

**FISHERIES AND OCEANS
CANADIAN ENVIRONMENTAL ASSESSMENT ACT (CEAA) 2012
PROJECT EFFECTS DETERMINATION REPORT**

GENERAL INFORMATION

1. Project Title: Shippagan Gully Dredging and Breakwater Construction, Le Goulet Small Craft Harbour	
2 Proponent: Fisheries and Oceans Canada, Small Craft Harbours (DFO-SCH)	
3. Other Contacts: Chyann Kirby, Senior Environmental Specialist Public Services and Procurement Canada (PSPC) Environmental Services, Saint John, New Brunswick	4. Role of Each Contact: OGD Consultant
5. Source of Project Information: Jean Girouard – Project Manager (PSPC) Garth Holder – Project Engineer (DFO-SCH)	
6. Received Date: 2016-04-01	
7. PATH No.:	8. DFO File No:
9. Other relevant file numbers: PSPC Project # R.076592.004	

BACKGROUND

10. Background about Proposed Development (including a description of the proposed development):

The proposed Shippagan Gully Dredging and Rock Protection project will take place at an established and active Fisheries and Oceans Canada (DFO) - Small Craft Harbour (SCH) facility. The harbour is a Class A facility (greater than 800 vessel metres) that opens to an inlet in Shippagan Bay / Shippagan Gully, in the Gulf of St. Lawrence along the northeastern shore of New Brunswick (refer to **Figures 1 and 2 in Appendix A**). The fishing industry is a very important element of the local economy, and Le Goulet is an active harbour servicing the commercial fishery as well as recreational users.

The Le Goulet Small Craft Harbour currently consists of a western training wall/wharf/rock protection structure, eastern rubblemound training wall, two floating wharves within the harbour basin, a concrete haul-out ramp, a parking/service area, a fenced upland storage area, various buildings including bait/storage sheds, an ice house, Harbour Authority office, and two former fish processing plants. Fuel and waste oil aboveground storage tanks (ASTs) are located in a gravel and grassed area to the southwest of the boat ramp. The associated navigational channel provides access to both Le Goulet Harbour as well as to Shippagan Bay/Harbour via Shippagan Gully.

For many years Shippagan Gully has served as an important navigation channel, providing boaters from communities in the Acadian Peninsula and the Baie des Chaleurs with direct access to the open waters of the Gulf of St-Lawrence. The fishing industry, a very important element of the local economy, relies on safe navigation through the inlet. Over the last few decades, significant volumes of sediment have accumulated within the inlet mouth due to natural processes. These accumulations have constricted the navigation channel, making it more difficult and riskier for fishing vessels to pass safely through the inlet on their way to and from the Gulf of St-Lawrence (Provan *et. al.*, 2013). Many of the larger vessels (including those of the Canadian Coast Guard who respond to emergencies at sea) which once relied on the inlet for safe and sheltered passage to and from the Gulf of St. Lawrence can no longer safely navigate the constricted channel and must now circumnavigate the Acadian Peninsula, thus considerably lengthening their journey and forcing passage through the rough waters off Miscou Point.

Shippagan Gully has been maintained by purpose-built coastal structures such as seawalls and breakwaters, since the late 19th century. With the exception of the removal of approximately 8,000 cubic metres (m³) of material in early 2017, the navigational channel within the gully has not been dredged since 1983. The channel has deteriorated in recent decades to the point where water flow and water depth represent significant navigational hazards. The high energy environment of the gully and age of structures are responsible for the deterioration. A restored channel will serve the interests of commercial

and aboriginal fishing vessels berthing at Le Goulet, Shippagan, Savoy Landing, Caraquet and Lemèque as well as the Canadian Coast Guard stationed in Shippagan, whose vessels currently steam around the Acadian Peninsula to respond to marine emergencies, adding significant delays to response times. Other vessel traffic, commercial and recreational, entering or leaving Shippagan Bay will also use the restored channel.

DFO-SCH has undertaken harbour improvements/restoration efforts in recent years, specifically reconstruction of the breakwater and training walls at the Le Goulet SCH, which improved facility infrastructure and enhanced safety for harbour users. However, the Shippagan Gully, which is adjacent and east of the Le Goulet SCH, is unsafe for fishing vessels, pleasure boats and the Coast Guard vessel stationed at Shippagan, to pass due to the swift current and the infilling of sediments in the channel. Proposed restoration remaining to be completed consists of construction of a breakwater at the seaward end of the gully, shoreline protection/reconfiguration on the eastern side of the channel, and dredging of channel to the approximate dimensions of 110 to 140 metres wide, 600 metres long, and 4.0 metres in depth. Unlike many dredging projects these dimensions are not defined by navigational clearance requirements. Rather, the proposed channel is designed to increase the cross-sectional area of the channel, thus reducing water flow and increasing marine safety. The design of the channel and breakwater is also intended to minimize future maintenance dredging requirements in the channel and a nearby ebb delta¹.

DFO-SCH is therefore proposing to dredge and construct a breakwater within Shippagan Gully, as part of the project proposal herein. Specifically, this work would include:

- Restoration/improvement to the Domitien Lane access road;
- Construction of a lay-down area, refueling pad, and installation of necessary contractor facilities;
- Construction of a 200 metre long breakwater.
- Land-based dredging of the Gully and on-site temporary disposal of materials;
- Post-dredging monitoring of Gully channel speed and depths;
- Dredging of the remaining portion of the channel to -4.0 metres below chart datum; and
- Permanent disposal of dredged material within two sites (DS1 and DS2).

Dredging activities associated with the Shippagan Gully Dredging and Breakwater Construction project are intended to be separated into two distinct phases (A and B) based on risk factors and certain unknown factors. Phase A will include land-based dredging of the footprint of the breakwater and land-based dredging of the eastern side of the channel. These dredging activities are presently proposed to be conducted intermittently between the summer of 2019 and the fall of 2020 and will be preceded by site preparation activities and run concurrently with breakwater construction. Dredging activities undertaken as part of Phase B will rely on floating equipment and will complete the dredging of the channel to the necessary depth. This work is currently scheduled for the summer/fall of 2021.

All material dredged will be placed on a temporary stockpile area to be located on the adjacent barrier spit². The material will be double-handled in order to place the strategically use and place the material as part of project activities at the selected disposal/placement sites. Work completed in the fall and winter months will include dredging and direct placement at the DS1 and/or DS2 sites. Refer to Section 18 for a detailed scope of work and schedule of activities.

These proposed works are based on recommendations derived from National Research Council Canada (NRC)'s *Simulation of Coastal Processes at Shippagan Gully Inlet and Assessment of Future Scenarios* (Provan *et. al.*, 2013) for the sustainable operation of the DFO-SCH facility of Le Goulet. Not only will the proposed project improve the overall Le Goulet DFO-SCH facility, it will improve the safety of the Shippagan Gully channel, allowing vessels to more readily travel to the Gulf of St. Lawrence instead of circling Miscou Island (an additional 6-hour trip), including the Coast Guard search and rescue vessel stationed in Shippagan.

Material to be dredged from the navigation channel has been sampled and characterized by DFO-SCH with results summarized in **Appendix B**. The material, as noted in the **Appendix B** report, is a mixture of sand, gravel and cobbles, but is considered of such quality suitable for a variety of potential beneficial uses; however, a primary consideration of the disposal of said material will be to return it to the littoral drift.

¹ Ebb delta: A tidal delta formed seaward of an inlet by ebbing tidal currents and modified in shape by waves. Synonyms are "ebb-tidal shoal" or "ebb-tidal delta. (U.S. Army Corps of Engineers (USACE), 2001).

² Barrier spit: A barrier beach that is connected at one end to the mainland. (USACE, 2001).

DFO-SCH has completed a detailed analysis of alternative disposal sites and uses for the dredged material. Based on an analysis of environmental constraints, potential beneficial uses, logistic challenges and financial considerations, disposal sites DS1 and DS2 were chosen as the viable sites for disposal. Refer to **Appendix C** for an analysis of alternatives specific to this proposed project.

PROJECT REVIEW

11. DFO's rationale for the project review:

Project is on federal land and;

- DFO is the proponent
- DFO to issue *Fisheries Act* Authorization, *Species at Risk Act* Permit or other regulatory permit
- DFO to provide financial assistance to another party to enable the project to proceed
- DFO to lease or sell federal land to enable the project to proceed
- Other

12. a) Fisheries Act Section(s) (if applicable): Sections 35(1) and 35(2)(b)

b) Species at Risk Act Section(s) (if applicable): To be determined (TBD)

13. Primary Authority: DFO-SCH

14. Primary Authority's rationale for involvement:

- Primary Authority is the proponent.
- Primary Authority to provide financial assistance to enable the project to proceed.
- Primary Authority to provide a license or an interest in land.
- Primary Authority to issue a regulatory permit, approval or authorization.

15. Other Authorities (if applicable):

- a) DFO-Fisheries Protection Program (FPP)
- b) Transport Canada – Environmental Affairs and Aboriginal Consultation Unit and Navigation Protection Program (NPP)
- c) New Brunswick Department of Environment and Local Government (NBDELG)

16. Other Authorities Rationale for Involvement:

- a) Permit Requirement: The proposed project will be referred to the DFO-Fisheries Protection Program (FPP) for review in accordance with the *Fisheries Act*.
- b) Approval Requirement: The proposed project will be referred to TC-Navigation Protection Program (TC-NPP) for review in accordance with the *Navigation Protection Act* (NPA).
- c) Approval Requirement: The proposed project is being registered as an Environmental Impact Assessment with the NBDELG under the *New Brunswick Clean Environment Act*.

17. Other Contacts and Responses:

- a) Environment and Climate Change Canada (ECCC) – Canada Wildlife Service (CWS)
- b) ECCC – Environmental Assessment and Marine Programs (EAMP)
- c) NBDELG – Surface Water Protection Group
- d) Mr. Georges Moore – DFO Aboriginal Program Area Coordinator
- e) Mr. Paul Aimé Mallet – Harbour Authority Representative for Le Goulet DFO-SCH
- f) Ms. Mélanie Aubé – Institut de recharge sur les zones côtières (IRZC)
- g) Mr. Dominique Bérubé – New Brunswick Department of Energy and Resource Development (NBDERD)
- h) Mrs. Mallet – Spouse of Mr. Cyrille Mallet (Aquaculture Lease Site MS-1049 Operator)

Indigenous Consultation

PSPC, on behalf of DFO-SCH, carried out an Indigenous Assessment at Shippagan Gully in accordance with DFO-SCH's Preliminary Duty to Consult (DTC) Assessment Guide. This Guide is intended to provide basic information to DFO-SCH in the Maritimes and Gulf Regions and to assist its Program Managers in making informed, prudent decisions that take into account statutory and other legal obligations, as well as policy objectives, related to Aboriginal and treaty rights.

The Supreme Court of Canada has held that the Crown has a duty to consult and, where appropriate, accommodate when the Crown contemplates conduct that might adversely impact potential or established Aboriginal or treaty rights. While there may be other reasons to undertake consultations (e.g. good governance, policy-based, etc.), three elements are required for a legal duty to consult to arise.

1. There is contemplated or proposed Crown conduct;
2. The Crown has knowledge of potential or established Aboriginal or treaty rights; and
3. The potential or established Aboriginal or treaty rights may be adversely impacted by the Crown

The Le Goulet Harbour Authority advised, during the DTC process, that there are Aboriginal vessels from the Esgenoôpetitj and Elsipogtog First Nations that fish commercially from the Le Goulet harbour but that, to their knowledge, the SCH facility is not utilized for Aboriginal traditional, food or ceremonial fisheries. During the DTC process, the DFO Area Aboriginal Program Coordinators also advised that the SCH facility is not known to be utilized for Aboriginal traditional, food or ceremonial fisheries. The proposed project site was also reviewed for archaeological potential with known archeological sites (pre-contact, historic, burial) in the area of the site, the scope and type of work to be conducted to deduce a residual archaeological potential.

Given the location, scale and nature of the proposed project, Indigenous consultation will be pursued prior to the work being carried out and as part of Environmental Impact Assessment registration activities and as a means of inclusive public engagement and good governance practice. Although DFO-SCH is currently organizing consultation efforts with Mi'kmaq and Wolastoqey First Nation communities at the program level, project notification and offers to consult are intended to be submitted to the Chiefs and Councils of the Mi'kmaq and Wolastoqey First Nations (as well as representing organizations Mi'gmawe'l Tplu'taqnn Incorporated (MTI) and Wolastoqey Nation in New Brunswick) and the New Brunswick Aboriginal Peoples Council (NBAPC).

Public / Stakeholder Consultation

The proposed dredging and breakwater construction project is essential to increasing the navigability and safety of the channel for commercial, recreational, and Indigenous fishers accessing the Gulf of St. Lawrence from Small Craft Harbours located in Le Goulet, Shippagan, Caraquet, Savoy Landing and Lamèque. Improving the safety of the channel will also allow for the Canadian Coast Guard to directly access the Gulf of St. Lawrence and respond to emergencies at sea (avoiding the current lengthy circumnavigation of the Acadian Peninsula). No negative public concern is expected as a result of this project.

The public consultation program will be submitted to the NBDELG for review and approval concurrent with the EIA review. The proposed program will be as per the *Guide to Environmental Impact Assessment in New Brunswick*.

18. Scope of Project (details of the project subject to review):

Project Description

Dredging of the Shippagan Gully and construction of the breakwater were originally considered a single works due to their proximity to one another. During project development, it became clear that risks and unknowns identified could be mitigated by separating the works into two phases (A and B), as:

- The breakwater construction and dredging of land accessible beach/channel materials is to be carried out as the first construction phase (Phase A), followed by floating plant dredging (Phase B) the following year. Floating plant dredging is not considered operationally viable within the channel in its current state.
- Without a floating plant component, there is potential for more local contractor interest to bid on Phase A, using local equipment and labour. There are cost advantages to this approach.
- Sand/gravel dredged by land-based equipment can be placed strategically in the coastal environment as a

beneficial use, to serve as shoreline reinforcement, dune reconstruction, and/or to replenish the beaches.

- Following the completion of Phase A, the channel's tidal current velocities and its exposure to offshore waves will have improved significantly, and subsequent tenders for dredging will consider new conditions and risks that have been significantly reduced.

It is important to note that this document has been prepared to provide descriptions of the alternatives that are most likely to be used to carry out the work, using standard or known techniques and experiences from previous local projects. It is based on scenarios that will deliver the project within a reasonable time-frame, risk and budget. There is potential that construction equipment or methods not typical of this region or country could be employed. Should alternate scenarios to what is herein described develop, this document will be reviewed for completeness and adequacy and revised as appropriate.

The description provided below is based on a construction schedule that commences in the late fall of 2018, and continues to the late fall of 2021. Blackout periods are imposed between May 1st to July 31st in 2019 and 2020 and May 1st to June 30th in 2021 in order for specific work activities to avoid interactions and negative impacts on sensitive receptors.

Pre-Project Activities:

The alternatives matrix provided in **Appendix C** indicates the most viable option for completing Phase A project activities (i.e., dredging and breakwater construction) is by accessing the site from the east and over Chiasson Office Spit. Access from land, however, requires the crossing of private property and the use of private access roads to reach the Project site on Federal Crown land.

- 1) Land acquisition and negotiated access privileges: DFO-SCH intends to acquire lands and water lots on the Chiasson Office Spit to access the construction site. Controlled access will help manage the site and provide future access to the infrastructure at the end of the spit.
 - a. Property PID 20173217 is currently registered to a private landowner and DFO-SCH is currently in negotiations with the land owner for purchase. This property is in the middle of the spit, and will be acquired so as to construct vehicle access through the middle of the property and provide permanent, managed access to the DFO Chiasson Office lighthouse.
 - b. A water lot parcel is to be subdivided from PID 00000002 (Province of New Brunswick submerged Crown Land) located in Shippagan Bay. The subdivided water lot would extend the length of the Shippagan Bay side of the Spit and encompass an area of approximately 12 hectares. This parcel will be configured to allow the construction of a permanent access road to bypass the Ducks Unlimited (DU) wetland and to place and shape dredged materials in the water.
 - c. The proponent will negotiate with property owners of Domitien Lane on property PIDs 20789442 and 20672846 to allow construction access. There is an existing 20m easement through this property for utilities (e.g., NB Power, Aliant) and DFO access to the lighthouse. NB Power and Aliant no longer use this easement, and the road is in poor condition. This easement will require widening and realignment to accommodate the new access road.
 - d. DFO-SCH will continue dialogue with Ducks Unlimited to construct a portion of the new access road across property PID 20194361. Also, the proponent will negotiate for access to Ducks Unlimited beaches by properties 20707568 and PID 20367835. Ducks Unlimited is not in a position to transfer ownership of these properties as the parcels were donated or bequeathed.
 - e. The proponent will seek a License of Occupation for project activities undertaken on submerged Provincial Crown lands which may be outside of any current water lots and whose project footprint(s) will not result in permanent installations (e.g., placement or disposal of materials).

Phase A (Land-Based Dredging and Breakwater Construction):

The dredging and breakwater construction work in Phase A is anticipated to be completed from land, accessing the construction site from Chiasson Office, over private roads and through private property. This phase of work consists of the following:

- 1) Construction of access road and laydown area: Domitien Lane is the existing access road that leads from Chaiasson Road and follows a 7.62m wide easement on PIDs 20789442, 20672846, and 20194361 to the DFO-

Coast Guard's lighthouse. Originally, the easement included power (NB Power) and communications (Aliant) infrastructure, but more recently the poles and utilities have been relocated to an alternative alignment and no longer follow within the easement. Domitien Lane is a private access road, the first 700 metres or upland section is at ground level, with a 6 m graded width. The remainder of the lane on the Chiasson Barrier Spit remains as a cart track meandering across the beach and spit. Portions of the road have eroded into the beach and water, and some sections are poorly drained and are now within a designated wetland. Work activities associated with access road and laydown area construction are detailed as follows:

- a. The first 675 m section of Domitien Lane, leading from Chiasson Road, is to be improved by raising the road 1.0 m with granular materials, adding shoulders and two 3.5 m wide travel lanes, and widening the base of the road to 12 m. Construction is within a regulated wetland. Within the wetland, the road will be constructed without ditching to reduce wetland footprint impact.
- b. The remainder of the upland portion of Domitien Lane will be permanently realigned, commencing near the Ducks Unlimited property, to direct traffic away from the beach, and avoid cottages and provincially significant wetland(s). The road bed will be constructed of granular materials, measuring approximately 15 m width at base and allowing for two 3.5 m wide travel lanes and wider shoulders on the curves. Construction is within a regulated wetland and buffer of a mapped provincially significant wetland. This section terminates at the beach, where a turn-around area will be constructed.

The work described in (a) and (b) will not necessarily be completed at the beginning of the project. Roadwork of this nature would be completed in the summer or fall when conditions are dry. This section of road must remain accessible for a number of summer residences that depend upon the road for access.

- c. A new 400 m causeway section is proposed to be constructed in the water to bypass Ducks Unlimited property (PID 20194361) and the mapped provincially significant wetland on the property. The causeway will replace an aging dam (constructed in 1882) that closed up the Shippagan East Channel. The road bed will be constructed as a single lane access road to a height of 2.5 m above chart datum, and a footprint width of 15m. The core of the dam will be constructed similar to a breakwater, anticipating the beach will further narrow and potentially be exposed to coastal elements. Armour protection on the seaward side (wetland side) will be placed at a later date should the beach continue to narrow and the structure be deemed at risk. Culverts are proposed to circulate water behind the dam and into existing wetlands.

Estimated quantity of rock for the causeway is 20,000 tonnes and includes core and filter rock. Core material will be end dumped or pushed into the water and shaped with excavator. Rock protection will be placed as the causeway construction advances.

- d. The remainder of the access road will be constructed on the Chiasson Barrier Spit (on properties PID 20173217 and PID 20171575) to extend to the proposed breakwater and Gully. The current design of the road follows an existing trail to the extent possible, however the final design will be determined based on a survey of wetlands to be undertaken in the Spring of 2018. The road will be single lane, with additional lanes installed at locations to allow meeting of two vehicles. The Contractor will be encouraged to use material dredged and placed at the end of the Chiasson Barrier Spit in 2017 as borrow fill.
- e. A laydown area will be established at the Gully end of the Chiasson Barrier Spit to facilitate equipment and rock storage. This laydown area is considered temporary as it will only be in service for the life of the project.

- 2) Import rock material to the site: Rock for the breakwater will be imported from outside the Acadian Peninsula. Trucks will travel to Domitien Lane by the Chiasson Road from Route 113 and Route 11. Loaded trucks will use Domitien Lane and the new causeway/access road to reach the breakwater. Rock will be either stockpiled on site (in the laydown area) or placed directly into the water. Hauling may occur over the unimproved sections of Domitien Lane the first year, but will not be allowed to haul over unimproved dune roads or beaches.

The estimated quantity of rock material required for the breakwater is 85,000 tonnes and includes filter rock, armour rock and core stone.

- 3) Breakwater construction: Construction of the breakwater is anticipated to proceed from the land using land based equipment and conventional methods of construction. Details as follows:

- a. Breakwater Design:
 - Crest elevation: 4.3 m above Chart Datum
 - Toe elevation: -4.0 m
 - Dredged Foot print width: 40m
 - Breakwater/Rock protection Slope: 1.5 h to 1 v
 - Armour Stone sizes; 2-4 tonnes and 4.5- .5 tonnes, 2 layers, 2.1 m thick.
 - Filter Stone sizes: 200-400kg, and 400-800 kg., 1.1 m thick
 - Core Stone sizes: 0.1 to 100 kg

- b. The footprint of the breakwater is to be dredged to elevation 4.0 m below chart datum, prior to placing imported rock core material. The seabed can be excavated from the breakwater's end, loaded into trucks and taken to the disposal sites or stockpiled. Rock core would be end-dumped or pushed into the water to replace seabed materials, shaped to just below high water, and immediately protected with layers of filter and armour rock. This procedure is repeated to advance the construction of the breakwater seaward.

- c. Material excavated within the footprint of/from beneath the breakwater are treated as dredged channel materials in consideration of its disposal methods.

- 4) Land-based channel dredging and access: Channel excavation will be carried out using land based heavy equipment, excavators, cranes, (clam and drag buckets) working from the shoreline, or from trestle works, temporary roads, or from nearshore floating structures:
 - a. The Contractor will be instructed to make temporary access to reach the dredged limits established approximately 30m beyond the zero (0.00m Chart Datum) contours.
 - b. The contractor will be encouraged to use local on-site materials or dredged materials to construct temporary access roads in the tidal zone.
 - c. The Contractor will be encouraged to use temporary access techniques to reach the dredge limits approximately 30m beyond the zero (0.00m chart datum) contour line. It is predicted that access will be made, by means of trestles bridges, pipe pile structures, SSP structure, or nearshore tethered floating equipment, to increase reach by land based equipment into the channel. While the Contractor will be given some flexibility as to the choice of access, infilling with imported materials and rock protection is not to be considered for creating access.
 - d. Trestles bridges structure, pipe pile structures, or SSP structures will require pile driving equipment to install the temporary structure, and extraction equipment to remove from the water upon completion.
 - e. The Contractor may consider floating equipment to reach the dredge limits. A spud barge secured to shoreline would be effective, or a near shore jack-up barge. Underwater shoals and high velocity currents in the un-dredged channel will affect maneuverability of the equipment.
 - f. The material will be placed on shore or in trucks, measured for payment, and placed at the stockpile site, or transported directly to either of two proposed disposal sites (DS1 or DS2).
 - g. Total dredged quantity from Phase A is estimated at up to 240,000 cubic metres place measure (cmpm), and includes excavation within the footprint of the breakwater.

- 5) Placement and positioning of dredged materials: Two areas are being considered for placement of sand and gravel from Phase A. The dredged material is to be distributed between DS1 and DS2, and is to be used beneficially at the beach at DS1 and on the inside of the barrier spit at DS2. At DS2 the gravel and sands from the channel will be shaped to resemble coastal features typical of the coastal area; high dunes, low dunes, wide beaches, wetlands. These features, constructed from the coarse dredged materials, will emulate the natural features only. The grain size of the dredged material is coarser than the sand that naturally would create the features. **NOTE:** DFO-SCH has contracted l'Institut de recherche sur les zones côtières (IRZC) to develop a restoration project to utilize the materials dredged from the channel in the most beneficial manner and restore the area. Placement of material will follow the measures outlined in the restoration proposal which will be submitted to NBDELG for review and comment prior to implementation.

- a. Site DS1 – DS1 is located north of Chiasson Barrier Spit, seaward of the Ducks Unlimited coastal property. Access to the coastal site will be over the frozen beach. The new cross section will extend the beach seawards by 45m over a 850m length, and be configured and contoured with a wide beach, a low to medium high dune, sloping back to the peat bog. This section of beach is being considered for placement as it appears not to have characteristics of critical habitat for species at risk, i.e wide beach, dune, back slope. Further assessment will verify these lacking characteristics prior to placement of dredged materials. The placement of materials along this section will slow down the erosion of the peat bog. DS1 can be shaped to accept up to 100 000 cubic metres of dredged material from Phase A.
- b. Site DS2 – DS2 is located inside the entire length of Chiasson Barrier Spit. The dredged materials are intended to be used to reconstruct the end of the spit, widen and reinforce the entire length of the spit on the inside, and widen the beaches on the inside. Within the reconstructed spit, areas will be set aside for coastal wetlands to develop. Material will also be used to protect the eroding base of the lighthouse. The DS2 site is intended to hold 240,000 cpm from both Phase A (140,000 cpm) and Phase B (100,000 cpm).

Phase B (Floating Plant/Barge Dredging):

Phase B will proceed after the completion of Phase A to remove materials that were beyond reach during Phase A dredge activities as well as any infilling that may have occurred between phases. This work will only proceed once the information gathered from post-construction monitoring has been reviewed and is made available to Contractors.

- 1) Floating plant dredging: Floating equipment can now be considered in Phase B as the new breakwater will provide protection of the floating equipment from offshore waves, the dredged channel will have significantly reduced current flow, and the dredged depth of 4.0 m in the channel will allow dredges, barges and tug boats to maneuver from the dredge site to shore based off-loading area. It is expected that the dredge quantity will consist of the materials not reached by land-based dredging in Phase A as well as any subsequent infilling. The volume of material to be removed is estimated at 100,000 cpm with the majority of the material derived from the middle of the channel. The dredge depth will be to -4.0 m.

Mechanical dredging (crane or excavator mounted on barge, dredge scows, tug boats) will require double handling of materials. A temporary berthing face will be required on the Chiasson Barrier Spit shoreline, commonly constructed with steel sheet piling, pile piles or trestle work. Dredged material will be loaded into trucks and stockpiled or directly placed within DS2. Mechanical dredging provides an opportunity to offload a portion of the dredged materials on the opposite shore, at le Goulet wharf, should future opportunities for beneficial use of materials be identified on that side of the Gully.

Suction dredging equipment may be considered (however the sand and gravel characteristics suggest the material is too coarse to pump significant distances). If suction dredging equipment is used, a containment cell will be shaped at the end of spit, with controlled release of excess water back into the channel. The cell will be regularly emptied and materials configured into DS2.

- 2) Disposal and positioning of dredged materials: The materials will placed in DS2 at the end of spit, and subsequently configured into beneficial coastal features. As noted above, placement of dredged material will follow measures outlined in the restoration proposal to be developed by IRZC and circulated to NBDELG prior to implementation.

Post-Construction Activities and Improvements:

- 1) Post-dredging monitoring: upon completion of dredging in both Phases A and B, the channel's bathymetry and tidal current speeds will be assessed, so as to (in the case of Phase A) establish the potential risks on completion of Phase B (floating plant dredging) and (in the case of Phase B) to ensure project depths and current speeds have been achieved for the dredge work to be considered complete.
- 2) Chiasson Barrier Spit Restoration: The laydown area material will be removed and the site remediated with sand and gravel from the dredging operation. Access control features (i.e., guide rail) and signage will be installed on the access road to control unauthorized traffic accessing the dune. A gate will be installed at the DU property making the entire spit inaccessible to unauthorized traffic. Domitien Lane will be restored or improved subject to negotiations with the private landowners and the requirements of the DELG.

Figures 3 to 6 of Appendix A provide site plans and diagrams that illustrate project activities, including road construction, breakwater construction, dredging in Phases A and B, proposed disposal/placement sites DS1 and DS2, and accessory activities in relation to the surrounding environment.

Operation / Maintenance:

Once completed, the proposed project will result in a safe channel for vessels to navigate Shippagan Harbour, Savoy Landing, Lamèque and Le Goulet. Not only will this provide a safer route to the Gulf of St. Lawrence, it will provide the Coast Guard emergency vessel located at Shippagan Harbour with direct access to search and rescue emergencies in the Gulf of St. Lawrence, where previously it has had to circumnavigate Miscou Island (a 6-hour delay). As such, the Shippagan Gully will be maintained as needed upon completion of the proposed project. Given the experience with similar harbours, it is anticipated that the Gully, breakwater, and disposal sites will require maintenance in the future on an as-needed basis. As with similar projects, these future maintenance activities would be conducted as future stand-alone projects and would be completed subject to environmental assessment and regulatory review.

Decommissioning / Abandonment:

Once completed, the proposed project is not anticipated to be decommissioned or abandoned. The Shippagan Gully is an important through fare for recreational, fishing and Coast Guard rescue vessels stationed at Shippagan Wharf, etc. to access the Gulf of St. Lawrence safely. The proposed project, including regular maintenance as noted above, will provide this function for the foreseeable future.

Scheduling

The works are anticipated to commence in the late fall of 2018 and be completed by early 2022, for a total of a just over three year project timeline. The proposed timeline is depicted in **Figure 7 of Appendix A**, however is subject to change based on receipt of funding and approvals.

19. Location of Project:

The Le Goulet DFO-SCH (Harbour Code 2631) opens to Shippagan Bay and Shippagan Gully inlet within the Gulf of St. Lawrence along the northeastern shore of New Brunswick in Gloucester County. The approximate coordinates of the project area are Latitude 47°43'05"N and Longitude -64°40'06"W.

Specifically, the Project Development Area (PDA) includes an area encompassing Shippagan Gully (approximately 75,000 square metre (m²) (+/- 9,000m²) dredge footprint), the Chiasson Barrier Spit, Domitien Lane, and Chemin Chiasson. The project will be located on the following Service New Brunswick (SNB) property parcel identification numbers (PIDs):

- Channel: 20725750, 00000002
- Chiasson Spit and Domitien Lane: 20171575, 20173217, 20194361, 20789442, and 00000001

Refer to **Figures 1 and 2 in Appendix A** for maps and an aerial photo showing the proposed project location and surrounding area. **Figures 3 to 6 of Appendix A** provide site plans and diagrams that illustrate the project activities in relation to the surrounding environment.

20. Environment Description:

Physical Environment

The Le Goulet DFO-SCH is located south of Shippagan, on the northeastern shore of the Acadian Peninsula in Gloucester County, New Brunswick. The harbour opens to an inlet in Shippagan Bay, in the Gulf of St. Lawrence. Le Goulet is situated within the coastal zone of the Caraquet ecodistrict, within the Eastern Lowlands Ecoregion of New Brunswick:

“The dramatic barrier beaches that characterize this ecoregion are the result of low coastal relief meeting the effects of longshore drift and other littoral phenomena. Interaction between the barrier beaches and the tidal estuaries at the mouths of major rivers has created a series of rich coastal marshes.”

“The coastline in this area is linked by an almost continuous chain of sand dunes, sand spits, protected bays, and salt marshes, severed only by estuaries of the Pokemouche, Tracadie, Tabusintac, and other rivers merging into the Gulf of St. Lawrence.”

“The salt marshes of the ecodistrict host several interesting butterfly species, including the nationally and provincially rare Maritime ringlet. These marshes also harbour the salt-marsh copper, and the uncommon short-tailed swallowtail butterflies” (New Brunswick Department of Natural Resources, 2012).

The coastal environment at Le Goulet is typical of the Gulf of St. Lawrence, with wide, relatively flat beaches extending into a shallow sloped inshore, sand beaches, and dunes. The tides in the area generally range from less than 0.5 to 1.5 m in height.

Based on available surficial geology maps, the native surficial soils consist of a moderately to highly permeable layer of silty, sandy deposits which may contain natural organic sediments (e.g., peat), generally 0.5 to 3 m in thickness (Rampton et. al., 1984). Bedrock mapping indicates the underlying rock formation is from the Late Carboniferous period and is comprised of red to grey sandstone, conglomerate, siltstone and shale (New Brunswick Department of Natural Resources and Energy, 2000).

The material to be dredged from the channel was sampled in 2016 and again in 2017. Sample analysis shows the material consists of sand and gravel layers underlain by glacial till to weathered sandstone bedrock, with cobbles as secondary constituents, and only trace amounts of silt and clay. Due to the high current speeds at this location, the samples are exempted from chemical characterization and are considered suitable for ocean disposal. Additionally, odours and colour observations of the material sampled were consistent with clean gravel and sand.

It is anticipated that the dredged material will also contain some anthropogenic debris from previously degraded structures, primarily steel and wood fragments.

Site Topography:

The subject site is generally a flat, low area adjacent to the coast with intertidal zones and coastal wetlands (Government of New Brunswick, nd). Land to the west of the Shippagan Gully generally slopes to the south towards the Gulf of St. Lawrence or northeast towards Shippagan Bay; surface drainage at the site appears to follow the general slope of the property, discharging from the north towards the Shippagan Bay and to the south and east toward the Gulf of St. Lawrence.

The Chiasson Spit, a sand spit peninsula consisting of low sand dunes and intertidal saltwater marshes, is located east of the Gully. The seaward side consists of a low, gently-sloping sand beach, and the interior side is a flat, low intertidal zone with inter-connected coastal marshes. Drainage along the spit is assumed to follow the topography and flow to the north towards Shippagan Bay, or south towards the Gulf of St. Lawrence.

The Upland portion of the project site consists of a regulated (freshwater) wetland bisected by Domitien Lane. This area is relatively flat, and surface drainage appears to discharge towards the south and the Gulf of St. Lawrence.

Results of a sampling program completed within the entrance channel (GHD, 2016) indicate the entrance channel consists of black, organic, sandy-silt with a strong organic odour. Currents within the channel prevents growth of significant aquatic vegetation within this area.

Atmospheric:

Canadian Climate Normals (1981-2010) for the Bathurst climate station (47°37'45.050"N and -65°44'54.020"W), the station located closest to the project, indicate a mean annual temperature of 4.8°C with extremes ranging from -35.6°C to 37.4°C. Measurable precipitation per year is approximately 1110.1 mm. Extreme daily precipitation of up to 96.3 mm has been recorded (Environment Canada, 2015a). Based on wind-rose diagrams generated for the Lamèque area, the wind is generally from the south or west (météoblue.com, nd).

No industrial sources of air emissions are located in proximity of the project site; however, there are a number of industrial peat bog harvesting operations, which can create fine particulate matter emissions on dry, windy days. The nearest peat bog operation is approximately 3km north east of the project site, and another is located approximately 7km southwest of the site. Sources of VOCs and GHGs are primarily attributed to internal combustion engines in vehicles and fishing vessels.

The Department of Environment and Local Government responded to complaints of sulphurous odours in Lamèque in 2002, and continued summer monitoring through the summer of 2005. The mobile monitoring unit identified exceedances of Total Reduced Sulphur (TRS) (as equivalent Hydrogen Sulphide (H₂S)). These elevated parameters were correlated with low tides and decaying seaweed, and were worse in July and August each year. No other parameters exceeded air

quality limits, with the exception of two transboundary events in 2005. The 2005 monitoring showed lower levels of TRS and monitoring was discontinued (NBDELG, 2004a, 2004b, 2006, 2007).

Given the lack of industrial emitters in the region, the distance from the site of the nearest peat bog operations, and the results of the 2002-2005 Special Air Quality study(s), the ambient air quality at the site is considered typical of a coastal environment (very good air quality).

Biological Environment

The PDA consists mainly of a marine aquatic environment dominated by aquatic and avian species. The Gulf of St. Lawrence and waters that feed into it are considered highly productive. Rainbow smelt (*Osmerus mordax*) and alewife (i.e., gaspereau) (*Alosa pseudoharengus*) occur throughout the nearshore marine environment of the Acadian Peninsula, with smelt traps common to bays, including within a few kilometres of the project location. Areas associated with American eel (*Anguilla rostrata*) are located within 5 kilometres (km) of the wharf. Soft-shell clams can be found near Le Goulet Harbour, while razor clams and bar clams (*Spisula solidissima*) are present in patches throughout nearshore waters. Blue mussels (*Mytilus edulis*) and American oysters (*Crassostrea virginica*) are also common within the bays of the Acadian Peninsula.

Atlantic mackerel (*Scomber scombrus*), dogfish (*Squalus acanthias*), and Atlantic herring (*Clupea harengus*) are noted as occurring within the inshore marine environment, particularly south of the project location. Atlantic lobster (*Homarus americanus*) and rock crab (*Cancer irroratus*) are prevalent in the waters of the Gulf of St. Lawrence. Northern whelk (*Buccinum undatum*) and short-finned squid (*Illex illecebrosus*) are noted within 5 km of the project location on the southeastern shore. Sea urchins (*Strongylocentrotus droebachiensis*) are noted approximately 5 km offshore to the southeast of the project location.

Species fished commercially from the Le Goulet SCH include rock crab, lobster, herring, groundfish, and mackerel. Atlantic salmon (*Salmo salar*), anadromous brook trout (*Salvelinus fontinalis*), striped bass (*Morone saxatilis*) and Atlantic tomcod (*Microgadus tomcod*) are noted as not being fished recreationally within the project site, however these species are likely to occur in the area.

Harbour seals (*Phoca vitulina*) are also common along the coast of the Acadian Peninsula and whales are present in deeper water greater than 5 km to the southeast of the project site.

An underwater benthic habitat survey (UBHS) was undertaken at several sites located along the shores of the Town of Le Goulet, the Le Goulet SCH, and the Shippagan Bay side of the Chiasson Barrier Spit. The program also included a commercial, recreational, and Aboriginal (CRA) fisheries assessment. Floral species of red algae, sea lettuce (*Ulva lactuca*), Fucus sp., and beds of eelgrass (*Zostera marina*) were noted at the Chiasson Barrier Spit survey site. This survey site was also noted as having the most diverse and abundant macrofauna compared to the other sites surveyed. Observations included frequent observations of shrimp (*Mysid* sp., *Crangon* sp., and *Pandulus* sp.); crustaceans including rock crab (*Cancer irroratus*) and hermit crab (*Pagurus* sp.); gastropods including periwinkles (*Littorina* sp.) and slipper snails (*Crepidula* sp.); as well as unidentified juvenile or larvae fish. In addition, sandlances (*Ammodytes* sp.) and a northern cerianthid (*Cerianthus borealis*) were observed. Encrusting invertebrates (colonial bryozoans) were observed growing epiphytically on eelgrass (CBCL, 2016). A UBHS (likely consisting of underwater surveys along a mix of transects and spot dives) will be undertaken in the Spring of 2018 to further characterize the proposed dredge material placement sites at DS1 and DS2. Results of this program will be submitted to NBDELG for review upon completion.

In terms of the Chiasson Office Spit, limited terrestrial wildlife is anticipated to inhabit this area, however the site is anticipated to provide foraging, breeding, and nesting habitat for a variety of bird species. The Maritime Breeding Bird Atlas identifies a total of 89 species of birds in the geographical block which contains Le Goulet Harbour (20LT78), 19 of which are listed as confirmed for breeding (Bird Studies Canada, 2015).

Domitien Road is anticipated to contain habitat for common small and medium terrestrial wildlife. It should be noted that DFO-SCH intends to contract a qualified biologist to conduct a pedestrian survey of the PDA in 2018 (see Surface Water-Wetlands sub-section below), and the results will be submitted to the NBDELG upon completion of their site visit and report.

Surface Water (Wetlands and Watercourses):

The area surrounding the Le Goulet DFO-SCH facility consists of many coastal and freshwater, regulated wetlands along the coastal region, and peat bogs further inland. Coastal wetlands are generally considered Provincially Significant Wetlands (PSWs) by the Province of New Brunswick due to their unique habitat environments and functions. The area west of the DFO-SCH consists of coastal PSWs within the intertidal zone almost 100% dominated by saltmarsh cordgrass (*Spartina alterniflora*). Other species present include sea-side lavender (*Limonium nashi*), glasswort (*Salicornia europaea*),

and sea milkwort (*Glaux maritima*) (AMEC, 2013), as well as salt-meadow cordgrass (*Spartina patens*), beach grass (*Ammophila brevilligulata*), black grass (*Juncus gerardii*), sea lyme grass (*Leymus mollis*), sea-milkwort, and beach-pea (*Lathyrus japonicus*) (Boreal Environmental, 2016 found in: GHD Limited, 2016).

Overall, coastal wetlands are considered high-functioning, unique environments which often contain flora and fauna species of conservation concern. The Chiasson Spit located to the east of the Gully is a peninsula consisting of a dunes dominated by beachgrass and a series of smaller PSWs dominated by salt-meadow cordgrass and black grass. These wetlands have been altered (and are being altered) by natural erosion processes, as well as by human activities. An existing trail (extension of Domitien Lane) within the Spit is used as a service road for a lighthouse; however it is heavily used by recreational vehicles which have damaged dune vegetation throughout the area. The trail is narrow (2 to 3m), undulating and has several sharp turns along its length. In addition, half of the trail length consists of uncompacted sand. GeoNB has identified several PSWs in the immediate vicinity of the existing trail. Limited ground-truthing of these wetlands identified three coastal wetlands along the trail which have also been heavily disturbed by recreational vehicle use but do not coincide with the GeoNB wetland inventory boundaries. Another trail was observed along the beach which appears to be occasionally used to access utility poles that service the lighthouse (Boreal Environmental, 2016 found in: GHD Limited, 2016).

Although this wetland presence/absence survey completed in 2016 confirmed the presence of PSWs with the project footprint, a more detailed survey (consisting of delineation and functional assessment) will be completed in order to facilitate the road construction portion of the proposed project. This survey will further confirm ('ground-truth') the GeoNB provincial wetland layer, and inform the final design and footprint of the proposed road.

The Upland portion of the project footprint consists of a private road, Domitien Lane, which bisects a regulated (freshwater) wetland. A detailed vegetation survey will be completed as part of the road upgrades/construction portion of the project; however, initial site observations show typical wetland vegetation, including speckled alder (*Alnus incana*), black spruce (*Picea mariana*), tamarack (*Larix laricina*), willow (*Salix* sp.), as well as species of sedge and grasses.

Based on GeoNB's hydrographic network mapping and confirmed by site observations, no freshwater watercourses (i.e. streams, ponds, lakes) are located within the project footprint, or will be adversely impacted by the project.

Groundwater:

A search of well logs within a 1km radius of the PDA on the NBDELG Online Well Log System (OWLS) generated six (6) returned well logs for domestic drinking water. Wells in the area source their potable water from a fractured sandstone bedrock aquifer. Well depths vary between 5.79 and 12.5 metres. The driller's estimated safe yields range between 31.85 and 68.25 Lpm (7 to 15 lpm). A review of associated water quality results indicate that general chemistry, trace metals and microbiological parameters meet Canadian Drinking Water Quality Guidelines and NB Drinking Water Guidelines with the exception of the following:

- Chloride in 3 wells (concentration range from 281 to 641 mg/L);
- Iron in 1 well (concentration of 0.518 mg/L)
- Manganese in 1 well (concentration of 0.098 mg/L);
- Sodium in 2 wells (concentrations of 313 and 346 mg/L);
- Selenium in 1 well (concentration of 13.6 ug/L);
- Total coliforms present in 2 wells;
- Turbidity in one well (concentration of 5.99 NTU).

Species at Risk (Aquatic and Terrestrial):

A search of the Atlantic Canada Conservation Data Centre (ACCDC) database was conducted through the PSPC Species at Risk Information System (SARIS). The search provided a list of rare/unique species (i.e. plants and animals) within a 5 km buffer zone (standard ACCDC procedures) of the site of the proposed work. The SARIS report identified 83 records of rare or endangered species, including 20 invertebrates, 79 flora and 137 vertebrates (PSPC, 2018; **Appendix D**). Of the 83 records of rare or endangered species noted within the 5 km buffer zone, 18 species are listed under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the *Species at Risk Act* (SARA).

All noted species were cross-referenced with Schedule 1 of the *Species at Risk Act* (SARA) listed as Extirpated, Endangered and Threatened or Of Special Concern. The melodus subspecies of Piping Plover (*Charadrius melodus melodus*), rufa subspecies of Red Knot (*Calidris canutus rufa*), Canada Warbler (*Wilsonia canadensis*), Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Bobolink (*Dolichonyx oryzivorus*), Short-eared Owl (*Asio flammeus*), Eastern Wood-pewee (*Contopus virens*), and the Harbour Porpoise (*Phocoena phocoena*) are SARA-listed species that

were identified in the SARIS search.

The **Piping Plover** is listed on Schedule 1 of SARA and by COSEWIC as Endangered. The Piping Plover is a North American bird that breeds along the Atlantic coast, from South Carolina to Florida, and in the Caribbean (Cuba, Bahamas). Approximately 25% of Canada's piping Plovers are found in the Atlantic Provinces and they breed on the Magdalen Islands of Quebec and in New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland. Piping Plovers nest above the normal high water mark on exposed sandy or gravelly beaches. Along the Atlantic coast, they often nest in association with small cobble and other small beach debris on ocean beaches, sand spits, or barrier beaches. They also forage for food on these beaches. The most important limiting factor for Piping Plovers of the *melodus* subspecies is the loss of habitat, mostly caused by human use of beaches, and the consequent human disturbance around nesting sites. (Environment Canada, 2015b). The beach along the community of Le Goulet (south of the DFO-SCH facility) and within the Chiasson Office area (north of the DFO-SCH facility) are identified by Environment Canada as critical habitat in the *Recovery Strategy for the Piping Plover (Charadrius melodus melodus) in Canada* (Environment Canada, 2012). A discussion of the Piping Plover critical habitat in relation to the proposed project is provided in the Chiasson Barrier Spit Management Plan (**Appendix E**). A survey of biophysical attributes of critical habitat of Piping Plover will be undertaken in the Spring of 2018 along the beach of the Chiasson Barrier Spit extending northward to the proposed DS1 site following protocols recommended by CWS. The results of this work will be submitted to the NBDELG and CWS for review upon completion.

The **rufa subspecies of Red Knot** is listed on Schedule 1 of SARA and by COSEWIC as Endangered. This shorebird breeds in the Arctic tundra, and travels thousands of kilometres during migration and may use the shores of Prince Edward Island as staging areas. Preferred migration stop-overs include sandflats and sometimes mudflats in coastal zones where they can feed on intertidal invertebrates. The species also frequents saltmarshes, brackish lagoons and mussel beds. Threats to Red Knot include decreased wetland habitats, human disturbance, and the effects of climate change such as increased storm activity during migration and rising sea levels (Environment Canada, 2015b).

The **Canada Warbler** is listed as Threatened by both Schedule 1 of SARA and COSEWIC. This bird breeds primarily across much of southeastern Canada, the northeastern United States, and the Great Lakes region. The Canada Warbler is found in a variety of forest types, but mostly in wet, mixed deciduous-coniferous forest with a well-developed shrub layer. In winter, this migratory bird uses primarily mature cloud rainforests located at an elevation of 1000 to 2500 m, as well as old-growth forests, forest edges, coffee plantations, agricultural field edges and semi-open areas (Environment Canada, 2015b). The proposed project development area does not contain Canada Warbler breeding/nesting habitat.

The **Bank Swallow** is listed by both Schedule 1 of SARA and COSEWIC as a Threatened Species. Per the SARA public registry: "*The Bank swallow is a small insectivorous songbird with brown underparts and a distinctive dark breast band. It is distinguishable in flight from other swallows by its quick, erratic wing beats and almost constant buzzy, chattering vocalizations. The species is highly social at all times of year and is conspicuous at colonial breeding sites where it excavates nesting burrows in eroding vertical banks. The Bank swallow breeds in a wide variety of natural and artificial sites with vertical banks, including river banks, lake and ocean bluffs, aggregate pits, road cuts, and stock piles of soil. Sand-silt substrates are preferred for excavating nest burrows. Breeding sites tend to be somewhat ephemeral due to the dynamic nature of bank erosion. Breeding sites are often situated near open terrestrial habitat used for aerial foraging (e.g., grasslands, meadows, pastures, and agricultural cropland). Large wetlands are used as communal nocturnal roost sites during post-breeding, migration and wintering periods.*" (Environment Canada, 2017). The proposed project development area does not contain Bank Swallow breeding or nesting habitat. The biologist contracted to perform the Piping Plover critical habitat biophysical attributes survey will also be engaged to survey the project areas for habitat associated with Bank Swallows.

The **Barn Swallow** is listed by both Schedule 1 of SARA and COSEWIC as a Threatened species. Per the SARA public registry: "*This is one of the world's most widespread and common landbird species. However, like many other species of birds that specialize on a diet of flying insects, this species has experienced very large declines that began somewhat inexplicably in the mid to late 1980s in Canada. Its Canadian distribution and abundance may still be greater than prior to European settlement, owing to the species' ability to adapt to nesting in a variety of artificial structures (barns, bridges, etc.) and to exploit foraging opportunities in open, human-modified, rural landscapes. While there have been losses in the amount of some important types of artificial nest sites (e.g., open barns) and in the amount of foraging habitat in open agricultural areas in some parts of Canada, the causes of the recent population decline are not well understood. The magnitude and geographic extent of the decline are cause for conservation concern.*" (COSEWIC, 2011). The proposed project development area does not contain Barn Swallow breeding or nesting habitat.

The **Bobolink** is listed by both Schedule 1 of COSEWIC and SARA as Threatened. Per the SARA public registry description: "*The Bobolink is a semi-colonial species that is often polygamous, depending on the region and habitat conditions. The first adults arrive from their wintering grounds in mid-May. The Bobolink originally nested in the tall-grass*

prairie of the mid-western U.S. and south central Canada. Most of this prairie was converted to agricultural land over a century ago, and at the same time the forests of eastern North America were cleared to hayfields and meadows that provided habitat for the birds. Since the conversion of the prairie to cropland and the clearing of the eastern forests, the Bobolink has nested in forage crops (e.g., hayfields and pastures dominated by a variety of species, such as clover, Timothy, Kentucky Bluegrass, and broadleaved plants). The Bobolink also occurs in various grassland habitats including wet prairie, graminoid peatlands and abandoned fields dominated by tall grasses, remnants of uncultivated virgin prairie (tall-grass prairie), no-till cropland, small-grain fields, restored surface mining sites and irrigated fields in arid regions. It is generally not abundant in short-grass prairie, Alfalfa fields, or in row crop monocultures (e.g., corn, soybean, wheat), although its use of Alfalfa may vary with region (Environment Canada, 2017). The proposed PDA may contain Bobolink breeding/nesting habitat.

The **Short-eared Owl** is listed by both Schedule 1 of SARA and COSEWIC as a species of Special Concern. The Short-eared Owl breeds in all of Canada's provinces and territories, but is most frequently found in the Prairie provinces of Alberta, Saskatchewan and Manitoba as well as along the Arctic coast. It generally heads southward in the winter and is found in open habitats along the extreme southern coast of British Columbia and in southern Ontario. It is also occasionally seen in coastal areas of Atlantic Canada or in the Prairie provinces, where the number of wintering individuals fluctuates significantly from one year to the next. This species of owl makes use of a wide variety of open habitats, including arctic tundra, grasslands, peat bogs, marshes, sand-sage concentrations and old pastures. It also occasionally breeds in agricultural fields. Preferred nesting sites are in dense grasslands, as well as tundra with areas of small willows (Environment Canada, 2015b). The proposed project development area does not contain Short-eared Owl breeding/nesting habitat.

Sensitive Environmental Areas:

As previously noted, the area surrounding the Le Goulet DFO-SCH facility consists of many coastal and freshwater, regulated wetlands along the coastal region, as well as peat bogs further inland. Due to their unique habitat environments and functions, wetlands can also be considered sensitive environmental areas. Refer to the Surface Water subsection above for further descriptions on these areas in relation to the PDA. Also **Figure 8 of Appendix A** provides an overview of the project location in relation nearby sensitive areas and features.

A search of the ACCDC database yielded no records of sensitive environmental areas within 5 km of the Le Goulet Harbour (PSPC, 2018). The nearest Important Bird Area (IBA) identified by IBA Canada is located approximately 5 km southwest of the project site and consists of the Beaches of Pokemouche and Grand Passage IBA.

The following Environmentally Significant Areas (ESAs) designated by the Nature Trust of New Brunswick (NTNB) (2005) are noted in proximity to the proposed project:

- **Le Goulet Cattail Marsh/École la Vague ESA** runs along the shore adjacent to Le Goulet (between Shippagan Beach and Baie de Petit Pokemouche) and consists of a coastal brackish marsh that supports a high diversity of bird life, very close to human settlement. This area is noted to be used by Piping Plovers and is thought to be used for feeding as the habitat is not ideal for nesting (NTNB, 2005).

This ESA is approximately 1km southwest of the project site and is not anticipated to be impacted by the proposed project.

- **Pointe-Sauvage Marsh (Burns Island) ESA** is located adjacent to the Le Goulet DFO-SCH and is characterized by NTNB as 100% high marsh with numerous shallow pannes and low primary productivity (Class II salt marsh). The Northern blue butterfly (*Plebejus idas*) has been noted by the NTNB to occur within an elevated bog west of the main road, however this species was not noted in the ACCDC database search conducted. The area around the wharf is used by roosting gulls, cormorants and some shorebirds, while the marsh on the lagoon side of Shippagan Beach to Pointe-Sauvage is used by several species of ducks, migratory shorebirds and herons (NTNB, 2005).

This ESA is immediately adjacent of the DFO-SCH facility, but is not anticipated to be impacted by the proposed project.

- **Chiasson Office Beach (ESA 185)** is located south of Chiasson, at Shippagan Harbour. A sandy beach with a series of older dunes; the beach is a nesting site for Piping Plover (2 pair in 1993; 1 pair in 1994). In some years no pairs nest, but there has generally been one pair over several years prior to 2005 (NTNB, 2005).

This site is immediately northeast of the DFO-SCH facility, across the navigation channel, and is a proposed disposal site for appropriate material dredged from the navigation channel. Refer to **Appendix C** for additional information on the proposed beach nourishment alternatives.

Socio-Economic Environment

The Le Goulet DFO-SCH is located along the northeastern shore of New Brunswick in Gloucester County. The Harbour is directly accessible from Rue du Havre off of Rue Pointe Sauvage and NB Route 133 in the village of Le Goulet, New Brunswick.

The LeGoulet DFO-SCH is located on two (2) federal water lots, identified by SNB parcel identification numbers 20725750 and 20725768, a total area of approximately 24 hectares. All built infrastructure, including roads, parking areas, wharves, cribs, seawalls and docks are a combined footprint of approximately 6 ha. The centre of the wharf is located at latitude 47°43'07.67"N and longitude -64°40'12.32".

The Harbour Authority, through a lease agreement with DFO-SCH, manages the property and facilities. The structures occupying the site include a western training wall/wharf/rock protection structure, eastern rubblemound training wall, two floating wharves within the harbour basin, a concrete haul-out ramp, a parking/service area, a fenced upland storage area, various buildings including bait/storage sheds, an ice house, Harbour Authority office, and two former fish processing plants. Fuel and waste oil aboveground storage tanks (ASTs) are located in a gravel and grassed area to the southwest of the boat ramp.

The Le Goulet DFO-SCH currently accommodates a home fleet of approximately 60 full-time commercial fishing vessels and 10 to 15 recreational vessels (P.A. Mallet, pers. comm., 2017). According to the Harbour Authority, the following fisheries operated out of the harbour:

- Snow Crab – harvested between April and July.
- Lobster – harvested between May and June.
- Herring – harvested from the end of August until the quota is reached.
- Rock Crab – harvested between the months of September to October.
- Groundfish – harvested at the end of July.
- Mackerel – harvested in the month of August.

There are two fish processing plants located near the wharf; however these are not currently in operation (P.A. Mallet, pers. comm., 2017). There are also currently no lobster holding facilities located near the wharf (P.A. Mallet, pers. comm., 2017).

There are two aquaculture lease sites situated within Shippagan Bay near the channel (New Brunswick Department of Agriculture, Aquaculture and Fisheries, 2017). Discussion with the owner/operator of one of the aquaculture lease sites located near the project site (MS 1049 – PID no. 20776639) indicated that the site will not be active in the fall and winter months (Mrs. C. Mallet, pers. comm., 2018). Vessels associated with one of the oyster aquaculture operations within Shippagan Bay utilize the Le Goulet harbour facilities (P.A. Mallet, pers. comm., 2017). Further consultations will be undertaken with the lease holders for the two aquaculture sites nearest to the project site (i.e., MS-1049 and MS-1210) to discuss project timing and potential interaction/impact on these sites.

According to the Le Goulet Harbour Authority, there are Aboriginal fishers from the Esgenoôpetitj (Burnt Church) First Nation and Elsipogtog First Nation who fish snow crab (April to July) for commercial purposes from the Harbour. However, there are no Aboriginal fisheries for food, social, or ceremonial purposes known to be occurring at the Harbour according to the Le Goulet Harbour Authority and the DFO Aboriginal Program Area Coordinator (P.A. Mallet, pers. comm., 2017; G. Moore, pers. comm., 2016).

The land in the immediate vicinity of the Harbour has been developed to serve the general fishing industry. The nearest residential property is located over 1 km from the harbour.

Archaeological and Heritage Resources:

Lands adjacent to the coastlines in the Maritimes tend to have high archaeological potential given their historic importance and proximity to transportation routes and fishing resources. The shoreline around and including Le Goulet is considered high potential for heritage and archaeological resources, however the nearest registered archaeological sites (CkDe-8, CkDe-14, and CkDe-15) are located east of Pointe-Sauvage, approximately 1 km north of the project site (New Brunswick Department of Tourism, Heritage and Culture, 2013).

The Shippagan Gully Tower (or Lighthouse), a Recognized Federal Heritage Building, is located on Chiasson Barrier Spit at the entrance to Shippagan Gully. The Tower was constructed in 1905 and listed on the Register in 2008 (Parks Canada, 2018).

In addition to this, a small fishing wharf and associated buildings were situated in the bay-ward side of Barrier Spit as early as 1882. No remnants of the wharf or buildings are visible at present.

Land Use:

The project development area is a coastal channel and barrier spit located approximately 4.3 kilometres from the nearest municipality (Shippagan). Five (5) seasonal dwellings are accessed via Domitien Lane and are adjacent to the coastline at the proposed DS2 site. The inner Bay beach of the Chiasson Barrier Spit is used for kite surfing by a local private tourism company. Chiasson Road, which will be used to access the site, contains approximately 100+ full-time and seasonal dwellings, as well as a large-scale commercial peat harvesting operation.

According to the Lamèque and Miscou Islands Unincorporated Areas Zoning Map (Commission d'aménagement de la Péninsule acadienne, 1997), the PDA is zoned C-Coastal (Barrier Spit from the Shippagan Gully to Chiasson Road), and Mixed – M1 (residential, industrial, commercial along Chiasson Road). The proposed project is a permitted activity within these zones.

Properties within the PDA are owned by the federal or provincial Crowns, with the exception of three (3) parcels owned by Ducks Unlimited Canada and the private enterprise noted above.

A search of the SNB Land Gazette resulted in no environmental flags for the properties within the PDA.

In general, the proposed project is not anticipated to adversely impact neighbouring lands or land uses. The above-noted landowners have been advised of the proposed project and have provided approval to proceed. DU Canada supports the beach nourishment at DS1, the rehabilitation/creation of coastal wetlands at DS2, and the restricted access that the project will create; and the private kite-surfing enterprise supports the creation of a larger, wider launching area at DS2 and road improvements.

21. Scope of Effects Considered (section 5(1) and 5(2)):

Evaluation of Environmental Effects

Table 1 of Appendix F provides a matrix of potential project/environmental interactions. The assessment is based on:

- information provided by the proponent;
- a review of project related activities;
- an appraisal of the environmental setting, and identification of resources at risk;
- the identification of potential impacts within the temporal and spatial bounds; and
- personal knowledge and professional judgment of the assessor.

Methodology:

The environmental effects evaluation methodology used in this report focuses the evaluation on those environmental components of greatest concern. The VECs most likely to be affected by the project as described are presented and discussed in **Tables 2.1 to 2.14 of Appendix F**. VECs were selected based on ecological importance to the existing environment (Section 20), the relative sensitivity of environmental components to project influences, and their relative social, cultural or economic importance. The potential impacts resulting from these interactions are summarized in Section 22 while Section 23 summarizes the required mitigation associated with the physical works/activities for the proposed project.

Scoping:

This environmental effects evaluation considers the full range of project / environment interactions and the environmental factors that could be affected by the project as defined above and the significance of related impacts with mitigation.

Determination of Significance:

The significance of project related impacts was determined in consideration of their frequency, the duration and geographical extent of the effects, magnitude relative to natural or background levels, and whether the effects are reversible or are positive or negative in nature. These criteria are defined below:

Magnitude	Magnitude, in general terms, may vary among Issues, but is a factor that accounts for size, intensity, concentration, importance, volume and social or monetary value. It is rated as compared with background conditions, protective standards or normal variability.	
	Small	Relative to natural or background levels
	Moderate	Relative to natural or background levels
	Large	Relative to natural or background levels
Reversibility	Reversible	Effect can be reversed
	Irreversible	Effects are permanent
Geographic Extent	Immediate	Confined to project site
	Local	Effects beyond immediate project site but not regional in scale
	Regional	Effects on a wide scale
Duration	Short Term	Between 0 and 6 months in duration
	Medium Term	Between 6 months and 2 years
	Long Term	Beyond 2 years
Frequency	Once	Occurs only once
	Intermittent	Occurs occasionally at irregular intervals
	Continuous	Occurs on a regular basis and regular intervals

22. Summary of Environmental Effects of the Project:

Potential Project/Environment Interactions and their effects are outlined in **Tables 2.1 to 2.14 of Appendix F** and summarized below. The effects are described for each project phase.

Shippagan Gully Dredging and Breakwater Construction:

- Impacts to/direct loss of marine fish habitat from access road construction, breakwater construction, dredging, and dredge material placement activities.
- Loss or alteration of habitat (including critical) from access road construction, breakwater construction, dredging, and dredge material placement activities.
- Disruption of fish migrations during dredging activities and site usage at DS1 and DS2.
- Potential for suspended solids/sediments and turbidity during construction, dredging, and placement activities affecting fish/fish habitat.
- Potential for introduction of invasive species into the marine environment during Phase B dredging activities.
- Contamination of marine water quality and/or existing habitats from an accidental release/spill of hazardous material.
- Potential disturbance aquatic and terrestrial species (including species at risk) from equipment operation and elevated noise levels.
- Potential project related elevated noise levels may cause a disruption to/displacement of nesting birds/habitat or migration.
- Construction equipment and disposal of dredge material may destroy nests or eggs.
- Potential to enhance populations of avian and mammalian predators or scavengers in the project area resulting in a disturbance to migratory birds (e.g., predation on eggs and chicks).
- Accidental release/spill of hazardous material into the marine environment may impact shorebird and waterfowl species.
- Interference with vessel movement/ navigation within the Gully impeding access to commercial/recreational fishing grounds and SCHs.
- Buried heritage/archaeological resources may be disturbed or destroyed by dredging and construction activities.
- Potential adverse impacts to the existing Shippagan Gully Tower lighthouse during construction.
- Placement of dredged materials at DS1 may result in physical changes to the beach along the Barrier Spit.

- Placement of dredged materials and reshaping of the inside area of the Barrier Spit may prevent seawater from accessing the coastal wetlands (PSWs).
- Dredging of the Gully may will result in physical changes (i.e., shape and velocities) that interfere with natural coastal processes.
- Construction of a breakwater will result in interference with natural coastal processes
- Activities may result in construction-related debris or toxic materials affecting marine, surface, and/or groundwater quality and/or soil/marine sediments.
- Accidental releases/spills of petroleum products during construction or dredging may contaminate soils/marine sediments.
- Construction and mobilization of equipment will cause increased levels of greenhouse gas emissions, VOCs and particulate matter from diesel combustion.
- Particulate matter (dust) levels will be higher during dry, windy periods of construction.
- Noise and dust generated as a result of the construction activities and transport of equipment/materials may cause a disruption to adjacent land-owners (especially those along Chiasson Road).
- Disruption to/permanent loss of Regulated and/or PSW wetland areas from the construction of the access road and placement of material at DS2.
- Impacts to PSWs from the construction of the new access road, which may obstruct saltwater from reaching the Barrier Spit;
- The project may result in physical changes to critical (and secondary) Piping Plover habitat and Chiasson Office Beach ESA.
- The viewscape of the Shippagan Bay will be temporarily altered due to the presence of large and medium-sized heavy equipment working (and stored) on the Barrier Spit and within the channel.
- The viewscape of the Shippagan Bay will be permanently altered due to the proposed placement of dredge materials and shaping of DS2.
- The project may impede neighbouring landowner's ability to use and enjoy their property(ies).
- Dredging of the channel may impede some vessels from traveling through the channel to access the Gulf.
- Having floating dredging equipment and private vessels (commercial, recreational) in the channel, where the navigable channel is narrow and swift) may create collisions/near-collisions.
- Degradation of transportation infrastructure from mobilization of heavy equipment and import of heavy rock materials.
- Members of the general public and contractors involved in the implementation of the project may be exposed to workplace hazards, both on land and in the Bay/channel.

Operation / Maintenance:

Maintenance of the channel through dredging and/or infrastructure upgrades will be conducted on an as-needed basis and will undergo environmental and legislative review as future stand-alone projects as necessary.

Decommissioning / Abandonment:

There is currently no plan to decommission or abandon the Shippagan Gully. The very nature of the proposed project is intended to ensure the viability and safety of the channel for marine transportation. The land along the spit is intended to be maintained by the Federal Crown following restoration efforts. Access is intended to be restricted to ensure the long-term effects of restoration efforts in this area.

Navigation Consideration:

Environmental effects of the project on navigation are taken into consideration as part of the Project Effects Determination (PED) only when the effects are indirect, i.e. resulting from a change in the environment affecting navigation. Direct effects on navigation are not considered in the PED, but any measures necessary to mitigate direct effects will be included as terms and conditions associated work approved or permitted pursuant to the *Navigation Protection Act*.

23. Summary of Mitigation Measures for Project:

Measures to be implemented to mitigate negative effects from potential project/environmental interactions are presented in **Tables 2.1 to 2.14 of Appendix F** and summarized below.

General:

- Weather conditions are to be assessed on a daily basis to determine the potential risk of weather on the project. Work is to be scheduled to avoid periods of heavy precipitation and to prevent erosion and release of sediment and/or sediment-laden water during the construction phase.
- All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. Hoses and tanks are to be inspected on a regular basis to prevent fractures and breaks.
- Fuel storage will be at least 30m away from any surface water, drainage feature or the coastal environment.
- Fuel storage and refueling of equipment will take place on a flat, level and impermeable surface and utilizing a spill tray.
- Onsite crews must have emergency spill clean-up equipment, adequate for the activity involved, on-site. Spill equipment will include, as a minimum, at least one 250L (i.e., 55 gallon) overpak spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags.
- All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633).
- Activities must be completed in such a way as to minimize the amount of fines and organic debris that may enter nearby aquatic environments.
- Any construction debris/material that enters the marine environment will be removed immediately.
- Construction debris and waste materials will be disposed of in accordance with Provincial Waste Management Regulations.

Fish / Fish Habitat, Sensitive Features, Water and Soil / Sediment Quality:

- A Request for Review will be submitted to DFO-FPP. The project will adhere to mitigation measures proposed by DFO-FPP in a letter of Advice. If a Paragraph 35(2)(b) Fisheries Act Authorization is deemed required, measures proposed by DFO-SCH and accepted by DFO-FPP to offset serious harm to fish must be adhered to.
- Visual monitoring of the turbidity will be required on a daily basis in the vicinity of the project to ensure that the turbidity is limited. If excessive change occurs in the turbidity that differs from the existing conditions of the surrounding water body (i.e., distinct colour difference) as a result of the project activities, the work must stop immediately to determine if further mitigation measures are required.
- Heavy machinery will not be allowed in the water. Machinery shall be operated on land above the high water mark, in a manner that minimizes disturbance to the banks and bed of the waterbody.
- Marine equipment may be inspected by PSPC or DFO to ensure invasive species are not introduced to the marine environment.
- Dredging will be conducted at such times to avoid critical spawning seasons. Dredging activities will cease if unexpected fish spawning/migrations are found in the area.
- All construction equipment that may come into contact with coastal waters or features during the work must be cleaned, washed with freshwater, and/or sprayed with undiluted vinegar prior to being mobilized to the project site to ensure it is free of any sediments, plant growth and aquatic invasive species. Equipment includes vessels, barges, cranes, excavators, transport trucks, pumps, pipelines, and any tools or various apparatus used previously in a waterbody. Cleaning and washing of equipment is to be performed prior to being mobilized to the project site, immediately upon their arrival at the site and before use in or over the waterbody.
- If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, ensure that appropriately-sized, clean rock is used; and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.
- Rocks will be placed on the bed of the waterbody as much as practical, rather than dropping or dumping, to limit any further encroachments and re-suspension of sediment.
- Where possible, install site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., excavation, dredging).
- Erosion and sediment controls will be visually monitored throughout the life of the project, and repaired immediately if necessary.
- All exposed soils must be stabilized as soon as possible in order to control sediment runoff during and after construction.
- Implement measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry
- If a marine mammal is identified within the vicinity of the project, work shall stop until the animal is gone.

Birds / Bird Habitat, Sensitive Features:

- The project footprint will avoid the beach and dune areas considered critical Piping Plover habitat.
- The final road alignment will be designed in a manner to avoid Piping Plover critical habitat and wetland areas.
- A qualified biologist will conduct a detailed study of the project area to identify the presence/absence of any Piping Plover critical habitat in the area.
- The location of disposal site DS1 will be outside of any critical habitat and will avoid impacting such areas.
- All work is to be conducted in accordance with the *Migratory Birds Convention Act*, which outlines that no migratory bird nests or eggs will be moved or obstructed during the construction or operational phase of the project.
- If works is to be conducted during times of migratory bird nesting season, a pre-construction nest survey will be conducted in the vicinity of the project. If active nests are identified the area will be buffered and activities in the immediate area will be minimized until nesting is complete and chicks have naturally migrated from the area.
- Concentrations of seabirds, waterfowl, or shorebirds must not be approached.
- All vessels and machinery must be well muffled at all times. Contractors should avoid any sharp or loud noises (e.g., not blow horns or whistles) and should maintain constant noise levels. If necessary, trucks may be required to avoid the use of "hammer" braking along specific sections of the route, while radio communication should replace whistle blasts and horns.
- Construction activities must be carried out during times acceptable to local authorities and smaller, less disturbing equipment will be used where possible.
- Should project activities be undertaken at night, any floodlights shall be shielded and positioned downwards as well as in the opposite direction of bird nesting habitats.
- The CWS Birds and Oil Response Plan Guidance will be followed in the event of a petroleum spill in or near the water.
- Contractors must ensure that litter/garbage (including food scraps) are not left at the work site or in coastal areas.
- No ditching in any wetland area will be permitted.
- A WAWA permit will be obtained from NBDELG for any works within 30m of a wetland or watercourse and conditions therein adhered to.
- Any permanent loss of regulated or PSWs will be compensated as per the Federal wetland conservation policy.

Coastal Processes:

- The shape of DS2 will be designed to mimic natural processes of coastal dynamics and will include dune shapes and low areas (wetland features).
- The shape and location of DS2 will ensure that the tidal connectivity between the Bay and the Barrier Spit coastal wetlands will be maintained.
- DS1 will be sited and shaped to ensure the littoral drift is maintained in the area.
- DS2 will be sited and shaped according to the results of a study commissioned by the IRZC to minimize negative impacts and optimize beneficial use of dredged material and restore coastal features with minimum impact on coastal processes.
- A Quarriable Substances Permit will be obtained from NBDERD.

Interruption of Channel Access / Navigation:

- Work shall be scheduled to avoid fishing seasons and therefore disruption of access to fishing grounds.
- The Harbour Authority of Le Goulet SCH will coordinate vessel movement during dredging and construction activities for the duration of the project so as to avoid unnecessary interference with harbour users and ensure adequate access. Any and all stipulations of federal, provincial, or municipal authorities or their officers must be strictly followed.
- Any tools, equipment, vehicles, temporary structures or parts thereof used or maintained for the purpose of building or placing a work in navigable water shall not be permitted to remain in place after the completion of the project.
- All materials and equipment used in construction must be marked in accordance with the Collision Regulations of the Canada Shipping Act 2001, when located on the waterway.
- Advise the Canadian Coast Guard, Marine Communication and Traffic Services (MCTS) at (902) 564-7751 or toll free at 1-800-686-8676 sufficiently in advance of commencement of work or when deploying or removing site markings in order to allow for appropriate Notices to Shipping/ Mariners action.
- Vessels shall be permitted safe access through the worksite at all times, and shall be assisted as necessary.
- Local fishing groups will be consulted during the final planning stages and advised of the project schedule.

- A *Navigation Protection Act* (NPA) approval is likely required for this project. The proponent will comply with all/any conditions of the NPA approval.
- All proper signage and warning lighting will be employed in the channel to warn vessels of the proposed project.
- Only licensed and qualified dredging contractors with previous, similar project experience will be used for the proposed project.

Historical, Archaeological, Paleontological, or Architectural Resources:

- All workers / contractors / staff will be advised of the high archaeological and heritage resource potential of the site;
- All construction personnel will be responsible for reporting any unusual materials unearthed during construction activities to the Construction Supervisor.
- In those situations where the find is believed to be an archaeological resource, the Construction Supervisor will immediately stop work in the vicinity of the find and notify his/her immediate supervisor and the PSPC Project Manager.
- Work in the area will be stopped immediately and an archaeological curator at the New Brunswick Department of Tourism, Culture and Heritage – Provincial Archaeological Services will be contacted at 506-453-2738.
- Work can only resume in the vicinity of the find when authorized by the PSPC Project Manager and Construction Supervisor, after approval has been granted by the New Brunswick Department of Tourism, Culture and Heritage.
- In the event of the discovery of human remains or evidence of burials, the excavation work will immediately cease and nearest law enforcement agency will be contacted immediately by the PSPC Project Manager and/or the Construction Supervisor.
- All workers / contractors / staff will be made aware of the importance of the lighthouse as a registered historic structure, and informed of the no-go 30m buffer zone surrounding the structure.

Disruption of Local Residences / Landowners / Site Usage:

- Dust suppression by the application of water must be employed when required. The project authority shall determine locations where water is to be applied, the amount of water to be applied, and the times at which it shall be applied. Waste oil must not be used for dust control under any circumstances
- Vehicles and equipment will be maintained in good working order;
- All machinery must be well muffled at all times. Contractors should avoid any sharp or loud noises (e.g., not blow horns or whistles) and should maintain constant noise levels. If necessary, trucks may be required to avoid the use of “hammer” braking along specific sections of the route, while radio communication should replace whistle blasts and horns.
- Potentially affected landowners will be informed of the project's anticipated impacts and duration.
- Excessive idling of motorized equipment/vehicles will not be permitted.
- The number of truck trips to and from the site will be minimized to the extent possible.
- Trucks will be tarped to minimize dust during transportation.
- The project is designed to ensure that the Barrier Spit and Shippagan Tower lighthouse will be preserved in the long-term;
- The proposed project will not impede the use of the beach for the neighbouring kite-surfing company.
- The project design will ensure that neighbouring landowners benefit from the completion of the project.
- Neighbouring/affected landowners will be notified and consulted on the project and timelines.

Transportation Infrastructure Usage:

- The contractor shall obtain all necessary permits (e.g., Access Permit/Certificate of Setback, Highway Usage Permit, Special Permits) and adhere to applicable legislation (e.g., Community Planning Act, Highway Act (Transfer of Administration and Control), Provincial Motor Vehicle Act) for transportation over public roadways.
- All posted speed limits will be strictly adhered to.
- Seasonal weight restrictions will be strictly adhered to.
- The number of truck trips will be limited to the minimal extent possible.
- Accidental spillage that occurs during hauling will be promptly removed from the highway following appropriate safety procedures.
- The NBDTI District Engineer will be contacted prior to initiating the project to ensure all concerns are addressed.
- The NBDTI District Engineer will be contacted immediately in the event of a road, bridge, culvert or other transportation-related issue.

24. Description of any Significant Adverse Environmental Effects of the project (after applying mitigation):

Although the potential exists for short-term environmental effects during the project, the implementation of recommended mitigation measures will result in insignificant impacts. DFO concludes that this project will not likely contribute to significant adverse environmental effects, provided that the above recommended mitigation measures are applied.

25. Other Monitoring and Compliance Requirements (e.g. Fisheries Act or Species at Risk Act requirements):

Potential monitoring and compliance requirements are to be determined and will be established through the EIA review process. DFO-SCH commits to working with appropriate regulatory agencies in the development of monitoring and compliance activities associated with the Shippagan Gully Dredging and Breakwater Construction project.

CONCLUSION

26. Conclusion on Significance of Adverse Environmental Effects:

The Federal Authority has evaluated the project in accordance with Section 67 of *Canadian Environmental Assessment Act (CEAA), 2012*. On the basis of this evaluation, the department has determined that the project is not likely to cause significant adverse environmental effects with mitigation and therefore can proceed using mitigative measures as outlined.

27. Preparation and Approval of PED Document

Prepared by: Chyann Kirby Date: Apr. 9, 2018

Name: Chyann Kirby

Title: Senior Environmental Specialist, PSPC

Prepared by: Jonathan Burt Date: Apr. 9, 2018

Name: Jonathan Burt

Title: Environmental Specialist, Roy Consultants (contract position with DFO-SCH)

Prepared by: Adrian McDonell Date: April 11, 2018

Name: Adrian McDonell

Title: Senior Environmental Advisor, DFO-SCH

Approved by: Raymond Losler Date: 2018/4/10

Name: Raymond Losler

Title: Senior Project Engineer, DFO-SCH

DECISION

28. Decision Taken

- The project is not likely to cause significant adverse environmental effects, and DFO may exercise its power, duty or function.
- The project is likely to cause significant adverse environmental effects, and DFO has decided not to exercise its power, duty or function.
- The project is likely to cause significant adverse environmental effects, and DFO will ask the Governor in Council to determine if the significant adverse environmental effects are justified in the circumstances.

Approved by: _____

Date: _____

Name: Raymond Losier

Title: Senior Project Engineer, DFO-SCH

29. Fisheries and Oceans Canada – Fisheries Protection Program

Project Title:

DFO File No.:

Fisheries Act Review Decision:

The DFO has reviewed the Project Effects Determination Report (Canadian Environmental Assessment Act (CEAA) 2012) and, in considering the implementation of mitigation measures that are included as a requirement in the DFO Section 35(2) Fisheries Act Authorization, DFO concludes the project is not likely to cause significant adverse environmental effects and, as such, DFO may exercise any power or perform any duty or function that would permit the project to be carried out in whole or in part.

Recommended by:

Title:

Signature:

Date:

Mailing Address:

Tel:

Fax:

Email:

Approved by:

Title:

Signature:

Date:

30. Transport Canada			
Project Title:			
TC File No.:			
NPP File No.:			
EED Decision:	<input type="checkbox"/> Taking into account the implementation of any mitigation measures that Transport Canada considers appropriate, the project is not likely to cause significant adverse environmental effects and, as such, Transport Canada may exercise any power or perform any duty or function that would permit the project to be carried out in whole or in part. <input type="checkbox"/> Taking into account the implementation of any mitigation measures that Transport Canada considers appropriate, the project is likely to cause significant adverse environmental effects that cannot be justified. As such, Transport Canada shall not exercise any power or perform any duty or function conferred on it by or under any Act of Parliament that would permit the project to be carried out in whole or in part, at this point in time. The project shall be referred to the Governor in Council to decide if those adverse environmental effects are justified under the circumstances pursuant to subsection 69(3) CEAA, 2012.		
Recommended by:			
Title:			
Signature:		Date:	
Mailing Address:			
Tel:		Fax:	
Email:			
Approved by:			
Title:			
Signature:		Date:	

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APPENDIX A: FIGURES

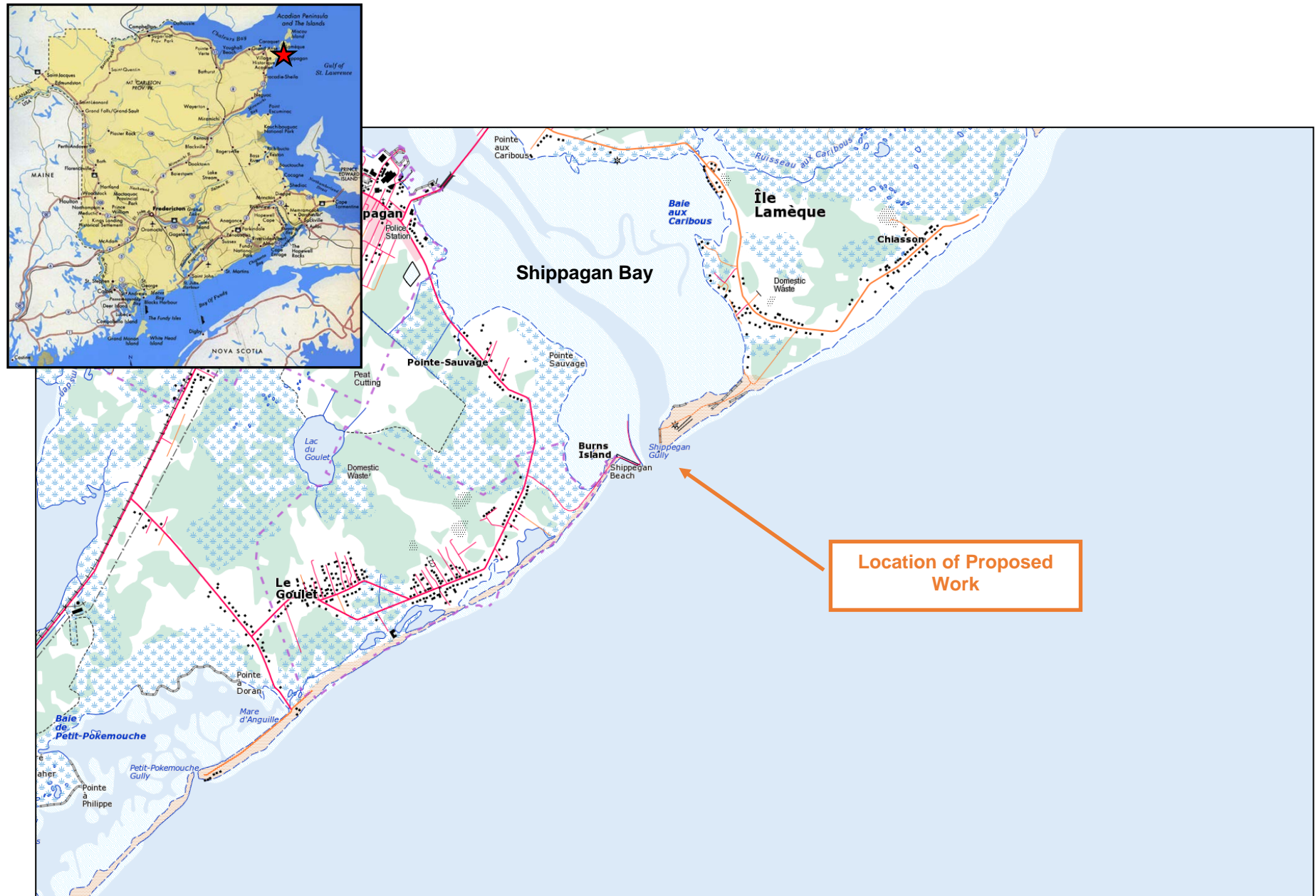


Figure 1: Topographic map indicating proposed project site, Le Goulet DFO-SCH, Shippagan Gully, Gloucester County, NB



Figure 2: Aerial photograph showing the Shippagan Gully, Le Goulet DFO-SCH, and southern portion of Chiasson Barrier Spit, Gloucester County, NB



Figure 3: Site Plan showing property boundaries within Project Area, Shippagan Gully and Chiasson Barrier Spit, Gloucester County, NB

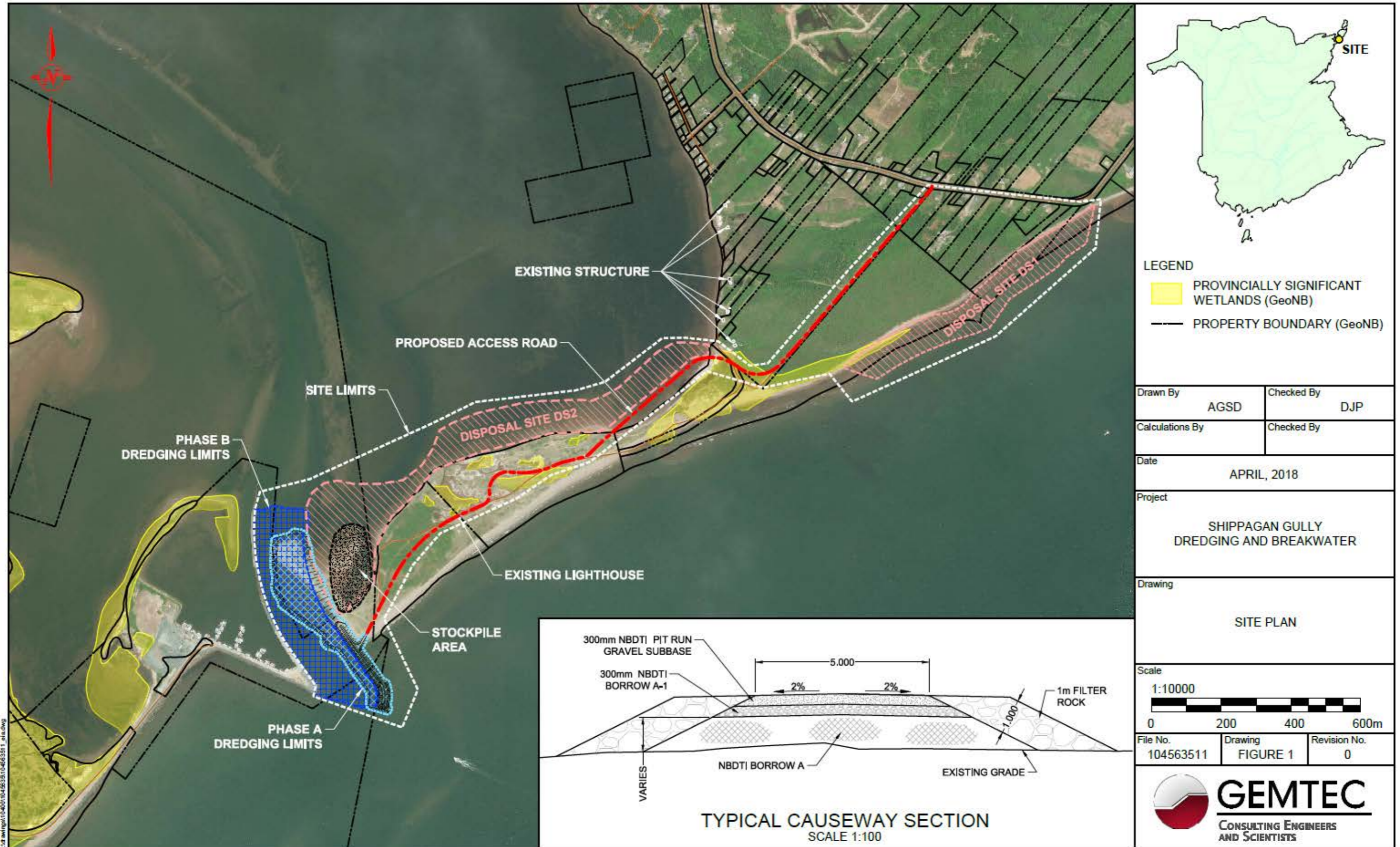
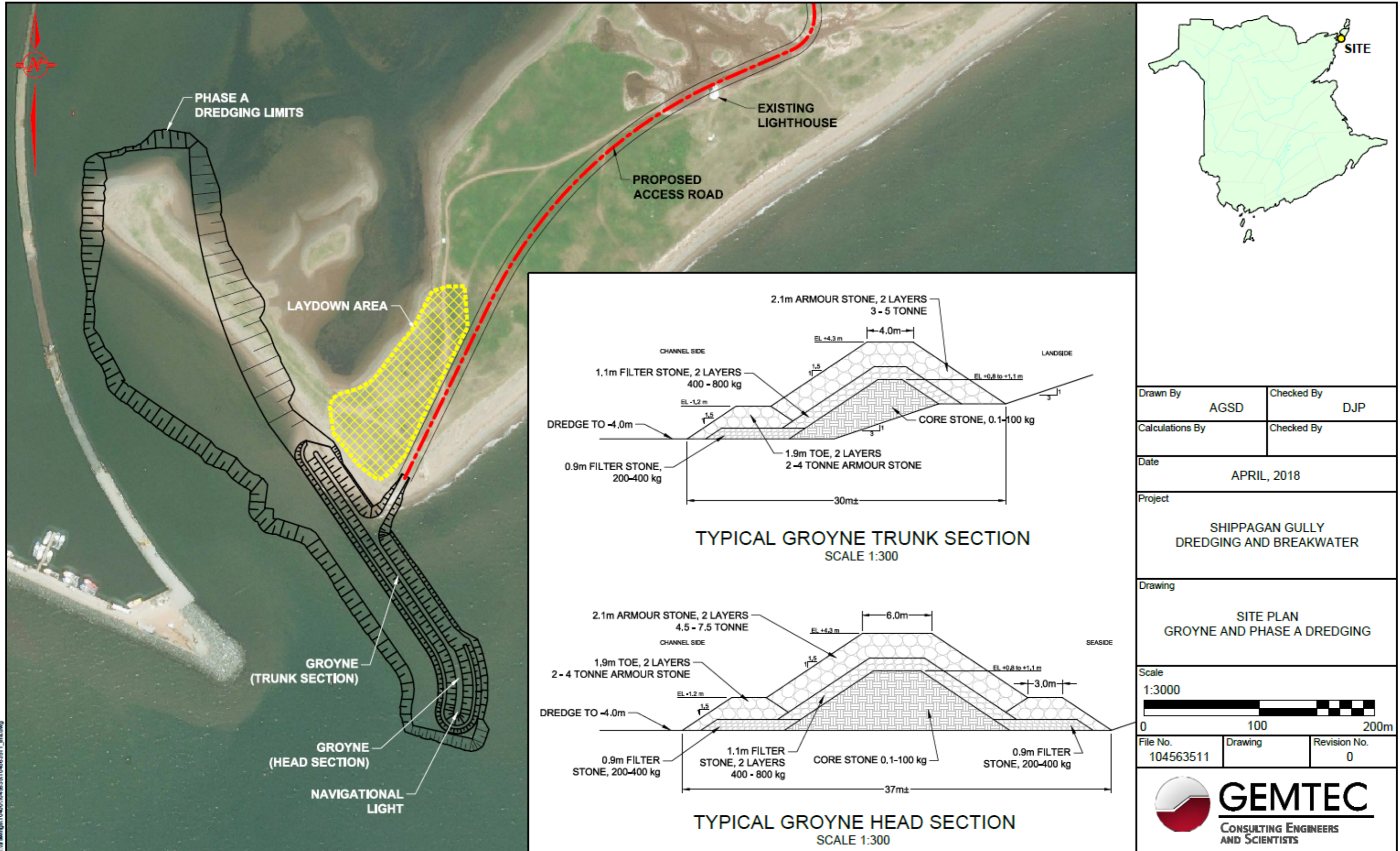


Figure 4: Site Plan showing Shippagan Gully Dredging and Breakwater Construction Project activities, Shippagan Gully and Chiasson Barrier Spit, Gloucester County, NB



Drawn By	AGSD	Checked By	DJP
Calculations By		Checked By	

Date
APRIL, 2018

Project
SHIPPAGAN GULLY DREDGING AND BREAKWATER

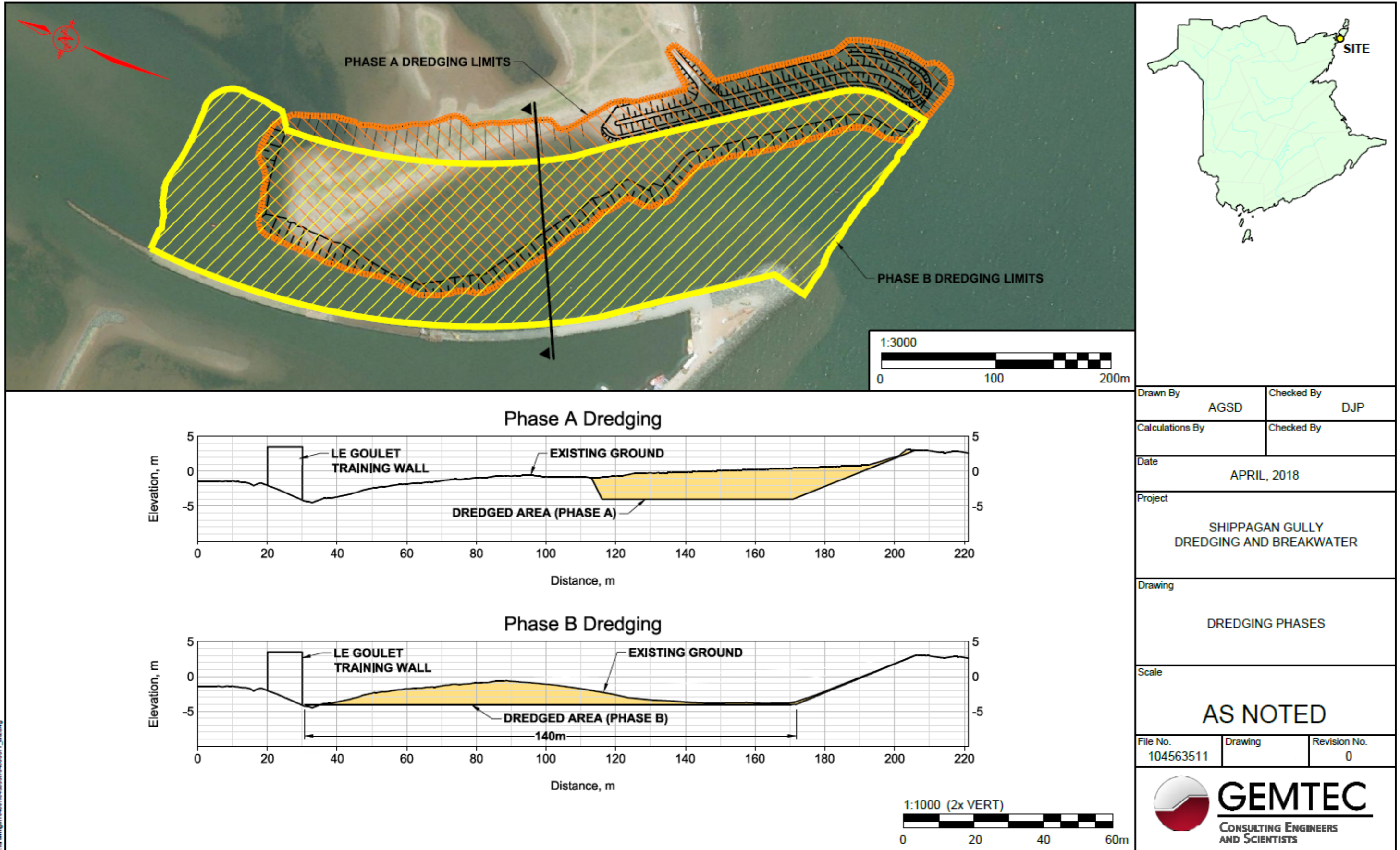
Drawing
SITE PLAN GROUYE AND PHASE A DREDGING

Scale
1:3000

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104563511		0



Figure 5: Site Plan showing breakwater construction, Shippagan Gully and Chiasson Barrier Spit, Gloucester County, NB



Drawn By	AGSD	Checked By	DJP
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Calculations By		Checked By	
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Date	APRIL, 2018
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Project	SHIPPAGAN GULLY DREDGING AND BREAKWATER
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Drawing	DREDGING PHASES
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Figure 6: Site Plan showing Phase A and B dredging activities, Shippagan Gully, Gloucester County, NB

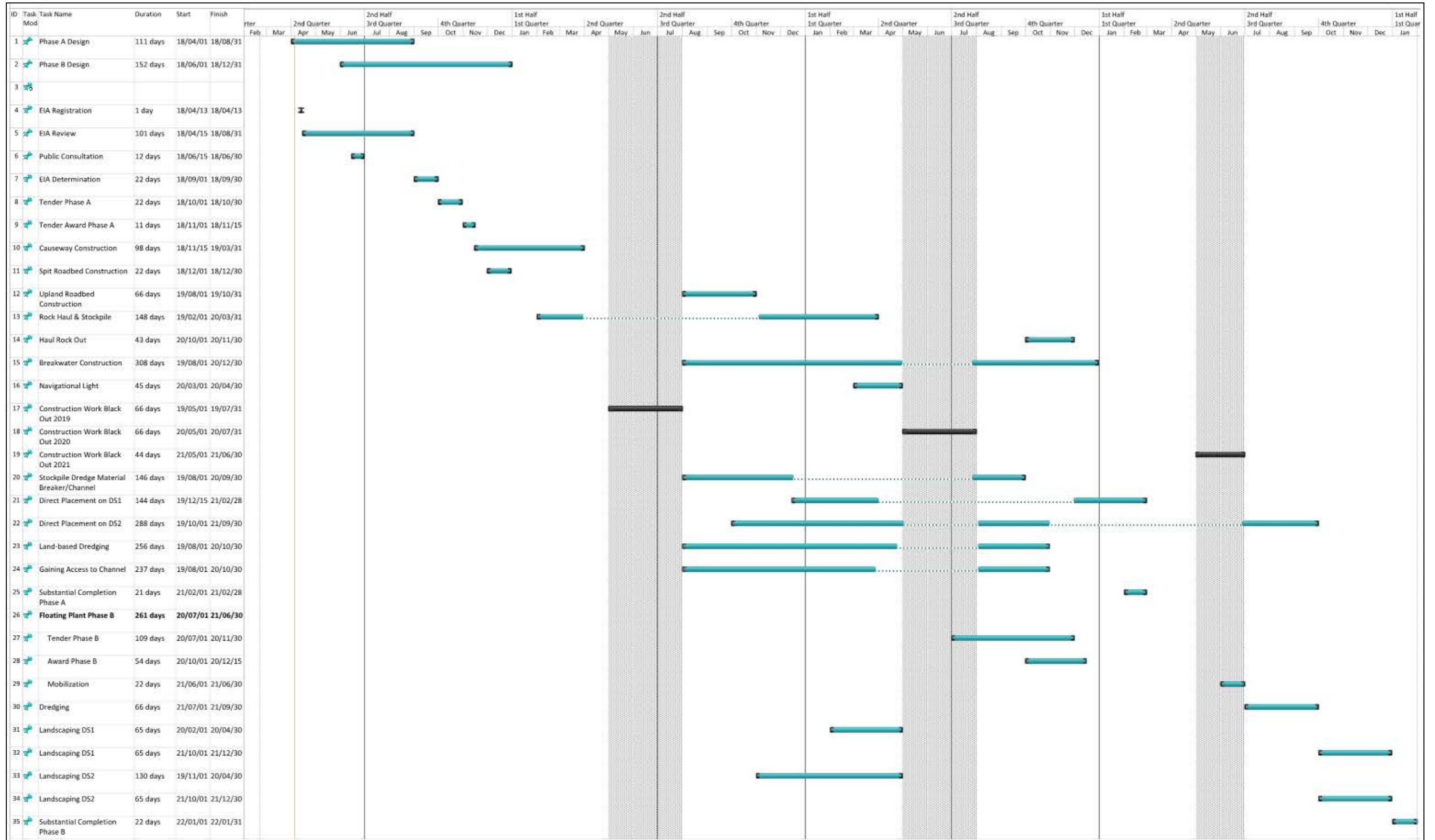


Figure 7: Conceptual Schedule / Timeline for Shippagan Gully Dredging and Breakwater Construction Project



Figure 8: Project site location in relation to sensitive environmental areas and features, Shippagan Gully and Chiasson Barrier Spit, Gloucester County, NB

**APPENDIX B:
DREDGE MATERIAL CHARACTERIZATION**

DREDGED MATERIALS CHARACTERIZATION

Introduction

A detailed description and characterization of a dredged material is an essential precondition for the consideration of dredged material disposal management options. It forms the basis for regulatory decisions as to whether and how dredged material will be approved for disposal. This report characterizes material to be dredged as part of Phases A and B of the Shippagan Gully Dredging and Breakwater Construction Project (the Project). It follows the guidance provided in Environment and Climate Change Canada (ECCC)'s *Guidance for Atlantic Region Disposal at Sea Permit Applicants* dated September 2017 (ECCC, 2017).

The proponent of the Project is Small Craft Harbours (SCH), a nationwide program run by Fisheries and Oceans Canada (DFO). Public Services and Procurement Canada (PSPC) is providing contracting and technical support to DFO-SCH.

Dredged material means material that is excavated or dredged from an area covered, permanently or periodically, by water. This dredged material characterization report is atypical in that it also characterizes material from above the ordinary high water mark. While material to be moved will be a mix of seabed and upland materials, the majority will be dredged material and the genesis of the remaining material is the marine environment. In the interest of simplicity and clarity, this report considers both material types as dredged material.

Existing Information

The principle sources of information used in the preparation of this report are:

1. GEMTEC. 2017. Geotechnical Investigation Le Goulet Dredging and Rock Protection (Phase 3) Shippagan, New Brunswick.
2. GEMTEC. 2016. Factual Report, Geotechnical Investigation, Le Goulet Dredging and Breakwater.
3. GEMTEC. 2013. Geotechnical Investigation Le Goulet Wharf Le Goulet, New Brunswick November 13, 2013. Prepared for Public Works and Government Services Canada.
4. GHD Limited. 2016. Marine Sediment Sampling Program (MSSP), Underwater Benthic Habitat Survey (UBHS) and Wetland Delineation Survey and Functionality Analysis, Le Goulet Small Craft Harbour, DFRP #04950, Le Goulet, New Brunswick. May 3, 2017. Prepared for Public Works and Government Services Canada. Project No. 10456.35.

DMMU Descriptions¹

The proposed dredging area is shown in Figure 1 as are locations where materials to be dredged have been sampled.

The land to the east of the dredge area is a barrier spit, undeveloped but for a power line leading to a Canadian Coast Guard lighthouse near the centre of the spit. The spit is heavily disturbed by deteriorated coastal structures, an informal network of roads, abandoned power poles, and upland disposal of materials from past dredging projects. To the west is Le Goulet Harbour, an artificial enclosure and a Small Craft Harbour facility serving local fishing interests. To the south is the open water of the Gulf of St. Lawrence. To the north is Shippagan Bay, a large coastal embayment with an extensive opening to Chaleur Bay on its northern boundary. It is the asymmetry between the northern and southern openings of Shippagan Bay that leads to large volumes of water leaving the small southern opening during falling tides, the nearby ebb delta, and the above-mentioned hazardous vessel passage conditions. Land uses, current and past, and the high energy environment suggest sediments in Shippagan Gully are at low risk of chemical contamination.

The Project has elements of maintenance dredging as the channel has been dredged in the past (the above-mentioned 8,000 cubic metres in 2017) and most of the material to be moved has been recently deposited. However, the channel has not been dredged to design standards for more than three decades and areas of the proposed channel have never been dredged. For regulatory purposes the proposed dredging is considered to be capital dredging.²

DMMU A: Breakwater Footprint and Shippagan Gully (East)

The dredgeability of gully materials is constrained by the present channel configuration, currents, and in situ material characteristics.³ The assumed equipment type is land-based heavy equipment, e.g., excavators, cranes, or drag lines.

Land-based equipment would work directly from the shoreline or from the breakwater as it advances seaward. Along the shoreline equipment may be positioned on temporary trestles or on temporary platforms constructed of in situ materials or a combination of in situ materials and fabricated construction materials. Alternatively, a jack-up barge may be used to position dredging equipment further out into the channel. Materials dredged by equipment working from a jack-up barge will require re-handling to transfer to land-based equipment.

¹ Dredged Material Management Unit (DMMU): The smallest volume of material to be dredged that is truly dredgeable (i.e., capable of being dredged independently from adjacent materials) and also for which a separate dredging and disposal decisions can be made (ECCC, 2017).

² Capital Dredging: Dredging that involves the creation of new or improved facilities such as a harbour basin, an enlarged and/or deeper navigation channel, a port, or an area of reclaimed land for industrial, residential or recreational purposes (ECCC, 2017).

³ Dredgeability: The ability to excavate underwater, remove to the surface, transport, and deposit sediments with respect to known or assumed equipment, methods, and in situ material characteristics (USACE, 2015).



Figure 1. DMMUs and Borehole, Surface Sample, and Test Pit Locations

The breakwater, complete with dredging of footprint materials, will be constructed in advance of Phase B channel dredging. The rationale for the phased approach is to minimize dredging requirements as the channel is vulnerable to rapid infilling during storm events. Advance breakwater construction will reduce the need for re-dredging channel sediments.

Table 1. DMMU A: Le Goulet Channel (East) and Breakwater Footprint

		Comments
Dredge Area (m²)	58,000	
Dredge Depth (m)		Proposed cut represents an average depth. Depths range from 1.5 metres at the tip of the breakwater to approximately 6.0 metres along the northeast corner of the channel. Contracting specifications will ensure over-dredging is minimal.
Proposed depth of dredge cut	3.1	
Allowance for over-dredging	0	
<i>Total dredge depth</i>	3.1	
Volumes (m³ place measure)		The 180,000 figure includes re-dredging and side slope dredging.
Place measure volume	180,000	
Additional volume for re-dredging	-	
Additional volume for side slope dredging	-	
Total Volume	130,000 to 240,000	The range reflects an uncertainty estimate of 30%.

DMMU B Channel

Following completion of breakwater construction and land-based dredging, the channel will undergo an approximate 14 month period of stabilization. To meet channel design specifications, dredging will be required in those areas beyond the reach of the Phase A excavators as well as re-dredging on the eastern side of the channel. Sediment removal will require use of floating mechanical equipment, likely barge-mounted cranes or excavators. Use of a hydraulic dredge, e.g., cutter suction, while unlikely, is a possibility.

DMMUs: Spatial Information

A xyz file of 2017 sweep bathymetry and a shapefile of the horizontal boundaries of the dredge area are available upon request.

Physical Characterization

2013 Characterization (GEMTEC, 2013)

The 2013 geotechnical survey investigated soil and bedrock conditions on the east side of Shippagan Gully. Of the six boreholes drilled, four are within or very close to the boundaries of the proposed dredge area. These boreholes consist of sand and gravel layers, underlain by glacial till to weathered sandstone bedrock. Cobbles were encountered in the sand and gravel layers.

Table 2. DMMU B Channel Dredging Specifications

		Comments
Dredge Area (m ²)	88,350	
Dredge Depth (m)		Proposed cut represents an average depth. Range will be 0 to 2.5 m.
Proposed depth of dredge cut	1.5	
Allowance for over-dredging	0	
<i>Total dredge depth</i>	1.5	Proposed depth includes an allowance for overdredging and side slopes.
Volumes (m ³ place measure)		
Place measure volume	100,00	
Additional volume for re-dredging	-	
Additional volume for side slope dredging	-	
Total Volume	70,000 to 130,000	A range is required as the volume is dependent upon Phase A dredging and infilling during the period of stabilization.

Figures 2 to 5 consist of details from the borehole logs that are relevant to the proposed channel. At each of the four boreholes the surface sand and gravel layers are dominant. Three of the four boreholes have a thin layer of material other than sand and gravel near the bottom of the dredge cut:

- BH-2013-9 indicated a thin layer (20 cm) of sand with some gravel and silt.
- BH-2013-12 indicated a thin layer (50 cm) of glacial till consisting of silty sand, with some gravel and trace clay.
- BH-2013-13 indicated a layer (1.0 m) of glacial till which touches on the underlying layer of sandstone bedrock (30 cm).

2015 Characterization (GEMTEC, 2016)

During a 2015 subsurface investigation one borehole was drilled within the boundaries of the proposed dredge area. Sand and gravel layers were not found at boreholes BH-2015-9 due to their proximity to the existing breakwater and exposure to strong currents. The overburden material above the dredge cut elevation was 0.75 metres of boulders/sandstone rubble (Figure 6).

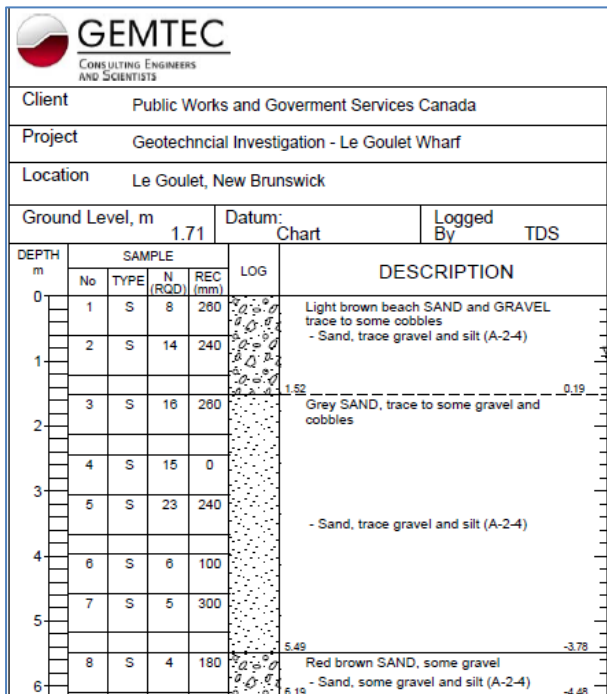


Figure 2. Borehole Log BH-2013-9 to Depth of Dredge Cut

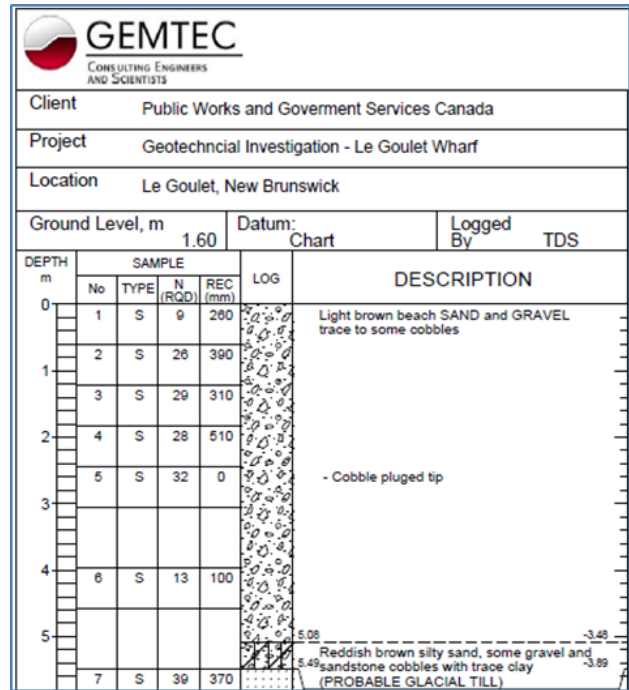


Figure 4. Borehole Log BH-2013-12 to Depth of Dredge Cut

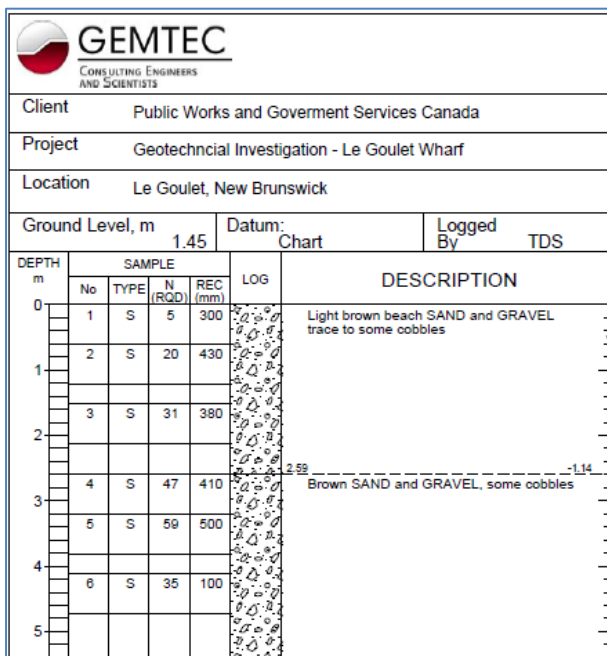


Figure 3. Borehole Log BH-2013-11 to Depth of Dredge Cut

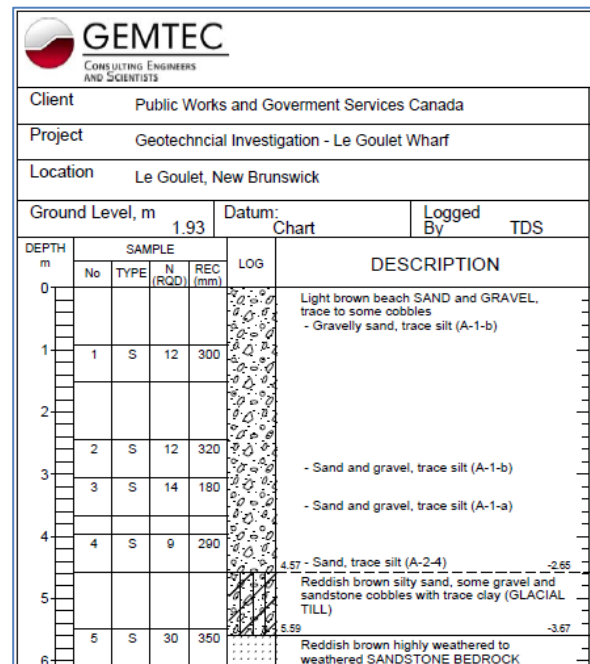


Figure 5. Borehole Log BH-2013-13 to Depth of Dredge Cut

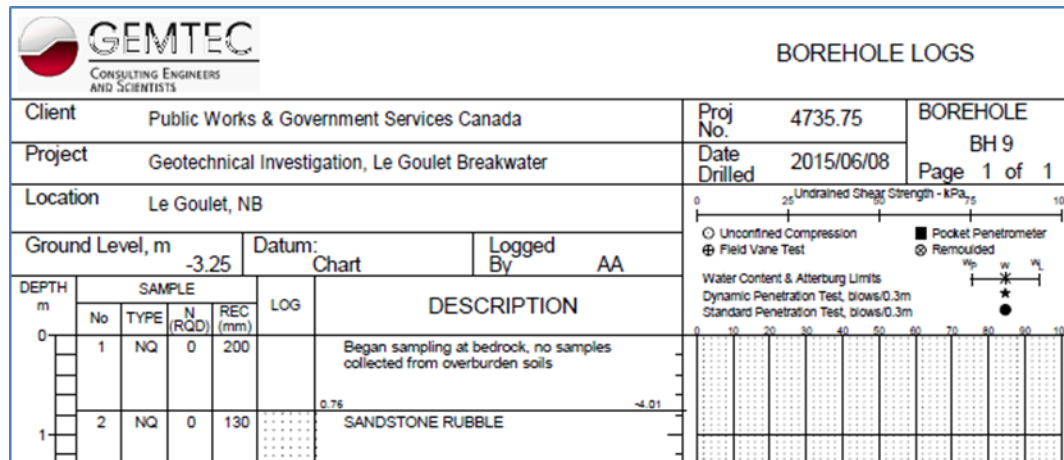


Figure 6. Borehole Log BH-2015-9 to Depth of Dredge Cut (-4.0m).

2016 Characterization (GHD, 2016)

In July of 2016 GHD Limited, on behalf of PSPC, collected surface sediment samples from 12 locations within the area proposed for dredging. The samples were collected by divers using a 50 mm diameter core pushed to the point of refusal. A smaller diameter rod was hand driven into the sediment at each location to measure the depth to refusal. Photographs were taken of each sediment sample collected and are included in the reference document.

Gain size results were classified in accordance with Folk (1974) and plotted as a ternary diagram using software described by Poppe and Eliason (2007). Table 3 lists the sample classifications and the depths to refusal. Figure 7 is the ternary diagram.

Table 3. Classification of 2016 Surface Sediment Samples and Depths to Refusal

Sample ID	Sample Classification	Depth to Refusal (m)
2016-SS-12	SAND	<0.05
2016-SS-13	SANDY GRAVEL	<0.05
2016-SS-14	SANDY GRAVEL	0.1
2016-SS-15	SANDY GRAVEL	<0.05
2016-SS-16	SANDY GRAVEL	0.1
2016-SS-17	SANDY GRAVEL	<0.05
2016-SS-18	SANDY GRAVEL	<0.05
2016-SS-19	GRAVELLY SAND	0.21
2016-SS-20	SANDY GRAVEL	<0.05
2016-SS-21	GRAVELLY SAND	0.21
2016-SS-22	SANDY GRAVEL	<0.05
2016-SS-23	SLIGHTLY GRAVELLY SAND	0.41

Surface samples are biased towards sands and gravels as coarser fractions are excluded from the laboratory analysis. In eight of the 12 samples the laboratory analyst commented that the sample contained rocks or large rocks (MAXXAM, 2016).

2016 Characterization (GEMTEC, 2017)

In March of 2017 seven test pits were excavated in the shoreline east of the channel using a long-reach excavator. Two of the test pits (TP5 and TP6) were advanced in areas that had been recently dredged. Samples were taken at depth at each test pit and analyzed for grain size. Classifications are provided in Figure 8.

The analytical and classification procedures do not account for the presence of cobble or boulders. Figure 9 does provide for an understanding of the presence of sediment fractions larger than gravel.

GEMTEC (2017) summarized the 2017 and previous surveys by concluding that material encountered in the eastern side of the channel:

- includes silt and clay at trace levels;
- consists predominantly of sand and gravel with some cobbles, and
- includes some large cobbles (up to 300 mm) in the material from the southern end of channel shoreline.

The report also concludes that some large cobbles were likely present during the earlier investigation but not observed due to sampling limitations. Due to current strengths, the sediments elsewhere in the area of the proposed channel may be larger than those encountered during the test pit investigation.

Conclusions—Physical Properties

The two DMMUs that make up the current project are defined by dredgeability and project scheduling, not by heterogeneous physical or chemical properties. The physical and chemical properties of the DMMUs are relatively homogenous and are characterized as one of the five dredge types identified in ECCC (2017):

Gravel and sand: Of the five dredged material types gravel and sand (granular materials) generally have the most inherent value. Rather than disposal, such material may have practical uses. Gravel and sand is generally not contaminated.

While predominantly gravel and sand, the material will have other characteristics:

- Fines will be at trace levels.
- Cobbles will be a secondary constituent.
- Boulders will be encountered and are more likely to be encountered as part of DMMU B dredging.

Much of the westernmost area of DMMU B is at or below design grade. Some of the material above grade will be bedrock which will remain in place.

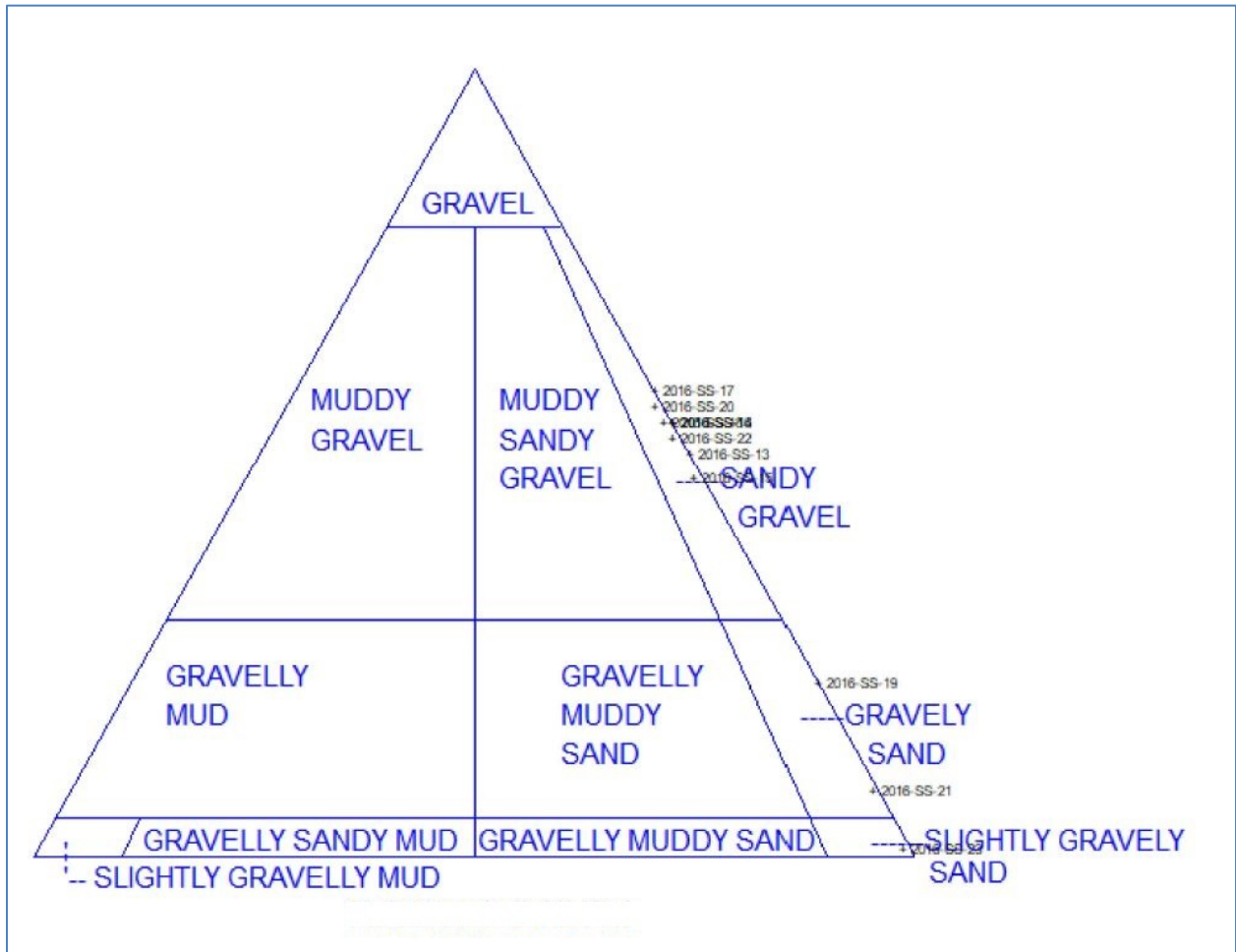


Figure 7. Ternary Diagram of Grain Sizes of 2016 Surface Samples

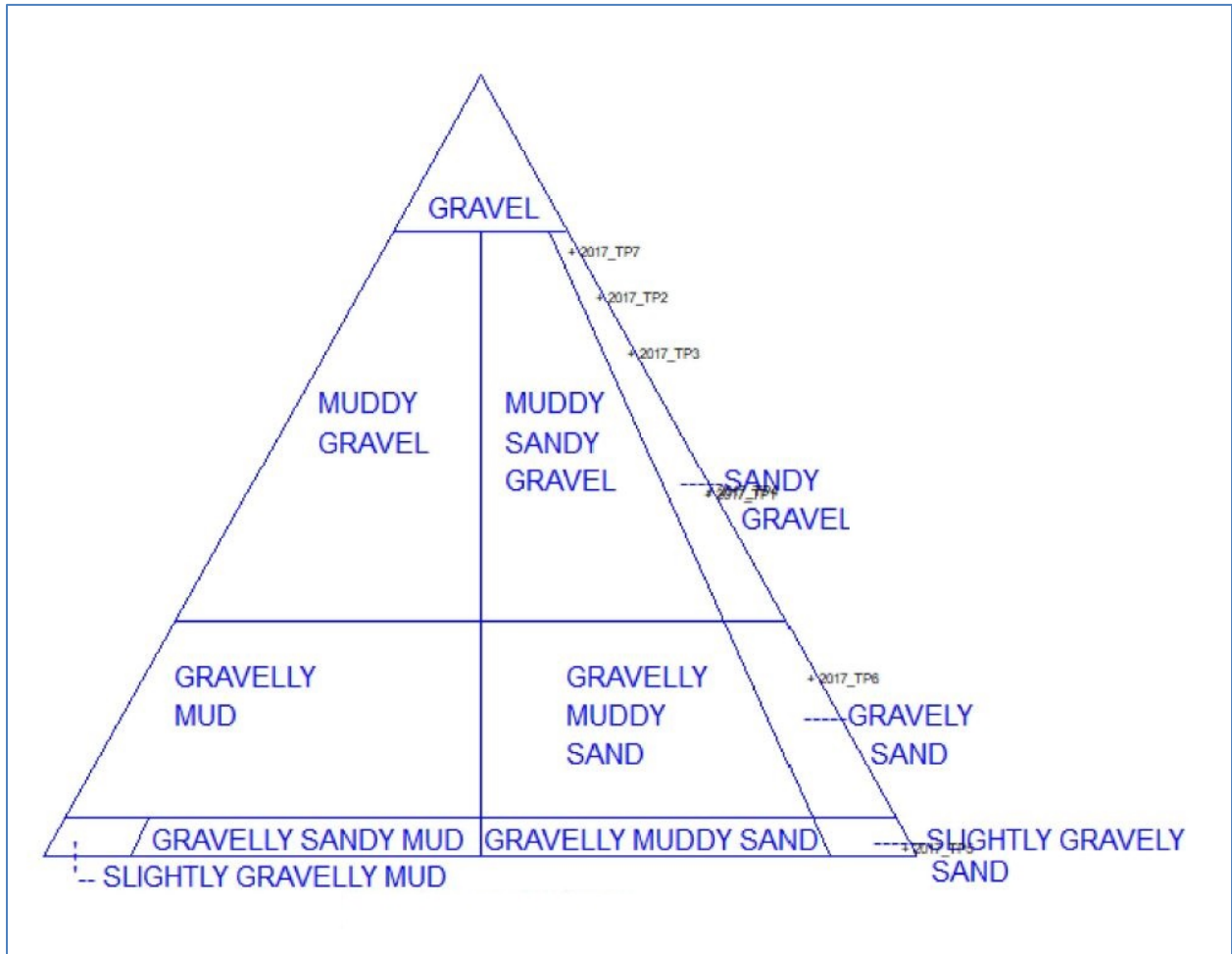


Figure 8. Ternary Diagram of Grain Sizes of 2017 Test Pits Samples

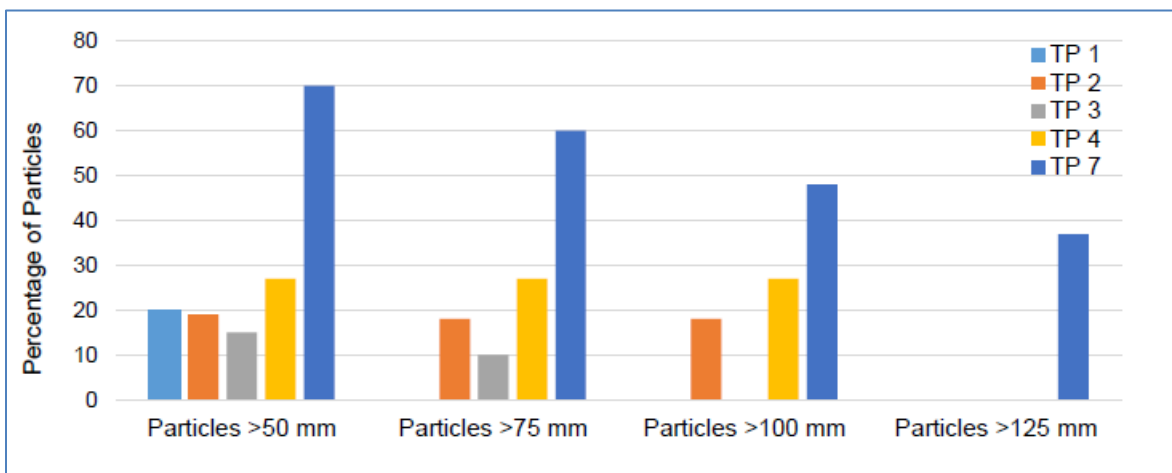


Figure 9. Test pit sample sizes (Source: GEMTEC, 2017)

Habitat Classification

Some of the material to be dredged may return to littoral and sublittoral environments modifying existing habitat. For comparison purposes, habitat of the material *in situ* has been classified. The European Nature Information System (EUNIS) habitat classification is a comprehensive and hierarchical system covering the terrestrial and European marine habitat types (EEA, 2012). Due to European origin of the classification system, the sediments to be dredged were classified only to the second level:

A5.1 Sublittoral coarse sediment

Coarse sediments including coarse sand, gravel, pebbles, shingle and cobbles which are often unstable due to tidal currents and/or wave action. These habitats are generally found on the open coast or in tide-swept channels of marine inlets. They typically have a low silt content and lack a significant seaweed component. They are characterised by a robust fauna including venerid bivalves.

Chemical Characterization of Sediments

The material found in the two DMMUs is composed predominantly of sand and gravel with some coarser fractions. The location is an area of high current and wave energy and is uninfluenced by existing and historical sources of appreciable pollution.

In accordance with the guidance provided in ECCC (2017), these materials are exempted from a detailed chemical characterization. The material is chemically suitable for open water disposal. Analytical results for surface samples collected in the area to be dredged are consistent with this assessment (GHD, 2016).

Other Properties

Visual Description and Odour

Photographs of materials are included in the reference documents above. Odours and observations at the time of data collection were consistent with a characterization of clean sand, gravel, and cobble materials.

Debris

Debris from degraded sheet steel pilings and wooden structures will be encountered during dredging the eastern shoreline. Measures to segregate this material for appropriate disposal will be required.

Physical and Cultural Heritage

The materials to be dredged are mobile, recently deposited, coarse marine sediments. They are difficult to investigate due to the changing landscape of the barrier spit and gully. Shell middens may have been found on the spit in the past but likely would have since been removed by storms. Impacts on cultural resources from dredging activities are not anticipated.

Microbials

Microbials are not considered a concern for the same reasons a detailed chemical characterization is not required—materials are found in an area of high energy and in a location uninfluenced by existing sources of appreciable pollution.

Military Munitions

The project is not in a location with a military history. The risk of encountering munitions is negligible. This conclusion is consistent with use of the screening tool ECCC has for conducting an initial assessment for the presence of munitions.⁴

Existing Stockpile

In 2017 approximately 8,000 m³ of sediment was dredged from the east side of the gully using land-based equipment. While this appendix is intended to address material to be dredged, the sources of information used in the development of the characterization report apply equally to that material. Conclusions drawn, with the possible exception of the debris-related conclusions, apply to that material as well.

Additional Field Programs

Existing information was used to provide the detailed characterization of dredged material required for regulatory review. DFO-SCH believes that additional field programs are not required.

⁴ Personal communication, Michael Parry, December 7, 2017.

References

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**APPENDIX C:
REVIEW OF PROJECT ALTERNATIVES**

ALTERNATIVES ANALYSIS OF SHIPPAGAN GULLY DREDGING AND BREAKWATER CONSTRUCTION PROJECT

Introduction

The analysis of project management options, often a complex problem, can be made simpler by separating it into more understandable elements. For the *Shippagan Gully Dredging and Breakwater Project* (the Project) those elements are the Project's need, purpose, and objectives; key assumptions; and analysis criteria.

The Project's alternatives analysis takes place in a context of federal and provincial legislated requirements, policies, and guidelines; sound engineering principles; and effective use of public funds. The Project objectives, are described below, are an outcome of earlier work on alternative designs to Shippagan Gully reconfiguration. The primary reference for that work is Provan et al. (2014). The subject of this appendix is alternatives to the Project and alternative means of carrying out the Project. The alternative means assessment focuses on dredging and dredged material disposal as many different approaches could potentially meet the Project's objectives. Less attention is given to rock hauling and road improvements/road construction as management options are fewer.

Appendix B of the Project Effects Determination (PED) report provides a detailed characterization of materials to be dredged--a precondition for the consideration of alternatives. The characterization concludes that the physical and chemical properties of the Project's materials to be dredged are relatively homogenous and can be categorised as:

Gravel and sand: Of the five dredged material types gravel and sand (granular materials) generally have the most inherent value. Rather than disposal, such material may have practical uses.

The practical use of dredged material, referenced above, is more commonly called beneficial use--a concept that dredged material can be disposed in a way that is economically and environmentally acceptable and accrues environmental, economic or other benefits to society (USACE, 2016). The terms "disposal" and "beneficial use" are used to describe the different approaches to managing dredged material. The term disposal means the depositing of dredged material without modification of disposal practices to maximize environmental, economic or other benefits to society. The term beneficial use describes the placement of dredged material with modification of disposal practices to maximize one or more environmental, economic or other benefits. With this particular use of terminology it should be clear that beneficial use is a form of disposal and, as such, dredging-related federal and provincial legislated laws, regulations, policies, and guidelines remain relevant. It should also be understood that in the context of beneficial use, dredged material is material of opportunity and unlikely to have ideal characteristics for the use or uses in question.

In analyzing disposal options for the Project, DFO-SCH has looked to a beneficial use solution. Given the characteristics of the material to be dredged and the character of the local environment, potential

beneficial use options have been identified. DFO-SCH is committed to working with other federal government departments, the Government of New Brunswick, Indigenous organizations, fishing interests, and others to balance the navigation/safety-related needs of the Project and environmental values by using the material to be dredged beneficially to the extent that is practicable.

Need and Purpose

The need for a project is defined as the problem or opportunity that the proposed project is intending to solve or satisfy. It establishes the fundamental justification or rationale for the project. The purpose of a project is defined as what is to be achieved by carrying out the project (GOC, 2007).

Need

DFO-SCH operates and maintains a national system of harbours to provide commercial fish harvesters and other harbour users with safe and accessible facilities. The Project addresses the need to provide improved marine access to five harbours for which DFO-SCH has responsibilities--Le Goulet, Shippagan, Savoy Landing, Caraquet, and Lemèque. The problem is Shippagan Gully is no longer safely navigable as present conditions limit access to and from Shippagan Bay. Those conditions include deteriorated shoreline structures, high velocity currents, a narrow navigational channel, and reduced navigational clearance. The underlying causes are the age of the shoreline structures and the high-energy coastal environment in which they are situated.

Purpose

Fishing vessels operate under conditions that are inherently dangerous. A recent data analysis project conducted by Statistics Canada and The Globe and Mail revealed that commercial fishing has the single highest fatality rate of any industrial sector in Canada and that the occupation of deckhand is 14 times more deadly than that of police officer (Grant, 2017). While many transportation projects produce safety benefits, safety should be included as a primary project purpose only where there is an identified safety need (The Center for Environmental Excellence, 2007). Presently the minimum width of the navigation channel in Shippagan Gully has been reduced to approximately 35 metres. That figure is for the typical vessel that uses the channel. For larger vessels, the minimum width would be increased. Both the minimum channel width and the high current velocities represent hazardous conditions for vessels using the channel. Velocities within the channel reach speeds of up to 2.2 metres per second and infilling of the navigational channel, is predicted to continue (Provan et al., 2014). As noted in the main text of this document, Canadian Coast Guard vessel operations stationed in Shippagan are compromised by the present condition of the Shippagan Gully. What could be a 10 kilometre trip to waters off Shippagan Gully, can be instead an 80 kilometre trip around île Lamèque or a 110 kilometre trip around Miscou Island.

The present and worsening conditions of Shippagan Gully represent an unacceptable level of risk for vessel traffic. For this reason, and consistent with The Center for Environmental Excellence advice, safety has been identified as the primary Project purpose. A secondary purpose is to minimize the need

for future dredging by constructing a breakwater to specifications that will minimize future needs for maintenance dredging. DFO-SCH believes this secondary purpose is in the interest of the careful use of public funds and, arguably, in the interest of the environment as minimizing the need for dredging through the use of structures (e.g., breakwaters) to reduce sedimentation can be considered a recognized best environmental practice (OSPAR, 2004).

Objectives

The Project will stabilize and widen the navigation channel passing through the gully. Since minimizing future maintenance costs are a secondary purpose, it important to find a solution for which sediment infilling will be minimized. The primary and secondary purposes of the Project can be addressed by meeting the following objectives:

1. Reduce current velocity in Shippagan Gully by increasing cross-sectional area of the channel to approximately 110 metres wide by approximately 4 metres deep.
2. Construct a breakwater on the eastern side of Shippagan Gully. The breakwater will serve to divert sediment-carrying waters away from Shippagan Gully and thus minimize the need for maintenance dredging.

Key Assumptions

Infilling Rates

The proposed breakwater and channel configuration is intended to provide long-term channel use. The channel is designed to function similar to the structures at Val Comeau and Richibucto. A requirement for annual maintenance dredging is not expected as ebb-tide flows should be sufficient to remove most depositing sediments to the existing ebb-tide delta. The anticipated maintenance dredging cycle is one dredging event approximately every twenty years. Given this expectation, locations for disposal of the dredged material are based on the assumption of one-time use. This does not preclude re-use of a disposal site but rather any future re-use will be based on a second alternative analysis comparing new sites to new sites rather than an existing disposal site to new sites.

The Barrier Spit (Chiasson Spit)

The life expectancy of the breakwater is 50 to 100 years. That structure coupled with the re-configured channel and periodic maintenance dredging can provide safe navigation for the same time period. This expected period of service is based on the assumption that the barrier spit remains intact. Should a breach occur, Shippagan Gully ebb-tide flows will be reduced such that gully hydrodynamics may no longer adequately move material from the gully to the ebb-tide delta, located immediately offshore from the gully entrance. A worst-case scenario would be a closure of the gully to navigation.

The barrier spit is not stable as evidenced by signs of barrier migration, e.g., power lines relocated landward. Landward migration is a response to some combination of sea-level rise, changes in sediment supply, storm surges, or waves. For the 50 to 100 years the breakwater will be in place, the barrier spit

will require management to protect against a breach/blowout and to ensure continued access to the lighthouse and the east side of gully. The need to manage the site creates a need for materials such as sands and gravels.

To manage the barrier spit is to interfere with natural coastal processes. This approach may have unwanted natural environment implications.

Managing the spit may also have positive benefits. For those benefits to be realized, and for the spit to be managed to achieve Project objectives, the Government of Canada requires improved control over barrier spit lands. The end of the spit presently consists of land registered to the Federal Crown. The middle portion is privately held and negotiations are underway with the intent it be transferred shortly to the Federal Crown.

Ducks Unlimited owns the Île Lamèque end of the spit. While sale of this land to the Government of Canada is not likely, Ducks Unlimited is interested in cooperating with the Government of Canada in implementing a management plan for the site that provides long-term of protection of avian habitat. The alternatives analysis is based on the assumptions that the land transfer and Ducks Unlimited agreement are achievable and that improved control over barrier spit activities is achievable. The development of a management plan for the barrier spit is described in Appendix D.

Climate Change

Global climate change with its expected rise in sea levels and increase of storm intensities will tend to increase the problems with erosion and storm damage to sandy coasts. Because sand is returned to deeper waters during storms, increasing storm frequency and intensity may lead to changes in the sand budget (McLachlan and Brown, 2006). Cancoast is a Natural Resources Canada database used in the mapping of coastal sensitivity to inundation, coastal flooding and erosion arising from climate-related changes in sea level, sea ice and storminess along all of Canada's marine coasts. Its preliminary map rates the project area as high in relation to coastal sensitivity to climate change (Lemmen et al, 2016). Hard coastal defence structures, such as the Project's breakwater, are in some circumstances necessary to address sea-level rise but it must be acknowledged that such structures disrupt coastal processes and can exacerbate erosion and sedimentation leading to degradation and loss of coastal habitats (Lemmen et al., 2016).

The predicted increase in storm intensities and damage and the presence of the breakwater all heighten the need to manage the barrier spit adjacent to Shippagan Gully.

Beneficial Use

While beneficial use of dredged material is commonly practiced, the physical and biological impact of dredged sediments when used for habitat enhancement remains an area of investigation (OSPAR, 2008). It cannot be assumed beneficial use for habitat purpose for the Project is without a measure of uncertainty.

Environmental Window

The Gulf of St. Lawrence beaches updrift and downdrift of Shippagan Gully are identified as critical habitat for the Piping Plover (Environment Canada, 2012). While direct effects on plovers may be unlikely, the Project nevertheless has been designed under the assumption that activities on the beaches, beyond the immediate area of the gully and the breakwater, should be prohibited during the most sensitive period of the year.

Regulatory Framework

The sources listed below identify the need for an alternatives analysis for the Project.

NB Clean Environment Act & Environmental Impact Assessment Regulations

Although neither the *Clean Environment Act* nor the Environmental Impact Assessment Regulations explicitly require the analysis of alternatives for the Project, the policy document “A Guide to Environmental Impact Assessment in New Brunswick” requires that alternatives, including alternative sites for the project, and alternatives to the project itself, be considered and ruled out in the course of the project assessment. Alternative assessments are to demonstrate the requirement for undertaking the project described in the registration document and to justify potential project-environment interactions (NBDELG. 2018).

Canadian Environmental Protection Act, 1999

CEPA, Schedule 6, Sections 5, 6, and 7 describe requirements for the assessment of alternatives for dredged material proposed for disposal in the marine environment. Schedule 6 states that a detailed description and characterization of the waste or other matter is an essential precondition for the consideration of alternatives and the basis for a decision as to whether the waste or other matter may be disposed of at sea. The required detailed description is found in Appendix B.

Consistent with Schedule 6, this alternatives analysis attempts to demonstrate that appropriate consideration has been given to a hierarchy of waste management options that implies an order of increasing environmental impact. The hierarchy for this analysis is as follows:

- (a) re-use or, in the context of dredged material management, beneficial use;
- (b) off-site recycling or, in the context of the Project, recycling within the littoral drift system;
- (c) disposal in the marine environment or disposal in the upland environment.

Schedule 6 includes destruction of hazardous constituents and treatment to reduce or remove the hazardous constituents as two additional management options. The Project’s materials characterization report makes clear that hazardous constituents are not relevant considerations for the Project.

CEPA requires that the availability of practicable options for disposal be considered in the light of a comparative assessment. The criteria for conducting the assessment are undue risks to human health, undue risks to the environment, and disproportionate costs.

Species at Risk Act

The Canadian Environmental Assessment Agency advises that alternatives to the project should be considered if there are adverse effects on a species at risk or its critical habitat (GOC, 2007). Relevant to the Project is the Recovery Strategy for the Piping Plover (EC, 2012). It states that project alternatives should be identified, potential impacts avoided or minimized, uncertainties investigated, impact predictions verified, and mitigation effectiveness tested.

NB Coastal Zone Policy

The *Coastal Areas Protection Policy for New Brunswick* does not specifically speak to alternatives; however, the policy permits “dredging, excavation and associated spoil disposal activities with an Ocean Disposal Permit from the Federal Government” (NBDELG. 2002).

Alternatives to the Project

As stated above, DFO-SCH has identified a need to provide improved marine access to five harbours and the proposed activities are to be carried out for a purpose that relates foremost to safety. In the planning stages of the Project, three alternatives were given consideration:

1. No Action.
2. A new channel.
3. Dredging of the existing channel.

The No Action alternative is not preferred as DFO-SCH believes it represents an undue risk to human health, a situation inconsistent with DFO-SCH’s mandate. A new channel may be practicable but, relative to the preferred alternative, offers no additional benefits while economic and technical costs unquestionably would be higher. It was rejected on the basis of disproportionate costs. The preferred alternative is the option put forward for consideration. It will be measured against the No Action alternative.

Consideration of Alternative Means

The sections below provide a summary of the processes used to assess the availability of alternatives means to dredge the existing channel and thereby provide safe marine access to the five harbours for which DFO-SCH has responsibilities. The approach borrows from that found in USACE (2016) with the amount of information provided commensurate with the scale of the Project. The approach is consistent with alternative assessment requirements under the federal environmental assessment process and Environment and Climate Change Canada’s Disposal at Sea process.

Assessment Criteria

Alternatives are scored using the criteria that follow. All are scored but alternatives are eliminated from further consideration if they are not “practicable”. The term practicable is used in the comparative analysis requirements for dredging projects in Canada, the United States, and internationally. The definition in use in the United States is:

Practicable - means possible to practise or perform, i.e., feasible. Federal regulations further state it means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. (USACE, undated).

Operational Viability

This criterion evaluates the feasibility of the various alternatives considered by taking into account the characteristics of the material being dredged and the types of dredges/equipment available.

Alternatives are scored as:

- 5 - This is the preferred alternative for the material to be dredged.
- 4 - This is not the preferred alternative but is practicable.
- 3 - This is not the preferred alternative and is marginally practicable.
- 2 - This is not the preferred alternative and is not practicable.
- 1 - This alternative is not operationally possible.

Environmental Acceptability

This element addresses the disposal of the dredged material. The alternatives are scored according to the following hierarchy:

- 5 - Beneficial use.
- 3 - Disposal (recycling) within the littoral drift system.
- 1 - Disposal on land and/or in water.

Beneficial Use

Sand and gravel can be used in a number of applications, including beach nourishment, recreational land development, habitat development, and concrete, and as fill in shoreline construction (USEPA and USACE, 2007). Beneficial use alternatives are assessed according to the following hierarchy:

- 5 - Beneficial use that offsets potential environmental impacts from the Project on the barrier spit and adjacent shorelines.
- 4 - Beneficial use that does not reduce impacts from the Project, but which has the potential to provide environmental benefits.
- 3 - Beneficial use that does not reduce impacts from the navigation channel, but which has the potential to provide economic benefits.
- 2 - Marginal beneficial use that does not reduce impacts from the navigation channel.
- 1 - Not a beneficial use.

Costs and Minimal Volumes

In environments such as Shippagan Gully, best environmental practices include keeping the volume of dredged material minimized through selective dredging (OSPAR, 2004). As volumes and costs positively correlate, for this analysis the two factors are given a joint score. As the Alternative Analysis is completed in the planning stages of a project, costs estimates are no better than preliminary.

Alternatives are eliminated if costs are “disproportionate” or not economically possible. Disproportionate is assessed by comparing the alternative to the preferred option and, more specifically, comparing the additional costs of the alternative to whatever gains are offered by that alternative. A large cost increase for a marginal environmental gain would be assessed as disproportionate. A small cost increase for the same marginal environmental gain would not be assessed as disproportionate. Scoring is as follows:

- 5 - This is the likely minimal volume and the likely minimal costs.
- 4 - This is not the likely minimal volume or costs are not minimal but not disproportionate.
- 3 - Costs may be disproportionate.
- 2 - Costs are disproportionate.
- 1 - This option is not economically possible.

Application of the Assessment Criteria to Alternative Means

Eighteen distinct dredging-related alternative means of carrying out the Project were assessed. All were scored with some alternatives receiving only a partial score when it became clear they were to be eliminated. As stated above, alternatives were eliminated if they were identified as operationally not practicable, operationally not possible, or if costs were disproportionate.

The preferred alternatives, as identified by DFO-SCH, were given a maximum score of 20 and carried through to the next phase of the environmental effects assessment. Recognizing the preliminary nature of the cost estimates and the need for input from regulators, Indigenous organizations, and others, non-preferred alternatives that were not eliminated but scored high (≥ 15) were also carried through to the next phase of the evaluation. The last criterion dropped two alternatives from additional consideration (Alternatives 14 and 15).

Description and Analysis of Alternatives

The conditions driving the need for the Project are, in large part, defining the practicable approaches to dredging the channel. The volumes of material to be dredged are large by local standards but not large by national or international standards. The Project volume is comparable to what is dredged each year in Saint John Harbour, albeit somewhat larger than the average. While the volume may be comparable to that dredged annually in Saint John, the dredging equipment required to move the material is not. The floating equipment used in Saint John--mechanical dredge with dump scows--cannot effectively or safely operate in the fast-flowing, narrow, and shallow waters of Shippagan Gully as they exists today. The same is true for a second type of dredge--a cutter suction dredge. That equipment type relies on

hydraulic suction to remove seabed materials and a pipeline to discharge it to another location. It also relies on spuds and cables which are not suitable for high energy sites. In addition, pumping the Project's material through the pipeline would be compromised by the percentage of gravel and the presence of cobble. Production rates, even if the work could be done safely, would extend the work schedule past the point of practicality.

Dredges larger than those typically used in the region could be operationally viable but present logistical challenges. More importantly, the larger the dredge, the greater navigational clearance the vessel requires. A large dredge, such as a trailing suction hopper, would require deeper waters to operate in and thus require dredging of more material. Large dredges represent higher mobilization costs, higher operating costs, and movement of more material. They score lower, or are eliminated, under the *Costs and Minimal Volumes* criterion.

The characterization report reveals that 240,000 m³ of the Project's material lies on the east side of Shippagan Gully. That volume is within 30 metres of the low-tide line and represents 70 per cent of the Project total volume. Removal of this material with the use of land-based heavy equipment is operationally viable and likely represents the most cost-effective approach with minimal volumes of material. While that alternative is attractive it does not meet the Project's objectives of increasing cross-sectional area of the channel to approximately 110 metres wide by 4 metres deep. To meet that objective what remains is the removal of an estimated 100,000 m³ of dredged material situated within the approximate 80 metre wide band of the proposed dredge area that lies out of reach to land-based equipment.

Phase A will provide a 110 metres wide channel but not a channel with an approximate depth of 4 metres. Upon completion of dredging and construction of the breakwater the channel will undergo a period of stabilization. At this point, the remaining dredge quantity and tidal currents are reduced and dredged areas provide improved maneuverability. Under these conditions the use of floating equipment becomes operationally viable and the four 4 metres channel depth objective is achievable.

DFO-SCH is of the opinion that a preferred alternative must begin with land-based dredging of materials on the east side of the gully and, to be successful, it must be complemented by a second phase of dredging to remove residual materials. The alternatives analysis is structured around this supposition. Table 1 identifies the 18 alternatives assessed, the scores for each assessment criteria, the total score for each alternative, the preferred alternatives, and if the alternative was eliminated.

Table 1. Scoring Matrix Dredging-Related Alternatives

	Alternative Dredging Method	Disposal / Beneficial Use Area	Operational Viability	Environmental Acceptability	Beneficial Use	Cost and Volumes	Score	Preferred	Eliminated	Reason for Elimination	
Phase A	1	Land-based	Disposal Site 2 (Barrier Spit, Wetland Compensation)	5	5	5	5	20	Yes	No	
	2	Land-based	Disposal Site 1 (Chiasson Village, Beach Nourishment)	5	5	2	5	17	No	No	
	3	Land-based	Barrier Spit (Road Construction)	1	5	3	5	14	No	Yes	Not operationally possible for materials to be dredged as road will need to be constructed before materials are available. Materials previously dredged and now located on the barrier spit are suitable and will be used.
	4	Land-based	Disposal Site 4 (Barrier Spit, Surf Zone)	3	3	1	2	9	No	Yes	Alternative represents a submerged berm approach to beach nourishment. Not practicable with land-based equipment.
	5	Land-based	Back Dune, Le Goulet Village or similar locations (Erosion Protection)	4	5	2	2	13	No	Yes	Additional costs are disproportionate. Off loading to west side of gully would require second work area and double handling. Trucking from barrier spit entails far greater trucking costs.
	6	Land-based	Inland disposal	4	1	1	2	8	No	Yes	Presently, no sites identified. Should there be a site, costs would be disproportionate due to salt content and need for washing and/or costs related to site development.
	7	Floating dredge (mechanical with dump scows)	Site selected is of no consequence.	1				1	No	Yes	Not operationally viable due to the fast-flowing, narrow, and shallow waters of Shippagan Gully as they exists today. See text for a more complete description.
	8	Floating dredge (cutter suction)	Site selected is of no consequence.	1				1	No	Yes	
	9	Floating Dredge (trailing suction hopper)	Site selected is of no consequence.	2			2	4	No	Yes	In addition to limited operational viability, large dredges represent higher mobilization costs, higher operating costs, and movement of more material. Eliminated due to both operational viability and disproportionate costs.

Table 1 (continued). Scoring Matrix Dredging-Related Alternatives

	Alternative Dredging Method	Disposal / Beneficial Use Area	Operational Viability	Environmental Acceptability	Beneficial Use	Cost and Volumes	Score	Preferred	Eliminated	Reason for Elimination	
Phase B	10	Floating Dredge (Mechanical)	Disposal Site 2 (Barrier Spit, Wetland Compensation)	5	5	5	5	20	Yes	No	
	11	Floating Dredge (Cutter Suction)	Disposal Site 2 (Barrier Spit, Wetland Compensation and Erosion Protection)	4	5	5	3	17	No	No	
	12	Floating dredge (Cutter Suction)	Barrier Spit, Surf Zone, (Updrift Location)	3	3	2	2	10	No	Yes	An extended pipeline would be required. <i>Environmental Acceptability</i> and <i>Beneficial Use</i> scored low as access to the beach for anchors and installing booster pumps may be required. Associated additional costs are disproportionate.
	13	Floating dredge (cutter suction)	Le Goulet Village, Surf Zone (Downdrift Location)	3	3	2	2	10	No	Yes	Same rationale as Alternative 12 but cost would be even higher due to greater distances.
	14	Floating dredge (Mechanical)	Back Dune, Le Goulet Village or similar locations (Erosion Protection)	3	5	3	3	14	No	Yes	Eliminated due to low score. Costs may be disproportionate as off-loading to west side of gully would require the approval of a second work area, triple handling, and additional trucking. The alternative is possible for only a portion of the dredged material due on-site storage limitations.
	15	Floating dredge (mechanical with dump scows)	Open Water	4	1	1	4	10	No	Yes	Failed to meet minimum score.
	16	Floating dredge (Mechanical or Cutter Suction)	Le Goulet Village, Tidal, Beach Nourishment	3	1	1	2	7	No	Yes	This alternative must respect the Piping Plover environmental window. Doing so would extend the start and completion dates for Phase B by at least an additional six months and likely longer. It is rejected on the basis of disproportionate costs.
	17	Floating dredge (Mechanical or Cutter Suction)	Disposal Site 1 (Chiasson Village, Tidal, Beach Nourishment)	2	1	1	2	6	No	Yes	Same rationale as Alternative 16.
	18	Floating dredge (mechanical or cutter suction)	Inland Disposal	4	1	1	2	8	No	Yes	Presently, no sites identified. Costs would be disproportionate due to salt content and water content for cutter suction option. Also, additional costs required for trucking and site development.

Additional Considerations

Phase A Dredging Alternative--Preferred

Working in favour of land-based dredging as the preferred Phase A option is DFO-SCH's previous experience with contractors and equipment. This dredging option is, operationally, less seasonally dependent and not dependent at all on sea state. Relative to floating equipment it should provide a higher rate of production. Material handling requirements will also be reduced.

Alternative 2: Land-based, Disposal Site 1 (Chiasson Village, Beach Nourishment)

Alternative 2, while not preferred is carried through and will be used for volumes that cannot be accommodated at Disposal Site 2.

Alternative 3: Land-based, Barrier Spit (Road Construction)

The alternatives analysis is assessing only materials to be dredged. Approximately 8,000 cubic metres of materials were dredged from the channel in 2017 and stockpiled on the barrier spit side of the channel. This material has excellent properties for use in road construction and will be used within the Project for that purpose. As identified in Table 2, material to be dredged cannot be used for that purpose as it is not operationally possible.

Alternative 11: Floating Dredge (Cutter Suction), Disposal Site 2 (Barrier Spit, Wetland Compensation)

The sand and gravels, if moved by suction dredge, will be limited to short distances. Cobbles will present challenges for smaller suction dredged and boulders will not be moved. Dredged material will be discharged to a prepared area close to the gully where it will be allowed to dewater and subsequently relocated and shaped. This process will involve relatively small volumes of material, e.g., 10,000 cubic metres, and repeated until the total volume has been dredged. The option is rated lower due to these operational challenges and additional costs. If implemented, wastewater discharge controls would be required. While the option at this time seems unlikely, it is practicable and including it as an alternative to carry through may be advantageous. It may provide for a more competitive bidding process.

Alternative 15: Floating Dredge and Open Water Disposal

The alternative of disposal offshore in waters deep enough to float a dump scow is scored very low as it is not a beneficial use option. DFO-SCH has undertaken surveys to identify potential disposal at sea sites and conducted extensive consultations with fishing interests on this option. They were opposed based on anticipated effects on fishing and fish habitat.

Alternatives Carried Through to Effects Assessment

Table 2 list the alternatives carried through to environmental effects assessment.

Table 2. Practicable Alternative Means

Alternative	Dredging Method	Disposal / Beneficial Use Area	Score	Preferred
A-1	Land-based	Disposal Site 2 (Barrier Spit, Wetland Compensation)	20	Yes
A-3	Land-based	Disposal Site 1 (Chiasson Village, Beach Nourishment)	17	No
B-11	Floating Dredge (Mechanical)	Disposal Site 2 (Barrier Spit, Wetland Compensation)	20	Yes
B-12	Floating Dredge (Cutter Suction)	Disposal Site 2 (Barrier Spit, Wetland Compensation)	17	No

Rock Haul

Moving rock for breakwater construction to the Project site by barge was given early consideration but rejected based on disproportionate costs. The option would require construction of an offloading structure of a significant size and sturdiness on the east side of the beach to allow the transfer of large rock. When it became apparent that a serviceable road was required on the barrier spit for a number of different purposes--e.g., site landscaping, access to the lighthouse, access to the breakwater and rock work, worker safety—the alternative was rejected.

Road Improvements/Road Construction

One of the objectives of the proposed spit management plan (Appendix D) is to avoid alteration of beach and intertidal habitat along the Gulf of St. Lawrence side of the barrier spit and so allow severe weather to create early successional stage Piping Plover habitat. That objective, and the ongoing need for access to service infrastructure, limits the options for road construction to the dune, backside of the dune, wetlands, and the seabed including areas with eelgrass. With the barrier spit migrating landward, that constraint has its advantages, including separating for an extended period of time the road from the erosive forces of waves. The chief disadvantage is the intrusion of the road into wetland and eelgrass habitats.

Both the foreshore and backshore road location options represent potential adverse environmental impacts to the barrier spit. The backshore option is preferred as it offers a less environmentally intrusive approach, i.e., the backshore option is a simpler engineering solution as it needs less protection from the energy of the Gulf of St. Lawrence waves. The backshore option also provides a more robust avoidance of Provincially Significant Wetlands (coastal marshes) and the critical Piping Plover nesting habitat on the foreshore beach – both “do not touch” protected areas through provincial and federal legislation, respectively. The backshore option, while preferred, is not acceptable without offsetting measures. That issue is discussed in more detail in Appendix D.

The Preferred Alternatives vs. The 'No Action' Scenario

The No Action scenario presents an undue risk to human health, specifically a safety risk to mariners using the Shippagan Gully. It presents a potential safety risk to mariners in distress by forcing Canadian Coast Guard to use a much longer alternative route to access the waters of the Gulf of St. Lawrence.

The Chiasson Barrier Spit has been harmed from past activities. It is expected to be further harmed by the erosive forces associated with a rising sea level and increasing storm intensity. Despite past harm and expected future harm, the barrier spit retains environmental values recognized by both the Government of New Brunswick and the Government of Canada. Through design measures and mitigation, some harm from the Shippagan Gully Dredging and Breakwater Project to those values will be avoided. When avoidance is not possible, harm will be mitigated. The residual harm will be offset by means of a barrier spit management plan that relies in large part on wetland rehabilitation and access control.

DFO-SCH holds the view that, due to safety concerns, the navigational status quo of Shippagan Gully is unacceptable. It also believes that, due to the inherent environmental value of the Chiasson Barrier Spit, the management of the spit requires improvements. The Project, as represented by the preferred alternatives, its mitigation, and its follow-up measures, addresses both concerns, admittedly, in the case of the barrier spit, in an imperfect manner. The No Action Scenario addresses neither. The No Action Scenario should be rejected.

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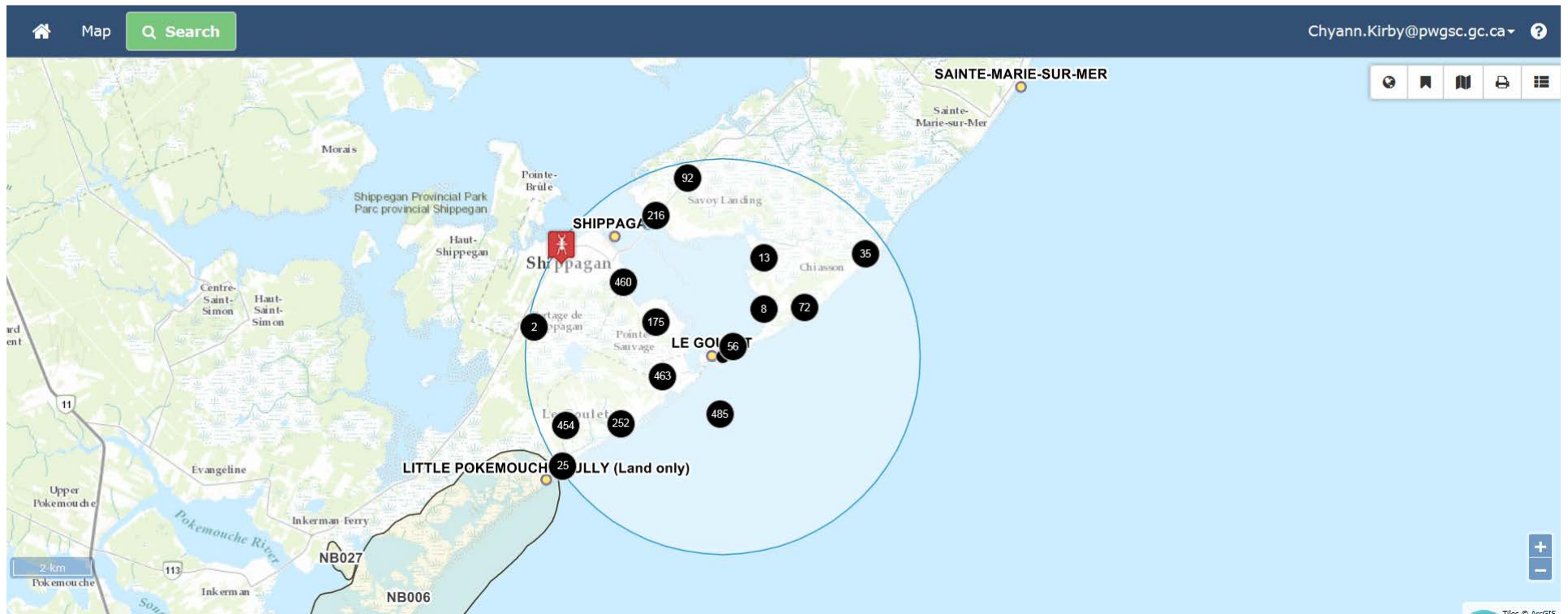
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**APPENDIX D:
SPECIES AT RISK SEARCH RESULTS**

Public Services and Procurement Canada – Atlantic Species at Risk Information System (SARIS)



Species Buffer Summary Report

2/22/2018

Latitude 47.7189
 Longitude -64.6662
 Search Radius 5 km

Animals

2646 Records

Common Name	Scientific Name	# of Records	COSEWIC Status	SARA Rank	Provincial Rarity Rank	SGSRANK
Common Loon	<i>Gavia immer</i>	15	NAR		S4B,S4M,S4N	4 Secure
American Wigeon	<i>Anas americana</i>	9			S4B,S4S5M	4 Secure
Mallard	<i>Anas platyrhynchos</i>	5			S5B,S4N,S5M	4 Secure
Northern Pintail	<i>Anas acuta</i>	18			S3B,S5M	3 Sensitive
Wood Duck	<i>Aix sponsa</i>	3			S4B,S4M	4 Secure
Northern Shoveler	<i>Anas clypeata</i>	10			S2S3B,S2S3M	4 Secure
Great Blue Heron	<i>Ardea herodias</i>	65			S4B,S4M	4 Secure
Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	83			S1S2B,S1S2M	3 Sensitive
Green-winged Teal	<i>Anas crecca</i>	8			S4B,S5M	4 Secure
American Black Duck	<i>Anas rubripes</i>	37			S5B,S4N,S5M	4 Secure
Ruddy Duck	<i>Oxyura jamaicensis</i>	1			S1B,S2S3M	4 Secure
Blue-winged Teal	<i>Anas discors</i>	5			S4B,S4M	4 Secure
Greater Scaup	<i>Aythya marila</i>	1			S1B,S4M,S2N	4 Secure
Semipalmated Plover	<i>Charadrius semipalmatus</i>	8			SNRB,S4S5M	4 Secure
Piping Plover melodus ssp	<i>Charadrius melodus melodus</i>	92	E	E	S1B,S1M	1 At Risk
Ruffed Grouse	<i>Bonasa umbellus</i>	3			S5	4 Secure
Virginia Rail	<i>Rallus limicola</i>	1			S3B,S3M	3 Sensitive
Sora	<i>Porzana carolina</i>	4			S4B,S4M	4 Secure
Ring-necked Duck	<i>Aythya collaris</i>	1			S5B,S5M	4 Secure
Hudsonian Whimbrel	<i>Numenius phaeopus hudsonicus</i>	3			S4M	4 Secure
Hudsonian Godwit	<i>Limosa haemastica</i>	1			S3S4M	4 Secure
Ruddy Turnstone	<i>Arenaria interpres</i>	2			S3M	4 Secure
Gyr Falcon	<i>Falco rusticolus</i>	1	NAR		SNA	5 Undetermined
Black-bellied Plover	<i>Pluvialis squatarola</i>	5			S3S4M	4 Secure
Spotted Sandpiper	<i>Actitis macularius</i>	14			S3S4B,S5M	4 Secure
Wilson's Snipe	<i>Gallinago delicata</i>	13			S3S4B,S5M	4 Secure

Great Black-backed Gull	<i>Larus marinus</i>	22			S5	4 Secure
Least Flycatcher	<i>Empidonax minimus</i>	1			S5B,S5M	4 Secure
Horned Lark	<i>Eremophila alpestris</i>	7			S1B,S4N,S5M	2 May Be At Risk
Killdeer	<i>Charadrius vociferus</i>	30			S3B,S3M	3 Sensitive
American Woodcock	<i>Scolopax minor</i>	2			S5B,S5M	4 Secure
Wilson's Phalarope	<i>Phalaropus tricolor</i>	1			S1B,S1M	3 Sensitive
Barn Swallow	<i>Hirundo rustica</i>	3	T	T	S2B,S2M	3 Sensitive
Eastern Wood-Pewee	<i>Contopus virens</i>	2	SC	SC	S4B,S4M	4 Secure
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	10			S2S3B,S2S3M	3 Sensitive
Ruby-crowned Kinglet	<i>Regulus calendula</i>	6			S4B,S5M	4 Secure
Winter Wren	<i>Troglodytes hiemalis</i>	9			S5B,S5M	4 Secure
Herring Gull	<i>Larus argentatus</i>	41			S5	4 Secure
Golden-crowned Kinglet	<i>Regulus satrapa</i>	5			S5	4 Secure
Palm Warbler	<i>Dendroica palmarum</i>	3			S5B,S5M	4 Secure
Cape May Warbler	<i>Dendroica tigrina</i>	5			S3B,S4S5M	4 Secure
Tree Swallow	<i>Tachycineta bicolor</i>	49			S4B,S4M	4 Secure
Hermit Thrush	<i>Catharus guttatus</i>	21			S5B,S5M	4 Secure
Bay-breasted Warbler	<i>Dendroica castanea</i>	2			S4B,S4S5M	4 Secure
Swainson's Thrush	<i>Catharus ustulatus</i>	14			S5B,S5M	4 Secure
Savannah Sparrow	<i>Passerculus sandwichensis</i>	73			S4S5B,S5M	4 Secure
Swamp Sparrow	<i>Melospiza georgiana</i>	25			S5B,S5M	4 Secure
Northern Mockingbird	<i>Mimus polyglottos</i>	2			S2B,S2M	3 Sensitive
Brown Thrasher	<i>Toxostoma rufum</i>	1			S2B,S2M	3 Sensitive
Canada Warbler	<i>Wilsonia canadensis</i>	2	T	T	S3B,S3M	1 At Risk
Northern Cardinal	<i>Cardinalis cardinalis</i>	3			S4	4 Secure
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	65			S4B,S4M	4 Secure
Lincoln's Sparrow	<i>Melospiza lincolni</i>	10			S4B,S5M	4 Secure
Purple Finch	<i>Carpodacus purpureus</i>	15			S4S5B,SUN,S5M	4 Secure
Ovenbird	<i>Seiurus aurocapilla</i>	1			S5B,S5M	4 Secure
Chipping Sparrow	<i>Spizella passerina</i>	15			S5B,S5M	4 Secure
Bobolink	<i>Dolichonyx oryzivorus</i>	28	T	T	S3B,S3M	3 Sensitive
House Sparrow	<i>Passer domesticus</i>	3			SNA	7 Exotic
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	1			S5	4 Secure
American Beaver	<i>Castor canadensis</i>	1			S5	4 Secure
Green Frog	<i>Lithobates clamitans</i>	7			S5	4 Secure
Harbour Porpoise - Northwest Atlantic pop.	<i>Phocoena phocoena</i> (NW Atlantic pop.)	1	SC	T	S4	
Southern Red-backed Vole	<i>Myodes gapperi</i>	1			S5	4 Secure

Cinereus Shrew	<i>Sorex cinereus</i>	1			S5	4 Secure
Meadow Jumping Mouse	<i>Zapus hudsonius</i>	1			S5	4 Secure
American Bittern	<i>Botaurus lentiginosus</i>	3			S4B,S4S5M	4 Secure
Osprey	<i>Pandion haliaetus</i>	39			S4S5B,S5M	4 Secure
Belted Kingfisher	<i>Megaceryle alcyon</i>	5			S5B,S5M	4 Secure
American Crow	<i>Corvus brachyrhynchos</i>	130			S5	4 Secure
Eastern Kingbird	<i>Tyrannus tyrannus</i>	3			S3S4B,S3S4M	3 Sensitive
Northern Flicker	<i>Colaptes auratus</i>	15			S5B,S5M	4 Secure
Mourning Dove	<i>Zenaida macroura</i>	47			S5B,S5M,S4N	4 Secure
Black-capped Chickadee	<i>Poecile atricapilla</i>	27			S5	4 Secure
Red-breasted Nuthatch	<i>Sitta canadensis</i>	10			S5	4 Secure
Nashville Warbler	<i>Vermivora ruficapilla</i>	35			S5B,S5M	4 Secure
Northern Harrier	<i>Circus cyaneus</i>	10	NAR		S4B,S4S5M	4 Secure
Rock Pigeon	<i>Columba livia</i>	9			SNA	7 Exotic
Alder Flycatcher	<i>Empidonax alnorum</i>	71			S5B,S5M	4 Secure
Bank Swallow	<i>Riparia riparia</i>	17	T	T	S2S3B,S2S3M	3 Sensitive
European Starling	<i>Sturnus vulgaris</i>	88			SNA	7 Exotic
Tennessee Warbler	<i>Vermivora peregrina</i>	19			S4B,S5M	4 Secure
Blue-headed Vireo	<i>Vireo solitarius</i>	9			S5B,S5M	4 Secure
American Robin	<i>Turdus migratorius</i>	130			S5B,S5M	4 Secure
Red-eyed Vireo	<i>Vireo olivaceus</i>	46			S5B,S5M	4 Secure
Yellow Warbler	<i>Dendroica petechia</i>	90			S5B,S5M	4 Secure
Magnolia Warbler	<i>Dendroica magnolia</i>	33			S5B,S5M	4 Secure
American Redstart	<i>Setophaga ruticilla</i>	48			S5B,S5M	4 Secure
Common Yellowthroat	<i>Geothlypis trichas</i>	127			S5B,S5M	4 Secure
Black-and-White Warbler	<i>Mniotilta varia</i>	17			S5B,S5M	4 Secure
Yellow-rumped Warbler	<i>Dendroica coronata</i>	20			S5B,S5M	4 Secure
Song Sparrow	<i>Melospiza melodia</i>	162			S5B,S5M	4 Secure
Common Raven	<i>Corvus corax</i>	28			S5	4 Secure
Cedar Waxwing	<i>Bombycilla cedrorum</i>	37			S5B,S5M	4 Secure
Common Grackle	<i>Quiscalus quiscula</i>	119			S5B,S5M	4 Secure
Brown-headed Cowbird	<i>Molothrus ater</i>	5			S3B,S3M	2 May Be At Risk
American Goldfinch	<i>Carduelis tristis</i>	90			S5	4 Secure
Greater Yellowlegs	<i>Tringa melanoleuca</i>	5			S1?B,S5M	4 Secure
Lesser Yellowlegs	<i>Tringa flavipes</i>	1			S4M	4 Secure
American Golden-Plover	<i>Pluvialis dominica</i>	2			S2S3M	3 Sensitive
Sanderling	<i>Calidris alba</i>	3			S3S4M,S1N	3 Sensitive

Dunlin	<i>Calidris alpina</i>	2			S4M	4 Secure
Red Knot rufa ssp	<i>Calidris canutus rufa</i>	2	E		S2M	1 At Risk
White-throated Sparrow	<i>Zonotrichia albicollis</i>	72			S5B,S5M	4 Secure
Semipalmated Sandpiper	<i>Calidris pusilla</i>	3			S3S4M	4 Secure
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	2			S4M	4 Secure
Dark-eyed Junco	<i>Junco hyemalis</i>	7			S5	4 Secure
Nelson's Sparrow	<i>Ammodramus nelsoni</i>	9	NAR		S4B,S4M	4 Secure
Black-throated Green Warbler	<i>Dendroica virens</i>	2			S5B,S5M	4 Secure
Northern Parula	<i>Parula americana</i>	12			S5B,S5M	4 Secure
Common Tern	<i>Sterna hirundo</i>	11	NAR		S3B,SUM	3 Sensitive
Downy Woodpecker	<i>Picoides pubescens</i>	4			S5	4 Secure
Willet	<i>Tringa semipalmata</i>	5			S3B,S3M	3 Sensitive
Blue Jay	<i>Cyanocitta cristata</i>	15			S5	4 Secure
Purple Sandpiper	<i>Calidris maritima</i>	1			S3M,S3N	4 Secure
Gadwall	<i>Anas strepera</i>	3			S2B,S3M	4 Secure
American Coot	<i>Fulica americana</i>	2	NAR		S1S2B,S1S2M	3 Sensitive
Red-breasted Merganser	<i>Mergus serrator</i>	5			S3B,S5M,S4S5N	4 Secure
Canada Goose	<i>Branta canadensis</i>	5			SNAB,S5M	4 Secure
Red-tailed Hawk	<i>Buteo jamaicensis</i>	1	NAR		S4	4 Secure
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	1			S5B,S5M	4 Secure
Hairy Woodpecker	<i>Picoides villosus</i>	3			S5	4 Secure
Pine Siskin	<i>Carduelis pinus</i>	1			S3	4 Secure
Merlin	<i>Falco columbarius</i>	2	NAR		S5B,S5M	4 Secure
Wilson's Warbler	<i>Wilsonia pusilla</i>	1			S4B,S5M	4 Secure
Blackpoll Warbler	<i>Dendroica striata</i>	6			S3S4B,S5M	4 Secure
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	21	NAR		S5B,S5M	4 Secure
Ring-billed Gull	<i>Larus delawarensis</i>	24			S3S4B,S5M	4 Secure
Northern Gannet	<i>Morus bassanus</i>	5			SHB,S5M	4 Secure
Least Sandpiper	<i>Calidris minutilla</i>	1			S4M	4 Secure
Black Scoter	<i>Melanitta nigra</i>	3			S3M,S1S2N	3 Sensitive
Pine Warbler	<i>Dendroica pinus</i>	8			S5B,S5M	4 Secure
Boreal Chickadee	<i>Poecile hudsonica</i>	1			S4	4 Secure
Veery	<i>Catharus fuscescens</i>	1			S4B,S4M	4 Secure
Gray Catbird	<i>Dumetella carolinensis</i>	1			S4B,S4M	4 Secure
Solitary Sandpiper	<i>Tringa solitaria</i>	1			S2B,S5M	4 Secure
Short-eared Owl	<i>Asio flammeus</i>	2	SC	SC	S2B,S2M	3 Sensitive

Common Eider	<i>Somateria mollissima</i>	3		S3B,S4M,S3N	4 Secure
Short-billed Dowitcher	<i>Limnodromus griseus</i>	1		S4M	4 Secure

Plants

104 Records

Common Name	Scientific Name	# of Records	COSEWIC Status	SARA Rank	Provincial Rarity Rank	SGSRANK
Fall Dandelion	<i>Leontodon autumnalis</i>	1			SNA	7 Exotic
Oxeye Daisy	<i>Leucanthemum vulgare</i>	2			SNA	7 Exotic
Wild Caraway	<i>Carum carvi</i>	1			SNA	7 Exotic
New Belgium American-Aster	<i>Symphyotrichum novi-belgii</i> var. <i>novi-belgii</i>	2			S5	4 Secure
Red Maple	<i>Acer rubrum</i>	1			S5	4 Secure
Common Yarrow	<i>Achillea millefolium</i>	2			S5	4 Secure
Pearly Everlasting	<i>Anaphalis margaritacea</i>	2			S5	4 Secure
Northern Bog Goldenrod	<i>Solidago uliginosa</i> var. <i>linoides</i>	1			SNR	5 Undetermined
Gray Birch	<i>Betula populifolia</i>	1			S5	4 Secure
Common Saltwort	<i>Salsola kali</i>	1			SNA	7 Exotic
Little Starwort	<i>Stellaria graminea</i>	1			SNA	7 Exotic
Sheep Laurel	<i>Kalmia angustifolia</i>	1			S5	4 Secure
Rabbit's-foot Clover	<i>Trifolium arvense</i>	2			SNA	7 Exotic
Yellow Clover	<i>Trifolium aureum</i>	1			SNA	7 Exotic
Low Hop Clover	<i>Trifolium campestre</i>	2			SNA	7 Exotic
Alsike Clover	<i>Trifolium hybridum</i>	2			SNA	7 Exotic
Red Clover	<i>Trifolium pratense</i>	2			SNA	7 Exotic
Creeping Buttercup	<i>Ranunculus repens</i>	1			SNA	7 Exotic
Three-Toothed Cinquefoil	<i>Sibbaldiopsis tridentata</i>	3			S5	4 Secure
Little Yellow Rattle	<i>Rhinanthus minor</i>	1			SNA	4 Secure
Fireweed	<i>Chamerion angustifolium</i>	1			S5	4 Secure
Woolly Beach-heath	<i>Hudsonia tomentosa</i>	2			S3	4 Secure
Loesel's Twayblade	<i>Liparis loeselii</i>	2			S3	4 Secure
Beach Wormwood	<i>Artemisia stelleriana</i>	2			SNA	7 Exotic
Northern Bayberry	<i>Morella pensylvanica</i>	1			S5	4 Secure
Cloudberry	<i>Rubus chamaemorus</i>	1			S3S4	4 Secure
Smoothish Hawkweed	<i>Hieracium x floribundum</i>	1			SNA	7 Exotic
Field Sow Thistle	<i>Sonchus arvensis</i>	2			SNA	7 Exotic
Common Tansy	<i>Tanacetum vulgare</i>	1			SNA	7 Exotic
Common Buttercup	<i>Ranunculus acris</i>	1			SNA	7 Exotic
Tamarack	<i>Larix laricina</i>	1			S5	4 Secure
Mouse-ear Hawkweed	<i>Hieracium pilosella</i>	1			SNA	7 Exotic

Speckled Alder	<i>Alnus incana ssp. rugosa</i>	1		S5	4 Secure
Red Osier Dogwood	<i>Cornus sericea</i>	1		S5	4 Secure
Seaside Goldenrod	<i>Solidago sempervirens</i>	1		S5	4 Secure
White Goldenrod	<i>Solidago bicolor</i>	1		S5	4 Secure
Sheep Sorrel	<i>Rumex acetosella</i>	1		SNA	7 Exotic
Sea Glasswort	<i>Salicornia maritima</i>	2		S5	4 Secure
White Sea-blite	<i>Suaeda maritima</i>	1		S5	4 Secure
Black Crowberry	<i>Empetrum nigrum</i>	1		S5	4 Secure
Mountain Cranberry	<i>Vaccinium vitis-idaea ssp. minus</i>	1		S4S5	4 Secure
Beach Pea	<i>Lathyrus japonicus</i>	2		S5	4 Secure
Seaside Plantain	<i>Plantago maritima var. juncoides</i>	2		S5	4 Secure
Sea Lavender	<i>Limonium carolinianum</i>	2		S5	4 Secure
Sea Milkwort	<i>Glaux maritima</i>	2		S5	4 Secure
Bebb's Willow	<i>Salix bebbiana</i>	1		S5	4 Secure
Red Raspberry	<i>Rubus idaeus ssp. strigosus</i>	1		S5	4 Secure
Quack Grass	<i>Elymus repens</i>	2		SNA	7 Exotic
Seaside Arrowgrass	<i>Triglochin maritima</i>	2		S5	4 Secure
Baltic Rush	<i>Juncus balticus var. littoralis</i>	1		S5	4 Secure
Black-Grass Rush	<i>Juncus gerardii</i>	1		S5	4 Secure
Starry False Solomon's Seal	<i>Maianthemum stellatum</i>	1		S4S5	4 Secure
Red Fescue	<i>Festuca rubra</i>	2		S5	4 Secure
Canada Blue Grass	<i>Poa compressa</i>	1		SNA	7 Exotic
Butter-and-Eggs	<i>Linaria vulgaris</i>	1		SNA	7 Exotic
White Meadowsweet	<i>Spiraea alba var. latifolia</i>	1		S5	4 Secure
Club Spur Orchid	<i>Platanthera clavellata</i>	1		S4S5	4 Secure
Saltmarsh Bulrush	<i>Schoenoplectus maritimus</i>	1		S5	4 Secure
American Beach Grass	<i>Ammophila breviligulata</i>	2		S5	4 Secure
Coltsfoot	<i>Tussilago farfara</i>	1		SNA	7 Exotic
Blunt-leaved Sandwort	<i>Moehringia lateriflora</i>	1		S5	4 Secure
Harlequin Blue Flag	<i>Iris versicolor</i>	1		S5	4 Secure
Arethusa	<i>Arethusa bulbosa</i>	1		S4	4 Secure
Tuberous Grass Pink	<i>Calopogon tuberosus</i>	1		S4	4 Secure
Russet Cottongrass	<i>Eriophorum russeolum</i>	1		S3S4	4 Secure
White Fringed Orchid	<i>Platanthera blephariglottis</i>	2		S3	4 Secure

Royal Fern	<i>Osmunda regalis</i> var. <i>spectabilis</i>	1		S5	4 Secure
White Clover	<i>Trifolium repens</i>	1		SNA	7 Exotic
Scotch Lovage	<i>Ligusticum scoticum</i>	1		S5	4 Secure
Saltmeadow Cord Grass	<i>Spartina patens</i>	1		S5	4 Secure
Tufted Vetch	<i>Vicia cracca</i>	1		SNA	7 Exotic
Chaffy Sedge	<i>Carex paleacea</i>	1		S5	4 Secure
Smooth Cord Grass	<i>Spartina alterniflora</i>	1		S5	4 Secure
Canada Sandspurrey	<i>Spergularia canadensis</i>	1		S4	4 Secure
Common Eelgrass	<i>Zostera marina</i>	1		S4	4 Secure
Sea Ditchgrass	<i>Ruppia maritima</i>	1		S5	4 Secure
Maritime Saltbush	<i>Atriplex acadiensis</i>	1		S4?	4 Secure
White Sweet-clover	<i>Melilotus albus</i>	1		SNA	7 Exotic
Creeping Bent Grass	<i>Agrostis stolonifera</i>	1		S5	4 Secure
Tundra Alkali Grass	<i>Puccinellia tenella</i>	1		S4S5	4 Secure

Invertebrates

83 Records

Common Name	Scientific Name	# of Records	COSEWIC Status	SARA Rank	Provincial Rarity Rank	SGSRANK
Short-tailed Swallowtail	<i>Papilio brevicauda</i>	2			S3	4 Secure
Bog Copper	<i>Lycaena epixanthe</i>	2			S5	4 Secure
Oblique-lined Tiger Beetle	<i>Cicindela tranquebarica</i>	1			S5	4 Secure
Permanent Marsh Mosquito	<i>Anopheles walkeri</i>	1			SU	5 Undetermined
a Mosquito	<i>Culex territans</i>	41			SU	5 Undetermined
Woodland Pool Mosquito	<i>Ochlerotatus canadensis</i>	3			S5	4 Secure
Woodland Mosquito	<i>Ochlerotatus excrucians</i>	4			S5	4 Secure
Northern House Mosquito	<i>Culex pipiens</i>	4			S5	4 Secure
Cattail Mosquito	<i>Mansonia perturbans</i>	3			S5	4 Secure
Saltmarsh Mosquito	<i>Ochlerotatus sollicitans</i>	6			SU	4 Secure
Eastern Treehole Mosquito	<i>Ochlerotatus triseriatus</i>	1			S5	4 Secure
Brown Saltmarsh Mosquito	<i>Ochlerotatus cantator</i>	1			S5	4 Secure
Seven-spotted Lady Beetle	<i>Coccinella septempunctata</i>	2			SNA	7 Exotic
a Ground Beetle	<i>Amara littoralis</i>	6			S4	5 Undetermined

Transverse Lady Beetle	<i>Coccinella transversoguttata richardsoni</i>	1			SH	2 May Be At Risk
Northern Bluet	<i>Enallagma annexum</i>	1			S4	4 Secure
European Skipper	<i>Thymelicus lineola</i>	1			SNA	7 Exotic
Salt Marsh Copper	<i>Lycaena dospassosi</i>	1			S3	4 Secure
Pink-edged Sulphur	<i>Colias interior</i>	1			S5	4 Secure
Northern Crescent	<i>Phyciodes cocyta</i>	1			S5	4 Secure

Fungus 0 Records

Common Name	Scientific Name	# of Records	COSEWIC Status	SARA Rank	Provincial Rarity Rank	SGSRANK
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Nonvascular Plants 0 Records

Common Name	Scientific Name	# of Records	COSEWIC Status	SARA Rank	Provincial Rarity Rank	SGSRANK
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**APPENDIX E:
CHIASSON BARRIER SPIT MANAGEMENT PLAN**

CHIASSON BARRIER SPIT MANAGEMENT PLAN

Introduction

Appendix C, the Alternatives Analysis for the Shippagan Gully Dredging and Breakwater Construction Project (the Project), advises that Fisheries and Oceans Canada-Small Craft Harbours (DFO-SCH) is committed to working with other federal government departments, the Government of New Brunswick, Indigenous organizations, fishing interests, and others to balance the navigation-related needs of the Project and environmental values by using the material to be dredged beneficially to the extent that is practicable. The Government of Canada has identified one environmental value of the barrier spit by designating an area of critical habitat for the endangered Piping Plover that includes the barrier spit (EC, 2012). The Government of New Brunswick has identified another value by designating wetlands on the barrier spit to be Provincially Significant Wetlands. These wetlands include coastal marsh land. Historically, impacts to this habitat type have been severe (NBDNR and NBDELG, 2002).

The Project will have impacts on Piping Plover critical habitat and on Provincially Significant Wetlands. In recognition of the historical and on-going wetland loss and the identified need to ensure enough suitable habitat is available to meet population objectives for the Piping Plover, SCH has conducted its environmental assessment of the Project to avoid adverse wetland impacts and alteration of Piping Plover critical habitat to the extent practicable. It has attempted to minimize those impacts that cannot be avoided. What remains is to compensate for remaining unavoidable wetland and plover habitat impacts by through wetland rehabilitation and other efforts. Those efforts will address the existing degraded conditions found on the barrier spit and will developed in the form of a barrier spit management plan.

Legal Protections

Piping Plover

The Piping Plover is protected by the *Migratory Birds Convention Act 1994*. The act prohibits the destruction, disturbance or collection of the birds and their nests and eggs. The subspecies is listed as *Endangered* under Schedule 1 of the federal *Species at Risk Act (SARA)*. The Recovery Strategy for the Piping Plover identifies Chiasson Beach as critical habitat (EC, 2012). The plover is also protected as *Endangered* under the *New Brunswick Endangered Species Act*.

Prohibitions¹

1. No person shall kill, harm, harass, capture or take a Piping Plover.
2. No person shall damage or destroy a Piping Plover nest.
3. No person shall destroy any part of the critical habitat of a Piping Plover (SARA). Any Project activity which alters or disturbs the key habitat attributes described is considered an activity

¹ The prohibitions are taken from the federal legislation and for present purposes are compatible with the New Brunswick prohibitions.

likely to result in the destruction of critical habitat. The Recovery Strategy states that suitable habitat may be roughly approximated by the following key habitat attributes:

- a. Slope: gently sloping foredune;
- b. Beach width: wide stretches of beach that afford protection from flooding at normal high tide;
- c. Substrate: sand, gravel, or cobble, or some combination of these; and
- d. Foredune vegetation density: sparsely vegetated or relatively free of vegetation.

Provincially Significant Wetlands

According to *New Brunswick Wetlands Conservation Policy*, and unlike protections afforded to species at risk, existing legislative tools, at the provincial level, were not designed for managing wetlands. In the past this has resulted in an inconsistent and ineffective approach to wetland conservation (NBDNR and NBDELG, 2002). The purpose of the wetland policy is to clearly identify the Government's intent with respect to wetland management--to manage human activity on or near wetlands in a manner which will achieve no loss of habitat.

The Barrier Spit²

The Chiasson barrier spit is a two kilometre land feature located in a wave-dominated environment where longshore drift moves sandy sediments in a net southward direction past Shippagan Gully and on toward the beach fronting the Village of Le Goulet. The spit's low elevation makes it vulnerable to the effects of sea-level rise. The environment is harsh due to constant exposure to waves, salt spray, shifting sands, wind, and relatively sterile soils. The beach side of the spit consists of the inshore surf zone, the intertidal zone, and the back beach area. The latter is found between the intertidal zone and the beach dunes; it is an above-tide environment that is only occasionally inundated by storm waves. The back beach and the intertidal zone are Piping Plover habitat. It offers early successional habitat, most often free of dense vegetation, and is preferred plover nesting habitat (EC, 2012).

The Shippagan Bay side of the beach is more influenced by the small tides of the Gulf of St. Lawrence than by wave energy. The movements of the tide allow the settling of fine sediments leading to the formation of mud flats followed by coastal marshes. The coastal marshes are biologically productive and serve as foraging habitat for migratory birds including the Piping Plover. Gieder et al. (2014) advises that plovers typically nest on flat, open, low-lying dry sand or pebble beaches with clumped sparse vegetation, a description consistent with EC (2012). The authors further advise that nests are typically adjacent to feeding habitat--areas near dunes, away from the high tide boundary, with moist substrate habitat, e.g., coastal wetlands. Thus it can be seen that the two identified barrier spit environmental values in need of protection--wetlands and plovers--are very much interrelated.

² The U.S Geological Society has a useful primer on barrier spit ecology (USGS, 2017). Some of that material has been used in preparing this section.

Historic land uses have altered the barrier spit. Figure 1 is an 1882 drawing of the spit. Evident are a breakwater and shoreline structures at the west end of the spit and a dam on the east end of the spit, Shippagan Bay side. Current imagery, Figure 2, reveals straight shorelines at the east end, evidence of the past shoreline structures and a large accumulation of sediment in the gully behind what was the 1882 breakwater. The dam on the other side of the spit is no longer evident. The green elevated area towards the west end is revegetated dredged material that was placed there in the 1980s. Strikingly evident is the informal network of roads. Not evident in the images is the landward migration of the barrier spit. Power poles running to the lighthouse have been moved landward on two occasions due to the retreating shoreline. The eastern end of the road, Domitien Lane, has also been relocated landward. Figure 3 illustrates the rate of shoreline changes on the barrier spit in recent years. Of note are the high rate of beach erosion near the centre of the spit and the rapid rate of accretion in the gully.

The Canadian Coast guard lighthouse, the white structure situated to the east of mound of dredged material and on the edge of one of the coastal wetlands, is a *Recognized Federal Heritage Building* due to its historical associations, its architecture, and its environmental value. It can be seen in the middle/left portion of Figure 2. The Government of Canada has determined that the simple, undeveloped setting is appropriate to the building and that the setting should be respected. (Parks Canada, undated). Consistent with Treasury Board policy, DFO is responsible for respecting and conserving the heritage character of the building. The structure is currently exposed to harm from flood waters encroaching from the Shippagan Bay side of the spit.

Site Management Plan Assumptions

Project Needs vs. Environmental Values

Appendix C provides information on the Alternatives Analysis for the Project. One alternative is specific to the barrier spit and is worth repeating here.

The life expectancy of the breakwater is 50 to 100 years. That structure coupled with the re-configured channel and periodic maintenance dredging can provide safe navigation for the same time period. This expected period of service is based on the assumption that the barrier spit remains intact. Should a breach occur, Shippagan Gully ebb-tide flows will be reduced such that material may no longer move to the ebb-tide delta.

The Recovery Strategy for the plover advises that maintenance of natural ecological processes along coastal areas is essential to the protection of nesting areas (EC, 2012). Dredging Shippagan Gully and construction of a breakwater are contrary to maintaining natural coastal processes and are the origins for the identified need to balance the navigation-related needs of the Project and environmental values. As noted in the Recovery Strategy, feeding areas must be locally available so flightless chicks can gain access to them. A re-constructed road will run the length of the barrier spit. A large volume of dredged material presently separates the beach from the Shippagan Bay side coastal marshes. While habitat improvements are a realistic possibility, ideal habitat for the Chiasson Barrier Spit is not a realistic

outcome for the site management plan. Regardless, it has potential to play a small part in the future recovery of the species.

Destruction of Piping Plover Critical Habitat

EC (2012) identifies coastal development occurring in plover habitat or in other habitats closely associated with plover habitat and beach nourishment as activities **likely** to result in the destruction of critical habitat. The Project is a coastal development occurring in plover habitat or in other habitats closely associated with plover habitat and beach nourishment is an associated activity. The Project is put forward for environmental assessment under the assumption that, due to the unique characteristics of the Chiasson Office Barrier Spit and the off-setting measures incorporated into the Project, destruction of plover critical habitat is not likely.

The gully end of Chiasson Office Spit is the area that will undergo fundamental change—its key attributes will change. For the Project to advance, DFO-SCH must demonstrate that the re-configured gully, complete with the proposed breakwater, does not represent destruction of plover critical habitat. Based on existing information, DFO-SCH is working under the assumption that gully end of the barrier spit is not critical habitat. That assumption is based upon a number of factors, two of which arise from the plover's Recovery Strategy (EC, 2102). It notes that Piping Plovers will nests in non-traditional habitats, such as dredged materials or sites with steep embankments, and that such sites may be less significant than typical critical habitat because a key feature of the habitat is often missing. As noted elsewhere in this document, Shippagan Gully is a disturbed environment. The existing structure on the west side of the gully and degraded structures on the east are interfering with natural coastal processes. The gully end of the barrier spit cannot migrate westward, as it would under undisturbed conditions, as it has no further room to migrate. The extent to which it has migrated has created the narrow fast-flowing channel that exists today. It seems reasonable to expect that, even if the end of the barrier spit should have attributes seemingly consistent with plover critical habitat, it seems unlikely that, in that compromised environment, the complex interactions of the functioning and degraded structures, currents, waves, and sediments are behaving in such a way that critical habitat designation would be appropriate.

The defining attributes of plover critical habitat are, as appropriate, qualitative rather than quantitative and the expectation described in the preceding paragraph—the end of the barrier spit should not be considered critical habitat—is arguable. The gully end of the barrier spit is federally owned but federal part-ownership of Chiasson Beach is not identified is the Recovery Strategy suggesting that, this parcel of land, the most extensively disturbed on the spit, is considered non-traditional habitat.

The Recovery Strategy also recognizes that barrier spit beaches, such as Chiasson Office, are part of dynamic and changing coastal system and that critical habitat exists at these beaches where the criteria for identification of critical habitat have been met. DFO-SCH recognizes that a final determination on the extent of plover critical habitat on and near the barrier spit will be determined by way of a biophysical

attribute field survey to address that specific issue. Such a survey is proposed but the working assumption is the end of the barrier spit is non-traditional habitat.

Threats to Plovers and Plover Habitat

Table 1 uses the threats to Piping Plovers identified in its Recovery Strategy (EC, 2012) to clarify the relationships among threats to plovers as a species and the relevance of those threats to both the Project and the Site Management Plan. It reveals the strategy behind the Site Management Plan--one of one Medium Positive Effect and one High Positive Effect offsetting one Medium Negative Effect and one High Negative Effect.

Site Management Plan Purpose

Recognizing past harm to the barrier spit and the Project's potential for further disturbance, the plan's purpose is, through the collaborative development, to:

- take a holistic and forward-looking view of the barrier spit and the interconnections of the environment in which it is situated; and
- balance the navigation-related needs of DFO-SCH and environmental values by identifying and implementing rehabilitation and off-setting actions for the barrier spit that seek to establish, to the extent that is practicable, natural barrier spit conditions and processes.

The plan is not designed to address direct effects on plovers from the Project. Those effects are killing, harming, harassing, capture or taking a Piping Plover or damaging or destroying a nest. Those threats are addressed elsewhere in the Project's environmental assessment.

Site Management Plan Goals

Stewardship

- To improve barrier spit stewardship through Government of Canada land acquisition and cooperative relationships with private landowners and the Government of New Brunswick.

Wetland Communities and Habitats

- To protect barrier spit wetland communities and habitats, including Piping Plover habitat, from the environmental effects of the Project so that biological diversity and ecological integrity are maintained.
- Where adverse environmental effects on barrier spit wetland communities and habitats cannot be avoided, to offset those impacts by way of on-site wetlands rehabilitation.

Coastal Processes

- To the extent practicable, maintain the coastal processes that shape the barrier spit so that the Piping Plover habitat is protected.

- Where adverse environmental effects on coastal processes cannot be avoided, offset those impacts through by addressing threats to Piping Plover habitat from sources unrelated to coastal processes.

Table 1. Threat Assessment

Threat	Level of Concern ³	Relevance to Project and Management Plan	Comments
Predation of adults, eggs, and young	High	Negligible	May be very minor, post-construction, indirect benefits from reduced human use of the spit and reduced availability of food scraps.
Recreational beach use and human disturbance	High	Medium Positive	The gated road is expected to reduce recreational beach use.
Vehicles	High	High Positive	The proposed gated road and road barriers represent the most significant offsetting measures for both the plover and wetlands. The one, controlled access road will replace the informal network of roads currently in use.
Coastal development	High	High Negative	Road construction and improvements will result in harm with mitigation and offsetting measures required. The Project can be more accurately described as coastal re-development. Development practices of the past have been insufficiently protective of the barrier spit. They have provided the need for off-setting/rehabilitating measures.
Natural processes	Medium	Medium Negative	The breakwater, by design, is intended to interfere with coastal processes. Literal drift sediments will accrete on the updrift side of the structure and reduce sediment migration into the gully. Its placement in the gully is the key driver for offsetting measures for plover and plover habitat.
Oil or contaminant spills	Medium	Negligible	Relevant to dredging and breakwater construction activities but of little relevance to the site management plan.
Flooding and extreme weather events	Medium	Negligible	Primarily a climate change issue. Not an issue that can be meaningfully addressed through the Project's environmental assessment.
Environmental contaminants	Low	Negligible	While the barrier spit has been disturbed there is no evidence of contaminants present at levels of concern. A proposed hazard assessment is intended to address this issue.

Cultural Heritage

- To reduce the lighthouse's exposure to harm from waters encroaching from the Shippagan Bay by way of use of infill materials and landscaping.

Reduced Vehicle Use and Human Presence

- To reduce current levels of harm from human presence and human disturbances.

³ As assessed in the Recovery Strategy.

Site Management Objectives

1. Manage Project activities and wetland rehabilitation activities in manners which will achieve no loss of wetland habitat.
2. Replace informal network of roads with one road (Domitien Lane).
3. Restrict use of Domitien Lane to authorized vehicles.
4. Avoid alteration of beach and intertidal habitat along the Gulf of St. Lawrence side of the barrier spit and allow severe weather to create early successional stage plover habitat.
5. Notwithstanding objective 4, allow road construction and road protection works along the 200 metre-long area of the barrier spit which is currently most vulnerable to overwash. This measure will prevent barrier spit breaching and avoid the consequences that a breach could have on Shippagan Gully hydrodynamics.
6. Historic and presently deteriorating shore protection structures are to continue to deteriorate in place unless a hazard assessment suggests removal would be appropriate. Removal of relatively benign materials could cause unnecessary damage.

Actions

1. **April 2008.** Field survey of deteriorating shore protection structures and assessment of hazards, e.g., presence of creosote.
2. **May 2018:** Consistent with the guidance provided by Environment and Climate Change Canada, conduct a field survey to describe the biophysical attributes of the Chiasson Barrier Spit and the beach to the north of the barrier spit with an emphasis on Piping Plover critical habitat attributes.
3. **May 2018:** Consistent with the guidance provided by New Brunswick Department of Environment and Local Government, conduct a field survey to delineate Chiasson Barrier Spit wetlands and to assess wetland function.
4. **June 2018:** Submit to New Brunswick Department of Environment and Local Government, for technical review, reports on:
 - a. biophysical attributes of the Chiasson Barrier Spit and the beach to the north of the barrier spit with an emphasis on Piping Plover critical habitat attributes; and
 - b. Chiasson Barrier Spit wetlands delineation and wetland functionality assessment.
5. **June 2018:** Submit to New Brunswick Department of Environment and Local Government, for technical review the Chiasson Barrier Spit Management Plan (Draft).
6. **August 2018:** Submit to New Brunswick Department of Environment and Local Government a revised Chiasson Barrier Spit Management Plan reflecting comments received on:
 - a. report on biophysical attributes of the Chiasson Barrier Spit and the beach to the north;
 - b. report on Chiasson Barrier Spit wetlands delineation and wetland functionality assessment; and
 - c. Chiasson Barrier Spit Management Plan (Draft).

Monitoring Effects on Piping Plover and Piping Plover Habitat

DFO-SCH is aware of the obligation imposed on it by the *Species at Risk Act* to ensure that measures are taken to avoid or lessen Project-related effects on the Piping Plover and its critical habitat and the additional obligation to monitor those Project-related effects. Development of a monitoring proposal is currently premature but, following completion of the required field surveys, one will be incorporated into the Chiasson Barrier Spit Management Plan.

The responses of plovers to barrier spit changes site due to the Project and site management plan activities will be the fundamental indicator of success. However, site fidelity (i.e., proximity to prior year's nest sites) is an influential variable that may partly explain why Piping Plovers continue to nest in the same general location even after habitat conditions have changed dramatically (Geider et. al., 2014). As plovers have not been nesting at Chiasson Beach in recent years, and not nesting in significant numbers on the beach to the south, site fidelity may prevent use of the beach by plovers even if site management efforts are successful in creating improved habitat. Whether used or not in the immediate future, improving habitat at the site is consistent with meeting population recovery objectives and is in the long-term interests of the species.

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Figures

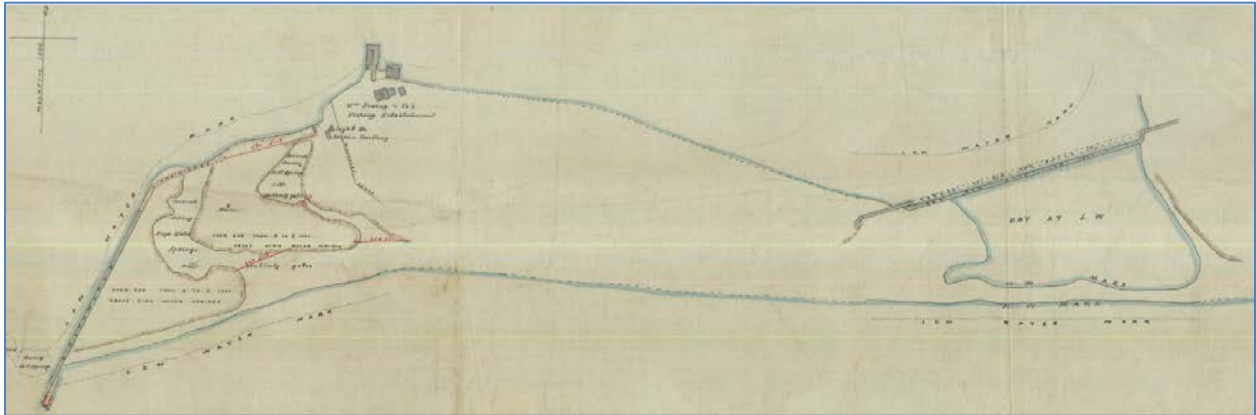


Figure 1. Drawing of Chiasson Barrier Spit, 1882. (Source: Public Works, Canada (1882)).



Figure 2. Aerial Imagery of Chiasson Barrier Spit, 2018. (Source Bing Aerial © Microsoft).

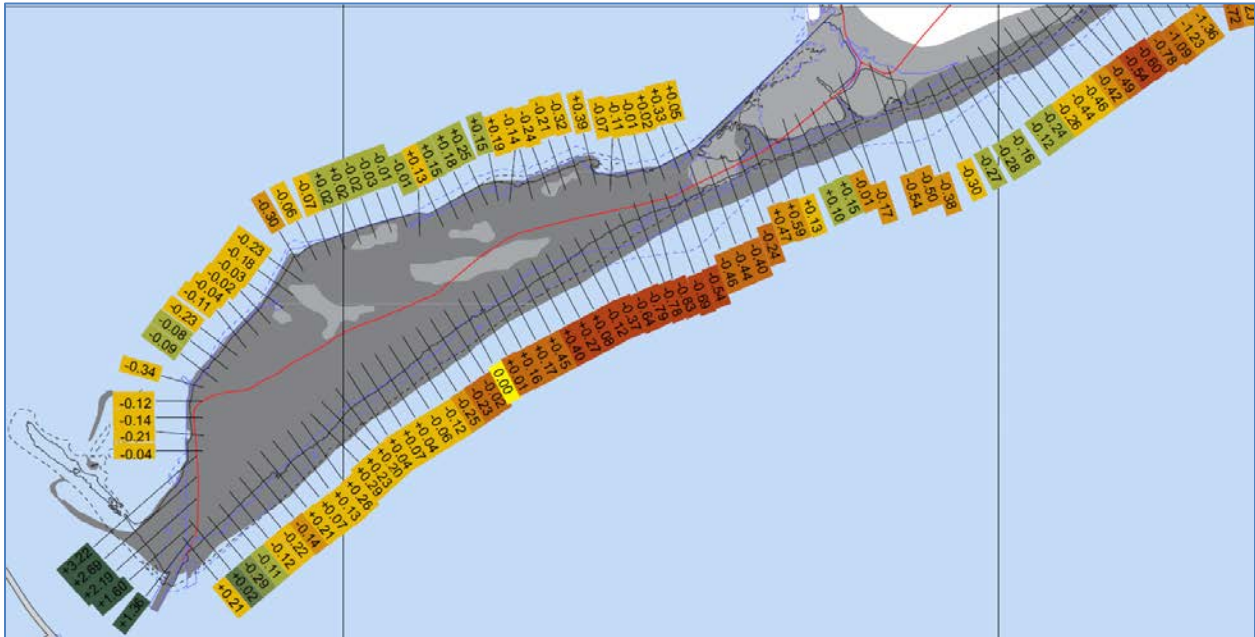


Figure 3. Rates of Coastline or Shoreline Change in the LeGoulet Area. Units are metres per year. Negative values represent erosion and positive values represent accretion. Image extracted from O'Carroll et al. (2014).

**APPENDIX F:
EFFECTS ASSESSMENT**

Scope of Effects Considered (CEAA Section 5(1) and 5(2))

Table 1: Matrix of Potential Project / Environmental Interactions

Project Phase / Physical Work/Activity		As per Section 5(1)			Section 5(1c)				Section 5(2)			Due Diligence									
					Aboriginal Interest																
		Fish and Fish Habitat (Fisheries Act)	Aquatic and Terrestrial Species and Habitat (SARA)	Birds (MBCA)	Health and Socio-Economic	Physical and Cultural Heritage	Land Use	HAPA * Significance	Health and Socio-Economic	Physical and Cultural Heritage	HAPA * Significance	Coastal Processes and Features	Soil and Marine Sediments	Air Quality and Noise	Terrestrial / Aquatic Species and Habitats	Water Quality (surface, marine, groundwater)	Sensitive Environmental Areas (including wetlands)	Land-Use and Aesthetics	Navigation	Transportation Infrastructure	Safety
Shippagan Gully Dredging and Breakwater Construction																					
Phases A and B	Mobilization / Demobilization of land-based construction and dredging equipment.	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P
Phase A	Construction of access road and laydown area.	P	P	-	-	-	-	P	-	-	P	P	P	P	P	P	P	P	P	-	P
Phase A	Import of rock material to the site.	-	-	P	-	-	-	-	-	-	-	P	P	P	P	P	-	-	P	P	
Phase A	Construction of breakwater.	P	P	P	P	-	-	P	P	-	P	P	P	P	P	P	P	P	P	-	P
Phase A	Land-based channel dredging and stockpile of dredge spoils.	P	P	P	P	-	-	P	P	-	P	P	P	P	P	P	P	P	P	-	P
Phase A	Placement of dredged materials at DS1.	P	P	P	P	-	-	P	P	-	P	P	P	P	P	P	P	P	P	-	P
Phase B	Mobilization / Demobilization of floating-plant dredging equipment.	P	P	P	P	-	-	-	P	-	-	-	-	P	P	-	-	P	-	P	
Phase B	Floating-plant dredging and stockpile of dredge spoils.	P	P	P	P	-	-	P	P	-	P	P	P	P	P	P	P	P	P	-	P
Phases A and B	Placement of dredged materials at DS2.	P	P	P	P	-	-	P	P	-	P	P	P	P	P	P	P	P	P	-	P
Phase B	Post-construction restoration activities at Chiasson Barrier Spit.	-	P	P	-	-	-	-	-	-	-	-	P	P	P	P	P	-	-	-	P
Accidents / Malfunctions		P	P	P	P	-	-	P	P	-	P	-	P	P	P	P	P	P	-	-	P
Operation / Maintenance		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Decommissioning / Abandonment		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

N/A = Not Applicable

- = no interaction.

P = potential effect of project on environment.

Table 2.1 Valued Ecosystem Component – Fish and Fish Habitat (<i>Fisheries Act</i>) per CEAA, 2012 Section 5(1)	
Potential Effect: Contamination or direct loss of <i>marine</i> fish habitat.	
Potential Interaction	Mitigation / Best Management Practices
<ul style="list-style-type: none"> • Impacts to/direct loss of marine fish habitat from access road construction, breakwater construction, dredging, and dredge material placement activities. • Disruption of fish migrations during dredging activities and site usage at DS1 and DS2. • Potential for suspended solids/sediments and turbidity during construction, dredging, and placement activities affecting fish/fish habitat. • Potential for introduction of invasive species into the marine environment during Phase B dredging activities. • Contamination of marine water quality from an accidental release/spill of hazardous material. 	<ul style="list-style-type: none"> • A Request for Review will be submitted to DFO-FPP. The project will adhere to mitigation measures proposed by DFO-FPP in a letter of Advice. If a Paragraph 35(2)(b) <i>Fisheries Act</i> Authorization is deemed required, measures proposed by DFO-SCH and accepted by DFO-FPP to offset serious harm to fish must be adhered to. • Visual monitoring of the turbidity will be required on a daily basis in the vicinity of the project to ensure that the turbidity is limited. If excessive change occurs in the turbidity that differs from the existing conditions of the surrounding water body (i.e., distinct colour difference) as a result of the project activities, the work must stop immediately to determine if further mitigation measures are required. • Marine equipment may be inspected by PSPC or DFO to ensure invasive species are not introduced to the marine environment. • Dredging will be conducted at such times to avoid critical spawning seasons. Dredging activities will cease if unexpected fish spawning/migrations are found in the area. • All construction equipment that may come into contact with coastal waters or features during the work must be cleaned, washed with freshwater, and/or sprayed with undiluted vinegar prior to being mobilized to the project site to ensure it is free of any sediments, plant growth and aquatic invasive species. Equipment includes vessels, barges, cranes, excavators, transport trucks, pumps, pipelines, and any tools or various apparatus used previously in a waterbody. Cleaning and washing of equipment is to be performed prior to being mobilized to the project site, immediately upon their arrival at the site and before use in or over the waterbody. • All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. Hoses and tanks are to be inspected on a regular basis to prevent fractures and breaks. • Fuel storage will be at least 30m away from any surface water, drainage feature or the coastal environment. • Fuel storage and refueling of equipment will take place on a flat, level and impermeable surface and utilizing a spill tray. • Onsite crews must have emergency spill clean-up equipment, adequate for the activity involved, on-site. Spill equipment will include, as a minimum, at least one 250L (i.e., 55 gallon) overpak spill kit containing items to prevent a spill from spreading; absorbent booms,

		<p>pillows, and mats; rubber gloves; and plastic disposal bags.</p> <ul style="list-style-type: none"> • All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633). • Activities must be completed in such a way as to minimize the amount of fines and organic debris that may enter nearby aquatic environments. • Any construction debris/material that enters the marine environment will be removed immediately. • If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, ensure that appropriately-sized, clean rock is used; and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment. • Rocks will be placed on the bed of the waterbody as much as practical, rather than dropping or dumping, to limit any further encroachments and re-suspension of sediment. • Where possible, install site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., excavation, dredging). • Erosion and sediment controls will be visually monitored throughout the life of the project, and repaired immediately if necessary. • Implement measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Moderate	Reversible/Irreversible	Immediate/Local	Medium-Term	Once
Residual Effects:	Based on the project design with respect to avoidance of, mitigation, and offsetting for fish and fish habitat, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.			
Monitoring / Follow-up:	Should nearby aquaculture sites be in operation during dredge activities, a Marine Water Quality Monitoring Program (MWQMP) will be developed and implemented.			
<p>Comments: Aquaculture site lease holders have been, and will continue to be, consulted as part of the public consultation/notification activities associated with this project.</p> <p>A UBHS (likely consisting underwater surveys along a mix of transects and spot dives) will be undertaken in the Spring of 2018 to further characterize the proposed dredge material placement sites at DS1 and DS2. Results of this program will be submitted to NBDELG for review upon completion.</p>				

Table 2.2 Valued Ecosystem Component – Aquatic and Terrestrial Species and Habitat (*Species at Risk Act*) per CEAA, 2012 Section 5(1) and Due Diligence

Potential Effect: Impacts to, or loss of, aquatic and terrestrial species (including Species at Risk) and habitats

Potential Interaction	Mitigation / Best Management Practices
<ul style="list-style-type: none"> • Potential disturbance aquatic and terrestrial species (including species at risk) from equipment operation and elevated noise levels. • Loss or alteration of habitat (including critical) from access road construction, breakwater construction, dredging, and dredge material placement activities. • Contamination of existing habitats from an accidental release/spill of hazardous material. 	<ul style="list-style-type: none"> • If a marine mammal is identified within the vicinity of the project, work shall stop until the animal is gone. • The project footprint will avoid the beach and dune areas considered critical Piping Plover habitat. • The final road alignment will be designed in a manner to avoid Piping Plover critical habitat areas. • A qualified biologist will conduct a detailed study of the project area to identify the presence/absence of any Piping Plover critical habitat in the area. • The location of disposal site DS1 will be outside of any critical habitat and will avoid impacting such areas. • All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. Hoses and tanks are to be inspected on a regular basis to prevent fractures and breaks. • Fuel storage will be at least 30m away from any surface water, drainage feature or the coastal environment. • Fuel storage and refueling of equipment will take place on a flat, level and impermeable surface and utilizing a spill tray. • Onsite crews must have emergency spill clean-up equipment, adequate for the activity involved, on-site. Spill equipment will include, as a minimum, at least one 250L (i.e., 55 gallon) overpak spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. • All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633). • Implement measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry. • Any construction debris/material that enters the marine environment will be removed immediately.

Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Moderate	Reversible	Immediate	Short-term	Intermittent
Residual Effects:	Based on the project design with respect to avoidance of and mitigation for aquatic and terrestrial species and their habitats, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.			
Monitoring / Follow-up:	A qualified biologist will be contracted to survey the project site prior to work activities being undertaken in the summer months.			
Comments: All Species at Risk information / data obtained as part of this project will be provided to CWS for review and acceptance.				

Table 2.3 Valued Ecosystem Component – Birds (<i>Migratory Birds Convention Act</i>) per CEEA, 2012 Section 5(1)	
Potential Effect: Direct impacts to birds, or loss of bird habitat	
Potential Interaction	Mitigation / Best Management Practices
<ul style="list-style-type: none"> • Loss or alteration of habitat (including critical) from access road construction, breakwater construction, and dredge material placement activities. • Construction equipment and disposal of dredge material may destroy nests or eggs. • Potential project related elevated noise levels may cause a disruption to/ displacement of nesting birds/habitat or migration. • Potential to enhance populations of avian and mammalian predators or scavengers in the project area resulting in a disturbance to migratory birds (e.g., predation on eggs and chicks). • Contamination of existing habitats from an accidental release/spill of hazardous material. 	<ul style="list-style-type: none"> • All work is to be conducted in accordance with the Migratory Birds Convention Act, which outlines that no migratory bird nests or eggs will be moved or obstructed during the construction or operational phase of the project. • If works is to be conducted during times of migratory bird nesting season, a pre-construction nest survey will be conducted in the vicinity of the project. If active nests are identified the area will be buffered and activities in the immediate area will be minimized until nesting is complete and chicks have naturally migrated from the area. • Concentrations of seabirds, waterfowl, or shorebirds must not be approached. • All vessels and machinery must be well muffled at all times. Contractors should avoid any sharp or loud noises (e.g., not blow horns or whistles) and should maintain constant noise levels. If necessary, trucks may be required to avoid the use of “hammer” braking along specific sections of the route, while radio communication should replace whistle blasts and horns. • All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. Hoses and tanks are to be inspected on a regular basis to prevent fractures and breaks. • Construction activities must be carried out during times acceptable to local authorities and smaller, less disturbing equipment will be used where possible. • Should project activities be undertaken at night, any floodlights shall be shielded and positioned downwards as well as in the opposite direction of bird nesting habitats. • The CWS Birds and Oil Response Plan Guidance will be followed in the event of a petroleum spill in or near the water. • Fuel storage will be at least 30m away from any surface water, drainage feature or the coastal environment. • Fuel storage and refueling of equipment will take place on a flat, level and impermeable surface and utilizing a spill tray. • Onsite crews must have emergency spill clean-up equipment, adequate for the activity involved, on-site. Spill equipment will include, as a minimum, at least one 250L (i.e., 55 gallon) overpak spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. • All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour

		Environmental Emergencies Report System (1-800-565-1633). <ul style="list-style-type: none"> • Implement measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry. • Any construction debris/material that enters the marine environment will be removed immediately. • Contractors must ensure that litter/garbage (including food scraps) are not left at the work site or in coastal areas. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Small	Reversible	Immediate	Short-term	Intermittent
Residual Effects:	Based on the project design with respect to avoidance of and mitigation for migratory birds, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.			
Monitoring / Follow-up:	A qualified biologist will be contracted to survey the project site prior to work activities being undertaken in the summer months.			
Comments: The project design incorporates measures to avoid impacts to wetlands and other potential bird habitat to the greatest extent possible. Construction work will be undertaken outside of bird nesting seasons, namely May to July.				

Table 2.4 Valued Ecosystem Component – Health and Socio-Economic per CEAA, 2012 Section 5(1c) (Aboriginal Interest) and Section 5(2)				
Potential Effect: Adverse impacts to the health and socio-economic well-being of Indigenous peoples and SCH users.				
Potential Interaction		Mitigation / Best Management Practices		
<ul style="list-style-type: none"> Interference with vessel movement/ navigation within the Gully impeding access to commercial/recreational fishing grounds and SCHs. 		<ul style="list-style-type: none"> Work shall be scheduled to avoid fishing seasons and therefore disruption of access to fishing grounds. The Harbour Authority of Le Goulet SCH will coordinate vessel movement during dredging and construction activities for the duration of the project so as to avoid unnecessary interference with harbour users and ensure adequate access. Any and all stipulations of federal, provincial, or municipal authorities or their officers must be strictly followed. Any tools, equipment, vehicles, temporary structures or parts thereof used or maintained for the purpose of building or placing a work in navigable water shall not be permitted to remain in place after the completion of the project. All materials and equipment used in construction must be marked in accordance with the Collision Regulations of the Canada Shipping Act 2001, when located on the waterway. Advise the Canadian Coast Guard, Marine Communication and Traffic Services (MCTS) at (902) 564-7751 or toll free at 1-800-686-8676 sufficiently in advance of commencement of work or when deploying or removing site markings in order to allow for appropriate Notices to Shipping/ Mariners action. Vessels shall be permitted safe access through the worksite at all times, and shall be assisted as necessary. Local fishing groups will be consulted during the final planning stages and advised of the project schedule. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Small	Reversible	Immediate	Short-term	Intermittent
Residual Effects:		Based on the project design with respect to avoidance of and mitigation for health and socio-economic, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.		
Monitoring / Follow-up:		None proposed.		
Comments: None.				

Table 2.5 Valued Ecosystem Component – HAPA* Significance per CEAA, 2012 Section 5(1c) (Aboriginal Interest) and Section 5(2)				
Potential Effect: Adverse Impacts to, or loss of HAPA resources				
Potential Interaction		Mitigation / Best Management Practices		
<ul style="list-style-type: none"> Buried heritage/archaeological resources may be disturbed or destroyed by dredging and construction activities. Potential adverse impacts to the existing Shippagan Gully Tower lighthouse during construction. 		<ul style="list-style-type: none"> All workers / contractors / staff will be advised of the high archaeological and heritage resource potential of the site; All construction personnel will be responsible for reporting any unusual materials unearthed during construction activities to the Construction Supervisor. In those situations where the find is believed to be an archaeological resource, the Construction Supervisor will immediately stop work in the vicinity of the find and notify his/her immediate supervisor and the PSPC Project Manager. Work in the area will be stopped immediately and an archaeological curator at the New Brunswick Department of Tourism, Culture and Heritage – Provincial Archaeological Services will be contacted at 506-453-2738. Work can only resume in the vicinity of the find when authorized by the PSPC Project Manager and Construction Supervisor, after approval has been granted by the New Brunswick Department of Tourism, Culture and Heritage. In the event of the discovery of human remains or evidence of burials, the excavation work will immediately cease and nearest law enforcement agency will be contacted immediately by the PSPC Project Manager and/or the Construction Supervisor. All workers / contractors / staff will be made aware of the importance of the lighthouse as a registered historic structure, and informed of the no-go 30m buffer zone surrounding the structure. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Moderate	Irreversible	Immediate	Short-term	Once
Residual Effects:		Based on the project design with respect to avoidance of and mitigation for discovery of structure, site, or thing that is of HAPA* significance, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.		
Monitoring / Follow-up:		None proposed.		
Comments: MTI will be undertaking an Indigenous Knowledge Study (IKS) for the project. Results of this study will foster consultation and communication between DFO-SCH and the Mi'kmaq of New Brunswick regarding potential impacts to resources within the project footprints and potential additional mitigation measures that may be required.				

*structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Table 2.6 Valued Ecosystem Component – Coastal Processes and Features per Due Diligence				
Potential Effect: Adverse impacts to the coastal processes and features specifically related to the formation and maintenance of the Chiasson Barrier Spit				
Potential Interaction		Mitigation / Best Management Practices		
<ul style="list-style-type: none"> • Placement of dredged materials at DS1 may result in physical changes to the beach along the Barrier Spit. • Placement of dredged materials and reshaping of the inside area of the Barrier Spit may prevent seawater from accessing the coastal wetlands (PSWs). • Dredging of the Gully may result in physical changes (i.e., shape and velocities) that interfere with natural coastal processes. • Construction of a breakwater will result in interference with natural coastal processes. 		<ul style="list-style-type: none"> • The shape of DS2 will be designed to mimic natural processes of coastal dynamics and will include dune shapes and low areas (wetland features). • The shape and location of DS2 will ensure that the tidal connectivity between the Bay and the Barrier Spit coastal wetlands will be maintained. • DS1 will be sited and shaped to ensure the littoral drift is maintained in the area. • DS2 will be sited and shaped according to the results of a study commissioned by the IRZC to minimize negative impacts and optimize beneficial use of dredged material and restore coastal features with minimum impact on coastal processes. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Moderate	Reversible	Immediate/Local	Long-Term	Continuous
Residual Effects:		Based on the project design with respect to avoidance of and mitigation for impact on coastal processes and features, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant .		
Monitoring / Follow-up:		NBDERD and the IRZC undertake monitoring of erosion and deposition rates along the Acadian Peninsula. DFO-SCH will engage with IRZC to monitor such rates along the seaward and interior of the Barrier Spit following project completion to assess the efficacy of deposition of DS1 and DS2.		
Comments: Based on NBDERD's predicted coastal erosion rates, the proposed project is likely to offset the erosion occurring to the Barrier Spit and its sensitive habitats, through the addition of material at DS1 and DS2.				

Table 2.7 Valued Ecosystem Component – Soil and Marine Sediments per Due Diligence				
Potential Effect: Adverse impacts to soil and marine sediment quality				
Potential Interaction		Mitigation / Best Management Practices		
<ul style="list-style-type: none"> • Activities may result in construction-related debris or toxic materials affecting soil/marine sediments. • Accidental releases/spills of petroleum products during construction or dredging may contaminate soils/marine sediments. 		<ul style="list-style-type: none"> • Construction debris and waste materials will be disposed of in accordance with Provincial Waste Management Regulations. • All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. • All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. Hoses and tanks are to be inspected on a regular basis to prevent fractures and breaks. • Fuel storage will be at least 30m away from any surface water, drainage feature or the coastal environment. • Fuel storage and refueling of equipment will take place on a flat, level and impermeable surface and utilizing a spill tray. • Onsite crews must have emergency spill clean-up equipment, adequate for the activity involved, on-site. Spill equipment will include, as a minimum, at least one 250L (i.e., 55 gallon) overpak spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. • All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633). • Implement measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry. • Contractors must ensure that litter/garbage (including food scraps) are not left at the work site or in coastal areas. • Any construction debris/material that enters the marine environment will be removed immediately. • A Quarriable Substances Permit will be obtained from NBDERD. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Moderate	Reversible	Immediate	Short-term	Once

Residual Effects:	Based on the project design with respect to avoidance and mitigation for soil and marine sediments, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.
Monitoring / Follow-up:	None proposed.
Comments: None.	

Table 2.8 Valued Ecosystem Component – Air Quality and Noise per Due Diligence				
Potential Effect: Adverse impacts to air quality and noise generated from the operation of heavy equipment.				
Potential Interaction		Mitigation / Best Management Practices		
<ul style="list-style-type: none"> Construction and mobilization of equipment will cause increased levels of greenhouse gas emissions, VOCs and particulate matter from diesel combustion. Particulate matter (dust) levels will be higher during dry, windy periods of construction. Noise and dust generated as a result of the construction activities and transport of equipment/materials may cause a disruption to adjacent land-owners (especially those along Chiasson Road). 		<ul style="list-style-type: none"> Construction activities must be carried out during times acceptable to local authorities and smaller, less disturbing equipment will be used where possible. Dust suppression by the application of water must be employed when required. The project authority shall determine locations where water is to be applied, the amount of water to be applied, and the times at which it shall be applied. Waste oil must not be used for dust control under any circumstances Vehicles and equipment will be maintained in good working order; All machinery must be well muffled at all times. Contractors should avoid any sharp or loud noises (e.g., not blow horns or whistles) and should maintain constant noise levels. If necessary, trucks may be required to avoid the use of “hammer” braking along specific sections of the route, while radio communication should replace whistle blasts and horns. Potentially affected landowners will be informed of the project’s anticipated impacts and duration. Excessive idling of motorized equipment/vehicles will not be permitted. The number of truck trips to and from the site will be minimized to the extent possible. Trucks will be tarped to minimize dust during transportation. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Small	Reversible	Immediate	Medium-term	Intermittent
Residual Effects:		Based on the project design with respect to avoidance and mitigation for air quality and noise, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.		
Monitoring / Follow-up:		None proposed.		
<p>Comments: The alternative approach of importing materials by floating barge was assessed but considered not feasible due to the existing high currents and water depths within Shippagan Bay. The distance from nearby properties ensures that, once material is imported by truck to the site, noise disturbance to nearby landowners will be minimal.</p> <p>The proposed project, when completed, will permit vessels to directly access the Gulf via the Shippagan Gully, thereby avoiding the 6-hour (each way) trip around Miscou Island. This significantly reduces the amount of fuel consumption required per vessel, and by consequence reduces GHG and particulate matter emissions in the region.</p>				

Table 2.9 Valued Ecosystem Component – Water Quality (surface, marine, groundwater) per Due Diligence	
Potential Effect: Adverse impacts to surface, marine and groundwater quality	
Potential Interaction	Mitigation / Best Management Practices
<ul style="list-style-type: none"> • Activities may result in construction-related debris or toxic materials affecting marine water quality. • Potential accidental release of toxic materials on land or entering the marine environment affecting marine, surface, and groundwater quality. 	<ul style="list-style-type: none"> • Weather conditions are to be assessed on a daily basis to determine the potential risk of weather on the project. Work is to be scheduled to avoid periods of heavy precipitation and to prevent erosion and release of sediment and/or sediment-laden water during the construction phase. • Heavy machinery will not be allowed in the water. Machinery shall be operated on land above the high water mark, in a manner that minimizes disturbance to the banks and bed of the waterbody. • Visual monitoring of the turbidity will be required on a daily basis in the vicinity of the project to ensure that the turbidity is limited. If excessive change occurs in the turbidity that differs from the existing conditions of the surrounding water body (i.e., distinct colour difference) as a result of the project activities, the work must stop immediately to determine if further mitigation measures are required. • Activities must be completed in such a way as to minimize the amount of fines and organic debris that may enter nearby aquatic environments. • Implement measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry. • Use site isolation measures (e.g. silt boom or silt curtain) for containing suspended sediment where/when possible. • All exposed soils must be stabilized as soon as possible in order to control sediment runoff during and after construction. • Erosion and sediment controls will be visually monitored throughout the life of the project, and repaired immediately if necessary. • All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. • All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. Hoses and tanks are to be inspected on a regular basis to prevent fractures and breaks. • Fuel storage will be at least 30m away from any surface water, drainage feature or the coastal environment.

<ul style="list-style-type: none"> • Fuel storage and refueling of equipment will take place on a flat, level and impermeable surface and utilizing a spill tray. • Onsite crews must have emergency spill clean-up equipment, adequate for the activity involved, on-site. Spill equipment will include, as a minimum, at least one 250L (i.e., 55 gallon) overpak spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. • All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633). • Any construction debris/material that enters the marine environment will be removed immediately. • A WAWA permit will be obtained from NBDELG for any works within 30m of a wetland or watercourse. • Contractors must ensure that litter/garbage (including food scraps) are not left at the work site or in coastal areas. 				
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Moderate	Reversible	Immediate	Short-term	Intermittent
Residual Effects:	Based on the project design with respect to avoidance and mitigation for water quality, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.			
Monitoring / Follow-up:	Should nearby aquaculture sites be in operation during dredge activities, a Marine Water Quality Monitoring Program (MWQMP) will be developed and implemented.			
Comments: The nearest groundwater supply is approximately 1,000m from the proposed equipment storage and refueling site.				

Table 2.10 Valued Ecosystem Component – Sensitive Environmental Areas (including wetlands) per Due Diligence	
Potential Effect: Adverse impacts to, or permanent loss of Provincially Significant and regulated wetlands, and other environmentally sensitive features.	
Potential Interaction	Mitigation / Best Management Practices
<ul style="list-style-type: none"> • Disruption to/Permanent loss of Regulated and/or PSW wetland areas from the construction of the access road and placement of material at DS2. • Impacts to PSWs from the construction of the new access road, which may obstruct saltwater from reaching the Barrier Spit; • The project may result in physical changes to critical (and secondary) Piping Plover habitat and Chiasson Office Beach ESA. 	<ul style="list-style-type: none"> • The final road alignment will be designed in a manner to avoid wetland areas. • No ditching in any wetland area will be permitted. • All exposed soils must be stabilized as soon as possible in order to control sediment runoff during and after construction. • Where possible, install site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., excavation, dredging). • Erosion and sediment controls will be visually monitored throughout the life of the project, and repaired immediately if necessary. • All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. • All equipment must be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products. Hoses and tanks are to be inspected on a regular basis to prevent fractures and breaks. • Fuel storage will be at least 30m away from any surface water, drainage feature or the coastal environment. • Fuel storage and refueling of equipment will take place on a flat, level and impermeable surface and utilizing a spill tray. • Onsite crews must have emergency spill clean-up equipment, adequate for the activity involved, on-site. Spill equipment will include, as a minimum, at least one 250L (i.e., 55 gallon) overpak spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. • All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633). • All construction equipment that may come into contact with coastal waters or features during the work must be cleaned, washed with freshwater, and/or sprayed with undiluted vinegar prior to being mobilized to the project site to ensure it is free of any sediments, plant growth and aquatic invasive species. Equipment includes vessels, barges, cranes, excavators, transport trucks, pumps, pipelines, and any tools or various apparatus used previously in a

		<p>waterbody. Cleaning and washing of equipment is to be performed prior to being mobilized to the project site, immediately upon their arrival at the site and before use in or over the waterbody.</p> <ul style="list-style-type: none"> • Any permanent loss of regulated or PSWs will be compensated as per the Federal wetland conservation policy; • A WAWA permit will be obtained from NBDELG for any works within 30m of a wetland or watercourse and conditions therein adhered to. • DS2 will be sited and shaped according to the results of a study commissioned by the IRZC to minimize negative impacts and optimize beneficial use of dredged material and restore coastal features with minimum impact on coastal processes. • A qualified biologist will conduct a detailed study of the project area to identify the presence/absence of Piping Plover critical habitat in the area. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Moderate	Reversible	Immediate	Medium-Term	Intermittent
Residual Effects:	Based on the project design with respect to avoidance, mitigation and compensation for sensitive features (including wetlands), the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.			
Monitoring / Follow-up:	<p>The proponent has committed to completing a detailed wetland study of the area, which will confirm present-day extent of the wetlands within the project footprint. The proposed project has been designed to maximize avoidance of a variety of habitats and environmental features, including PSW's, wetlands, and their buffers. The above proposed mitigation measures are generally-accepted mitigation measures known to work on similar other project. Where impacts cannot be avoided or mitigated, a wetland compensation plan will be developed, submitted for approval, and implemented by the proponent. The proposed disposal of dredged material at DS2 is intended to have a positive net impact (i.e., will create additional coastal wetland area).</p> <p>Post-construction monitoring will be undertaken following completion of the coastal wetland created by the construction of the access road and deposition of material at DS2. The final monitoring plan will be developed with input from Environment Canada and the Surface Water Protection Group of NBDELG prior to implementation.</p>			
Comments: None.				

Table 2.11 Valued Ecosystem Component – Land Use and Aesthetics per Due Diligence				
Potential Effect: Land use conflicts and adverse impacts to the aesthetic quality of the area from changes to the Chiasson Barrier Spit.				
Potential Interaction		Mitigation / Best Management Practices		
<ul style="list-style-type: none"> The viewscape of the Shippagan Bay will be temporarily altered due to the presence of large and medium-sized heavy equipment working (and stored) on the Barrier Spit and within the channel. The viewscape of the Shippagan Bay will be permanently altered due to the proposed placement of dredge materials and shaping of DS2. The project may impede neighbouring landowner's ability to use and enjoy their property(ies). 		<ul style="list-style-type: none"> The project is designed to ensure that the Barrier Spit and Shippagan Tower lighthouse will be preserved in the long-term; DS2 will be sited and shaped according to the results of a study commissioned by the IRZC to minimize negative impacts and optimize beneficial use of dredged material and restore coastal features with minimum impact on coastal processes. The proposed project will not impede the use of the beach for the neighbouring kite-surfing company. The project design will ensure that neighbouring landowners benefit from the completion of the project. Neighbouring/affected landowners will be notified and consulted on the project and timelines. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Moderate	Reversible	Immediate	Medium-Term	Intermittent
Residual Effects:	Based on the project design with respect to avoidance and mitigation for land use and aesthetics, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant .			
Monitoring / Follow-up:	None proposed.			
Comments: The project is a temporary, 2-year project with various "blackout", or non-working, periods to minimize the potential aesthetic and socio-cultural impacts of the project. Additionally, by extending the life of the Chiasson Barrier Spit, the aesthetic character of the area, including the beach and lighthouse, will be preserved.				

Table 2.12 Valued Ecosystem Component – Navigation (Due Diligence)				
Potential Effect: Adverse impacts to navigation of vessels within the and through the project area.				
Potential Interaction		Mitigation / Best Management Practices		
<ul style="list-style-type: none"> • Dredging of the channel will impede some vessels from traveling through the channel to access the Gulf. • Having floating dredging equipment and private vessels (commercial, recreational) in the channel, where the navigable channel is narrow and swift) may create collisions/near-collisions. 		<ul style="list-style-type: none"> • Work shall be scheduled to avoid fishing seasons and therefore disruption of access to fishing grounds. • The Harbour Authority of Le Goulet SCH will coordinate vessel movement during dredging and construction activities for the duration of the project so as to avoid unnecessary interference with harbour users and ensure adequate access. Any and all stipulations of federal, provincial, or municipal authorities or their officers must be strictly followed. • All materials and equipment used in construction must be marked in accordance with the Collision Regulations of the Canada Shipping Act 2001, when located on the waterway. • Advise the Canadian Coast Guard, Marine Communication and Traffic Services (MCTS) at (902) 564-7751 or toll free at 1-800-686-8676 sufficiently in advance of commencement of work or when deploying or removing site markings in order to allow for appropriate Notices to Shipping/ Mariners action. Vessels shall be permitted safe access through the worksite at all times, and shall be assisted as necessary. • A <i>Navigation Protection Act</i> (NPA) approval is likely required for this project. The proponent will comply with all/any conditions of the NPA approval. • All proper signage and warning lighting will be employed in the channel to warn vessels of the proposed project. • Only licensed and qualified dredging contractors with previous, similar project experience will be used for the proposed project. • Any tools, equipment, vehicles, temporary structures or parts thereof used or maintained for the purpose of building or placing a work in navigable water shall not be permitted to remain in place after the completion of the project. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Small	Reversible	Immediate	Short-term	Intermittent
Residual Effects:	Based on the project design with respect to avoidance of and mitigation for impacts to navigation, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant .			
Monitoring / Follow-up:	None proposed.			
Comments: Completion of the proposed project will result in a positive net impact on navigation (i.e., the safe navigation of the channel).				

Table 2.13 Valued Ecosystem Component – Transportation Infrastructure per Due Diligence				
Potential Effect: Adverse impacts to roads, culverts, and other transportation infrastructure as a result of the construction of the project.				
Potential Interaction		Mitigation / Best Management Practices		
<ul style="list-style-type: none"> Degradation of transportation infrastructure from mobilization of heavy equipment and import of heavy rock materials. 		<ul style="list-style-type: none"> The contractor shall obtain all necessary permits (e.g., Access Permit/Certificate of Setback, Highway Usage Permit, Special Permits) and adhere to applicable legislation (e.g., Community Planning Act, Highway Act (Transfer of Administration and Control), Provincial Motor Vehicle Act) for transportation over public roadways. All posted speed limits will be strictly adhered to. Seasonal weight restrictions will be strictly adhered to. The number of truck trips will be limited to the minimal extent possible. Accidental spillage that occurs during hauling will be promptly removed from the highway following appropriate safety procedures. The NBDTI District Engineer will be contacted prior to initiating the project to ensure all concerns are addressed. The NBDTI District Engineer will be contacted immediately in the event of a road, bridge, culvert or other transportation-related issue. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Moderate	Reversible	Immediate/Local	Short-term	Once
Residual Effects:		Based on the project design with respect to avoidance of and mitigation for transportation infrastructure, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.		
Monitoring / Follow-up:		None proposed.		
Comments: None.				

Table 2.14 Valued Ecosystem Component – Safety per Due Diligence				
Potential Effect: Safety hazards caused by the construction and operation of the project.				
Potential Interaction		Mitigation / Best Management Practices		
<ul style="list-style-type: none"> Members of the general public and contractors involved in the implementation of the project may be exposed to workplace hazards, both on land and in the Bay/channel. 		<ul style="list-style-type: none"> All posted speed limits will be strictly adhered to; Only licensed and qualified contractors with similar-project experience will be used for the proposed project; All proper signage and warning lighting will be employed in the channel to warn vessels of the proposed project; All contractors and employees will use appropriate personal protective equipment (PPE); Contractors will be required to maintain safe work practices at all times, including holding “tailgate” safety briefings and maintaining necessary safety equipment on site at all times. Site access must be restricted to authorized workers only. Workers in contact with hazardous materials must be provided with and use appropriate personal protective equipment. Proper safety procedures must be followed for the duration of the project as per applicable municipal, provincial and federal regulations. Employees will be trained in health and safety protocols (e.g., safe work practices, emergency response). The requirements of the NBDTI Work Area Traffic Control Manual (WATCM) will be implemented where necessary, including but not limited to temporary signage along Chiasson Road. 		
Magnitude	Reversibility	Geographic Extent	Duration	Frequency
Small	Reversible	Immediate	Medium-term	Intermittent
Residual Effects:		Based on the project design with respect to avoidance and mitigation of human safety hazards, the frequency, duration, reversibility and extent of the proposed project, the adverse environmental impacts from this project are considered: Not Significant.		
Monitoring / Follow-up:		None required.		
<p>Comments: The safety of contractors and their employees shall be their responsibility, as per the criteria stipulated in the awarded contract.</p> <p>It is important to note that The overall project objective is to improve safety of the channel for fishing, recreational, and rescue vessels.</p>				