, Bayview Dam E, Little Chute Dam G in Port Severn, as well as 3 outlets from Six Mile Lake at Little Go Home Bay, Hungry Bay and Crooked Bay dams. The latter three dams at Six Mile are infrequently operated due to their remote locations. They are managed time to time in the event of extreme flow. The bulk of the water is managed through the Port Severn Dams (Figure 13). The Main Dam is the primary water control structure and is operated to maintain the levels upstream within the acceptable range for navigation.

Table 7.2 Discharge at Main Dam when Water Level is at MNOL (180.50 m) as a Function of Stoplog Removal

Stoplogs Removed	Discharge (m^3/s) Main Dam's Sluices 1	2	3	4	5	6	7	8	9	Dam E	Dam G	Little Go Home Bay Dam	Maximum Potential Impact from Submergence
0	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.22	0.02	0.10	-
1	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.44	0.90	*	-
2	5.90	5.90	5.90	5.90	5.90	5.90	5.90	5.90	3.70	5.84	2.24	*	-
3	10.20	10.20	10.20	10.20	10.20	10.20	10.20	10.20	3.70	10.04	3.91		-
4	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	3.70	14.86	5.85		-
5	20.80	20.80	20.80	20.80	20.80	20.80	20.80	20.80	3.70	20.19	7.99		-
6	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	3.70	25.96	10.32		-
7	33.60	33.60	33.60	33.60	33.60	33.60	31.30	27.20	3.70	32.09	12.80		-
8	40.70	40.70	40.70	40.70	40.70	40.70	31.30	27.20	3.70	38.54			-
9	48.10	48.10	48.10	48.10	48.10	48.10	31.30	27.20	3.70	45.25			-
10	56.00	56.00	56.00	56.00	56.00	56.00	31.30	27.20	3.70				0.9 %
11		64.10	64.10										2.4 %
12		72.60	72.60										4.2 %

Green: not affected by submergence - Orange: affected by submergence - Grey: log removal has no effect due to downstream rock outcrop

— - — bottom logs below dashed line cannot be relied upon for sluice operation

* Little Go Home Bay Dam is not operated for flood discharge.

Figure 13. Discharge at the main dam at regular operational water level of 180.5m, as a function of stoplog removal (from DSR-Port Severn-Main Dam, AECOM 2013).

The Severn River and Gloucester Pool water levels fluctuate during the year, but not greatly. The range of water level, as measured at Gloucester Pool, is between an average minimum of 180.32-180.48m (non-navigation) and average maximum of 180.32-180.48m during the navigation season. Table 5 gives minimum, maximum and average water elevation data in Gloucester Pool for the last 10 years by month. Figure 14 graphically depicts these values. The highest discharge through Swift Rapids was 275m³/s in April 1960, since recording started in 1953. The highest water level recorded on Gloucester Pool was 180.72 in 1948, while the lowest level was recorded on January 15, 2008 (180.03m). Estimated total discharge of the Main Dam is up to 245m³/s at a water level of 180.5m.

Table. 5 Minimum, maximum and average water elevations in Gloucester Pool for the last 10 years by month. Navigation season is highlighted.

	Min.	Max.	Avg.
January	180.19	180.52	180.39
February	180.21	180.46	180.38
March	180.21	180.56	180.37

April	180.18	180.56	180.32
May	180.25	180.60	180.44
June	180.42	180.57	180.50
July	180.42	180.54	180.48
August	180.42	180.56	180.48
September	180.42	180.56	180.48
October	180.36	180.56	180.48
November	180.13	180.55	180.42
December	180.14	180.54	180.36

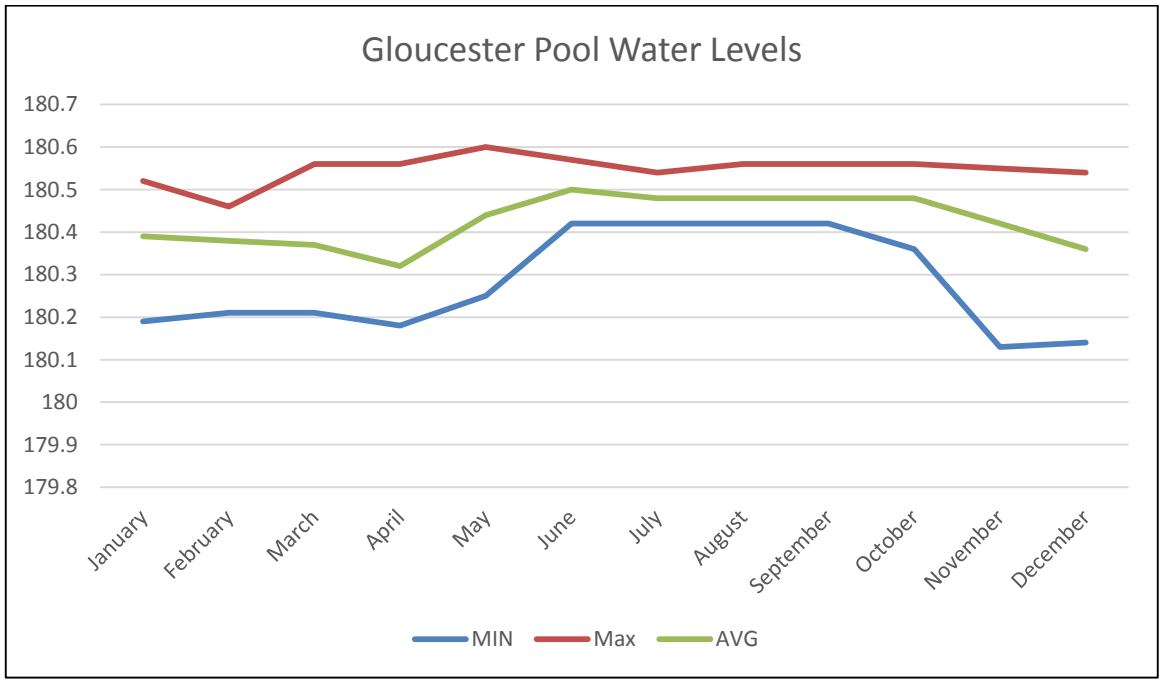


Figure 14. Graphic depiction of the values presented in Table 5.

Discharge through the sluices is controlled by adding or removing stoplogs. In each sluice, the stoplogs are inserted in the gains on top of each other to block the water flow. In the fall, logs are pulled and dam sluices are opened to lower water levels to accommodate snowmelt in the spring. During the spring freshet, the water levels and flows are at their maximum. Once freshet abates, logs are replaced to hold back water sufficient to provide navigation from the Victoria Day weekend in May to the Thanksgiving weekend in October. At the Main Dam, only sluices 2 to 6 are normally needed and used, with sluices 2 and 3 being the most frequently operated. The bottom logs have never been removed and it is unknown whether they can be or not. Sluices 7-8-9 have not been opened in 32 years. Sluice 1 is rarely opened since it creates disturbance to the navigation entering and leaving the lock. Figure 15 is a re-representation of Figure 13 that depicts the typical sluices operated and resultant discharge as a function of stoplog removal.

	Main Dam									
Stoplogs removed	Sluice 1	Sluice 2	Sluice 3	Sluice 4	Sluice 5	Sluice 6	Sluice 7	Sluice 8	Sluice 9	Total
0	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.00	0.00	1.00
1	0.00	2.40	2.40	2.40	2.40	2.40	0.00	0.00	0.00	12.00
2	0.00	5.90	5.90	5.90	5.90	5.90	0.00	0.00	0.00	29.50
3	0.00	10.20	10.20	10.20	10.20	10.20	0.00	0.00	0.00	51.00
4	0.00	15.20	15.20	15.20	15.20	15.20	0.00	0.00	0.00	76.00
5	0.00	20.80	20.80	20.80	20.80	20.80	0.00	0.00	0.00	104.00
6	0.00	27.00	27.00	27.00	27.00	27.00	0.00	0.00	0.00	135.00
7	0.00	33.60	33.60	33.60	33.60	33.60	0.00	0.00	0.00	168.00
8	0.00	40.70	40.70	40.70	40.70	40.70	0.00	0.00	0.00	203.50
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11		0.00	0.00							
12		0.00	0.00							

Figure 15. Sluices normally operated and resultant discharge as a function of stoplog removal at regular operational water level of 180.5m

As depicted in Figure 12a and b, the coffer dams will be staged in order to allow water to continue to pass through the dam during construction. As the TSW needs to retain the ability to maintain unimpeded navigational water levels and to control flow, especially high flow, the project must not, and will not impact historical water levels. The upstream coffer dam will need to be constructed to handle high water, needing to be configured to allow water passage in the event of unusually high water.

The flows necessary to leave the system have been calculated and are presented in Figure 16. When sluices 1-3 are closed for construction for Stage 1, the calculated capacity of sluices 5-8 and partial sluice 4 will be 189.9m³/s. (Sluice 9 will remain closed throughout to protect property below the dam). The TSW requires a maximum capacity of roughly 220m³/s, which normally is accommodated by the Main Dam, but at this point would not be. During this period, Bayview Dam will be closed for its construction. However, the discharge, if necessary, can be provided by sending water through Crooked Bay and Hungry Bay Dams at Six Mile Lake. After December 2018, Bayview dam will be operable again.

		Main Dam									Hungry Bay Crooked Bay	Bayview/ Little Chute	TSW Required	Total Capacity
		Sluice 1	Sluice 2	Sluice 3	Sluice 4	Sluice 5	Sluice 6	Sluice 7	Sluice 8	Sluice 9				
Phase 1A (Oct 2018-Dec 2018)	Status	Closed	Closed	Closed	Partial	Open	Open	Open	Open	Closed	Open	Closed		
	Flow	0	0	0	27.1	40.7	40.7	40.7	40.7	0	30	0	220	**219.9**
Phase 1B (Jan 2019-Aug 2019)	Status	Closed	Closed	Closed	Partial	Open	Open	Open	Open	Closed	Open	Open		
	Flow	0	0	0	27.1	40.7	40.7	40.7	40.7	0	30	30	220	**249.9**
Phase 2 (Sept 2019-Dec 2020)	Status	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open		
	Flow	55.3	55.3	55.3	0	0	0	0	0	0	30	30	220	**225.9**

Figure 16. Calculation of maximum discharge and dam capacity (AECOM)

In the second Stage, the three new mechanical gates, with their increased capacity will only pass 165.9m³/s. However, the discharge, if necessary, can again be provided by sending water through the dams at Six Mile Lake and Bayview and Little Chute Dams. Important to note that these discharges are worst case scenarios and that water would be expected to be less than 220m³/s most years (Figure 17). Therefore, the primary effect on dam flow due to construction will not be total volume discharged, but the portion of the dam it is discharged from.

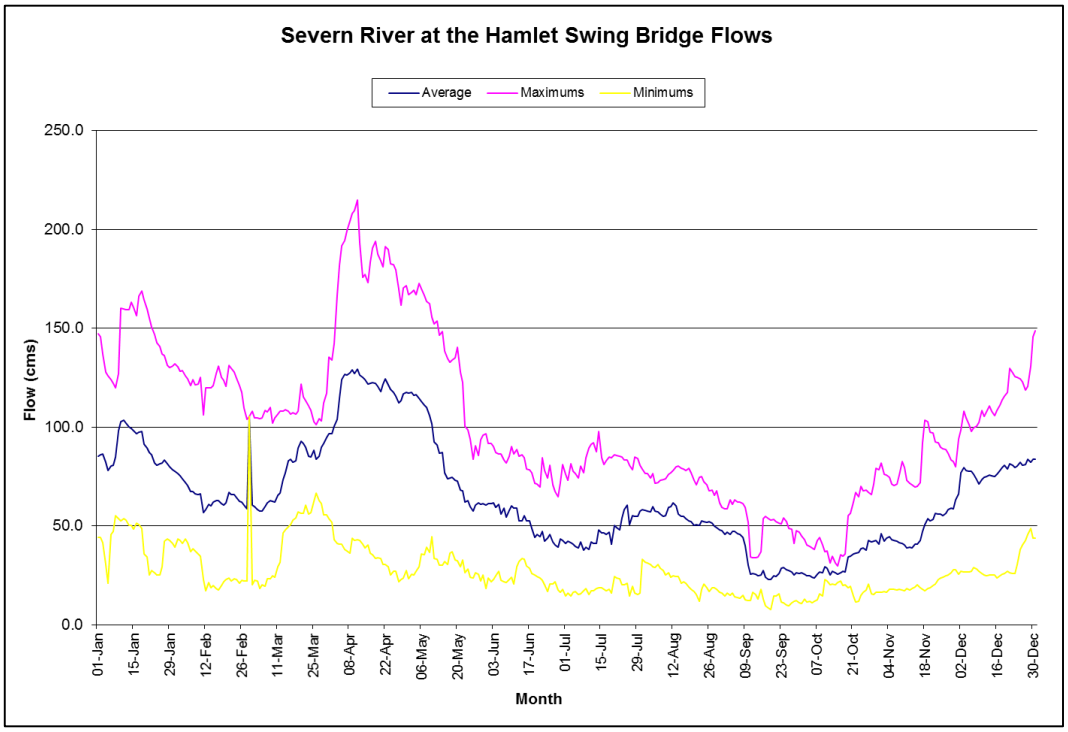


Figure 17. Average, Minimum and Maximum Severn River discharge as calculated at Hamlet.

However, as the area immediately below the Main Dam has not been identified as providing important spawning habitat, there should be no adverse effect due to the staging as changes in flow distribution should not be discernable further downstream. It has been noted that the flows out of the Main Dam in the spring do play an important role in Walleye and Sturgeon spawning in Severn Sound. Adult walleye begin to gather in Severn Sound near Port Severn under the ice in late winter in preparation for spawning. Shortly after ice out, adult walleye move into the outflow of Gloucester Pool and towards the reach below Bayview Dam, where there are suitable spawning substrates and depths. They would be drawn towards the dams during high flows in spring that are needed to attract fish. The main dam would continue to perform this ecological function in tandem with Bayview Dam.

Additional assessment of the staging of the works at the main dam involves the potential indirect effects of the project on the Bayview Dam. The main risk is a high water event, nearing the 220m³/s threshold during Phase 1B construction (Figure 16), which is planned to occur in the period from January to August 2019. In this scenario, the dams in Six Mile Lake, Bayview Dam and Little Chute would be used to pass the discharge required. In a worst case scenario, depending on the timing of the high flows, a high discharge at Bayview could potentially disrupt or effect Walleye and/or Sturgeon spawning there. As mentioned, the Bayview Dam and associated spillway is recognized as an important spring spawning area for both species. Higher flows are attempted to be maintained for several weeks in the early spring (March to late May) which allows fish to access the spawning channel and maximizes wetted perimeter for egg deposition. In a later period, an abated flow is desirable, to ensure that while incubating eggs are still submerged, that they are not negatively affected by high volumes of fast water. If higher than expected water levels were experienced in the period of mid-May to mid-July it may pose some risk.

Fortunately, the planned discharges have some flexibility. In the period from January to August, total discharge capacity will be approximately 250m³/s and the TSW requirement is only 220m³/s, a difference of 30m³/s (Figure 16). Therefore, it is unlikely that extraordinarily high volumes will need to go through the Bayview Dam and can likely be managed through the Main Dam. Also, this risk, while notable, is

essentially no different than that which exists every year on the Severn. Historical spring flows through Bayview are anywhere from as low as 6m³/s and as high as 50m³/s (average of 30m³/s). The highest values occur naturally when all logs are pulled from the dam. This happens in extreme flood conditions and subsequent threat to property. Due to the historical variability of the water through the Port Severn Dams, which has occurred since they were built in 1915, it is understood that aquatic species have endured and existed under TSW water management operations. No large deviation from historical river flow or levels will occur as a result of the project. The timing of the work, the nature of the site, limiting the size of cofferdams, plus using best practices will reduce the impact of the dam construction on aquatic resources.

The final evaluation of flow effects involves the three outlets from Six Mile Lake at Little Go Home Bay, Hungry Bay and Crooked Bay dams. The latter three dams at Six Mile are infrequently operated due to their remote locations. As shown in figure 16, operation of these dams may be necessary to release flood waters if necessary during all stages of the Main Dam construction. Capacity for flows at Hungry Bay and Crooked Bay are estimated at up to 30m³ with all logs out.

Both SLR and Niblett assessed the downstream environments at these locations. Crooked Bay features rock outcroppings bordering the river with backwaters dominated by Winterberry (*Ilex verticillata*), Red Osier Dogwood (*Cornus stolonifera*), Speckled Alder (*Alnus rugosa*), Joe Pye-weed (*Eutrochium* spp.) and Broad-leaved Cattail (*Typha latifolia*). The riparian habitat is forested and shaded at the Dam restricting turtle nesting opportunities. Habitat affinities for SAR reptiles are not present; there are no tableland rocks, or appropriate rock/rock barren structures. At Hungry Bay, the downstream marsh consists of Pickerelweed (*Pontederia cordata*), Common Reed (*Phragmites australis*), Meadowsweet (*Filipendula ulmaria*) and Red Maple (*Acer rubrum*). The Dam itself has very limited SAR habitat. Lizard's-tail (*Saururus cernuus*) was observed downstream of Hungry Bay dam. This is a native wetland plant that occurs along edges of streams and rivers as well as in low wet woods. This species is ranked as S3 and N3, meaning it is 'vulnerable' both provincially and nationally. There is a large water body below the Hungry Bay dam and a large beaver dam is present 600m downstream.

Additional flow through these areas are likely not a concern for fish because there are no sensitive spawning habitats recognized below these structures. Likewise, the habitats are common and there are no sensitive species. Lizard's-tail, is a wetland species and should not be negatively affected by the flow. The potential for impact on the beaver dam is likely controlled release with pauses between stop log removal to gradually increase the flow, rather than pulling all logs a once. Sudden release could potentially breach the beaver dam move debris downstream. With slower release, the beaver dam may be over-topped with the most likely response being beavers would reinforce or heighten the structure, depending on the length of time water levels remain high.

Once again these discharges are worst case scenarios and that water would be expected to be less. Therefore, it is unlikely that extraordinarily high volumes will need to go through theses dams and can likely be managed through the Main Dam. Also, this risk, while notable, is essentially no different than that which exists every year on the Severn, as outlined above in the Bayview discussion. Due to the historical variability of the water through the Port Severn Dams, these environments have endured and existed under TSW water management operations. No large deviation from historical river flow or levels will occur as a result of the project.

2) Effects of Design Change of the Main Dam

Footprint

Main Dam

There will some increase in the footprint due to construction. Converting the stoplog sluices to mechanical gates will require extra dam depth by way of extended piers upstream. The new bridge piers will be 1.5m longer and the same width of 1.83m for a new dam footprint of 1036m². As the existing dam is 932m², the increase is 104m² (11%). This increase in footprint will not affect fish as the area between the dam piers and 1.5m upstream of the existing piers would not be considered fish habitat. Above the Main Dam, there is no natural shoreline (concrete walls), no suitable substrate and no aquatic vegetation. Impacts to fish will be limited to exclusion during low flow periods.

Dam D

With respect to Blind Dam D, there is no change in footprint. There will be no permanent change or effects on aquatic habitat. The coffer dam will be temporary – from September to October. Therefore, the area will still be accessible for fish during the subsequent spring spawning period.

Operational Flow

Any increased capacity of the dam is only for purposes of managing unusually large flood conditions. No changes in historical river flow or water levels will occur as a result of the new dam configuration and regular operation. As stated, the Severn River and Gloucester Pool water levels do not fluctuate much during the navigational season and do not change greatly in non-navigation season. The range of water level in navigation period varies by as little as 10cm. If water levels go up, more water is allowed through the dam; if water levels drop, it is held back. In the non-navigation season, the range is greater but is generally in the range of 30cm difference (180.2 to 180.5m). This has been the historical operation of the dams and will continue to be so in the new configuration.

An important consideration in switching from a log sluice style to mechanical gate will be assessing the potential for flow change through the dam. The final configuration for the new dam consists of reconstruction of 9 spillway bays of equal width corresponding to the width of the bays of the existing dam. All bays will have the same sill elevation - 177.38 m. The present dam has 2 different sill elevations: sluice 1, 4, and 5-9 are set at 177.38m, while sluices 2 and 3 are lower at 176.77m.

A field survey was performed over a period of two days in March 2017 consisting of velocity measurements, water level readings and discharge (AECOM, *Port Severn Area Dams Hydraulic Study Report Main Dam - Downstream Navigation Channel Area*, May 2018). Those measurements were performed with different hydraulic flow conditions where the estimated total discharge of the Main Dam was between 89m³/s and 133m³/s while for Dam E, the estimated total discharge was 25m³/s. This data was used to compare modelled results. Since the new configuration of the Main Dam is similar to the existing configuration, model results considering both configurations were also expected to be similar. A series of simulations of flow of the new configuration were carried out in order to compare the results with the ones obtained using the existing configuration. Testing produced similar flows. It was also determined that the effect of raising the sill elevation of all spillway bays to 177.38m has a non-significant effect on the flow patterns. Since there will be no operational changes in historical river flow or water levels as a result of the new configuration, then the volumes of water passing through the dam shall remain the same. The main difference will be that water passes under the gates versus over the logs. Thus, there should be no negative effect on operational dam flow due to the project.

Invasive Aquatic Species

The last important consideration in a change in flow pattern below the dam as a result of a switch to mechanical gates is the potential for the passage of aquatic invasive species. The following aquatic species information has been provided to assess the Port Severn Main Dam gate design.

Asian Carps

Several studies have been performed to determine Asian Carp swim speeds, leap height and velocity restrictions. A literature review found detailed information on juveniles and sub-adults of the Bighead Carp and juveniles, sub-adults and adult Silver Carp. It was documented that adult Silver Carp have a burst speed of 7.78 to 9.74m/s, a leap angle of 44 ˚ to 70˚ with a leap height of 1.81 to 2.24m. They were not able to withstand velocities greater than 10 m/sec and vertical drops greater than 3m. The large juveniles and sub-adult Silver Carp can only sustain a swimming speed of 0.5-0.6m/s for more than 200 minutes. During laboratory testing, small juvenile Bighead Carp could only sustain a swimming speed of 0.2m/sec and sub-adults could only sustain a swimming speed of 0.8cm/s.

Electrical barriers have been used in the United States to help prevent the movement of Asian Carp. The barrier creates an electric current underwater. Fish attempting to pass the electrical field are exposed to increasing electrical stimuli which deters them from swimming through the electrified area. On-going monitoring is underway to determine the electrical barrier is preventing Asian Carp from the Illinois River into the Great Lakes via the Chicago Sanitary and Ship Canal (Asian Carp Regional Coordinating Committee, 2014).

Sea Lamprey

The burst speed of Sea Lamprey is relatively low, less than 3BL/s (body lengths per second) and their swimming performance is reduced at shallow water depths (0.15 to 0.04m). Several methods to prevent the movement of sea lamprey have been implemented throughout in the Great Lakes. The primary method to control Sea Lamprey is a lampricide called TFM (3-trifluoromethyl-4'-nitrophenol), used to kill larval sea lamprey. TFM is reported to be non-toxic and has minimal effects on aquatic fish, plans, invertebrates and wildlife and approximately 200 Great Lake stream are treated with TFM.

Physical barriers have been used to prevent upstream migration. Barriers are constructed to allow jumping fish to pass. Sea Lamprey trapping is also conducted throughout the Great Lakes, traps are designed to catch Sea Lamprey and prevent them from traveling upstream to spawn. Sea Lamprey are extremely sensitive to smell, pheromones are sometimes used as bait for trapping or manipulating their behavior to disrupt reproduction.

Round Goby

A study completed on Round Gobies predicts water velocities must be in excess of 1.25 m/s to prevent upstream movement. The most common prevention method of Round Gobies has been electrical barriers.

Potential for Species Passage

The sill elevations of 177.38 mean that they will be set at least 2.44m above the bedrock bottom below the dam. The river bed drops to 173.72 downstream of these sills. The dam modelling demonstrated that current and projected velocities are 4m/s through the sluices and 3m/s immediately below. Therefore in order to pass through the bottom of the gates, carp would have to manage a 2.4m jump against water velocities of 4m/s. High carp burst speeds are usually associated with leaps out of the water, rather than high velocity barriers. That said, with the adjacent lock nearby, it is likely that if carp manage to enter the Severn River from Georgian Bay if, or when they arrive they would probably do so

through the lock, instead of the dam. Round Goby have already made it into the Severn, mostly likely through Lock 45. It is more doubtful that Sea Lamprey could pass through the dam gates. In summary, even with the change from stop logs to gates, the dam would not be considered a vector for invasive fish. Deterrent mechanisms may need to be investigated in the future for Lock 45 in the event that carps manage to enter Lake Huron and Georgian Bay.

Water Quality

A major focus during construction will be maintaining water quality in areas upstream and particularly, downstream of the project site. Port Severn is part of the South Georgian Bay/Lake Simcoe Source Water Protection Region – Black-Severn River District. The sites are located within an Intake Protection Zone 1. This is the zone closest to the intake with the highest concern for vulnerability to source water. The Port Severn Water Treatment Plant serves a population of approximately 500 people in the Community of Port Severn. The plant draws its water from a point in Little Lake approximately 825m upstream from the project sites and has a rated water production capacity of 1900m^3/day.

Sediment Contamination

Sampling conducted at Dam D in December 2017, indicated there are exceedances of some metal (copper) and PAH contamination in the sediment. While PAH in a sample at Dam D exceed CCME ISQGs, they are below Probable Effect Levels. Metals satisfy CCME ISQGs. Thus, human and ecological health risk due to the exposure of sediments at the dam is low. If additional sediment with suspected contamination is encountered during construction, appropriate measures – potentially testing – may need to be taken to ensure that it is addressed to mitigate ecological and human health risks.

Controls will be expected to be put in place to mitigate sediment exposure to workers during the construction activities. There is potential for freshwater aquatic life, as well as recreational/residential users of Port Severn to come into contact with disturbed sediment in the water column as well as surface water containing contaminants released from sediments from the Port Severn work area. The potential for effects from this contact was evaluated through water quality predictions and comparisons to applicable water quality guidelines.

A site-specific relationship between TSS and turbidity was developed based on field measurements of turbidity and analytical results for TSS collected during the sediment assessment at Port Severn. Based on the above equation, the turbidity associated with 25mg/L of TSS is 14 NTU, while the DFO upper discharge limit of 75mg/L is associated with an equivalent turbidity of 40 NTU. Both turbidity and TSS are intended to be applied as “above background” levels. Based on the data collected in the field, the average background TSS was less than the reportable detection limit of 2mg/L, while the average background turbidity was approximately 2 NTU. The above evaluation verified that the use of the CCME short-term Water Quality Guideline 25mg/L will be protective of human health and the aquatic environment. For TSS, this value is the CCME WQG for short-term exposure (i.e. < 24 hours) of 25mg/L above background and 5mg/L above background on average for long-term exposure (i.e. 30 days). WQG exceedances above the drinking water quality guideline should be addressed immediately, due to the potable water intake at Tug Channel, immediately downstream from the work area.

Recreation/Local Business

Parks Canada has worked closely with local business owners, recreational groups, community associations and the municipality to gain a solid understanding of the economic importance of the summer and winter tourist seasons. Utilizing this information PCA has determined a schedule to minimize the impact of the work on the community. The focus will be on maintaining transparency to

the public and providing as much notice as possible to these groups to ensure they can plan accordingly around current and future work.

Species at Risk

Due to the diversity of habitats in the Port Severn area and its use by numerous SAR, the evaluation of potential effects on snake and turtle SAR and their Critical Habitats is important. This is a highly developed site with little native habitat. However, all work at the site needs to consider the potential for turtle and snake presence and their use of the area. Aside from the potential for individual harm to species, there is the potential to alter the function, or destroy, Critical Habitat for those species identified.

Potential for Harm to Individuals

The area provides suitable habitat for several species of turtle, in this case mostly summer basking along the rocky shoreline downstream. There are no nesting areas within manicured lawns or areas near locks or buildings. Soil excavation, stock piling of materials and other forms of landscape disturbance has the potential to attract turtles to the area for nesting. Standard mitigation such as well-maintained exclusion fencing should prevent this. As for other SAR and non-SAR reptiles, the poor nature of the dam habitat will generally avoid negative impacts to them. Activities can be temporarily halted if an individual nears a project site.

Critical Habitat

The project will take place within the proposed bounding polygon of SARA Critical Habitat for Blanding's Turtle, Eastern Foxsnake and Massasauga Rattlesnake. These species are known to occur in the broader area, however, suitable habitat features (hibernation, gestation, nest sites) are not found around the Main Dam. Construction access and work areas are to be confined to the minimum area required for construction activities and such areas are to be defined in the field using appropriately installed protective fencing or other suitable barriers. If any adjacent area is required, its use will be subject to further review. Barrier fencing must be inspected periodically to ensure it is functioning as intended. Fuelling areas should be located as far away from SAR habitat as reasonably possible. Implementation of these measures will mitigate negative effects on SAR and their habitat.

Air/Noise

Project construction activities may result in short-term, localized increases in fugitive dust from non-combustion sources and exhaust emissions from construction vehicles and stationary sources. Mitigations aimed at dust suppression and proper equipment use and maintenance will be implemented to mitigate potential adverse effects to air quality.

Noise level increases are expected during project construction. These increases are anticipated to be short-term, localized and associated with the use of various heavy construction machinery and associated work activities. The Contractor will be expected to control noise by the proper use and maintenance of all construction machinery.

Cultural Resources Management

Rehabilitation of Port Severn Main Dam, Side Dams and Fixed Bridge are inevitable due to the repair requirements. There were initial discussions about repairing the historic structures, but geotechnical investigations showed that replacement was the only viable option.

Various mitigations to cultural impact have been recommended in the SCRIA. These include measures such as designing within the recommendations provided in the Conservation Guidance 2016-2021

Capital Works Program, TSW, documenting the existing structures that will be removed and matching as much as possible the existing location of the historic dam.

Archeology

An Archaeological Impact Assessment was completed by Parks Canada to determine the existing conditions in the proposed work areas (Archaeological Overview Assessment, Rehabilitation of Port Severn Area Dams, Trent –Severn Waterway, Bayview Dam E And Blind Dam C). For the construction/repair, most of the work will involve extant infrastructure and bedrock, as such there is very little archaeological concern with this portion of the project. Staging and parking areas will remain within current roadways and parking areas. If significant archeological resources (i.e., Indigenous artifacts, structural remains and/or high artifact concentrations) are encountered during construction, work will cease and Parks Canada contacted for advice and assessment of significance, which will in turn determine what will be required to further mitigate impacts.

Other Environmental Considerations

Extreme weather events - such as high precipitation, early freshet or multiple freshets - should no longer be considered unexpected occurrences and must be factored into project planning and mitigation. Heavy rainfall will cause the Severn River and Little Lake to rise suddenly. Elevated water levels, large water volumes and high velocities are the result and must be anticipated and factored into the design, especially coffer dams, pump capacities, erosion control and project activities in de-watered areas. In April 1960, the Swift Rapids station recorded a discharge of 275m³/s. This remains the highest mean daily discharge recorded at this station since its implementation in 1953. In 1948, the water level in Gloucester Pool reached a historical peak of 180.72 m.

Ice jams have occurred, especially in springtime. They occur when a quick melt generates ice blocks, which hit the pier noses. Average ice thickness over the past years is measured at 24 to 30 inches (60 to 75 cm). Normally the ice cover forms at the beginning of December, and stays in place up to late March, sometimes to mid-April. Ice cover may form as early as November and as late as January.

8. MITIGATION MEASURES

General

1. Inform PCA Environmental Authority (Environmental Officer, Trent-Severn Waterway in Peterborough) regarding any changes to project plans and/or scheduling. Any changes not assessed under this Detailed Impact Analysis (DIA) will require approval from PCA and may require further mitigation measures.

2. Contractor is required to submit an Environmental Management Plan (EMP) to the Department Representative and Parks Canada that outlines all the measures to be implemented by the contractor on the project site to eliminate or reduce environmental effects and address mitigation measures outlined in this DIA. In order to allow for the timely commencement of project activities, the EMP can be submitted as separate components as project details become available. The EMP, or its components, will be submitted in writing prior to implementation of project activities and must be accepted by Parks Canada and the Departmental Representative.

3. It is recommended that an environmental professional(s) prepare the EMP or its component plans incorporating guidance found in PCA's Environmental Standards and Guidelines - Ontario Waterways (2017). The EMP will detail frequency of monitoring and list high-risk construction activities where an environmental professional must be onsite. Monitoring and testing should be

adaptable to changing site conditions and will capture any event/incident for the length and scope of that event.

4. As per the Historic Canal Regulations applicable to lands administered by the Trent-Severn Waterway National Historic Site of Canada, a permit signed by Parks Canada's Ontario Waterways Director will be required to authorize the project work prior to commencement of the project.

5. Parks Canada's Environmental Authority (EA), Trent-Severn Waterway will outline all the prescribed mitigation measures, including those found in BMPs, in a construction start-up meeting with the project manager and the contractor, to ensure that all on-site personnel are aware of these mitigation measures.

6. The contractor is to ensure that all on-site personnel are aware of, and comply with, these mitigation measures.

7. Should conditions at the work site indicate that there are unforeseen negative impacts to fish, wildlife, cultural or visitor experience resources, all works shall cease until the problem has been corrected and/or any required input can be obtained by Parks Canada or other relevant authorities. The Trent-Severn Waterway has the right to require that work be altered or ceased immediately.

8. All materials and equipment used for the purpose of site preparation and project completion shall be operated and stored in a manner that prevents any deleterious substance (e.g. petroleum productions, debris etc.) from entering the water. Ensure measures are in place to minimize impacts of accidental spills.

9. Store all oils, lubricants, fuels and chemicals in secure areas on impermeable pads.

10. All machinery and equipment shall be clean, free of leaks, in optimal working condition.

11. Use well-maintained heavy equipment and machinery, preferably fitted with fully functional emission control systems/muffler/exhaust baffles, engine covers, etc.; machines shall not be left to unnecessarily idle in order to avoid emissions.

12. Vehicle and equipment re-fueling and/or maintenance shall be conducted off of slopes, on impermeable pads and away from the water at a recommended distance of 30m if possible. If not possible this, fuelling sites will be as per Environmental Management Plan and mitigations to prevent substances from entering the water course applied.

13. A designated re-fueling depot will minimize the potential for extensive impacts at the site due to accidental releases of substances; proper spill management equipment shall be in place for fueling.

14. Drip trays shall be placed under fuel-powered equipment.

15. Only the working part of a machine is to enter the water; any part of a machine or equipment entering the water shall be free of fluid leaks and externally degreased to prevent any deleterious substance from entering the water. Complete the in-water activity as quickly as possible to minimize the time equipment is in the water; do not leave equipment in water during breaks in work activity.

16. There shall be no discharge of chemicals and cleaning agents in or near aquatic habitats; all such substances shall be disposed of at a facility licensed to receive them.

17. No tools, equipment, temporary structures or parts thereof, used or maintained for the purpose of this project, shall be permitted to remain at the site after completion of the project.

18. Spill control and emergency plans will be in place prior to initiation of construction. A spills kit will be maintained on site and the contractor will ensure that adequate additional resources are available. Spills shall be reported as soon as possible to the Parks Canada Project Manager. The Ontario Ministry of Environment and Climate Change Spills Action Center, (1-800-268-6060) shall be notified, if required.

19. In the event of a spill, remediation will be conducted immediately contain and clean up in accordance with federal regulatory requirements and to the satisfaction of Parks Canada. Documentation of remediation, testing and results will be provided to Parks Canada.

<u>Erosion and sediment control</u>

20. Mandatory submission of an Erosion and Sediment Control Plan, as part of the Environmental Management Plan, must be prepared and submitted to the Departmental Representative and accepted by Parks Canada. The focus of the EMP will be to reduce the amount of sediment laden water produced. A focus on separating offsite and infiltrating water into the construction site from construction activities and sediment sources. The document will demonstrate:

- A focus on erosion control primarily and sediment control secondary;
- Erosion and sediment controls will be tailored to the type of sediment found onsite (e.g. if clay is present, additional controls are necessary).
- The area to be controlled. In addition to the construction site, it is necessary to identify adjacent areas that could be negatively impacted by construction activities;
- Drainage areas and patterns based on pre-construction topography and construction design;
- How clean storm run-on will be diverted around the site and away from exposed areas;
- Channels that are designed and constructed to the necessary design discharge;
- Temporary and permanent erosion control needs for all drainage channels;
- Consideration of project schedule in selecting, designing and laying out environmental controls;
- Consideration of seasonal requirements; select and design controls and practices for controlling erosion and sedimentation including shutdown periods;
- Consideration for particles size present in the sediment, which is key to selecting the appropriate sediment treatment option(s).

21. The size of particles present in the sediment is a key consideration for selecting the appropriate sediment treatment option(s):

- If the sediment consists primarily of gravel or sand, which are relatively large particles, a single treatment using a more basic technology, such as a sediment trap or sediment bag, may be adequate.
- If the sediment consists of silt and/or clay or concrete fines, which are relatively small particles, the effluent will most likely need a more advanced technology, such as a filter press or chemical treatment with anionic flocculent and a filtration method.
- If the sediment consists of a large spectrum of particle sizes, the water may need primary treatment to remove larger particles, followed by secondary treatment to remove finer particles.

22. Erosion and sediment control measures shall be implemented prior to work and maintained during the work phase, to prevent entry of sediment into the water where site access or other activities cause exposed soil.

23. All erosion and sediment control measures shall be inspected daily to ensure they are functioning properly and are maintained and/or upgraded as required to prevent entry of sediment into the water.

24. Contingency planning is necessary in the event that erosion and sediment control measures are not functioning properly and need to be adjusted, improved or enhanced.

25. Erosion and sediment control measures shall be left in place until all areas of the work site have been stabilized.

26. Sediment control measures and exclusion fencing must be removed in a way that prevents the escape or re-suspension of sediments.

27. Environmental protection measures shall be checked after each extreme weather event.

28. Any stockpiled materials shall be stored and stabilized a safe distance away from any watercourse, drainage course or swales to prevent erosion and subsequent entry into the water body OR removed from the site, in accordance with all federal, municipal and provincial regulations.

29. Upon completion of the work all debris shall be completely removed and the area restored to its original state or better. Repair all damages to property due to project activities.

30. The contractor will maintain a standby supply of pre-fabricated sediment fence barriers, or an equivalent ready-to install sediment control devices.

Fish & Aquatic Habitat

31. The contractor will provide a marine grade turbidity curtain - US DOT Type 2 - across all areas where sediments can enter the watercourse. Turbidity curtains are to be anchored or weighted down along its length to form a continuous seal on the river bed with adequate flotation at water surface to prevent over spills of turbid water.

32. Sediment/turbidity curtains shall be deployed in a manner – e.g. moved in a direction from close to shore/structures outward – that prevent entrapment of fish inside the curtain.

33. All work is to be completed in the dry. A de-watering Plan shall be submitted, as part of an EMP, to Parks Canada for review and acceptance prior to any dewatering.

34. Installation and removal of coffer dams shall be conducted within the proper in water timing window. In-water work cannot occur from March 15th to July 15th.

35. Coffer dam de-watering systems and sediment treatment areas must be designed to have sufficient capacity to remove fine sediments from water prior to being released; flocculants for settling fines may be necessary due to the nature of particulates.

36. Sediment control measures shall be in place during any in-water work to control turbidity levels. Sediment curtains, or other appropriate measures, shall be implemented prior to any in-water work that may result in sedimentation. These shall remain in place until all suspended sediments have settled.

37. Turbidity curtains should not be used as a settling area for dewatering activities. Clean water must be returned to the system. In the event that turbidity remains high after treatment, settling areas within curtains may need to be cleaned – i.e. sediment removed from the bottom – prior to curtain removal.

38. For coffer dams, an engineered design rather than loose aggregate rock berm-style is preferred, to minimize in-water disturbance while they are placed and particularly, while they are removed;

39. Flow dissipaters and/or filter bags, or equivalent, shall be placed at water discharge points to prevent erosion and sediment release.

40. For de-watering, fish screens must comply with *DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines* when pumping in fish-bearing water to prevent impingement or entrainment of fish;

41. Any fish found within the dewatered coffer dam areas will be removed and placed downstream if found in the downstream coffer dam area and upstream if found upstream;

42. Only clean material free of fine particulate matter shall be placed in or near water where it has been previously planned and authorized.

43. No acid-generating rock (containing sulphides) or limestone based rock shall be used.

44. Monitor water quality for unacceptable suspended sediment levels during in water activities.

45. CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life will form the baseline for water and streambed quality monitoring and assessment.

46. Should conditions at the work site indicate that there are negative impacts to fish or their habitat, all work shall cease until the problem has been corrected and Parks Canada EA staff has been consulted.

Aquatic Invasive Species

47. To reduce the risk of introducing invasive species, all equipment must be thoroughly cleaned prior to coming to the site. Any machinery that appears to have not been cleaned will not be permitted on site. For additional information or guidance on how to properly clean equipment, see the Clean Equipment Protocol for Industry developed by the Ontario Invasive Plant Council and found here: http://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf.

48. Any equipment or vehicles which are to be used in water, should be thoroughly cleaned before and after use of any visible mud, vegetation, mussels, etc.:

- Vessels/equipment should be drained of standing water;
- Vessels/equipment should ideally be cleaned with hot water (>50 °C) at high pressure water (>250 psi);
- Vessels/equipment should be dried for 2 – 7 days in sunlight before transported between waterbodies;
- Cleaning of vessels/equipment should be conducted away from waterbodies at a recommended distance of at least 30m from the shoreline.

49. Mud, dirt and vegetation should be cleaned from clothing and footwear prior to entering the work site, and prior to leaving the work site.

50. Move only weed/contaminate-free materials into non-infested areas. Moving materials from one infested location to another within a particular zone may not cause contamination, but moving materials from infested to non-infested areas could lead to the introduction and spread of invasive plants.

51. If removal of invasive species occurs, individuals will be disposed of appropriately, offsite to ensure no further propagation.

52. Should an invasive species be encountered (or at least suspected) not identified in this DIA, a photo and report of the specimen should be sent to Parks Canada's EA staff.

Water Quality

53. Monitoring of the downstream environment shall be conducted after coffer dam installation and should conditions indicate that there are negative impacts to water quality, flows may need to be increased/adjusted accordingly.

54. Ontario Drinking Water Quality Guidelines cannot be exceeded (beyond parameters that currently exist) due to project activities.

Contamination

55. During installation and removal of the containment structure, care should be taken to minimize disturbance of substrate. Where a coffer dam (or similar structure) is installed or removed, an impermeable turbidity curtain shall be placed around the structure to contained disturbed sediment. The turbidity curtain will be left in place until suspended particles have re-settled and the water quality requirements are met. The contractor may present alternative control methods to that of a turbidity curtain but such methods must prevent the distribution of sediment.

56. After the Work Area is dewatered, a barrier may need to be placed on the substrate to minimize disruption of the sediment. Where fluidized sediment (i.e., mud) is created, additional control of the potential for sediment release may be needed.

57. Total Suspended Solids (TSS) concentration greater than 25mg/L and 14NTU should not occur at the point of discharge (i.e., diffuse discharge through the containment system or point of discharge during active dewatering).

- In the event that the maximum TSS value of 75mg/L (40 NTU) is exceeded at the point of discharge, or TSS is more than 25mg/L (14 NTU) above background for > 24 hours, the construction work should be stopped and the work site and methods reviewed to determine appropriate mitigation measures to reduce TSS. Once the mitigations are implemented, work can resume.
- In the event that the TSS is more than 25 mg/L above background for < 24 hours, the work site and work activities should be reviewed to determine appropriate mitigation measures to reduce TSS.
- In the event that TSS in the receiving environment is on average > 5mg/L (2 NTU) above background for > 30 days (i.e. if the work in a given area lasts longer than 30 days), the contractor should inspect the work site and work activities should be reviewed to determine appropriate mitigation measures to reduce TSS.

58. In the event that the WQG for drinking water quality has been exceeded downstream of the work area, the work should be stopped and the work site and methods reviewed to determine appropriate mitigation measures to reduces TSS. Once the mitigations are implemented, work can resume.

59. It is recommended that the Contractor develop a contingency plan for in the event that **mitigation 57** cannot be met or water in the enclosed work area is found to be acutely lethal to fish. This may include alternate means for temporary storage (e.g. holding tank) and pre-treatment of discharge water using a mobile treatment unit with an Environmental Compliance Approval (ECA) prior to discharging water to the environment. Contingency plans must be designed and in place to address schedule disruptions and unforeseen storm events with associated potential high water flows.

60. The pumping system to transfer dewatering effluent from the work area to outside will need to be situated in such a way that it does not re-suspend sediment from the bed within the work area or otherwise pump water from which particulates have not been allowed to settle. The pumping system may need a pre-filtration step to further minimize the transfer of suspended sediments.

<u>Vegetation removal/restoration</u>

61. Identify and keep work activities confined to planned areas and within previously disturbed areas;

62. Where practical, the branches of the large trees should be trimmed back as the first option rather than cutting the entire tree.

63. Disturbance of vegetation along the shoreline must be limited to what is required for allowing reasonable completion of the project with minimal environmental impact; if necessary, riparian vegetation will be removed last and kept to a minimum.

64. Phase vegetation removal to reflect construction activity (i.e. removal for access only for construction of coffer dam).

65. Local soil will be stockpiled and re-used as opposed to bringing in soil from other locales.

66. Stabilize the ground surface at all disturbed areas.

67. De-compact subsoil which has been compacted from the movement of construction equipment and project staging.

68. All disturbed areas of the work site shall be stabilized immediately with erosion protection. All exposed areas should be covered with erosion control blankets or other measures such as mulch to keep the soil in place and prevent erosion until vegetated in the spring.

69. Restore the site and to a specific future condition; ensure re-planting success.

70. Native grasses, shrubs, etc. should be planted to match existing species growing on the sites.

71. Seed purchased commercially should have a label that states the following:

- Species;
- Purity: Most seed should be no less than 75% pure and preferably over 85% pure. The rest is inert matter, or other seed;
- Weed seed content: The tag should state NO invasive plants are present. Only certified weed-free seed should be used; and

- Germination of desired seed: Germination generally should not be less than 50% for most species, although some shrubs and forbs will have lower percentages.

Wildlife

72. The Site Specific EMP must demonstrate procedures for avoiding disturbance/harm to wildlife.

73. On a daily basis, an inspection or "sweep" of the work area shall be performed prior to commencement of project works and activities to ensure wildlife are not present in the work area (include in site checklist).

74. Field information regarding incidental encounters with wildlife (non-SAR wildlife) shall be compiled and reported.

75. For incidental encounters, the following information should be recorded in the field:

- Locations, dates and time of day where the species were encountered;
- Names of species encountered;
- Photographs of the species, if taken;
- Condition of animal.

76. If injured/dead wildlife are encountered report to PCA immediately. PCA may require retrieval and storage on ice of carcass for laboratory testing

77. All vehicles and equipment used by project personnel will follow any construction zone speed limits to reduce the risk of hitting wildlife, as enforced by the site supervisor.

78. Work areas will be kept clean and free of potential hazards to wildlife such as wire, cable, tubing, plastic, antifreeze or other materials that wildlife may eat or become entangled in.

79. Waste will be stored, handled, and transported in accordance with the Waste Management Plan, including storage of all solid waste in sealed, bear-proof containers.

80. Feeding of wildlife is prohibited.

Species at Risk

81. The EMP must demonstrate procedures for avoiding disturbance/harm to wildlife.

82. Species at risk training shall be provided to all employees before they begin work on site (materials can be part of the Environmental Protection Plan). Employees must be able to identify potential species at risk and know the proper procedures to follow when they encounter a species at risk.

83. Should any suspected species at risk – snakes or turtles and/or eggs be encountered during construction - project staging, implementation or demobilization - work would halt immediately and Parks Environmental Assessment Staff would be notified. Stop work immediately and contact EA staff on how to proceed. Additional measures to avoid impacts may be required before work can restart. Stand back and allow the animal to leave the site.

84. If a turtle is found within the project limits it should be left alone to leave the area if possible, or the animal should be gently placed outside of the construction site. Typically, animals should be released not more than 250m from the capture site. Release sites should be near water with vegetation cover for shelter.

85. Synthetic plastic Erosion Control Blankets/Mats should not be utilized, particularly during nesting season, as they pose as an entrapment hazard to turtles. Fibre-based bio-degradable Erosion Control Blankets/Mats are only to be utilized.

86. Construction access and work areas are to be confined to the minimum area required for construction activities and such areas are to be defined in the field using appropriately installed protective fencing or other suitable barriers. Minimize the disturbed area; clearly mark the work space.

87. Fuelling areas should be located as far away from identified SAR habitat as reasonably possible.

88. Park on roads or disturbed areas only.

Noise /Air

89. Adhere to local noise by-laws. Notify residents of planned activities that may cause disturbance and schedule them to avoid sensitive time periods.

90. Monitor and mitigate public complaints by keeping a record of complaints and addressing any issues raised by the public.

91. All on-site vehicles are expected to have a Drive Clean Emissions Report in compliance with O. Reg. 361/98: Motor Vehicles under the Environmental Protection Act, R.S.O. 1990, c. E.19. EA Officers may stop a vehicle if they believe the vehicle is emitting excessive exhaust smoke or suspect that emission control equipment has been tampered with or removed.

92. Use well-maintained heavy equipment and machinery, fitted with fully functional emission control systems/muffler/exhaust baffles, engine covers, etc.

93. Machines shall not be left to unnecessarily idle in order to avoid emissions.

Cultural Resources

94. Allow PCA to conduct a heritage recording of the dam and landscape prior to construction. Additional recordings of the submerged components may be required once dewatering occurs but prior to demolition. Such methods may include written descriptions and analyses, photographs (aerial or terrestrial), rectified photography, photogrammetry, geophysical survey, maps, measured plans, drawings and sketches, or other traditional and modern technologies.

95. Inform the CRM Officer (Ontario Waterways) regarding any changes to project plans and/or scheduling. Any changes not assessed under this Impact Analysis will require approval from PCA and may require further mitigation measures.

96. If unrecorded archaeological resources (i.e. structural remains and/or artifact concentrations) or any other cultural resource be encountered, work shall cease until the item can be reviewed by a PCA or PCA appointed archaeologist, the situation reviewed and direction for mitigation measures is provided to the Environmental Assessment Coordinator and Project Manager. Ensure that all exposed underwater cultural materials are kept submerged and/or wet while waiting for direction.

Waste Disposal

97. Recyclable material and waste shall be removed from the site, in accordance with all federal, provincial and municipal regulations, to disposal facilities licensed to receive them;

98. Waste generated will be disposed according to regulations (i.e., O. Reg. 102/94 and O. Reg. 558/00, R.R.O. 1990, 347).

Concrete

99. Concrete leachate is alkaline and highly toxic to fish and aquatic life. Measures must be taken to prevent any incidence of concrete or concrete leachate from entering the watercourse. Maintain complete isolation of all cast-in-place concrete and grouting from fish-bearing waters for a minimum of 48 hours if ambient air temperature is above 0°C and for a minimum of 72 hours if ambient air temperature is below 0°C or until significantly cured to allow the pH to reach neutral levels.

100. Ensure that all works involving the use of concrete will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse;

101. At the discharge point into the watercourse, pH will be maintained between 6.5 and 9.0. Water with pH > 9 cannot be released directly back into the watercourse, but must be treated prior to release. Water with a pH ≥ 12.5 is considered toxic and treated as a hazardous waste under Ontario Regulation 347 of the Environmental Protection Act and wastewater in this condition must be removed from the site.

102. Additional Environmental Mitigation Measures For Placement of Tremie Concrete or concrete pours when forms are not isolated from moving water:

- Ensure concrete forms are tight and no flow is occurring.
- Isolate area with curtain or impermeable material specified for concrete particulates; ensure fish exclusion is followed.
- Isolated area should be the minimum size required to complete task.
- For tremie pours, CO_2 system must be installed and operating along the entire length of the isolated area; the tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels. Ensure sufficiently sized tanks for the concrete volumes used.
- Workers shall be trained in the use of the system.
- Use of neutralizing acids is not permitted.
- pH monitoring conducted downstream of the work area and adjacent to the pH treatment area.

103. In the event of a release of concrete or grout, Parks Canada and the Ontario Spill Action Centre (1-800-268-6060) shall be notified; remediation will be conducted immediately contain and clean up in accordance with provincial and federal regulatory requirements AND to the satisfaction of Parks Canada; documentation of remediation, testing and results will be provided to Parks Canada.

104. Wash equipment away from water and provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment;

105. Filter fabric material will consider the grain size characteristics of concrete sediment and shall be designed around the principals of maintaining sufficient hydraulic flow and prevention of particle movement through the material.

106. Concrete debris shall be placed into an enclosed container daily, or more frequently if required.

Dam/Sluice Commissioning

107. During re-flooding and commissioning of the new sluice, if elevated turbidity beyond 8 NTU from background levels for a short-term exposure (e.g., 24-h period) is observed Parks Canada will assess potential impact to the aquatic environment. A determination will be made by Parks Canada as to whether subsequent flushing is permitted. If not, additional mitigation measures may be required.

108. The area inside of the coffer dams, if necessary, will be cleaned or alternately capped with clean rock, in order to mitigate turbidity from the former construction area as it is re-flooded.

Floods/Extreme or inclement weather/Ice formation

109. Undertake construction under normal weather conditions, to the extent possible, and design the project worksite to withstand variable weather conditions.

110. Apply wet weather restrictions on construction activities to reduce surface run-off from exposed work areas and to minimize the risk of inundation.

111. The work area shall be stabilized against the impacts of high flow/heavy rainfall events at the end of each workday.

112. Work shall be suspended and the work area stabilized when there is a high probability of a rainfall event.

9. PUBLIC/STAKEHOLDER ENGAGEMENT & ABORIGINAL CONSULTATION

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

☐ No
☒ Yes

Departments & Agencies

Ontario Ministry of Natural Resources & Forestry (OMNRF), Parry Sound District and Arunas Liskauskas from the OMNRF Upper Great Lakes Management Unit, Lake Huron Office were contacted In order to obtain advice and information on fish and fish habitat at the project site.

The project was self-assessed for impacts to fish and fish habitat. The nature of the site, the scheduling of the works and implementation of mitigations in this EA will prevent the serious harm to fish as per the *Fisheries Act*.

Public Communications summary for Port Severn.

- October - December 2016 - public bulletins re: investigations for the project;
- April 2017 - letters to Mayors at Township of Georgian Bay and Township of Severn Re: project scope;
- April 6, 2017 - Meeting with Township of Georgian Bay and Township of Severn;
- June 12, 2017 - Presentation to Township of Georgian Bay council;
- July, 2017 - Meeting with marina owner and staff;
- July 2017 - Community bulletin with closure dates sent to communications list including businesses, municipal staff and council;
- September 2017 - letters to home owners next to Dam A and C;
- Formal updates have gone out when we expect action or investigations on site.

9 b) Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed project:

☐ No
☐ Yes

There is potential for project to affect use of lands or resources by aboriginal persons, potential effects on treaty rights, impact of activities on land, historic presence and use and spiritual significance will be considered.

On 3 April 2016, a letter was sent to the 7 Williams Treaties First Nations Chiefs advising them of the TSW Federal Infrastructure Projects and their status. To date, the Williams Treaties First Nations consultation officers have identified that consultation is not required as the proposed project activities do not appear to impact Aboriginal or Treaty Rights. However, this Impact Assessment and project scope will be shared with community members to ensure all potential impacts have been assessed. Continued information, engagement and monitoring of project activities will occur to ensure the accuracy of proposed mitigation measures and to ensure that no impacts occur to the communities Aboriginal or Treaty Rights. Should such an impact arise, formal consultation to address the impact would be undertaken.

As part of the agreed to process, the community consultation representatives receive updates through the construction phase. As is Ontario Waterway practice, community consultation representatives have been and will be offered the opportunity for a site visit and will be accompanied by senior project staff should they make that request. In the event of an accident on site, contamination due to construction, or discovery of archaeological material, stop work order provisions in the contract will allow work to be temporarily halted around the impacted area and the community consultation representatives will be notified and if needed be invited to participate in any monitoring of the site.

10. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

Residual effects from the project activities may include effects from temporary upstream habitat loss, loss of terrestrial habitat below Dam E, effects from sediment disturbance/releases downstream and loss of vegetation. The magnitude, geographic extent, duration, frequency and reversibility of these effects have been determined to be low. Therefore, the residual adverse effects of the projects are not expected to be significant. Because these residual effects are not significant, cumulative effects, that is the potential additive effects of these projects with future dam projects in the Port Severn area, it is also expected to be low. Monitoring and reporting during construction will be important in verifying this conclusion, as Parks Canada begins more projects in the area.

11. SURVEILLANCE

☐ Surveillance is not required
☒ Surveillance is required
☒ Required in accordance with the *Parks Canada Cultural Resource Management Policy*

12. FOLLOW-UP MONITORING

Follow-up monitoring is:

☐ Not required
☐ Legally required (e.g. under the *Species at Risk Act* or *Fisheries Act)*

13. SARA NOTIFICATION

Notification is:

☒ Not required

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

The activity will not lead to residual adverse effects that contravene a SARA prohibition for a listed species at risk, its residence or Critical Habitat.

14. EXPERTS CONSULTED

Department/Agency/Institution: Ontario Ministry of Natural Resources and Forestry	Date of Request: July 20 2018
Expert's Name & Contact Information: Arunas Liskauskas, Upper Great Lakes Management Unit Lake Huron Office	Title: Management Biologist
Expertise Requested: advice on timing window/habitat below Port Severn Main Dam	
Response: There is no concern over work in the fall period as there are no known fall spawners in the zone below the dams. It is the spring timing that is most important and that the area below the Bayview dam is the key consideration.	

Department/Agency/Institution: Ontario Ministry of Natural Resources and Forestry	Date of Request: June 5 2018
Expert's Name & Contact Information: Steve Scholten OMNRF Parry Sound District	Title: Management Biologist
Expertise Requested: advice on timing window below Port Severn Main Dam	
Response: No response received to date	

Department/Agency/Institution: SLR Consulting Inc.	Date of Request: June 2016
Expert's Name & Contact Information: Michael Roy	Title: Senior Ecologist
Expertise Requested: Environmental Baseline - SAR Survey	
Response: Reptile Species at Risk Survey –Severn Waterways	

Department/Agency/Institution: Niblett Environmental Inc.	Date of Request: March 2017
Expert's Name & Contact Information: Amanda Smith	Title: Aquatic/Terrestrial Biologist
Expertise Requested: Environmental Baseline – Terrestrial & Aquatic Resources	
Response: Environmental Constraints and Mitigation Report For the Rehabilitation of Port Severn Dams, Trent Severn Waterway	

Department/Agency/Institution: Arcadis	Date of Request: June 2016
Expert's Name & Contact Information:	Title: Aquatic Biologist
Expertise Requested: Environmental Baseline – Fish Habitat Survey	
Response: Fish Habitat Assessment of Various Sites Along the Trent-Severn Waterway	

Department/Agency/Institution: SNC Lavalin	Date of Request: September 2017
Expert's Name & Contact Information: Melanie Siewert	Title: Senior Client Contact
Expertise Requested: Trent-Severn Waterway Sediment Assessment at Various Sites in Support of Structural Upgrades	
Response: Trent-Severn Waterway Sediment Assessment in Support of Construction Activities, Port Severn Sites, Port Severn, Ontario, May 2018	

Department/Agency/Institution: Parks Canada Agency	Date of Request:
Expert's Name & Contact Information: Nathalie Desrosiers	Title: Policy Advisor, Cultural Resources Management
Expertise Requested: Cultural Resource Impact Assessment and Recommendations	
Response: Statement of Cultural Resource Impact Analysis	

Department/Agency/Institution: Parks Canada Agency	Date of Request:
Expert's Name & Contact Information: Stacey Taylor	Title: Terrestrial Archaeologist
Expertise Requested: Archaeological Overview Assessment	
Response: Archaeological Overview Assessment, Rehabilitation Of Port Severn Area Dams, Trent –Severn Waterway, Bayview Dam E And Blind Dam C	

15. DECISION

Taking into account implementation of mitigation measures the project is:

☒ Not likely to cause significant adverse environmental effects.

☐ Likely to cause significant adverse environmental effects.

FOR SARA REQUIREMENTS:

☒ A SARA-Compliant Authorization Decision Tool was not required

16. RECOMMENDATION AND APPROVAL

Prepared by: Randy Power, EA Officer	
Signature:	Date: 2018-08-20
Recommended by: Valerie Minelga, EA Team Leader	
Signature:	Date: 2018-09-26
Approved by: Jewel Cunningham, Director, Ontario Waterways	
Signature:	Date: Sept 21, 2018

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.*

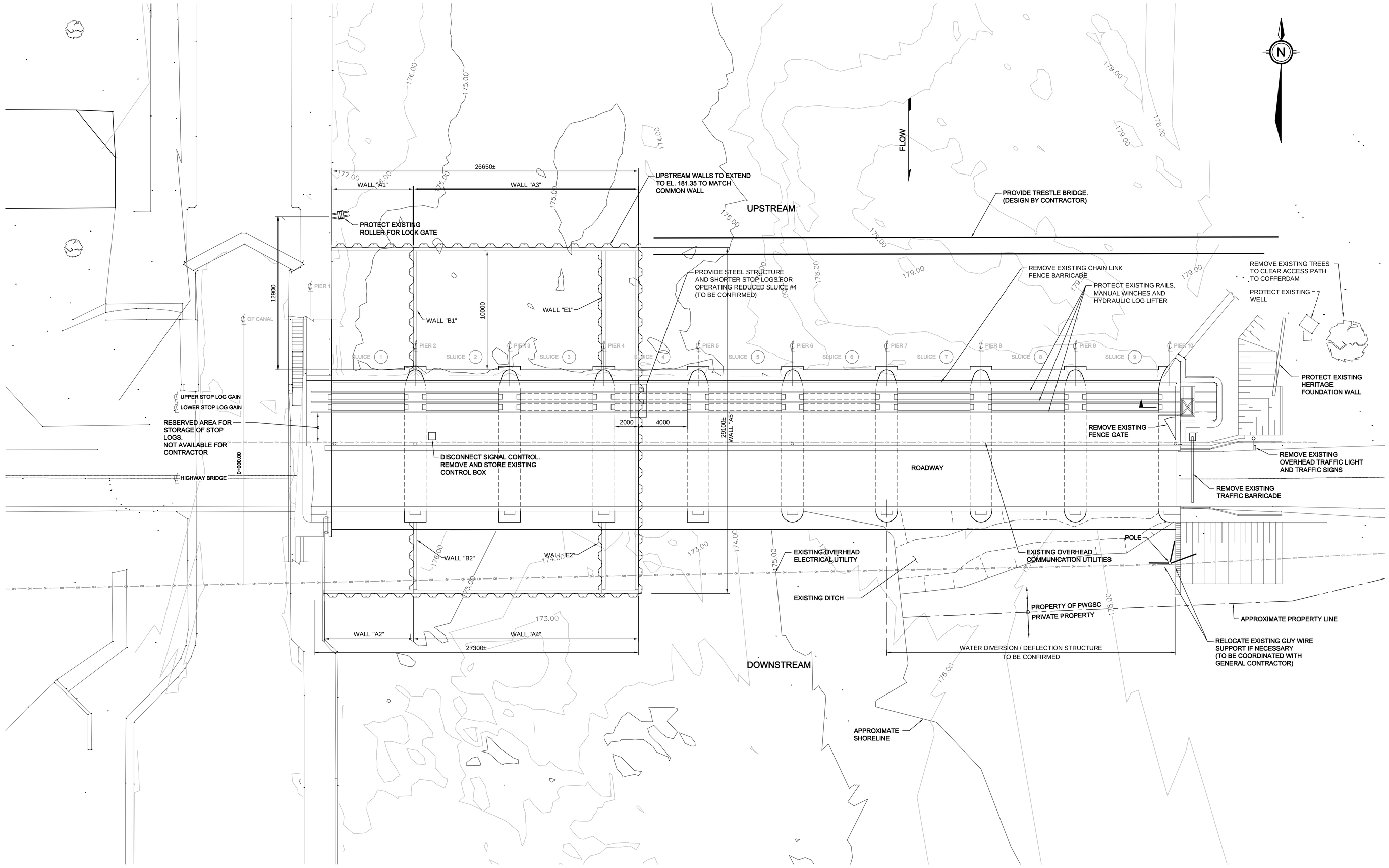
18. APPENDICES

1. Effects Identification Matrix
2. Project Drawings
3. Consultation Letter to Williams Treaties First Nations
4. SLR Consulting SAR Survey Map & Fact Sheet
5. NEA Baseline Report

APPENDIX 1 ENVIRONMENTAL EFFECTS IDENTIFICATION MATRIX

	Fish, aquatic habitat	**water quality**	**Recreation/ local business**	**SAR**	**Air/ Noise**	**CRM/ Archeology**
Activities						
Set up of temporary facilities	☐	☐	☒	☒	☐	☒
Transport of materials/ equipment	☐	☒	☒	☒	☐	☐
Supply and storage of materials	☐	☒	☒	☐	☐	☐
Use of machinery	☒	☒	☒	☒	☒	☒
Coffer dams	☒	☒	☐	☐	☐	☒
Dewatering and Maintenance Pumping	☒	☒	☐	☐	☐	☒
Demolition	☒	☒	☐	☐	☐	☐
Concrete	☒	☒	☐	☐	☐	☐
Drainage	☒	☒	☐	☒	☐	☐
Disposal of waste	☐	☒	☐	☐	☐	☐
Road Closure	☐	☐	☒	☐	☐	☐
Dam Design Change	☒	☐	☐	☐	☐	☐
Vehicle Traffic (Use)/ Maintenance	☐	☐	☐	☐	☐	☐

APPENDIX 2 PROJECT PLANS/DRAWINGS



PLAN - STAGE 1 TO BE COMPLETED BEFORE JANUARY 2nd 2019

SCALE 1:150

STAGE 1 / CONSTRUCTION SEQUENCE

1. CONSTRUCT WATER DIVERSION / DEFLECTION STRUCTURE FOR SLUICES 7 TO 9.
2. ERECT WALL'S "A1", "A3", AND "A5".
3. SEAL JOINTS AND BASE OF ERECTED WALLS.
4. OPEN STOP LOG GAINS TO ALLOW WATER TO EVACUATE DOWNSTREAM.
5. SEAL LEAKS IN BEDROCK BY CRACK INJECTION IF REQUIRED.
6. ERECT WALL "A2 AND "A4".
7. AFTER CONCRETING AND REMOVAL OF FORMWORK OF PIER 2, GENERAL CONTRACTOR WILL INSTRUCT WHEN TO ERECT WALLS "B1 AND "B2" AND REMOVE WALLS "A1" AND "A2".
8. AFTER CONCRETING AND REMOVAL OF FORMWORK OF PIER 4 GENERAL CONTRACTOR WILL INSTRUCT WHEN TO ERECT WALLS 'E1' AND 'E2' AND REMOVE STAGE I COFFERDAM.

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

Heritage Canals and Engineering Works
Heritage Conservation Directorate
Canaux historiques et travaux d'ingenierie
Direction de la conservation du patrimoine

Canada

AECOM

NOTES

1. ALL CHAINAGES AND LEVELS SHOWN ARE IN METERS AND DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. CONTRACTOR TO HAVE MATERIAL FOR WALL 'B1' AND 'B2' ON SITE IF FLOOD EVENT IS PREDICTED AFTER PIER 2 IS COMPLETE THEN CONTRACTOR SHALL ERECT WALLS 'B1' AND 'B2' AND BE PREPARED TO REMOVE WALLS 'A1' AND 'A2'.
3. LOWER STOP LOGS IN GATE 4 MAY NEED TO BE CUT TO BE REMOVED.
4. ALL REQUIRED BRACING AND ANCHORS FOR COFFERDAM MUST BE INCLUDED IN CONTRACTOR'S DESIGN.
5. ALL COFFERDAM JOINTS, CONTACT SURFACES AND BOTTOMS MUST BE SEALED TO ENSURE WATERTIGHTNESS.
6. ALL WORK AREAS MUST BE FREE OF ANCHORS AND ANY OTHER OBSTACLES FOR WORKERS / EQUIPMENT.
7. DIMENSIONS AND POSITIONS SHOWN ON THIS DRAWING MUST BE VALIDATED ON SITE BY THE CONTRACTOR BEFORE STARTING WORKS.

No.	Description	Dwn By / Des Par	Date
B	90 % SUBMISSION	R.T.	JUNE 21, 2018
A	50 % SUBMISSION	J.W.	JUNE 6, 2018

Revision / Révision

A Detail number / Numéro du détail
B Location dwg. number / Numéro sur dessin

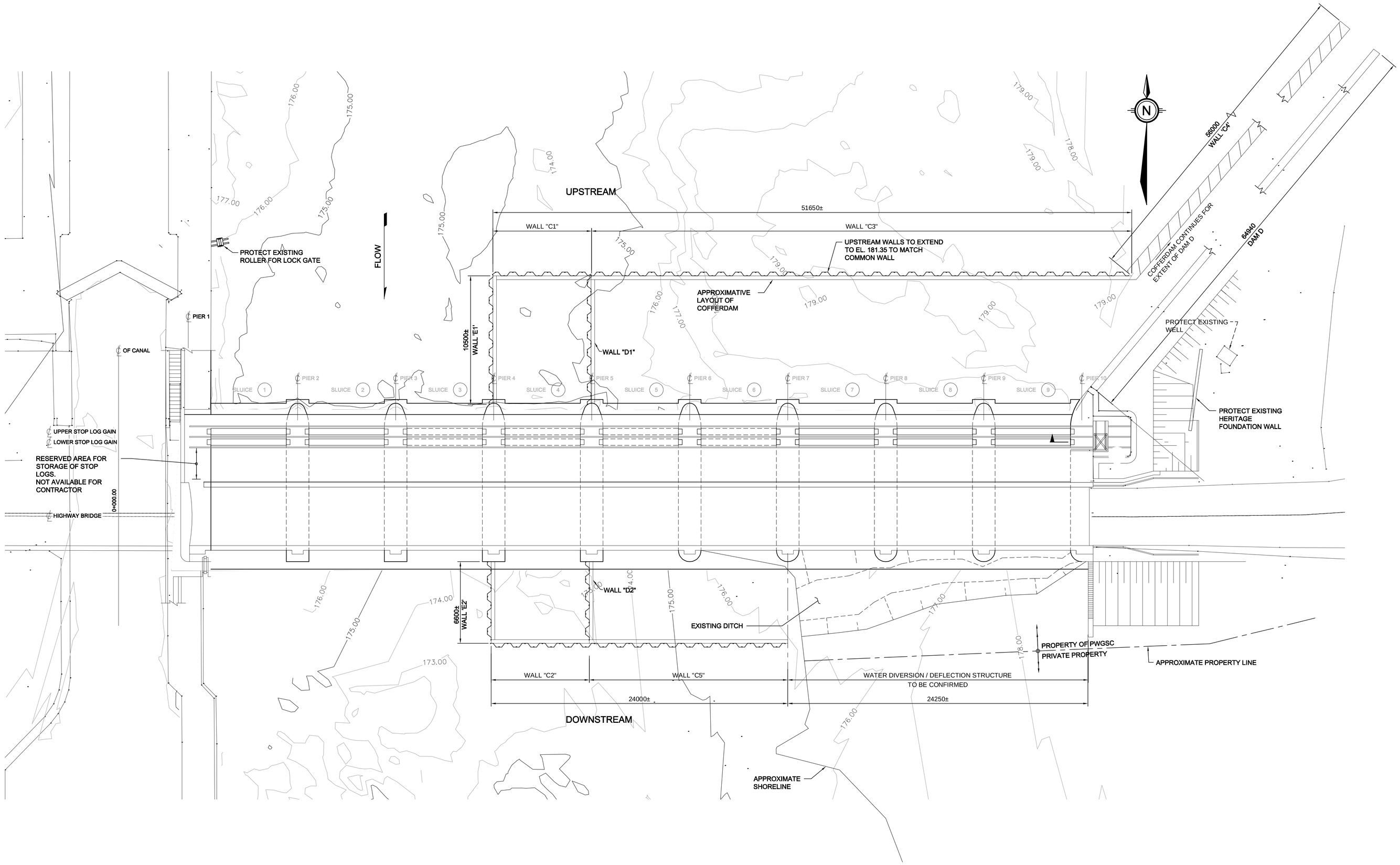
Project title / Titre du projet

PORT SEVERN DAMS
DAM SAFETY REVIEW

Drawing title / Titre du dessin

MAIN DAM
COFFERDAM
STAGE 1

Drawn by / Dessiné par: K.KANAGASABAI	Designed by / Conçu par: J.WALLACE
Approved by / Approuvé par: J.WALLACE	Drawing Date / Date du dessin: JUNE 6 2018
Project manager / Administrateur de projet: J.WALLACE	
File Number / Numéro du Dossier: PWL--6-39059	Drawing Number/ Numéro du Dessin: 100
Project Number / Numéro du projet: R.076951.039	Sheet / Feuille 1 of / de 2



PLAN - STAGE 2
(JULY 15th 2019 TO SEPTEMBER 15th 2019)

SCALE 1:150

STAGE 2 / CONSTRUCTION SEQUENCE

1. REMOVE ALL STAGE 1 COFFERDAM MATERIALS.
2. ERECT WALL'S "C1", "C2", "C3", "C4" AND "C5".
3. SEAL JOINTS AND BASE OF ERECTED WALLS.
4. ALLOW WATER TO LOWER TO DOWNSTREAM ELEVATION
5. SEAL LEAKS IN BEDROCK BY CRACK INJECTION IF REQUIRED.
6. AFTER CONCRETING AND REMOVAL OF FORMWORK OF PIER 5, GENERAL CONTRACTOR WILL INSTRUCT WHEN TO ERECT WALLS "D1 AND "D2" AND REMOVE WALLS "C1" AND "C2", "E1" AND "E2".

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

Heritage Canals and Engineering Works
Heritage Conservation Directorate
Canaux historiques et travaux d'ingenierie
Direction de la conservation du patrimoine

Canadä

AECOM

NOTES

1. ALL CHAINAGES AND LEVELS SHOWN ARE IN METERS AND DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. CONTRACTOR TO HAVE MATERIAL FOR WALL "D1" AND "D2" ON SITE. IF FLOOD EVENT IS PREDICTED AFTER PIER 5 IS COMPLETE THEN CONTRACTOR SHALL ERECT WALLS "D1" AND "D2" AND BE PREPARED TO REMOVE WALLS "C1" AND "C2".
3. ALL REQUIRED BRACING AND ANCHORS FOR COFFERDAM MUST BE INCLUDED IN CONTRACTOR'S DESIGN.
4. ALL COFFERDAM JOINTS, CONTACT SURFACES AND BOTTOMS MUST BE SEALED TO ENSURE WATERTIGHTNESS.
5. ALL WORK AREAS MUST BE FREE OF ANCHORS AND ANY OTHER OBSTACLES FOR WORKERS / EQUIPMENT.
6. DIMENSIONS AND POSITIONS SHOWN ON THIS DRAWING MUST BE VALIDATED ON SITE BY THE CONTRACTOR BEFORE STARTING WORKS.

No.	Description	Dwn.By Des.Par	Date
B	90 % SUBMISSION	R.T.	JUNE 21, 2018
A	50 % SUBMISSION	J.W.	JUNE 6, 2018

Revision / Révision

A Detail number / Numéro du détail
B Location dwg. number / Numéro sur dessin

Project title / Titre du projet

PORT SEVERN DAMS
DAM SAFETY REVIEW

Drawing title / Titre du dessin

MAIN DAM
COFFERDAM
STAGE 2

Drawn by / Dessiné par: K.KANAGASABAI	Designed by / Conçu par: J.WALLACE
Approved by / Approuvé par: J.WALLACE	Drawing Date / Date du dessin: JUNE 6 2018
Project manager / Administrateur de projet: J.WALLACE	
File Number / Numéro du Dossier: PWL-6--39059	Drawing Number/ Numéro du Dessin: 101
Project Number / Numéro du projet: R.076951.039	Sheet / Feuille 2 of / de 2

APPENDIX 3 SAR SURVEY MAP & FACT SHEET

Port Severn Main Dam

Reptile & Amphibian Species at Risk –Habitat Feature Overview

Species at Risk [1]

	Present [2]	May Occur	Unlikely
Blanding's Turtle			●
Northern Map Turtle	●		
Snapping Turtle	●		
Eastern Musk Turtle		●	
Eastern Foxsnake (*GLSL pop.*)			●
Eastern Massassauga			●
Eastern Hog-nosed Snake		●	
Eastern Milksnake		●	
Northern Ribbonsnake			●
Five-Lined Skink (*GLSL pop.*)			●
Western Chorus Frog (*GLSL pop.*)			●

GLSL = Great Lakes – St. Lawrence Population

Overview

Large site encompassing several structural features, pedestrian trails and habitat communities which are limited to developed areas and rock shoreline. The site is situated within the village of Port Severn and the adjacent lands are a mixture of residential properties or marina's.

Species of Interest – Eastern Foxsnake, Eastern Massassauga Rattlesnake and Blanding's Turtle. These species are known to occur in the broader area, however, suitable habitat features (hibernation, gestation, nest sites) are not found within the Dam areas.

[1] *COSEWIC Draft/ Final Critical Habitat Mapping, Conservation Planning and Stewardship Section Canadian Wildlife Service – Ontario Region, NHIC & Ontario Reptile and Amphibian Atlas*

[2] *Field Observation, Parks Canada Staff Personal Communications (2016), SLR background review and MNRF species occurrence review.*

Habitat Communities

This is a highly manicured and heavily used site with little native habitat. Remnant swales are filled with Calico Aster and Tall Goldenrod. Scattered young specimen trees dot the manicured lawns. Wetland is severely limited persisting in shallow corners near shore with cattail, bulrush and burreed.

Staging Areas / Other

Core (all turtles & snakes)

- **Deciduous treed inclusions, rock barrens**, adjacent woodlands.
- **Lake and embayment environs.**

Seasonal /Movement (Snakes)

- All developed areas, rock shorelines.

Seasonal /Movement (Turtles)

- River channels and Lake Environs.

Seasonal /Movement (Lizard)

- No indicators present.

Habitat Features – Structures & Developed Area

Refer to Habitat Map for areas of high priority (*locations observed during field surveys*)

Hibernation

Eastern Foxsnake

- Habitat affinities not present.

Eastern Massassauga Rattlesnake

- Habitat affinities not present.

Snakes (Generally)

- Habitat affinities not present.

Turtles (Generally)

- Locks not expected to provide hibernation habitat. These are deep and the frequent use to late in season do not provide optional habitat. Adjacent **shallow embayment** (Little Lake) is better suited.

Gestation

Eastern Massassauga Rattlesnake

- Affinities not present. No tableland rocks, appropriate rock / rock barren structure.

Oviposition (Snakes)

- Very limited. Forest inclusions, rock barren habitats (open and shrub) do not have good rotting logs, vegetation present.
- Anthropogenic features of adjacent residences may provide opportunities (i.e. woodpiles, refuse, compost piles).

Nesting (Turtles)

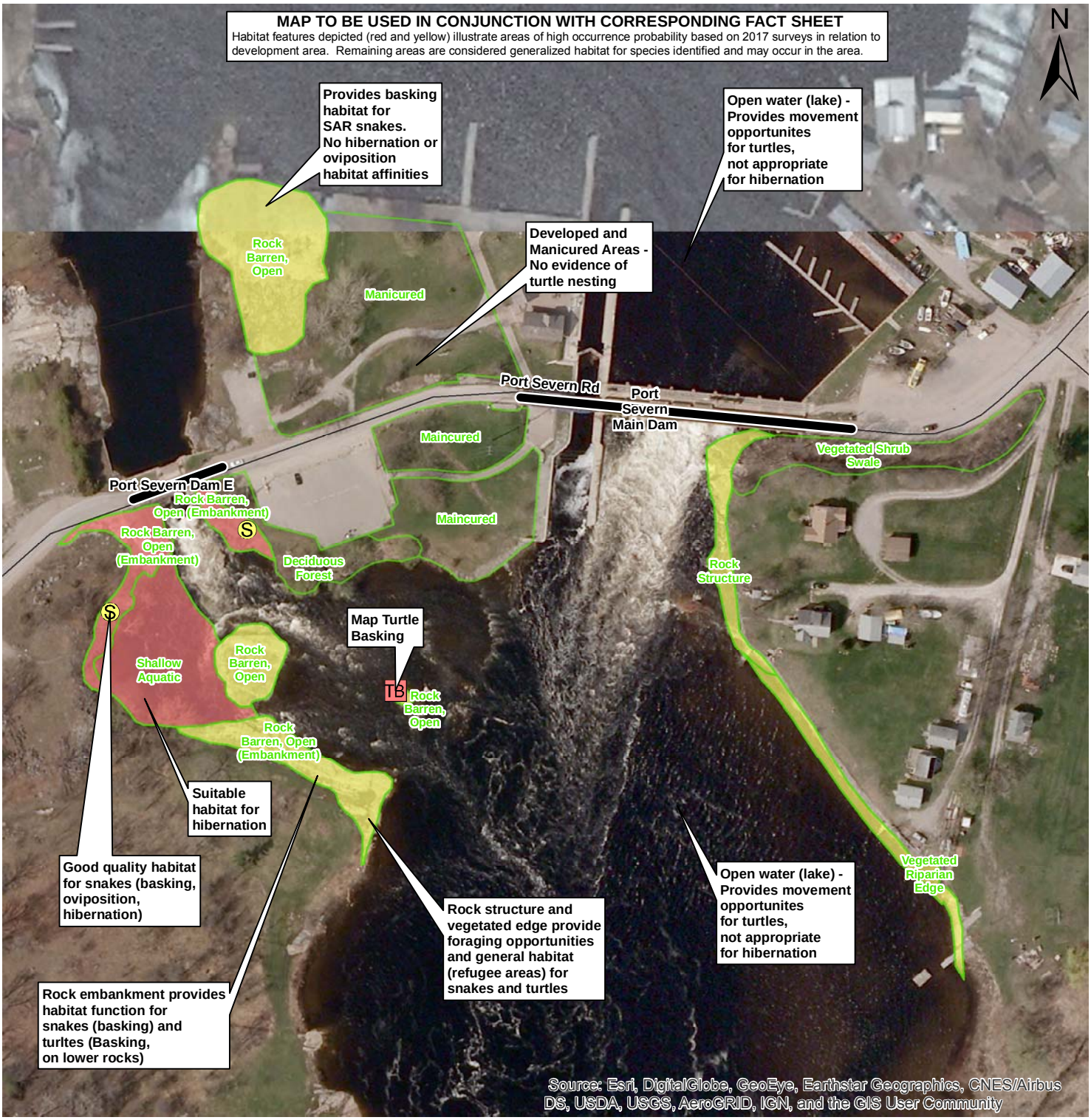
- No known areas within manicured lawns or areas near locks or buildings. No documented evidence to date.

Core habitat – Western Chorus Frog

- Habitat affinities not present.

Core habitat – Five-lined Skink

- Habitat affinities not present.



LEGEND

- Dams
- Building

Critical Habitat Features

- Reproductive or Overwintering Habitat
- Important Habitat (interpreted)
- S Potential Snake Use
- TB Confirmed Turtle Basking

Balance of Site: General Habitat

0 12.5 25 50 Meters

SCALE: 1:2,000
WHEN PLOTTED CORRECTLY AT 8.5x11
NAD 1983 UTM Zone 17N

NOTES

Basedata: Ontario Ministry of Natural Resources, Land Information Ontario (LIO) © Queen's Printer for Ontario, 2016, Downloaded October 2016

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
ON BEHALF OF PARKS CANADA AGENCY

REPTILE SPECIES AT RISK SURVEY – RIDEAU CANAL AND SEVERN WATERWAYS
CONTRACT NO.: EQ447-141528/009/TOR ORDER NO.: 700359983

CRITICAL HABITAT FEATURES
PORT SEVERN MAIN DAM AND DAM E

May 5, 2017	Rev 2.0
Project No.	209.40402.00000

SLR global environmental solutions

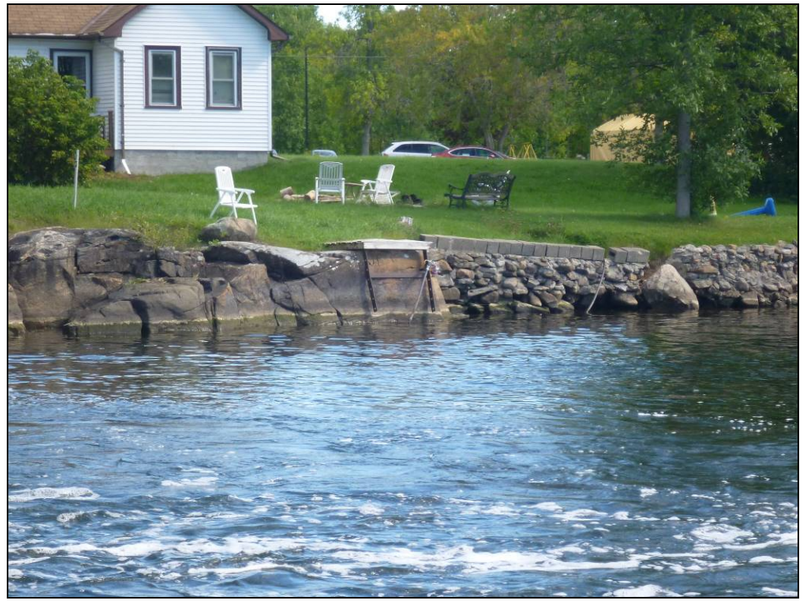
N:\Markham\GIS_Projects_GIS\209_40375_TrentRideauWatershed_Dams\1.MXDs\3.WRKG\209_40375_Muskoka_FactSheet.mxd

Port Severn Main Dam – Severn (Muskoka)

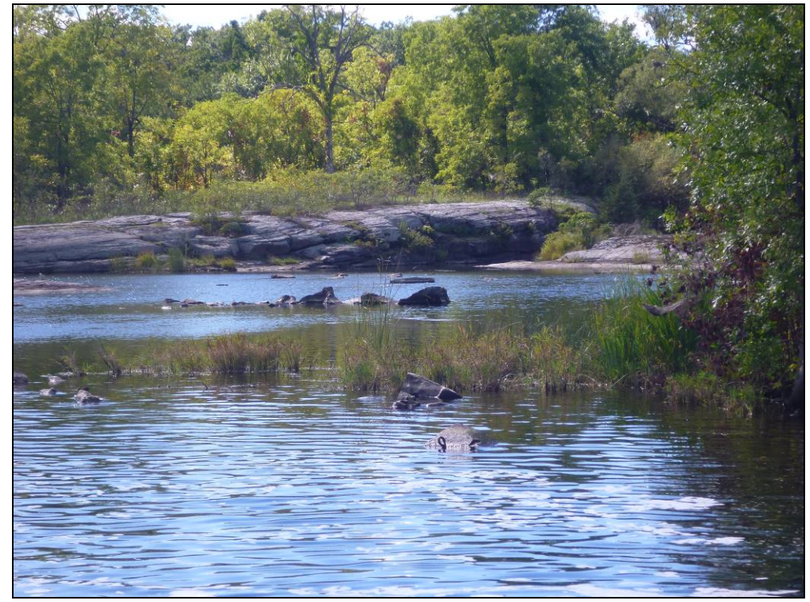
Concreate riparian walls limit access to shore for nesting by turtles (September 24, 2016).

No significant crevices in the foundations were observed for use as Critical Habitat for snakes (September 24, 2016).

Manicured lawn with very limited natural habitat (September 24, 2016).



View of adjacent riparian habitats on the east shore (September 24, 2016).



View towards the Port Severn Dam E – view west. This shallow area provides a refuge for waterfowl and turtles (Map Turtle) observed during the September 24 2016 field visit.

Low quality rock barren near parking not (September 24, 2016),

SLR	Port Severn Main Dam – Severn (Muskoka) Representative Site Photographs
SITE PHOTOGRAPHS	Job No: 209.40402.00000

APPENDIX 4 NIBLETT ENVIRONMENTAL BASELINE REPORT

4.2 Aquatic Environment

4.2.1 Aquatic Habitat

Methods

NEA biologists were on site July 5th, 2017 to document general aquatic habitat features of each Port Severn Dam for the purpose of identifying sensitive features, site constraints, and potential mitigation measures relative to the proposed conceptual designs for each Port Severn dam site.

The following aquatic habitat features were documented: substrate composition, riparian habitat, percent in-stream cover, channel morphology, fish redds, potential spawning habitat, and unique features. Assessments were completed visually from shore using standardized provincial aquatic protocols (OSAP, MTO).

Results

General Features

The Trent-Severn Waterway connects Georgian Bay to Lake Ontario, running from Port Severn in the southeastern corner of Georgian Bay through Lake Simcoe into Lake Ontario near Trenton. Port Severn dam sites are location within the Eastern Georgian Bay watershed. Little Lake is upstream of all site dams and Georgian Bay is the downstream receiving watercourse of all dams (Figure 1).

The Port Severn aquatic habitat is characterized by granite outcrops, mixed substrates, sparse to moderate aquatic vegetation and sections of wetlands, typically found downstream of the dams. Site specific summaries of each dam have been provided in Table 3 and the aquatic habitat assessment details have been provided in Table 4. All GPS coordinates of fish species redds and invasive species observation by NEA has been provided in Appendix VII.

Table 3. Aquatic Habitat Summary from NEA (3-Nov-15).

Dams	General Aquatic Habitat Description	Key Findings
A	Port Severn Dam A was characterized by shallow aquatic wetland dominated by a diversity of submergent, emergent, and floating aquatic vegetation. Little lake waters flow through the dam's made-made notch and side channel, meandering through the wetland habitat until Baguley Rd where the watercourse flows through a CSP culvert downstream into a large wetland habitat downstream. Overall the water depth was shallow and velocity was slow. The substrate was a mixture of silt, sand, and gravel. The vegetation cover and in-stream roughness and complexity provide optimal habitat for bait and sport fish species know to the area. The abundance of emergent vegetation along the Little Lake shoreline has the potential to provide spawning habitat for Northern Pike upstream and for smaller fish species (i.e. cyprinids, centrarchids) within the stream habitat downstream.	• Wetland upstream and downstream of the dam. Directly supports fish, birds, amphibians and general wildlife. All construction impacts to be avoided (Appendix VIII). • Upstream Northern Pike spawning habitat. • Downstream and upstream provide optimal fish habitat for all sensitive life history stages (spawning, incubation, rearing, and feeding) for the local fish community. • Amphibian habitat.
C and D	Port Severn Dams C and D are disturbed sites characterized by mixed substrates, hardened concrete shoreline and moderate submergent and floating vegetation. The average water depth was 0.5m and velocity was slow. The presence of in-water modifications, boat traffic, watercraft pollution and human disturbance, fish habitat was marginal. The invasive Round Goby and Zebra mussel were observed at both sites. Pumpkinseed redds were observed at both site C and D within the proposed coffer dam areas. Dam C northeast shoreline was dominated by an emergent cattail stand that provided amphibian habitat. Two pained turtles, green frog and bullfrog were observed within the habitat.	• Two invasive species present, Round Goby and Zebra Mussel (Appendix VII). • Pumpkinseed spawning habitat for all sensitive life history stages (spawning, incubation, rearing, and feeding) (Appendix VII). • Amphibian habitat.

Dams	General Aquatic Habitat Description	Key Findings
E	Port Severn Dam E upstream habitat was characterized by moderate flows and run habitat. The channel was constricted by exposed granite bedrock with minimal aquatic and riparian vegetation. The downstream habitat was dominated by fast white-water flow, and boulders and granite bedrock substrate. High velocities from the dam tailrace prevent the deposition of smaller substrate particles and establishment of aquatic vegetation.	• The invasive Zebra Mussel confirmed in high density upstream (Appendix VII).
G	Port Severn Dam G upstream habitat was characterized by slow flow, pool habitat and moderate aquatic vegetation along the dam wingwalls. The substrate was a mix of sand, silt and gravel. The habitat along the left bank wing wall supported pumpkinseed spawning habitat. Redds were observed in very high densities and the habitat is considered a significant sport fish spawning area by NEA (Appendix V). The downstream habitat was dominated fast flowing waters. The substrate and riparian habitat was dominated by granite bedrock. High velocities from the dam tailrace prevent the deposition of smaller substrate particles and establishment of aquatic vegetation.	• High density (significant) Pumpkinseed spawning habitat confirmed (Appendix VII). Habitat provides sensitive life history stages (spawning, incubation, rearing, and feeding). All construction impacts to be avoided.
Main Dam and Lock 45	The Main Dan and Lock 45 upstream habitat was a deep run, average water depth was 4m. The substrate was mixed. Aquatic and riparian vegetation was minimal due to boat traffic and shoreline hardening. The downstream habitat was dominated by fast flowing white waters. The substrate and riparian habitat was hardened by Lock 45 structures and the riparian habitat was predominately manicured lawn. No sensitive aquatic features were identified upstream or downstream within the site.	• No sensitive features were identified upstream or downstream within the site.

Table 4. Aquatic Habitat Observations by NEA (July 5th, 2017).

Dam		Substrate	Instream Cover	Canopy Cover	Overhead Cover	Avg. Water Depth (m)	Avg. Wetted Water Width (m)	Avg. Velocity (m/sec)	Morphology	Buffer Present
A	Down-stream	10% gravel 10% sand 80% fine organics	20% submergent aquatic vegetation	0-24%	30% non-woody vegetation	0.4	1	0.01	50% run 50% pool	Yes Wetland
	Up-stream	20% silt 80% fine organics	20% submergent aquatic vegetation	0-24%	5% woody debris 40% non-woody vegetation	0.3-1.0	30	0.01	20% run 80% pool	Yes Wetland
C		10% bedrock 15% boulder 10% cobble 10% sand 55% fine organics	10% large woody debris 10% submergent aquatic vegetation 2% emergent aquatic vegetation 10% boulders	0-24%	25% docks	0.5	80	0	100% flats	No
D		10% bedrock 15% boulder 10% cobble 10% gravel 55% fine organics	n/a	0-24%	30% docks 10% boats	0.4-0.6	43	0	100% flats	No
Main and Lock 45		70% bedrock 20% fine organics 10% aquatic vegetation	10% large woody debris	0-24%	0	0.5-5.0	85	0.1-4	100% run	No
E	Up-stream	40% bedrock 10% gravel 40% sand 10% fine organics	5% large woody debris 5% small woody debris	0-24%	2% shrubs 2% trees	0.5-5.0	30	1	50% run 50% pool	Yes

	Down-stream	80% bedrock 20% boulder	15% boulder	0-24%	2% boulder	1-2	12	5	100% whitewater	Yes
G - Upstream		30% bedrock 20% boulder 20% cobble 10% sand 10% gravel 10% fine organics	2% large woody debris 5% submergent aquatic vegetation 5% emergent aquatic vegetation 20% boulder	0-24%	0	0.5-1.5	170	0.02	100% flats	Yes

4.2.2 Surface Water Quality

Methods

Surface water quality was collected by NEA on July 5th, 2017 at two locations in the Port Severn Dams study area to record baseline conditions for the purpose of construction monitoring. Measured parameters included dissolved oxygen (mg/L), conductivity (us/cm), total dissolved solids (mg/L) and water temperature (°C) using a handled YSI Pro2030 System. The pH was recorded with a handheld waterproof pH meter and turbidity was recorded with a handheld LaMotte2020.

Results

Surface water quality parameters were measured upstream of Dam A and the Main Dam. Results have been provided in Table 5 and GPS coordinates provided in Appendix VII. The collected data should be incorporated into developing the baseline for in-water works surface water quality monitoring,

Table 5. Surface Water Quality Results (July 5th, 2017).

Water Quality Parameters	Dam	
	A	Main
Environmental Conditions	Sunny and BWS 1	Sunny and BWS 1
Time of Collection (24 hr)	10:30	12:59
Sample Depth (m)	0.3	1.0
Air Temperature (°C)	23.2	29
Water Temperature (°C)	20.1	22.6
Dissolved Oxygen (mg/L)	n/a	8.42
Total Dissolved Solids (mg/L)	n/a	169
Conductivity (us/cm)	n/a	247.4
Salinity (ppt)	n/a	0.12
pH	n/a	7.32
Turbidity (NTU)	1.97	0.50

Note: BWS=beaufort wind scale, n/a data not available.

4.3 Fish Spawning

Methods

Spawning habitat for the known fish community was assessed visually on July 5th, 2017. Observations were incidental, no targeted spawning surveys were conducted. In addition, NEA completed a literature review of all available information on the fish spawning habitat present within the study area. Information was obtained from the Ministry of Natural Resources and Forestry (MNRF) and consultation with Trent-Severn Waterway (TSW).

Results

The literature found previously identified spawning habitat for sport fish species within the vicinity of the study area. MNRF classified sensitive fish spawning habitat for Walleye and Northern Pike within the Port Severn Dams study area (OMNR, 2012). NEA biologist also confirmed Pumpkinseed spawning habitat in Little Lake, GPS coordinates have been provided in Appendix VII. Spawning habitat information has been presented for each site in the Table 6.

Table 6. Port Severn Dams Fish Spawning Habitat Summary.

Dam	Common Name	Location	Source
A	Northern Pike	Upstream of dam in Little Lake. All back-bay habitats.	MNRF Spawning Data
C	Pumpkinseed	Upstream of middle of blind dam structure around docks, approximately 2-5m from the dam.	NEA observation July 5th, 2017. -6 active redds 3 old or abandoned redds.
D	Pumpkinseed	Upstream of middle of dam structure around middle docks approximately 1-3m from the dam.	NEA observation July 5th, 2017. -3 active redds
Main (Lock 45)	Walleye	Downstream of main dam approximately 400m (Refer to map, Appendix V).	MNRF verified habitat around Sawdust Island.
E	Walleye	Downstream of main dam approximately 400m (Refer to map, Appendix V).	MNRF verified habitat around Sawdust Island.

G	Pumpkinseed	Upstream entire left bank from shore to 8 m into open water. Very high density of redds (Refer to map, Appendix V).	NEA observation July 5th, 2017. -50+ active redds

Northern Pike (Upstream of Dam A)

The shoreline and back bays of Little Lake and directly upstream of Dam A are open water wetlands. The bay habitat supports an abundance of submergent and emergent aquatic vegetation. Based on NEA's summer habitat assessment, the aquatic habitat upstream of Dam A is optimal for Northern pike spawning. Targeted species spawning surveys have not been conducted to date and therefore, the habitat function upstream of Dam A has not been verified.

Northern pike typically spawning in early spring once ice melts and when water temperatures reach 4.4-11.1°C in April to early May (Scott & Crossman, 1973). Spawning typically occurs during the day over vegetated area of shallow clear water, spawning as also been documented to occur in flooded terrestrial vegetation and shallow, weedy bays and/or backwaters (U.S Fish and Wildlife Service, 1982) .

During spawning, typically a larger female and two smaller males swim through and over vegetation in water no deeper than 0.17 m. At irregular intervals, the female and male roll together simultaneously releasing eggs and milt, this behaviour is repeated 2 to 5 times a day. After each spawning act, Northern Pike usually thrust their tails which scatters the eggs over the vegetation. Northern Pike do not construct nests, the eggs adhere to vegetation (Scott & Crossman, 1973).

In the absence of local Northern Pike spawning information, it is recommended the areas upstream habitat of the site is classified as potential spawning habitat and the DIA address potential impacts from construction. In-water work should be restricted between March 15th and May 31st to protect the species sensitive life history phases.

Walleye (Downstream of Dam E, Main Dam, Lock 45, Dam C and Dam D)

Sawdust Island has been identified as Walleye spawning habitat. Sawdust Island is located approximately 400m downstream of the Main Dam. In-water works for Dam E, Main Dam, Lock 45, Dam C and Dam D should consider the downstream walleye spawning habitat. Changes to surface water quality or flow regime have the potential to affect the downstream Walleye spawning habitat.

Walleye spawn in spring or early summer when water temperatures are between 6.7°-8.9°C (Scott & Crossman, 1973) but have been known to spawn in Ontario in water temperatures that range from 5°C to 10°C (OMNR, 1997). They do not construct nests but rely on the interstitial space between substrate particles to provide protection for developing eggs. Walleye also require some form of water movement (e.g. current, wave action) to maintain dissolved oxygen levels suitable for development. Walleye do not provide any form of parental care for the eggs or fry post-spawn (Scott & Crossman, 1973). Optimum walleye spawning habitat is therefore, a combination of adequate water depths, velocities and substrate sizes present throughout the spawning, incubation, hatching and larval drift phases.

Construction works downstream of the Main Dam, Lock 45 and Dam G should consider indirect impacts to the downstream walleye spawning habitat between March 15th and May 31st. It is recommended that the DIA report addressed Walleye spawning downstream of the listed dams. Site restoration efforts may include the creation of walleye spawning habitat downstream of the Main Dam.

Pumpkinseed

Pumpkinseed centrarchid redds were confirmed in Little Lake, upstream of Dam C, D, and G.

Pumpkinseed typically spawning between May and August when water temperatures are between 17 - 26°C. The male constructs a pit nests that are approximately 0.10 to 0.40 m in diameter in shallow (0.1 to 0.3 m) waters of lakes, pond or slow-moving streams. The nests are found in areas of submerged aquatic vegetation, there is often multiple nests very close together. The substrate preferred can be clay, sand, gravel and rock, the male typically only sweeps down to expose a hard bottom. Spawning behavior consist of the male and female swimming in a circular motion releasing a small amount of sperm and eggs on top of the nest. The male guards and fans the eggs, he will stay with the newly hatched eggs for approximately 11 days to protect them from predators (Scott & Crossman, 1973).

Construction works upstream of Dam C, D, and G must consider direct and indirect impacts to the pumpkinseed and general centrarchid spawning habitat. It is recommended that the DIA report addressed pumpkinseed and general centrarchid spawning habitat of the listed dams. In-water work should be restricted between March 15th and July 15th to protect Walleye (March 15th to May 31st) and pumpkinseed (May 1st to July 15th) species sensitive life history phases.

Site restoration efforts should include the restoration of the existing substrate, aquatic vegetation and general enhancement of spawning habitat.

4.4 Fish Community

Methods

Fish community surveys were not conducted by NEA due to the presence of existing fish data. A fish species list for Little Lake and Georgian Bay was obtained from the Ontario Ministry of Natural Resources and Forestry (OMNR, 2012).

Results

The Little Lake fish community is composed of fish species that prefer a diversity of thermal regimes, warm, cool and cold-water and are common to the Eastern Georgian Bay watershed. Cumulatively, 13 fish species have been document in Little Lake and represent the following families; *Catostomidae, Centrarchidae,* Cyprinidae, Clupeidae, *Esocidae, Ictaluridae* and *Percidae*. The fish species found in Little Lake are widely distributed southern Ontario (Table 7).

Cumulatively, 23 fish species have been documented in Georgian Bay and represent the following families: *Amiidae, Atherinopsidae, Catostomidae, Centrarchidae,* Cyprinidae, *Esocidae, Fundulidae, Ictaluridae, Lepisosteidae, Osmeridae and Percidae*. The fish species present prefer a diversity of thermal regimes, warm, cool and cold-water and are common to the Eastern Georgian Bay watershed. The Georgian Bay fish community is widely distributed southern Ontario (Table 8).

Table 7. Little Lake Fish Species List (Upstream of all Port Severn dam structures).

Family Name	Common Name	Scientific Name	Preferred Thermal Regime	Spawning Season	Restricted In-Water Work Timing Window
Catostomidae	White Sucker	*Catostomus commersonii*	Coolwater	Spring (April-June)	March 15th to July 15st
Centrarchidae	Largemouth Bass	*Micropterus salmoides*	Warmwater	Spring (May-June)	May 1st to July 15th
	Pumpkinseed	*Lepomis gibbosus*	Warmwater	Spring-summer (May-August)	March 15th to July 15th
	Rock Bass	*Ambloplites rupestris*	Coolwater	Spring (May-June)	March 15th to July 15th
	Smallmouth Bass	*Micropterus dolomieu*	Coolwater	Spring (May-June)	May 1st to July 15th
Cyprinidae	Common Carp	*Cyprinus carpio*	Warmwater	Spring-summer (May-August)	March 15th to July 15th
	Bluntnose Minnow	*Pimephales notatus*	Warmwater	Summer (June-August)	March 15th to July 15th
Clupeidae	Alewife	*Alosa pseudoharengus*	Coldwater	Summer (June-August)	March 15th to July 15th
Esocidae	Northern Pike	*Esox lucius*	Coolwater	Spring (March-May)	March 15th to July 15th
Ictaluridae	Brown Bullhead	*Ameiurus nebulosus*	Warmwater	Spring (May-June)	March 15th to July 15th
Percidae	Johnny Darter/Tesselated Darter	*Etheostoma nigrum*	Coolwater	Spring (May-June)	March 15th to July 15th
	Walleye	*Sander vitreus*	Coolwater	Spring (April-June)	March 15 to May 31st
	Yellow Perch	*Perca flavescens*	Coolwater	Spring (April-May)	March 15 to July 15

Note: Fish species list for Little Lake was obtained from the Ontario Ministry of Natural Resources and Forestry (OMNR, 2012), The thermal regime and spawning season for each fish species was obtained from *Ontario Freshwater Fishes Life History Database* (Eakins, 2017).

Table 8. Georgian Bay Fish Species List (Downstream of all Port Severn dam structures).

Family Name	Common Name	Scientific Name	Preferred Thermal Regime	Spawning Season	Restricted In-Water Work Timing Window
Amiidae	Bowfin	*Amia calva*	Warmwater	Spring (May-June)	March 15th to May 31st
Atherinopsidae	Brook Silverside	*Labidesthes sicculus*	Warmwater	Spring-summer (May-August)	March 15th to July 15th
Catostomidae	White Sucker	*Catostomus commersonii*	Coolwater	Spring (April-June)	March 15th to July 15th
Centrarchidae	Black Crappie	*Pomoxis nigromaculatus*	Coolwater	Spring (May-June)	March 15th to July 15th
	Largemouth Bass	*Micropterus salmoides*	Warmwater	Spring (May-June)	May 1st to July 15th
	Pumpkinseed	*Lepomis gibbosus*	Warmwater	Spring-summer (May-August)	May 1st to July 15th
	Rock Bass	*Ambloplites rupestris*	Coolwater	Spring (May-June)	May 1st to July 15th
	Smallmouth Bass	*Micropterus dolomieu*	Coolwater	Spring (May-June)	May 1st to July 15th
Cyprinidae	Blackchin Shiner	*Notropis heterodon*	Coolwater	Summer (June-August)	March 15th to July 15th
	Blacknose Shiner	*Notropis heterolepis*	Coolwater	Summer (June-July)	March 15th to July 15th
	Bluntnose Minnow	*Pimephales notatus*	Warmwater	Summer (June-August)	March 15th to July 15th
	Mimic Shiner	*Notropis volucellus*	Warmwater	Summer (June-July)	March 15th to July 15th
	Spottail Shiner	*Notropis hudsonius*	Coolwater	Spring (May-June)	March 15th to July 15th
Esocidae	Muskellunge	*Esox masquinongy*	Warmwater	Spring (April-May)	March 15th to May 31st
	Northern Pike	*Esox lucius*	Coolwater	Spring (March-May)	March 15th to May 31st
Fundulidae	Banded Killifish	*Fundulus diaphanus*	Coolwater	Summer (June-August)	March 15th to July 15th
Ictaluridae	Brown Bullhead	*Ameiurus nebulosus*	Warmwater	Spring (May-June)	March 15th to July 15th

Lepisosteidae	Longnose Gar	*Lepisosteus osseus*	Warmwater	Spring (May-June)	March 15th to July 15th
Osmeridae	Rainbow Smelt	*Osmerus mordax*	Coldwater	Spring (March-April)	March 15th to July 15th
Percidae	Iowa Darter	*Etheostoma exile*	Coolwater	Spring (April-June)	March 15th to July 15th
	Johnny/Tesselated Darter	*Etheostoma nigrum*	Coolwater	Spring (May-June)	March 15th to July 15th
	Walleye	*Sander vitreus*	Coolwater	Spring (April-June)	March 15th to May 31th
	Yellow Perch	*Perca flavescens*	Coolwater	Spring (April-May)	March 15th to July 15th

Note: Fish species list for Little Lake was obtained from the Ontario Ministry of Natural Resources and Forestry (OMNR, 2012), The thermal regime and spawning season for each fish species was obtained from *Ontario Freshwater Fishes Life History Database* (Eakins, 2017).

4.5 Aquatic Invasive Species

Methods

NEA conducted a literature review of all available information on the aquatic invasive species present within the study area to help assess the potential risk of spread and dam construction activities. Information was obtained from the Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC) make a map online database (OMNRF, 2016) and consultation with Trent-Severn Waterway (TSW).

Results

Two aquatic invasive species are present within the vicinity of all six dams (OMNRF, 2016). The Round Goby (*Neogobius melanostomus*) is present in Little Lake (upstream of dams) and Georgian Bay (downstream of dams). NEA biologists visually observed Round Goby (1 male, 5 females) at Dam D within the proposed coffer dam footprint. Zebra Mussels (*Dreissena polymorpha*) are identified as present in Georgian Bay (OMNRF, 2016), however, NEA biologists also observed the species in Little Lake. GPS coordinates for invasive species observed by NEA have been provided in Appendix VII.

The potential spread of Asian Carps, Round Goby (*Neogobius melanostomus)* and Sea Lamprey (*Petromyzon marinus*) are management challenges for Parks Canada, MNRF and DFO. Specifically, the spread of "Asian Carps", referring to four species (Silver Carp (*Hypophthalmichthys molitrix*), Bighead Carp (*Hypophthalmichthys nobilis*), Grass Carp (*Ctenopharyngodon idella*) and Black Carp (*Mylopharyngodon piceus*)) are a current significant threat to Ontario waters.

To date, only a few occurrences of Bighead Carp and Grass Carp have been confirmed in the Great Lakes. Silver Carp and Black Carp remain absent from Ontario waters. Although there have only been a few occurrences of Bighead Carp, this species along with Silver Carp are the most severe threat in Ontario, due to their large body size, density of schools and their rigorous movement (DFO, 2017).

4.6 Species At Risk

Methods

Literature Review-A number of potential Species at Risk were identified during a literature review prior to NEA field surveys. Several sources were consulted during the literature review including the MNRF Natural Heritage Information Centre (NHIC, 2017) and the

Reptile Species at Risk Survey report prepared by SLR Consulting Ltd. May 5, 2017 (SLR, May 2017). The species on the MNRF lists for the NHIC 1km squares found within the study area (17PK0061, 17PK0062, 17PK0161 and 17PK0162) included endangered, threatened, special concern and restricted species.

It should be noted that the NHIC Make-a-Map feature may not necessarily provide all listed Species at Risk and as such NEA has included additional information on SAR that are listed both federally and provincially under their respective pieces of legislation.

Field Review- Targeted surveys were conducted using specific techniques and protocols for the following species identified as significant on a national/provincial level (SARA, 2017; COSEWIC, 2017; SARO, 2017). Surveys were timed to maximize detection and where applicable using standard and recognized survey methodologies. The targeted species included: butternut (*Juglans cinerea*), Blanding's turtle (*Emydoidea blandingii*), common snapping turtle (*Chelydra serpentina*), barn swallows (*Hirundo rustica*), northern map turtle (*Graptemys geographica*), eastern musk turtle (*Sternotherus odoratus*), eastern foxsnake (*Pantherophis gloydi*), Massasauga rattlesnake (*Sistrurus catenatus*), eastern hognose snake (*Heterodon platirhinos*), milksnake (*Lampropeltis triangulum*), northern ribbonsnake (*Thamnophis sauritus septentrionalis*) and five-lined skink (*Eumeces fasciatus*).

Bats

Four (4) bat species have recently been listed as Endangered federally and/or provincially. Three bat species are listed Endangered under SARA and COSEWIC including the little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*) and Tri-colored bat (*Perimyotis subflavus*). The eastern small-footed bat (*Myotis leibii*) is only listed provincially as Endangered under COSSARO. Searches were conducted for cavity trees and snags that may provide suitable habitat for roosting or maternity. Bat acoustic monitoring surveys were not conducted.

Birds

In addition, a number of bird species are listed both federally and provincially and are protected under the Migratory Bird Convention Act (1994) and/or under the Fish and Wildlife Conservation Act (1997). The Migratory Bird Convention Act protects migratory birds, their eggs and nests. The Act applies to most birds that breed in Canada and prohibits the removal of vegetation used by nesting birds (trees, shrubs, groundcover etc.) during the peak breeding season (April 15th to August 15th in this area). Bird surveys were completed during our field visits and searches for stick nests of raptors and colonial birds.

Butternut Trees

Butternut trees (trees and saplings) were searched for at all dam locations where tree cover was present, however, no butternut trees were found at any of the dam locations. If trees were found they would have been assessed by an MNRF certified butternut health assessor.

Turtles

Turtle basking surveys targeted the wetland areas adjacent to the dams. At each dam, three biologists positioned themselves along the edge of the wetlands for a minimum of 20 minutes and scanned the wetlands with binoculars. Basking observations were recorded, along with the direction, distance and species of turtle and photographed if possible. Surveys were conducted from mid-morning to mid-afternoon.

The surveys for Blanding's turtles followed the recently released MNR survey protocols (Occurrence Survey Protocol for Blanding's Turtle (*Emydoidea blandingii*) in Ontario, May 2013, Ontario Ministry of Natural Resources, Species at Risk Branch). Visual searches for Blanding's turtles and other turtle species were conducted on July 5th, 2017 along the shoreline of all wetlands in the study area. Searches included visual scanning for basking turtles, presence of turtles in the shallow edges, walking the edges and sedge meadows and searching for nests or signs of turtles in the sandy/gravely roadway material or other suitable nesting habitat (e.g. Treed edges, sand piles, open areas, sunny slopes).

Snakes

Searches for snakes were made during the site visit and in all habitats. The searches included looking for evidence of hibernacula and thermal-regulation areas. Rocks were turned over and any suitable foraging or cover was also actively searched for snakes.

Skinks

Surveys for skinks were conducted on July 5th, 2017. The method included walking the rock barrens and areas of broken surface rock and turning over all rocks, woody debris and other materials on the open rock areas, actively seeking out skinks. Skinks, if found were measured (visual estimate), photographed and the location marked by GPS. Searches included all suitable habitats with the 120m distance of the dams by three biologists. Surveys were timed for the mid-day period.

Barn Swallows

Searches for barn swallow nests and evidence of swallows around the structures were conducted during the July 5, 2017 field surveys. Searches including scanning structures (dams, locks, buildings and bridges in the study area for barn swallow nests (active and old).

Results

The species are listed below by category. Status is based on the latest COSEWIC and COSSARO listings (2017) and DFO Critical habitat mapping (DFO, 2017) available at the time of this report was being produced. The following species lists are derived from historical information obtained from MNRF's Make-a-Map GIS Database and DFO. In addition, species were added by NEA biologist based on our knowledge of the reginal habitat and species at risk occurrences and habitat preferences (Table 9).

NHIC identified three (3) restricted species (Table 9). Restricted species names have not been provided as this information is prohibited for public release as per Federal and Provincial Regulations and Policies of Environment Canada and the Ministry of Natural Resources and Forestry. The project's next steps and data gaps have been disused in Section 7.6 of this report.

The baseline and literature review found 17 provincially and/or nationally listed species had the potential to occur within the study area. General habitat preferences of the listed species have been summarized to support the analysis of Port Severn Dam site habitat function for Species At Risk (Table 9).

Table 10-15 summarizes the findings of the preliminary SAR screening by SLR Consulting and NEA field observations for all of the possible SAR species for all dam sites within the study area. The habitat features have been mapped by SLR and provided in Appendix II-V, and GPS coordinates for SAR observations made by NEA have been provided in Appendix VII.

Table 9. Potential Species at Risk Identified in the Literature Review for the Study Area and Habitat Descriptions.

Common Name	Scientific Name	Status			Source				Habitat Description
		SARA (2017)	COSEWIC (2017)	COSSARO (2017)	SLR 2017	DFO 2017	NHIC 2017	NEA 2017	
Blanding's Turtle	*Emydoidea blandingii*	THR	END	THR			•		Shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps, or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs; not readily observed.
Northern Map Turtle	*Graptemys geographica*	SC	SC	SC			•		Large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water; home range size is larger for females (about 70 ha) than males (about 30 ha) and includes hibernation, basking, nesting and feeding areas; aquatic corridors (e.g. stream) are required for movement; not readily observed.

Common Snapping Turtle	*Chelydra serpentina*	SC	SC	SC			•		Slow-moving water with a soft mud or sand bottom and abundant vegetation; spend most of time in water and presser shallow waters; prefer mud and leaf litter as cover. Females travel overland for suitable spawning sites; prefer gravelling or sanding areas along streams or neater watercourses (OMNF, 2017).
Eastern Musk Turtle	*Sternotherus odoratus*	THR	SC	SC			•		Aquatic, except when laying eggs; shallow slow-moving water of lakes, streams, marshes and ponds; hibernate in underwater mud, in banks or in muskrat lodges; eggs are laid in debris or under stumps or fallen logs at water's edge; often share nest sites; sometimes congregate at hibernation sites; not readily observed.

Eastern Foxsnake (GLSL)	*Pantherophis gloydi*	END	END	THR			•		Use unforested areas, such as old fields, marshes and hedgerows bordering riparian zones along drainage features. Brush piles, rocks, tree stumps and driftwood are used for basking within their habitat. In the winter they hibernate in limestone fissures, small mammal burrows, wells and building foundations Uses oviposition sites (deposits eggs) (SLR, May 2017).
Eastern Milksnake	*Lampropeltis triangulum*	SC	SC	NAR			•		Farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings; often uses communal nest sites.
Massasauga Rattlesnake	*Sistrurus catenatus*	THR	THR	THR			•		This venomous snake species uses different habitats across their range but all include sufficient protection from predators, areas where they can get warm to digest food and reproduce. Rock based structures are key to identify gestation habitat are common spots to bask. Sufficient moisture in the hibernacula is key in surviving the winter and

									are often associated with wetlands or small, wet depressions in the terrain. Uses gestation sites (bears live young) (SLR, May 2017).
Eastern Hog-nosed snake	*Heterodon platirhinos*	THR	THR	THR			•		Sandy upland fields, pastures, savannahs, sandy beaches; dry open oak-pine-maple forest with sandy soils; prefer forest areas > 5ha.
Northern Ribbonsnake	*Thamnophis sauritus septentrionalis*	SC	SC	SC			•		Usually found close to water, especially in marshes, where it hunts for frogs and small fish. Will dive in shallow water. At the onset of cold weather, these snakes congregate in underground burrows or rock crevices to hibernate. Uses oviposition sites (deposits eggs) (SLR, May 2017).
Five-lined Skink (GLSL)	*Eumeces fasciatus*	SC	SC	SC			•		Moderately dense or open deciduous or mixed woodlands with logs and slash piles; damp spots under logs, leaf litter, or sawdust; open talus slopes, barren rock; sandy beaches of Lake Erie, Lake Ontario; breeds in forest floor litter; lays, protects eggs under rocks, logs; forages in open woodlands, in sandy areas, along shores of lakes, and

									islands; hibernates under rock piles, in rock crevices, under logs and in stumps
Lake Sturgeon (downstream)	*Acipenser fulvescens*	No Status	THR	THR			•		Bottom dwelling fish that are found in large lakes and rivers; prefer water depths that range from 5 to 10 m (DFO, 2016). Spawning occurs in the spring in large rivers usually below waterfalls, with velocities of 0.5 to 1.3 m/s, water depths of 0.1 to 2 m and substrate that consists of course gravel, boulder, cobble, hardpan clay and sand. Spawning that occurs in the connecting waters of the Great Lakes and St. Lawrence River has been observed at depths of 9 to 12 m. Lake Sturgeon typically abandon spawning locations immediately after spawning. Sub-populations that in-habit lakes are known to spawn along rocky lake shorelines that are exposed to wave action. Once larval Lake Sturgeon drift downstream from their spawning grounds it is unknown whether they display specific habitat preferences (OMNR, 2011).

Deepwater Sculpin	*Myoxocephalus thompsonii*)	SC	SC	n/a		•			Bottom dwelling fish that prefer cold water less than 7ºC in deep lakes. In the Great Lakes adults, usually in-habitat waters that are 60 to 150 m deep, for this reason not much information about their biology and their reproduction cycle is unknown (DFO, 2016).
Grass Pickerel	*Esox americanus vermiculatus*)	SC	SC	SC		•			The Grass Pickerel is a long and cylindrical shaped that are typically less than 300 mm in length. It has a pronounced snout and is usually green to brown with 12 to 24 irregular dark vertical narrow bars. They typically in-habitat warm, slow moving streams, ponds and shallow bays of larger lakes with clear to tea-colored water with abundant aquatic vegetation. The substrate that is preferred is mud but can also be present over rock and gravel. Spawning typically occurs in the spring when water temperatures are between 4˚ C to 12 ˚C. Grass Pickerel do not construct nests, there eggs are dispersed adhere to aquatic vegetation (DFO,

									2016).
Northern Brook Lamprey	*Ichthyomyzon fossor*	SC	SC	SC		•			Eel like appearance, typically found in clear streams of varying sizes. Adults only live for six months before they spawn and die. Preferred spawning habitat is swift current and substrates of coarse gravel and rock, the male will construct an inconspicuous nest (DFO, 2016).
Western Chorus Frog	*Pseudacris triseriata*	THR	THR	No Status	•				Breeds in small, shallow and/or seasonal wetland features such as ponds, swamps, marshes, and ditches. Selects terrestrial habitats mainly for their proximity to breeding ponds. Hibernates in terrestrial habitats under rocks, logs, leaf litter, loose soil, or animal burrows, but hibernation sites are sometimes flooded.
Butternut	*Juglans cinerea*	END	END	END				•	Generally, grows in rich, moist, well-drained soils, and is often found along streams. It may also be found on well-drained gravel sites, especially those made up of limestone, and less often on dry, rocky and sterile soils. In Often found in hedgerows and

									along edges and sunny openings in deciduous forests.
Barn swallow	*Hirundo rustica*	No Status	THR	THR				•	Nests in open rural and urban areas where their mud nests can be attached to open structures that include ledges such as under bridges, in culverts, and on buildings. Prefers to be near rivers, lakes, marshes, ponds, or farmland where there is space to forage aerially for insect prey.
Little Brown Myotis	*Myotis lucifugus*	END	END	END			•		Roost in trees and buildings with a preference for attics, abandoned buildings and barns. Hibernate in caves and abandoned mines.
Northern myotis	*Myotis septentrionalis*	END	END	END			•		Habitat includes boreal forests, roosting under loose bark and in cavity trees. Hibernate in caves or abandoned mines.
Tri-colored bat	*Perimyotis subflavus*	END	END	END			•		Found in a variety of forested habitats. Roost in older forests, occasionally in barns. Forage over water and along streams in the forest. Hibernate in caves.
Eastern small-footed myotis	*Myotis leibii*			END			•		Will roost in a variety of habitats including under rocks, in rock outcrops, in buildings, under bridges or in caves, mines or hollow trees. Hibernate in caves and abandoned mines.

EO 13214	Unknown	n/a	n/a	Restricted Species			•		MNRF to be contact to determine species occurrence
EO 13541	Unknown	n/a	n/a	Restricted Species			•		MNRF to be contact to determine species occurrence
EO 67505	Unknown	n/a	n/a	Restricted Species			•		MNRF to be contact to determine species occurrence

Table 10. Dam A- Species At Risk Site Observation and Habitat Features.

Refer to Appendix II for SLR Habitat Mapping.

Common Name	Individuals Observed On-Site	Potential Habitat on Site	Habitat Features
Blanding's Turtle	No	Yes	Backwater habitat optimal south of dam and along Little Lake shoreline/back bay environment suitable for hibernation. Possible nesting sites on adjacent property beach, wood chipped gardens and road shoulders.
Northern Map Turtle	Yes NEA 2017 Northern Map Turtle; observed 2 turtles basking on rocks east of dam structure (Appendix VII and VIII).	Yes	Backwater habitat optimal south of dam and along Little Lake shoreline/back bay environment suitable for hibernation. Possible nesting sites on adjacent property beach, wood chipped gardens and road shoulders.
Common Snapping Turtle	No	Yes	Backwater habitat optimal south of dam and along Little Lake shoreline/back bay environment suitable for hibernation. Possible nesting sites on adjacent property beach, wood chipped gardens and road shoulders. Landowner confirmed annual nesting along road way and shoreline.

Eastern Musk Turtle	No	Yes	Backwater habitat optimal south of dam and along Little Lake shoreline/back bay environment suitable for hibernation. Possible nesting sites on adjacent property beach, wood chipped gardens and shoreline.
Eastern Foxsnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Eastern Milksnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Massasauga Rattlesnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Eastern Hog-nosed snake	No	Yes	Basking habitat present on dam and adjacent berm/uplands..
Northern Ribbonsnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands..
Five-lined Skink	No	Yes	Limited rock barren features. Habitat on both sides in rock outcrops and gardens/beach area, but not on dam structure itself.
Lake Sturgeon	No	Unlikely	Habitat not present
Deepwater Sculpin	No	Unlikely	Habitat not present
Grass Pickerel	No	Yes	Shallow bay and shoreline wetland habitat with abundant aquatic suitable habitat.
Northern Brook Lamprey	No	Unlikely	Habitat not present
Butternut	No	Unlikely	Species not present
Barn swallow	No	Unlikely	No nests or individuals observed.
Western Chorus Frog	No	Yes	The wetland habitat upstream and downstream of the dam would provide suitable foraging habitat for this species (if present). The wetland area, although not considered ‘critical habitat’ for this species, may provide suitable habitat for foraging.

Table 11. Dam C - Species At Risk Site Observation and Habitat Features.

Common Name	Individuals Observed On-Site	Potential Habitat on Site	Habitat Features
Blanding's Turtle	No	No	Habitat not present. Wetland is severely limited on Dam C - persisting in shallow corners of marina near shore with cattail, bulrush and bur-reed with development surrounding site
Northern Map Turtle	No	Yes	Habitat (foraging and overwintering) present in shallow, weedy areas and small offshore islet at Dam C.
Common Snapping Turtle	No	No	Habitat not present, Wetland is severely limited -persisting in shallow corners of marina near shore with cattail, bulrush and bur-reed on Dam C. Shallow sandy shelf along dam with little cover.
Eastern Musk Turtle	No	No	Habitat (foraging, overwintering) present in shallow, weedy areas and around small offshore islet.
Eastern Foxsnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands. Development in area.
Eastern Milksnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands. Upland habitat would provide foraging habitat at Dam C with possible overwintering in foundations of houses.
Massasauga Rattlesnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Eastern Hog-nosed snake	No	Yes	Basking habitat present on dam and adjacent berm/uplands on Dam C.
Northern Ribbonsnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands. Foraging habitat in wetland/shoreline edges on Dam C.
Five-lined Skink	No	Yes	Marginal basking habitat present on dam and adjacent berm/uplands due to grass, shade and lack of cover objects. .
Lake Sturgeon	No	Unlikely	Habitat not present
Deepwater Sculpin	No	Unlikely	Habitat not present
Grass Pickerel	No	Unlikely	Habitat not present
Northern Brook Lamprey	No	Unlikely	Habitat not present

Butternut	No	Unlikely	Species not present
Barn swallow	No	Unlikely	No nests or individuals observed.
Western Chorus Frog	No	No	Habitat not present, lakeshore with patchy vegetation

Table 12. Dam D - Species At Risk Site Observation and Habitat Features.

Common Name	Individuals Observed On-Site	Potential Habitat on Site	Habitat Features
Blanding's Turtle	No	No	Habitat not present. Wetland is severely limited on D- persisting in shallow corners of marina near shore with cattail, bulrush and bur-reed with development surrounding site
Northern Map Turtle	No	Yes	Very limited habitat (nesting, foraging, cover) along offshore area of Dam D. No basking sites present.
Common Snapping Turtle	No	No	Dam D area is open water but may contain foraging habitat and overwintering habitat.
Eastern Musk Turtle	No	No	Habitat (foraging, overwintering) present in shallow, weedy areas and around shoreline.
Eastern Foxsnake	No	Yes	Basking habitat present on dam and adjacent berm/parking areas, parkette and uplands. Development in area however.
Eastern Milksnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands. Limited foraging habitat present.
Massasauga Rattlesnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands and gravel areas.
Eastern Hog-nosed snake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Northern Ribbonsnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands. Poor habitat for foraging on Dam D.
Five-lined Skink	No	Yes	Poor habitat present on dam and adjacent parking area and parkettes due to lack of cover objects.
Lake Sturgeon	No	Unlikely	Habitat not present

Deepwater Sculpin	No	Unlikely	Habitat not present
Grass Pickerel	No	Unlikely	Habitat not present
Northern Brook Lamprey	No	Unlikely	Habitat not present
Butternut	No	Unlikely	Species not present
Barn swallow	No	Unlikely	No nests or individuals observed.
Western Chorus Frog	No	No	Habitat not present, deep lakeshore with patchy vegetation

Table 13. Main Dam and Lock 45 Species At Risk Site Observation and Habitat Features.

Refer to Appendix VI for SLR Habitat Mapping.

Common Name	Individuals Observed On-Site	Potential Habitat on Site	Habitat Features
Blanding's Turtle	No	Unlikely	Habitat not present around locks due to deep water and boat traffic, no nesting sites accessible.
Northern Map Turtle	Yes, SLR Observation	Yes	Locks not expected to provide hibernation habitat. Open water habitat immediately upstream of dam and downstream marginal due to currents. Turtles recorded however, likely in calmer waters
Common Snapping Turtle	Yes, SLR Observation	Yes	Locks not expected to provide hibernation habitat. Open water habitat immediately upstream of dam and downstream marginal due to currents. Turtles recorded however further downstream, likely in calmer waters.
Eastern Musk Turtle	No	Yes	Locks not expected to provide hibernation habitat. Open water habitat immediately upstream of dam and downstream marginal due to currents.
Eastern Foxsnake	No	Yes	Basking habitat present on dam and adjacent uplands.
Eastern Milksnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Massasauga Rattlesnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands..
Eastern Hog-nosed snake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.

Northern Ribbonsnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Five-lined Skink	No	No	Habitat not present, no cover objects
Lake Sturgeon	No	Yes	Habitat present downstream
Deepwater Sculpin	No	Unlikely	Habitat not present
Grass Pickerel	No	Unlikely	Habitat not present
Northern Brook Lamprey	No	Unlikely	Habitat not present
Butternut	No	Unlikely	Species not present
Barn swallow	No	Unlikely	No nests or individuals observed on any structures, lock or bridge.
Western Chorus Frog	No	Unlikely	No suitable habitat present

Table 14. Dam E - Species At Risk Site Observation and Habitat Features.

Refer to Appendix III for SLR Habitat Mapping.

Common Name	Individuals Observed On-Site	Potential Habitat on Site	Habitat Features
Blanding's Turtle	No	Yes	The small backwater embayment on the south side of the Dam provides marginal habitat. Substrates appear to be a mix of rock and some organics. Burry depths appear limited.
Northern Map Turtle	Yes, SLR Observation	Yes	The small backwater embayment on the south side of the Dam provides habitat. One turtle observed by SLR on rocks in downstream habitat. Substrates appear to be a mix of rock and some organics. Burying depths for overwintering appear limiting.
Common Snapping Turtle	Yes, SLR Observation	Yes	The small backwater embayment on the south side of the Dam provides marginal habitat. Substrates appear to be a mix of rock and some organics. Burying depths for overwintering appear limited.
Eastern Musk Turtle	Yes, SLR Observation	Yes	The small backwater embayment on the south side of the Dam provides marginal habitat. Substrates appear to be a mix of rock

			and some organics. Burying depths for overwintering appear limited.
Eastern Foxsnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Eastern Milksnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Massasauga Rattlesnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Eastern Hog-nosed snake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Northern Ribbonsnake	No	Yes	Basking habitat present on dam and adjacent berm/uplands.
Five-lined Skink	No	No	Habitat not present, no cover objects
Lake Sturgeon	No	Yes	Habitat present downstream
Deepwater Sculpin	No	Unlikely	Habitat not present
Grass Pickerel	No	Unlikely	Habitat not present
Northern Brook Lamprey	No	Unlikely	Habitat not present
Butternut	No	Unlikely	Species not present
Barn swallow	No	Unlikely	No nests or individuals observed.
Western Chorus Frog	No	Unlikely	Habitat not present

Table 15. Dam G Species At Risk Site Observation and Habitat Features.

Refer to Appendix V for SLR Habitat Mapping.

Common Name	Individuals Observed On-Site	Potential Habitat on Site	Habitat Features
Blanding's Turtle	No	Unlikely	At dam itself, not expected to provide hibernation habitat. Shallow aquatic areas on the downstream side or embayments of the Lake on upstream provide nesting, overwintering and foraging habitats. Blanding's may find movement opportunities in lake.
Northern Map Turtle	Yes, SLR Observation	Yes	At dam itself, not expected to provide hibernation habitat. Shallow aquatic areas on the downstream side or embayment's of the Lake on upstream provide nesting, overwintering and foraging habitats.

Common Snapping Turtle	Yes, SLR Observation	Yes	At dam itself, not expected to provide hibernation habitat. Shallow aquatic areas on the downstream side or embayment's of the Lake on upstream provide nesting, overwintering and foraging habitats.
Eastern Musk Turtle	Yes, SLR Observation	Yes	At dam itself, not expected to provide hibernation habitat. Shallow aquatic areas on the downstream side or embayment's of the Lake on upstream provide nesting, overwintering and foraging habitats.
Eastern Foxsnake	No	Yes	Basking habitat present. Snakes may bask on concrete structures in spring and fall.
Eastern Milksnake	No	Yes	Basking habitat present. Snakes may bask on concrete structures in spring and fall.
Massasauga Rattlesnake	No	Yes	Basking habitat present. Snakes may bask on concrete structures in spring and fall.
Eastern Hog-nosed snake	No	Yes	Basking habitat present. Snakes may bask on concrete structures in spring and fall.
Northern Ribbonsnake	No	Yes	Basking habitat present. Habitat present for ribbon snake, riparian vegetation may provide foraging habitat. Snakes may bask on concrete structures in spring and fall.
Five-lined Skink	No	Yes	Possible habitat for skink on northeast portion and downstream rock outcrops.
Lake Sturgeon	No	Unlikely	Habitat not present
Deepwater Sculpin	No	Unlikely	Habitat not present
Grass Pickerel	No	Unlikely	Habitat not present
Northern Brook Lamprey	No	Unlikely	Habitat not present
Butternut	No	Unlikely	Species not present
Barn swallow	No	Unlikely	No nests or individuals observed.
Western Chorus Frog	No	Unlikely	Habitat not present in lake

5.0 Environmental Effects Analysis

5.1 Effects Matrix

To identify the potential effects the proposed dam rehabilitation works may have on the natural environment of the Port Severn sites, *Potential Effects Matrix* has been completed (Tables 16-21). In the matrix, the potential level of effect is determined to be either positive or negative or each criterion (OWA, October 2008). The *Potential Effects Matrix* is similar to the *Effects Identification Matrix* used in a Basic Impact Assessment under PCA policy, however, this table identifies the degree of effects, which is more appropriate for larger and potentially more complicated projects.

The following categories and definitions were used to assign the degree of effects to each of the rating categories.

- **"Nil"-** effect would be assigned where there is no effect on that criterion
- **"Low"-** potential effect would be assigned where the potential impact and/or benefit is considered low or minimal.
- **"High"-** potential effect could be assigned where the potential impact and/or benefit is considered High.
- **"Unk"-**would be assigned where the potential effects are unknown or there is insufficient information to assigned a potential level of effect with reasonable certainty.
- "**-**" means a potential negative effect
- "**+**" means a potential positive effect

The potential effect of each criterion has been rated based on the conceptual design descriptions for each site and assume that all mitigation measures identified in this report will be incorporated in the detail design. Furthermore, a high-level description of the predicted effects on the natural environment feature has been provided based on the conceptual design information.

The potential effect should be re-assessed at the detail design phase. Further mitigation measures or re-design may be required to reduce impacts to the natural environment.

Table 18. Potential Effects Matrix Dam D.

	Construction						Post Construction					
Criteria	+H	+L	Nil	Unk	-L	-H	+H	+L	Nil	Unk	-L	-H
Physical												
Flow Regime			*						*			
Soils and Sediment			*						*			
Water Quality					*				*			
Fish and Aquatic Habitat												
Fish Habitat						*					*	
Aquatic substrate					*						*	
Fish Community(mortality)					*						*	
Pumpkinssed Spawning					*						*	
Terrestrial Habitat												
Vegetation Community (Terrestrial)			*						*			
Wetland			*						*			
Species at Risk-turtles					*				*			
Species at Risk-snakes/skinks					*				*			
Birds/SAR birds			*						*			
Wildlife/SAR (bats)			*						*			

Table 19. Potential Effects Matrix Main Dam and Lock 45.

	Construction						Post Construction					
Criteria	+H	+L	Nil	Unk	-L	-H	+H	+L	Nil	Unk	-L	-H
Physical												
Flow Regime					*				*			
Soils and Sediment				*						*		
Water Quality					*					*		
Fish and Aquatic Habitat												
Fish Habitat					*				*			
Aquatic substrate					*				*			
Fish Community(mortality)					*				*			
Walley Spawning Habitat downstream					*				*			
Terrestrial Habitat												
Vegetation Community (Terrestrial)					*				*			
Wetland			*						*			
Species at Risk-turtles					*				*			
Species at Risk-snakes/skinks					*				*			
Birds/SAR birds			*						*			
Wildlife/SAR (bats)			*						*			