PORT QUÉBEC

MULTIFUNCTIONAL DEEP-WATER TERMINAL

BEAUPORT 2020

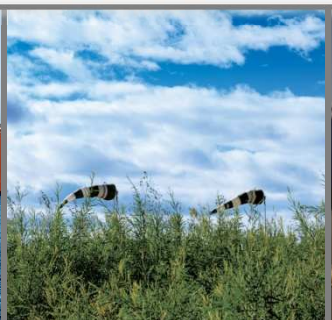
ENVIRONMENTAL IMPACT STATEMENT

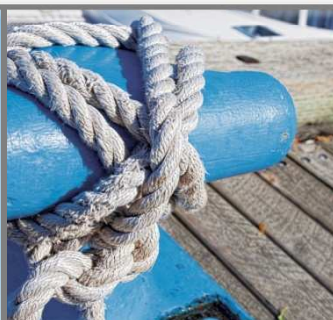
Amended version

September 2016

Englobe

Summary





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1 ENVIRONMENTAL ASSESSMENT: INTRODUCTION AND CONTEXT

1.1 SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT

This document presents a summary of the environmental impact statement (EIS) for the Port of Québec multifunctional deep-water terminal development project, hereinafter referred to as “Beauport 2020.” The EIS was prepared in accordance with the guidelines issued by the Canadian Environmental Assessment Agency (CEAA) for the project in fall 2015.

The elements considered therefore include, among others, the purpose of the project, the importance of the project, site options, the public’s observations, the project’s environmental effects, expected mitigation measures, the impacts of the environment on the project, marine and land risk analyses, cumulative effects and a monitoring and follow-up program. It also presents the work, studies, appendices and other characteristics necessary to facilitate understanding of the project’s environmental effects.

As indicated in the guidelines, the scope of the project for environmental assessment purposes includes the identified project components associated with the construction and operation phases. However, as the multifunctional terminal will have a lifespan of more than 75 years, the dismantling phase has not been addressed. Where necessary at the time of dismantling or closure, the applicable laws and regulations will be respected and an evaluation of environmental effects (EEE) will be called for.

Moreover, at the request of the CEAA, assumptions have been made regarding the amenities of transfer and storage infrastructure in the operations phase in order to evaluate the potential effects of future port operations. A hypothetical situation is therefore proposed that provides for the division of the area behind the wharf into three zones: the first dedicated to the transfer, storage and handling of liquid bulk, the second to covered dry bulk and the last to general merchandise (containerized or not).

However, the dismantling of a hangar in the Estuary sector is excluded from the scope of this project and the EIS. The development of a dolphin, as may be noted in certain related assessments, is also excluded, as this component of the project was abandoned. Moreover, the assessment excludes the definitive design of the terminal before the operations phase, as well as the final design of the beach once the rebuilding is complete. These designs will be managed by the Québec Port Authority’s (QPA’s) Environmental Citizen Participation Process (ECPP).

1.2 PROPONENT

The QPA is the project proponent. The QPA is responsible for the design, construction, leasing of land for post-construction operation of the port by users, and decommissioning of the terminal, if necessary.

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The QPA is a shared governance organization (federal, provincial and municipal) whose mission is to promote and develop maritime trade, to serve the economic interests of the Québec area and of Canada, and to ensure the Port of Québec's profitability in a way that respects both the community and the environment. The land, as well as some buildings and other assets of the Port of Québec, legally belong to the federal government, and the QPA's role is to manage them while respecting its mission.

The QPA is a financially independent body under the *Canada Marine Act*. It derives revenue from the transit of goods (70%), the cruise ship sector (15%) and various commercial revenues (15%). Note that the QPA does not receive any monetary compensation from the different levels of government. On the contrary, it must return a portion of its gross revenues to the federal government in the form of royalties, as well as pay applicable property taxes to the City of Québec.

The QPA has extensive experience in project management and the necessary in-house expertise to coordinate with specialized firms all the components of the deep-water terminal development project in terms of the environment, engineering, legal aspects, relationships with local and Aboriginal communities and public communications.

1.3 PROJECT LOCATION

The project site is located on federal land belonging to the Port of Québec, in the Beauport sector (see Figure 1). It is situated to the east of the Autoroute Dufferin-Montmorency and White Birch Paper's Stadacona mill. It is bordered by the estuary of the Saint-Charles River to the south, and by the St. Lawrence River to the east. The Beauport Bay recreation park lies to the north of the site.

The site is situated near industrial, commercial and residential sites, and serviced by transport facilities such as highways and rail access points.

Figure 1 Project location

1.4 ENVIRONMENTAL PROTECTION MECHANISMS

The QPA will implement a specific environmental protection plan for the Beauport 2020 project that will cover all phases of the project, as well as a detailed environmental monitoring and follow-up program. The following tools will also contribute to the healthy environmental management of the project.

- Sustainable development action plan

  The QPA's first sustainable development action plan, initiated in 2013, allowed the QPA to establish the foundations of a progressive and participative sustainable development process. The 16 planned actions were carried out. The QPA is preparing to present a new sustainable development action plan for 2016–2021 in the coming months.

- Green Marine

  The QPA is a founding member of Green Marine, a rigorous, transparent and voluntary certification program for the North American marine industry that audits the QPA's environmental performance every two years. In 2015, the QPA received a grade of 5 out of 5 for all evaluated criteria: greenhouse gas emissions, prevention of spills and leakages, community impacts and environmental leadership.

- Environmental policy and environmental management system (EMS)

  The QPA has an environmental policy that presents its formal commitments in terms of environmental management, environmental protection, governance and communications. This policy encompasses the EMS, based on the ISO 14001:2015 standard, which allows the Port of Québec to effectively manage the environmental aspect of its projects. The EMS specifies, in particular, stakeholders' responsibilities, targets and programs, efficient management procedures for environmental problems, communications processes, training for employees and entrepreneurs, as well as the auditing,

monitoring and follow-up process. A three-year environmental compliance auditing (ECA) process, which applies to both the port's and users' activities, was also introduced.

- Environmental Citizen Participation Process (ECPP)

  The ECPP is based on a risk management approach that varies according to project size. The ECPP entails the obligation to inform the public and ensure its participation in projects, to have an independent firm produce evaluations of environmental effects and to take into account the comments made by citizens and other interested parties. The type of citizen participation varies depending on the nature of the project.

2 PROJECT OVERVIEW

2.1 PURPOSE OF THE PROJECT

2.1.1 Maintain a strategic position in global trade

The Port of Québec ensures wealth creation both upstream and downstream from its activities. It maintains trade relations with over 50 countries and deals with over $20 billion in goods annually. As the main transit point for international cargo going to or coming from the Great Lakes region, it generates close to $1.35 billion in economic benefits nationally, as well as $247.8 million in tax revenues and incidental taxation. The port also helps to maintain 13,250 jobs with salaries that exceed the regional average by over 40%.

The Port of Québec's strategic geographic location ensures it has an important comparative advantage in international maritime trade. In fact, it is the last deep-water port on the St. Lawrence River before the Great Lakes. With a water depth of 15 m at low tide in the Beauport sector, the port is able to accommodate large ships, the use of which allows for economies of scale for the entire supply chain and makes Canadian imports and exports more competitive.

As the use of larger and larger vessels is a trend in the international marine industry, this strategic advantage makes the Port of Québec a transhipment hub between the Great Lakes and overseas markets. Its intermodal links with road and rail services also ensure invaluable commercial flexibility.

Maritime transport accounts for 90% of international trade. Canadian international trade and the ensuing collective wealth are intimately linked to the ability of Canadian industries to import and export goods produced nationally.

Considering that the Port of Québec is one of the main Canadian ports, with trade coming from or going to about 50 countries every year and that an increase in maritime transport is anticipated, it is essential that the QPA has the space required to fulfill its mission and thus allow the companies it serves to stay competitive.

2.1.2 Respond to growing demand

Thanks to its strategic position, the Port of Québec has seen strong growth since the early 2000s and is now at full capacity. The wharves occupancy rate is now at a critical commercial threshold, causing an increase in the number of vessels in waiting. Moreover, the QPA no longer has enough land to accommodate new freight traffic and projects. QPA is thus unable to meet new Canadian economical demands, preventing an increase in existing operations as well as new market development.

The international context suggests an upcoming increase in opportunities, owing particularly to the Canada and European Union Comprehensive Economic and Trade Agreement and to growing demand for natural resources.

The current situation thus obstructs the growth of the Port of Québec's activities and makes the development of new sectors impossible. Given the intense competition between ports on the US east coast, it is not only the growth of the Port that is compromised, but also its current activities.

2.1.3 Maintain permanent infrastructure

The Port of Québec is the oldest port in Canada. Its aging infrastructure requires major investments in order to ensure its sustainability. In fact, approximately $300 million will be necessary over a 20-year period simply to cover the restoration of existing assets.

Under the *Canada Marine Act*, the QPA does not have access to alternate sources of revenue and must thus finance a major portion of this restoration independently, by increasing its revenues with expansion projects.

In addition to allowing the Port of Québec to benefit from new spaces dedicated to economic development, the profits generated by the project will encourage reinvestment in existing infrastructure, thus ensuring its sustainability.

2.1.4 Contribute to broader plans, policies and programs

By allowing Canadian companies to benefit from the competitive economic and environmental advantages offered by maritime transport, the Beauport 2020 project reflects the Government of Canada's larger-scale desire to encourage the economy by leveraging its natural resources, among other things.

The project will help to strengthen the Canadian economy by bolstering the transport supply chain, providing its companies with economies of scale linked to maritime transport, increasing exports and diversifying Canada's trading partners. Accordingly, it will encourage the diversification of the Canadian economy by supporting new markets. Moreover, as the wharves managed by the QPA are public and used by many users according to the needs of different industries, they are mostly independent of market trends and economic cycles and thus offer additional resilience to our economy.

The project is also in line with many recommendations made in the St. Lawrence – Great Lakes Maritime Strategy, which was developed and updated by a joint working group formed by the Quebec government and private sector representatives involved with transport. This strategy targets the improvement and increase of bulk transfer facilities in Québec, the improvement of port capacity all along the network, the replacement of aging port infrastructure and the implementation of special interface zones for handling hydrocarbons in Québec and Montréal.

Finally, Beauport 2020 will make it possible for the QPA to fulfill the commitment it made in 2008 to the local community to improve, maintain and make official Beauport Bay's recreational function. However, the Beauport Bay beach is eroding and its current configuration does not offer sufficient stability to assure its durability through time. It is for this reason that the Beauport 2020 project has an entire component dedicated to rebuilding the beach and preserving it for future generations.

2.2 GOALS OF THE PROJECT

2.2.1 Improvement of services for users

The Beauport 2020 project aims to improve services for companies specializing in cargo handling and storage (terminal operators), who are responsible for the transit of cargo across the wharves of the Port of Québec.

The project will optimize the flexibility of current operations, facilitate the accommodation of vessels, as well as increase the transhipment and storage capacity of solid or liquid bulk, general goods and other

types of cargo, all in response to the current demands of the economy and with the objective of increasing Canadian exports.

The project will also create synergies with existing equipment, which will maximize the economic benefits of the investment, limit business risk and allow additional flexibility for traffic growth.

2.2.2 Specific economic objectives

In addition to the overall objective of strengthening the Canadian economy, the Beauport 2020 project should achieve the following objectives:

- Generate $300 to $400 million in private investments
- Create economic benefits of more than $100 million per year on average for the next 20 years after the start of the operations phase
- Create around 1,000 new full-time jobs annually until 2038
- Provide the Canadian government with additional direct and indirect revenues of more than $178.4 million over 20 years, thus allowing it to quickly recover its investment
- Create an economic growth similar to the one achieved historically, allowing QPA to release up to $300 million over 10 years for other initiatives

3 OPTIONS ANALYZED AND DESCRIPTION OF THE MAIN ELEMENTS OF THE PROJECT

3.1 SITE OPTIONS

3.1.1 Selection of potential sites according to key project requirements

Potential sites were identified by considering the ability of each to achieve the fundamental objectives of the project, namely to develop a multifunctional deep-water terminal and a new area behind the wharf able to accommodate new developments and generate new revenues.

On a technical level, the sites had to allow for the achievement of the project's objectives – the construction of two new berths measuring 610 m in length and ensuring a water depth of minimum 16 m at low tide, the presence of marine safety and public safety, the development of an area behind the wharf of minimum 17 ha to allow for new revenues to be generated, the development of a multifunctional terminal, the continuity of new port operations with existing ones, the intermodality of new infrastructure, the continuation of port operations 12 months of the year and the completion of the project in acceptable geotechnical conditions.

In terms of the project's effects, the sites had to allow for the minimization of encroachment on the river, dredging volume and the sedimentation rate (to minimize the volume and frequency of maintenance dredging), the repurposing of the dredged sediments on the project site as backfill for the area behind the wharf, the minimization of potential effects on the biophysical and human environment and the maximization of the project's economic profitability.

Based on the previously defined key requirements, four sites with the potential to accommodate the entire project were identified: the Estuary sector, the Beauport sector, the Lévis–Pointe de la Martinière sector and the Anse au Foulon sector. A more thorough technical review based on the project's key requirements, however, led to the rejection of the Estuary sector due to a lack of space. The Anse au Foulon, Lévis–Pointe de la Martinière and Beauport sectors were then subject to a multi-criteria comparative analysis with the goal of determining the best site for the project.

Figure 2 Site options considered for the analysis

3.1.2 Multi-criteria analysis of site options

In accordance with the requirements, the selection criteria of this multi-criteria analysis were the preservation of the quality of the environment, economic profitability and the preservation of living environments. The analysis also had to demonstrate that the site options met the project's objectives, were legally and technically feasible and would allow the project to be completed at costs that would not compromise its economic viability. A summary of the criteria is presented below.

On a technical level, the criteria considered were the site's geometry and topography, allowing for the development of an efficient and easily operated terminal; the intermodal quality, or the proximity of road and rail infrastructure; the flexibility and complementarity between the equipment and the current land; as well as the navigability, or the possibility for vessels to safely access and dock at the terminal.

On an economic level, the criteria considered were construction costs, including the development of new infrastructure, dredging and the management of dredged sediments; development costs generated by the development of new equipment or infrastructure (centralization of operations preferred); as well as the relocation costs generated by expropriations.

On an environmental level, the criteria considered were encroachment and disturbed areas; the volume of dredged sediment; as well as the environmental effects on the biological environment.

On a social level, the criteria considered were the distance between residences and the new wharves; the proximity of the new infrastructure to road and rail traffic routes in order to limit heavy traffic on local roads; the safety of new infrastructure for nearby recreational, touristic, urban and residential uses (civil security); as well as respect for the aims and functions of the land.

The table below gives each of the three potential sites a positive or negative value for each documented selection criterion according to the information gathered.

A positive value was given when the information indicated a significant advantage for the project, or that there would be limited impact. A negative value was given when the information indicated a constraint for the project, or that more significant impacts must be considered.

Table 1 Results of the multi-criteria analysis

CRITERION	VALUE GIVEN BY SITE		
TECHNICAL	**BEAUPORT**	**POINTE DE LA MARTINIÈRE**	**ANSE-AU-FOULON**
Geometry and topography	Positive	Negative	Positive
Intermodal quality	Positive	Negative	Negative
Flexibility	Positive	Negative	Positive
Navigability	Positive	Positive	Negative
ECONOMIC	**BEAUPORT**	**POINTE DE LA MARTINIÈRE**	**ANSE-AU-FOULON**
Construction costs	Positive	Negative	Positive
Centralization of operations	Positive	Negative	Positive
Expropriations	Positive	Negative	Negative
ENVIRONMENTAL	**BEAUPORT**	**POINTE DE LA MARTINIÈRE**	**ANSE-AU-FOULON**
Encroachment	Positive	Negative	Negative
Volume dredged	Positive	Positive	Negative
Biological environment	Negative	Positive	Negative
SOCIAL	**BEAUPORT**	**POINTE DE LA MARTINIÈRE**	**ANSE-AU-FOULON**
Distance from residences	Positive	Positive	Negative
Traffic	Positive	Negative	Negative
Civil security	Positive	Negative	Negative
Respect for the aims	Positive	Positive	Negative

The comparative multi-criteria analysis of the identified potential sites showed that the Beauport sector site stood out with positive values on many criteria. This site was thus chosen for the project.

The major advantages of this site were in the criteria related to the technical component (geometry, topography, intermodal quality, flexibility and navigability) and the economic component (lower costs, in particular regarding the centralization of operations the site allows). On an environmental level, this site would minimize the impact on the river and the volume of sediments to dredge.

The Anse au Foulon sector's technical challenges were particularly discriminating, as were the results for the social component. While its initial estimated costs were a little higher than those for the Beauport site, there was much uncertainty with regards to construction costs to ensure the functionality and presence of the required infrastructure on this site alongside the other components of the environment.

The Lévis–Pointe de la Martinière site is not currently developed, which poses a significant obstacle in terms of the key requirements of the project. Using this site would thus mean constructing and installing a full set of facilities and significant new developments (railway), resulting in a greater impact on the environment and much higher costs (more than double the costs of the Beauport site). While the Lévis–Pointe de la Martinière site offers good potential for port activities, as indicated by the multi-criteria analysis, it is not adapted to the context, market and commercial needs that justify the multifunctional deep-water terminal project, nor to its technical and logistical requirements; it would also have to deal with effects on the human and physical environment in the same way as the other sectors assessed for the project.

3.2 PROJECT DESIGN OPTIONS

Along with the site options, the QPA also analyzed different design and construction options in the Beauport sector.

Since 1967, the QPA has considered many options for expansion on the Beauport sector site. The main criteria used to evaluate these options were the area of encroachment on the river and the project's impact on the generation of new revenues. Through the different options proposed, the infrastructures were redesigned in order to minimize the project's effects on its environment. The number of wharves thus went from 50 to 1, and the area of encroachment from 1,190 hectares to 17.9. The QPA therefore recommends the most recent option, proposed in 2015, which includes the construction of a new wharf and the rebuilding of the beach with a total river encroachment of 17.9 hectares. This choice also meets the revenue creation criterion, as 16.9 of the additional hectares will be allocated to the area behind the wharf to support new developments.

The project presented in the EIS includes a new multifunctional terminal, a retaining dike and a sustainability design for the recreational beach, including the construction of a breakwater. Many other interventions will also be necessary, such as the expansion of the railway and the relocation of the City of Québec's emergency outfall.

Figure 3 Overview of projected work

3.2.1 Orientation, configuration and construction of the new wharf 54

It was determined that the new wharf will be made of prefabricated reinforced concrete cribs. The wharf will be built at a 17 degree angle to the northwest with respect to the current alignment of wharves.

The main construction steps of the new wharf are as follows:

- Fabrication of cribs
- Dredging of a trench for the installation of cribs
- Preparation of the crib foundations
- Installation of cribs
- Filling of cribs
- Installation of a construction road (temporary access) on the cribs
- Backfilling of the area behind the wharf
- Construction of the upper slab on the cribs and the cope wall
- Installation of anti-scour slabs

- Installation of wharf accessories

These steps are described in detail in chapter 3 of the EIS.

3.2.2 Retaining dike

The retaining dike must be constructed in conjunction with the installation of the cribs. The retaining dike will be approximately 480 m long. The final level of the area behind the wharf will be + 7.32 m, while the crest of the dike is expected to be at an elevation of + 8.65 m. The stone and the pit run materials will come from a quarry in the region and will be transported by truck or barge. The materials for the core of the dike will be poured directly in place, while the stone for the under-layers and the large riprap of the armour will be placed in their final location by a mechanical device installed on the dike. The work will begin on land and move toward the water. No excavation will be required for this step.

The retaining dike will be made up of a core of pit-run from the quarry, and the surface facing the water will be covered by a geomembrane and then by stone filter under-layers (5–8 kg and 100–200 kg) and finally by a stone armour layer.

3.2.3 Rebuilding of the beach and construction of a breakwater

3.2.3.1 Description of the selected option for the rebuilding of the beach

The rebuilding of the Beauport Bay beach will reposition the current beach so as to protect it against erosion and thus ensure its sustainability. The new beach measures 246.5 m long and is oriented so as to weaken the longshore currents and erosion resulting from storm surges from the east and east-northeast. The breakwater situated on the northern limit of the beach will slow down the longshore transport that currently tends to move the sand along the beach toward the southwest re-entrant.

The recreation and tourist area will also be redeveloped at the end of the work, and a separate evaluation of environmental effects (EEE) will be conducted as part of the QPA's Environmental Citizen Participation Process (ECPP). The Beauport Bay user forum was set up by the QPA in order to present the required infrastructure to users and discuss the future development of the beach.

In short, the project consists of using dredged sediments to rebuild the current beach. About 220,000 m^3 of sediments will be used to refill the beach. The sediments used to rebuild the beach will respect the criteria and standards in effect.

3.2.3.2 Description of the selected option for the construction of a breakwater

The breakwater, which is extended by an underwater jetty, will contain and protect the dredged materials that will be deposited to rebuild the existing beach. The breakwater section will be approximately 187 m long, with a leveled crest at an elevation of + 8.65 m. The jetty will be 47 m long and composed of 50–200 kg stones, with a maximum height of 6 m. These dimensions may be modified slightly in the final design.

The stone and the pit-run materials will come from a quarry in the region and will be transported by truck. The breakwater will be made up of a core of pit-run from the quarry, a filter layer and a stone under-layer, and will be covered with stone armour. In order to position the structure and ensure safe navigation, navigation aids will be installed to guide merchant shipping operators and boaters. They may be installed on the pierhead of the breakwater or even directly in the water on a buoy.

3.2.4 Options for the development of the area behind the wharf, product storage and materials handling equipment

As the QPA does not yet know which clients will use the new part of the wharf, the proposed design for development, storage and materials handling equipment is purely hypothetical. The projects for developing the area behind the wharf, including the placement of the cementitious matrix, the running surface, permanent linear infrastructure, the water system, fire protection, storm sewers and electrical conduits, as well as transhipment and storage facilities in connection with the arrival of a new user and the development of the beach will undergo the QPA's ECPP once they have been defined. These activities will systematically involve public participation.

Although the definitive designs for the area behind the wharf are unknown at this stage, a simulation was created for the EIS in order to understand the main elements of the project in the operation phase.

The development simulation involves the area behind the wharf being divided into 3 zones: the first dedicated to the transhipment of liquid bulk (62%), the second to covered dry bulk (20%) and the last to general merchandise (containerized or not) (18%). The storage areas will be built and positioned so as to allow for optimal versatility, supervision and coordination of activities. Transhipment will be conducted by ship, truck or the existing rail link. The QPA anticipates that a large part of the activities that will take place will necessitate marine transport upon both entry and exit, as is the case for existing marine activities.

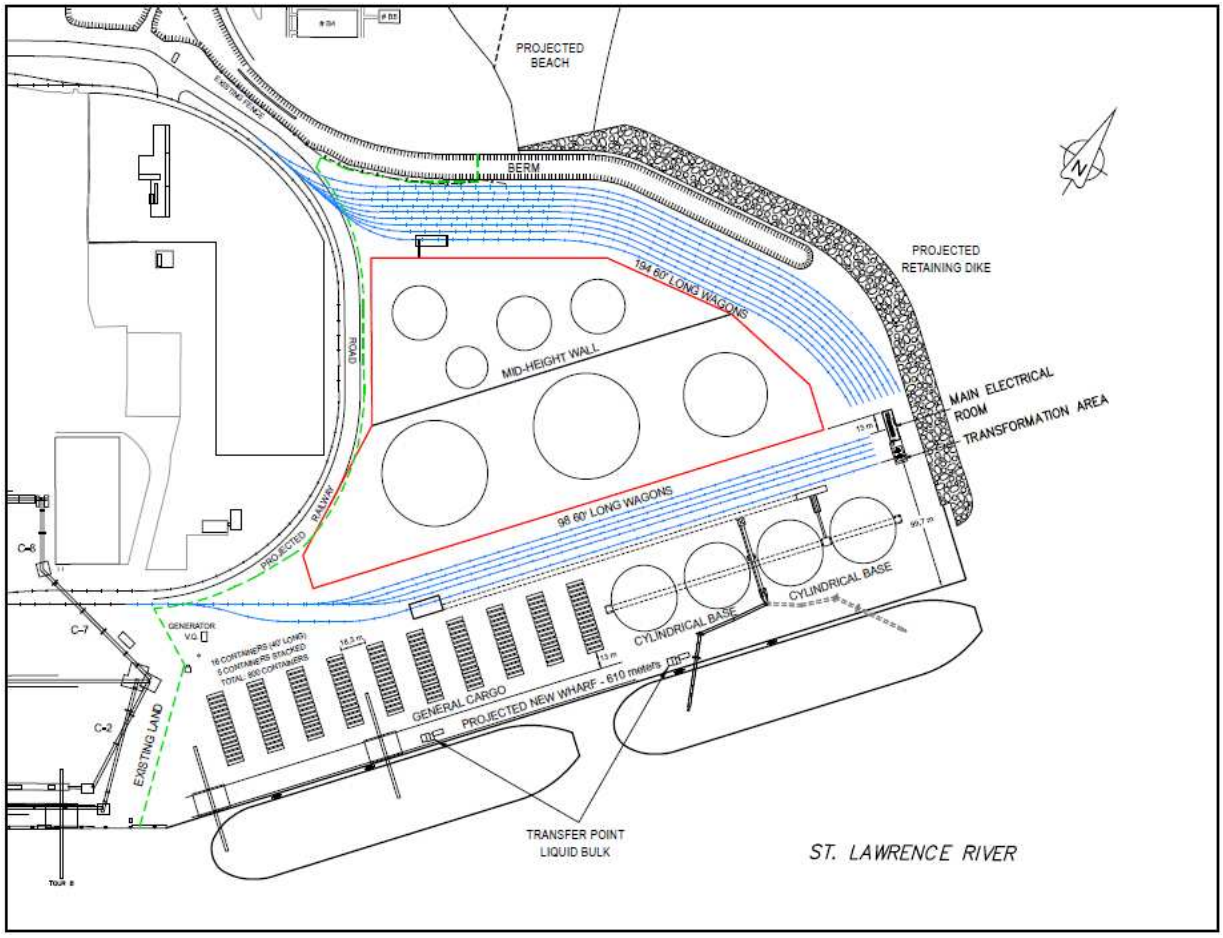

Figure 4 Projection of the hypothetical development of the area behind the wharf

3.2.5 Details of dry bulk transhipment, storage and handling facilities

According to the hypothetical situation, the construction of 4 domes with a ground-level diameter of 48 m, a footprint of around 15,570 m² and a storage volume of close to 256,164 m³ will be required. These domes would offer amenities to support the QPA's commitment regarding the development of covered dry bulk traffic.

A 98-car railway yard would be developed, as well as a gravity off-loading station connected by an underground conveyor to a transfer point that would connect it to different domes. Like what was built for the wood pellet terminal in the Anse au Foulon sector, the proposed amenities would include a vessel loading system that would allow the domes to be emptied by gravity onto an underground conveyor connected to a fully covered and articulated exterior shiploader. Finally, the chute located at the end of the shiploader would also be equipped with the required devices to help avoid potential particle emissions. This equipment would be able to reach different slipways in order to allow the vessels to be loaded without having to move them on their mooring lines. All of this activity would take place using covered facilities.

The handling and storage facilities would include the following main elements:

- Loading arm for the vessel (or other type of transport)

- Closed conveyors with closed chutes
- Domes with a storage capacity of 64,041 m³ each (256,164 m³ in total)
- Loading and off-loading stations for trucks and train cars (and even trains)
- Bucket elevators
- Ventilators for aeration and other prevention and safety equipment
- Dust extractors

The design of the handling and storage facilities would allow for minimal environmental repercussions on various levels, from a visual and noise level standpoint to air quality and the level of safety during the activities. Off-loading filters will be placed beneath the cars, and a closed conveyor system as well as dust extractors will be used to control emissions during handling. The noise level of the facilities and of handling and storage would be controlled in different ways in order to meet the target values. Properly positioning mechanical equipment (e.g., ventilators, dust extractors) around the structures to minimize the impact of noise when the equipment is running, as well as positioning certain pieces of equipment that make noise close to the ground (e.g., ventilator motor, dust extractor motor) will reduce the noise level. If it is impossible to adequately position the equipment, mitigation measures will be implemented. To this effect, an appropriate equipment design and the installation of noise reduction systems (silent, insulating or soundproof enclosures) for motorized parts would significantly mitigate the noise level. Further, the adoption of adapted operational methods and procedures (movement of cars at specific times) would help reduce the noise created by the activities of the dry bulk storage and handling facilities.

Continuous monitoring of all handling operations and the facilities would be carried out by the operator's control centre. All detection and alarm systems would be connected to the control centre, and all of this information would be transmitted in real time to the Port of Québec's harbour services.

3.3 DETAILS OF LIQUID BULK TRANSHIPMENT, STORAGE AND HANDLING FACILITIES

According to the accepted assumptions regarding the amenities of the area behind the wharf, the construction of 7 tanks with a footprint of around 54,285 m² and a storage volume of close to 287,561 m³ would be required. The simulation also provides for the development of a rail yard (minimum capacity of 194 cars) and an off-loading station connected by piping to the tanks. The storage and handling facilities would be designed to receive liquid bulk by vessel, train and truck and load it into these same three types of transport.

The tanks would have to be enclosed in a confinement area, as stipulated in the CCME's Environmental code of practice and the *National Fire Code of Canada* (NFC). A containment dike would be constructed around the seven tanks to contain any accidental spill that might occur. A low separation wall inside the dike would help contain small spills. The location of the dike, which would constitute the retention basin, would be determined in accordance to the requirements for the volume to be contained. Furthermore, the tanks' containment enclosure should be positioned so as to permit emergency vehicles access between the future infrastructure (e.g., railway, other terminals, border of the land) at all times.

The bottom of the containment enclosure would be covered with an impermeable membrane made of incombustible material that is compatible with the stored product. This membrane would make it possible to recover any accidental spill from a tank or from a leaking pipe seal to avoid the spill infiltrating the soil or groundwater and thus prevent contamination of the soil and groundwater body.

The simulation would also include the installation of piping to fill and empty the tanks, as well as the installation of pumps at a low point in the enclosure to manage rainwater. The piping and pumps would be channeled into a sediment pond. It should be noted that this water would be analyzed to ensure it meets applicable standards before being discharged into the storm drainage system. In the event of contamination, it would be treated inside the pond before being discharged.

The tanks would have to meet strict design standards. Inspection and maintenance of the tanks would be carried out in accordance with the API 653 (American Petroleum Institute) standard and best practices. The tanks would be equipped with control instrumentation. The pipelines and piping would meet the ASME B.31 (American Society of Mechanical Engineers) standard and the API 570 standard. The facilities would comply with the *National Fire Code of Canada* and the US NFPA 30 (National Fire Protection Association) standard.

3.3.1 Details of containerized general merchandise transhipment, storage and handling facilities

The proposed simulation includes storage spaces for a variety of general merchandise, covering an area of 15,725 m². The storage of containers in the facilities would vary according to the type of material used for handling. The facilities would have a storage capacity of 800 containers (or 1,600 twenty equivalent units).

The storage and handling facilities would be designed to receive containers by vessel, train or truck. The containers would then be efficiently moved between the handling, storage and recovery points according to the type of logistics in place. The operator would use the same access points, as well as, in some cases, the same materials handling equipment.

The vessel's cranes or mobile cranes would be used to handle containers between the vessel and the area behind the wharf. After vessels are off-loaded, mobile equipment such as lift trucks would handle the containers in the storage zone.

3.3.2 Extension of the railway

The railway, which belongs to the QPA, will be extended by about 1,300 m from Henri-Bourassa Boulevard to the entrance of the wharf 54 land. A total of 37,925 m³ of soil will have to be excavated.

Before work begins on extending the railway, a more in-depth environmental characterization will be carried out and will help to define more precisely the volume and level of contamination of the soil to be excavated. The CCME's guidelines for industrial sectors will be used to manage soil in situ. The demolition debris that is within the concentration limits defined by the CCME for land with an industrial function will be backfilled on site. Soil with a contamination level higher than the CCME's guidelines recommend will be treated or disposed of off-site, in keeping with the general criteria of the Soil Protection and Contaminated Sites Rehabilitation Policy of the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC). According to estimates made following the environmental characterization, only 6,057 m³ exceeds the CCME criteria and would thus not be able to be backfilled on site.

3.3.3 Emergency outfall from the City of Québec's wastewater treatment plant

The emergency outfall from the City of Québec's wastewater treatment plant is located behind wharf 54. The outfall will have to be extended by 100 m, with prefabricated concrete sections (2.4 m x 1.8 m) corresponding to the dimensions of the existing outfall, in order to allow water to be discharged between two cribs. The outfall is expected to be extended out to wharf 54, and its exit point will fall between cribs 2 and 3. The extension work will be completed as soon as possible in 2018 in order to avoid the discharge of water being impeded in the event the outfall has to be used while construction is underway. Particular attention will be paid during the intermediary phase of construction leading to the extension of the outfall to ensure that no material can block the flow of water or be removed in the event the emergency outfall must be used.

3.3.4 Vessel manoeuvering and mooring zone options

There were two options for vessel manoeuvering zones in front of the future facilities that would help ensure that navigation manoeuvers are carried out safely in sufficiently deep water. From these two options, the QPA chose the one that presented the least disruption to the environment, with a manoeuvering zone of 122,825 m² and a volume of 524 827 m³ to be dredged.

3.4 SEDIMENT DREDGING AND MANAGEMENT

3.4.1 Sediment dredging

Dredging should be performed only when necessary and be as minimal as possible in terms of surface area and volume without compromising marine transportation safety. This project involves the development of a multifunctional deep-water terminal and, as a result, will provide a minimum water depth of 16 metres at low tide in the channel, in the manoeuvring zone, in berths and at ship anchor points.

In light of this, dredging is planned in the new manoeuvring zone in front of wharf 54, which will be used by pilots to complete berthing. The placement of cribs for the construction of wharf 54 will also require the prior dredging of a trench approximately 31 m wide and up to 17.85 m below the stone layer that must be laid. Finally, in order to ensure breakwater stability, a layer of sediment measuring one metre thick on average will be removed from the seabed under its base. However, no dredging will be necessary in the access channel and anchor point areas. In total, approximately 900,000 m³ of uncontaminated sediment will be dredged, along with 45,000 m³ of contaminated sediment.

Many different methods can be considered to perform the dredging work. There is a variety of dredging equipment on the market that can perform this type of operation, including mechanical dredges, hydraulic dredges and special purpose dredges. Hydraulic dredges have the benefit of being much faster than mechanical dredges. Furthermore, considering the volumes that will be dredged, the physicochemical characteristics of the sediment and the hydrodynamic, current and tidal conditions, it is likely that hydraulic dredging would be recommended for the majority of the work. However, approximately 25% of the work will require the use of a mechanical dredge due to the presence of rocks on the seabed and high sediment density in some areas. The types of dredges that the contractor chooses to use will be their responsibility, since it constitutes part of their work process. The environmental effects (noise, emissions, sediment resuspension and water content of the dredged sediment) are fairly similar for the different kinds of dredges analyzed. The QPA, with the help of its experts, will ensure that the contractor complies with the environmental requirements in the environmental specifications with respect to noise and air pollution and sediment suspended in the water while the work is being performed.

3.4.2 Uncontaminated sediment management

The majority of the uncontaminated sediment will be excavated using a hydraulic dredge. As the sediment is very fluid, a settling pond will be set up on the bank, inside the working perimeter, to allow it to partially dewater before using it to either fill the area behind the wharf or rebuild the beach. No other option was analyzed for uncontaminated sediment management.

Two approaches have been selected at this point to manage dewatering water: install a spillway at the opposite end of the pond into which the sediment will be pumped, or install perforated drains under the bottom of the settling pond to recover the water flowing from the pond and direct it towards a sediment pond.

To avoid the spread of suspended solids (SS) in the water, the designated fill zone will need to be closed off. For this to happen, a watertight barrier will be installed between the end of the first section of the retaining dike that will be constructed and the bank. The barrier may take the form of a sheet pile wall or a floating baffle.

3.4.3 Contaminated sediment management

Contaminated sediment will be recovered using a mechanical dredge. This sediment will be stored and dewatered on parcel 4, located approximately 1 km from the work site. The contaminated sediment will remain on this parcel until it can be incorporated into a cementitious matrix that will be used as the foundation for the pavement structure at wharf 54. This approach is currently being studied at Montréal's École de technologie supérieure and will be required to undergo a specific evaluation of environmental effects (EEE) once the results are known. If the results do not allow for this approach to be implemented, the dewatered sediment will be then be deposited in an authorized site in compliance with the applicable regulations.

Two methods are proposed for dewatering the contaminated sediments: using a watertight basin or using Geotubes. Both methods comply with environmental requirements. At the time of drafting this EIS, testing is underway, and the results will lead to adjustments to the proposed method.

3.4.4 Demolition, restoration and extension of the existing bank

Once the filling of the area behind the wharf is completed in 2019, the bank that was present prior to the work and separated the operational part of the port from the recreational part will be restored.

Furthermore, it will be extended along the new surface of the area behind the wharf and developed to serve as a visual screen. To this end, the materials that were excavated and transported to the designated storage site when construction began will be brought back and placed in their original location. Dewatered sediment from the settling basin will be used to extend the bank. Above the bank, landscaping will be used to add to the visual screen and provide local birds with plants. The species that are already on the existing bank may be used in the new landscaping.

3.4.5 Maintenance dredging and refilling of the beach

Based on experience acquired over the years operating wharf 53, which is next to wharf 54, maintenance dredging work should be performed every 4 to 5 years in the manoeuvring zone. Considering the low anticipated volume to dredge—approximately 200 m^3—and the expected consistency of the sediment, a mechanical dredge should be used to carry out the work.

The mechanically dredged sediment will be then transported by barge and unloaded onto a wharf to be transported to a vacant lot that belongs to the QPA. Sediment sampling will be performed to ensure that it is not contaminated. Should it be contaminated, it will be directly transported to an authorized disposal site. If the sediment is not contaminated, it will be deposited into a pond equipped with a geomembrane to allow it to dewater. The objective is to minimize the sediment's moisture content in order to obtain sludge that can be shovelled and reduce the volume to deposit. The dewatering water will mostly be removed through percolation into the ground and evaporation. The sediment will be left undisturbed for a full freeze-thaw cycle to minimize its volume. The dewatered sediment will be deposited as soil in an authorized site in accordance with the law.

The artificial beach design proposed as part of the Beauport 2020 project would require resurfacing to be performed over the course of the beach's useful life (about 50 years). The first few springs after the beach is constructed, the backshore may need to be graded, primarily for esthetic reasons and user comfort. Considering the recommended construction slope (10%), the waves will significantly stir up sediment during the first few storms, and an erosion microcliff will develop on the backshore. At the beginning of summer, it is recommended that the slope on the high part of the beach be smoothed down in order to avoid the formation of a microcliff.

3.5 TIMELINE FOR COMPLETING THE PROJECT

All of the work in the construction phase associated with wharf 54 and the rebuilding of the beach will be carried out between April 2018 and December 2019. Meanwhile, the development phase for the area behind the wharf, including the permanent linear infrastructure, will be completed in 2021. Finally, the operation phase could begin in 2020, depending on the progress of the construction phase of the facilities at the new operator's marine terminal. The activities associated with the operation phase are hypothetical, as the users and their needs are not yet known. It should be noted that this timeline is based on the assumption that the project will be approved in the last quarter of 2017.

4 PUBLIC CONSULTATION

Sustainable development and the consideration of citizens' concerns are integral parts of the Port of Québec's management process. In keeping with its mission, the QPA has introduced several ways of proactively developing an open relationship with the community.

To do so, the QPA conducts several targeted communication activities (media, meetings, events, online) for all of its projects. It also uses direct channels of communication with the community through the use of standing committees and one-off activities that are open to the public. When it is decided that specific projects will come to fruition, dedicated meetings, activities and events involving the stakeholders are organized in order to answer their questions and incorporate their concerns into the thought process surrounding the project's development, as was the case for Beauport 2020.

Through various citizen participation activities, the QPA has been able to gain an understanding of the issues that are of concern for the people and stakeholders associated with the Beauport 2020 project.

4.1 THE CONSULTATION MECHANISMS FOR THE PROJECT

4.1.1 Consultation with the public

4.1.1.1 Information channels

Many means of communication were used by the QPA to reach a broad range of people. First, an open house day was held in October 2014 to provide information on the port's activities in general and the Beauport 2020 project in particular. In October 2015, the QPA also held a citizen information day specifically about the Beauport 2020 project, during which the public was invited to come ask questions and voice their concerns.

At the same time, the QPA used other means to reach a wider audience. Among other things, it worked closely with the media, distributed an information leaflet in the surrounding areas and produced a video about the project, which was shown on several occasions.

4.1.1.2 One-off discussion forums

In addition, several opportunities were provided for those interested to voice their concerns about the project, ask questions and speak with the QPA's experts.

The general public was invited to share their thoughts during open house and citizen information days. Furthermore, a hotline and an email address were created specifically to receive comments and questions about the project.

4.1.2 Consultation with stakeholders

In the fall of 2012, the Beauport 2020 project was presented to the public for the first time during a speech before the Chambre de commerce et d'industrie de Québec, the city's economic players and many journalists. The QPA also had the opportunity to meet with elected officials from the City of Québec during a plenary session, where it answered many questions and made some key commitments with respect to the project.

In addition, two standing committees were created to discuss various project issues. A targeted, systematic approach for consulting with the stakeholders was taken.

4.1.2.1 Standing committees

In order to ensure ongoing dialogue with certain key actors, the QPA established two standing committees that serve as platforms for general discussion about the Port of Québec's projects and are regularly convened to examine the Beauport 2020 project.

For this reason, the project has been listed on the agenda of all meetings of the Port/Community Coexistence Committee (PCCC) since 2015. The PCCC is a permanent discussion forum to inform community representatives about the Port of Québec's projects and receive their feedback. Created in 2012 as the community relations committee, it brings together economic actors and representatives from community boards, citizens' committees, environmental groups, the City of Québec and the Communauté métropolitaine de Québec.

To specifically address the topic of the development of the Beauport Bay beach and discuss the issues that this development may raise, the Beauport Bay user forum was created by the QPA in January 2016. The forum is made up of representatives from the world of water sports, the site's current management and representatives from the City of Québec's Table sur la mobilité restreinte.

4.1.2.2 Targeted, proactive approach to consultation on Beauport 2020

After applying for project funding from the federal government in the summer of 2014, the QPA held a series of information meetings with stakeholders to provide information about the Port of Québec, its strategic advantages, its challenges and the major projects it has planned.

In general, these meetings helped give stakeholders a better understanding of the economic benefits of the Beauport 2020 project, the Port of Québec's strategic position in the St. Lawrence–Great Lakes trade corridor and its strategic role for the Canadian economy, as well as the benefits associated with the environmental mitigation measures implemented by the QPA and its partners.

As part of this proactive approach, a stakeholders map was drawn up in 2015 so that all parties directly or indirectly affected by the Beauport 2020 project could be contacted. A directory containing the contact information of nearly 134 groups or stakeholders, all of whom were contacted, was then created. The content of the meetings conducted as part of this exercise was used to create the EIS and improve the project at the preparatory stage.

This contact enhanced the Beauport 2020 project delivery process and thus will be maintained by QPA representatives throughout the project's subsequent phases until its construction. In this way, the QPA can respond to questions and concerns that may arise along the way and ensure ongoing dialogue.

4.1.3 Future consultation activities

The QPA will actively participate in the consultation activities mandated by the CEAA according to the timeline determined by the CEAA.

A second citizen information day is also planned for the fall of 2016 to present the main components of the EIS submitted to the CEAA. This event will give the general public and stakeholders an opportunity to express their views and discuss with the QPA outside of the framework set by the CEAA.

Should the Canadian Minister of Environment and Climate Change (ECCC) issue a favourable decision regarding the project, the QPA intends to hold a third information day. This activity will once again present the project, its final parameters and the timeline for its completion.

Furthermore, the permanent mechanisms introduced during the project's development phase will continue to be used in subsequent phases. In particular, the project will stay on the PCCC's agenda, and the PCCC will thus be informed of its progress, including advancements related to the Environmental Citizen Participation Process (ECPP).

4.2 MAIN CONCERNS OF THE PUBLIC AND STAKEHOLDERS

The concerns expressed by citizens and various stakeholders during different consultation activities centred mainly on environmental, economic, social, technical and engineering issues. These concerns were expressed about both current facilities and those planned for the Beauport 2020 project. Other concerns were expressed about the Port of Québec's ECPP, marine safety and the Beauport Bay component.

- In terms of environmental concerns, stakeholders wanted to know about the legal requirements the project is subject to, its aesthetic impact, and compensation measures for bank swallows and other avian species in the area.
- In terms of economic concerns, stakeholders had questions about the project's funding, the Port's competitiveness, the global marine outlook, the project's economic benefits and estimated job creation. They also raised questions about the oil, gas and bulk cargo markets, as well as the marine industry in general.
- In terms of social issues, stakeholders cited concerns about the actions taking by the QPA to make its projects socially acceptable and the type of consultation that will be conducted for Beauport 2020.
- With respect to current facilities, stakeholders wanted to know about the safety measures in place to manage hazardous materials, the mitigation measures implemented by the QPA to limit the impact of its activities on the environment, and the current transport of oil to or from port facilities.
- With respect to engineering and the construction technique, concerns were raised about the project's timeline for completion and current and anticipated road traffic in the Beauport sector.
- Safety was also one of the points raised in various meetings. The focus of these concerns was marine traffic and the operation thereof, railway traffic and current traffic in relation to its proximity to residential neighbourhoods, the measures implemented to prevent terrorist attacks, and hazardous materials and safety measures that have been implemented to handle and transport them.
- Concerns surrounding the Beauport Bay component centred on the proposed facilities with respect to different uses, their mix of uses, the planned retaining dike and vegetated slope and their effects on wind direction and safe conditions for physical activity, the aesthetic impact of the planned breakwater, Beauport Bay's accessibility via bike paths, beach erosion and the planned presence of a breakwater and its impact on safe conditions for certain kinds of physical activity.

Furthermore, questions were raised about the timeline of the CEAA's consultation process, particularly to know about the consultation phases.

4.3 SUPPORT FROM THE CITY OF QUÉBEC AND THE QPA'S COMMITMENTS

On June 1, 2015, the mayor of Québec voiced his public support for the Beauport 2020 project during a press conference where he presented the priority projects selected by the City of Québec in anticipation of the federal general election in October 2015.

At this public event, the QPA showed a video presenting the Beauport 2020 project and its main components. The QPA also made commitments in respect of the Beauport 2020 project:

- The new port area will be exclusively reserved for completely covered terminals.
- Terminal development will promote intermodality with a small carbon footprint.
- The project will rebuild and ensure the sustainability of the Beauport Bay beach, to protect this exceptional recreational and tourist site from shoreline erosion.

5 CONSULTATION WITH ABORIGINAL PEOPLES

The QPA has held information and participation activities with the ten First Nations identified in the CEAA's guidelines for the Beauport 2020 project in accordance with the objectives of the *Canadian Environmental Assessment Act* (CEAA 2012).

In addition to informing the First Nations of the nature of the project, the purpose of these activities was to receive their input to identify their interests in, issues with and concerns about the project so that they may be taken into consideration in this EIS and the design of the Beauport 2020 project in general.

Per the guidelines issued by the CEAA, ten Aboriginal communities were considered and consulted:

Table 2 Aboriginal communities consulted

NATION	COMMUNITY
Huron-Wendat	---
Mohawk	Kahnawake Kanesatake Akwesasne
Abenaki (Waban-Aki)	Odanak Wôlinak
Maliseet	Viger
Innu	Pessamit Essipit Pekuakamiulnuatsh Takuhikan

At present, there are no treaties or self-government agreements with the considered Aboriginal groups that are specifically related to the project and the ongoing environmental assessment. However, documentary research conducted as part of the EIS and discussions with the consulted First Nations indicate that the Beauport 2020 project's wider study area is overlapped or covered by traditional Aboriginal territory, whether it is claim or non-claim territory.

The Huron-Wendat First Nation (HWN), the Abenaki First Nations of Odanak and Wôlinak, the Innu First Nations of Essipit, Pessamit and Mashteuiatsh and the Maliseet of Viger First Nation report having ancestral territory that partially or wholly overlaps with the Beauport 2020 project's wider study area.

Figure 5 shows the geographic location of the various Aboriginal communities in relation to the project site.

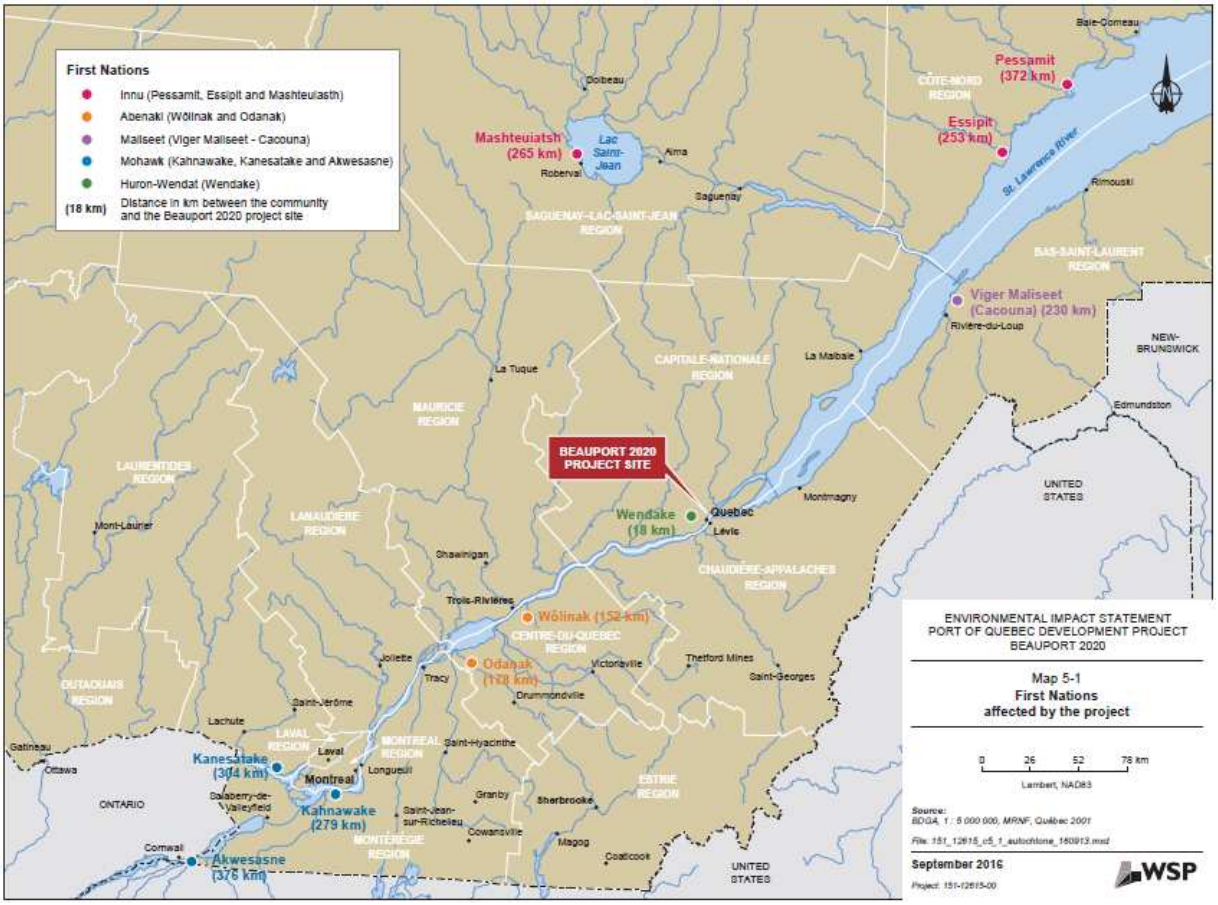

Figure 5 Location of First Nations in relation to the project site

5.1 COMMUNICATION AND CONSULTATION PROCESS WITH THE FIRST NATIONS

Since 2015, the QPA has led a communication and consultation process with the First Nations in accordance with the guidelines issued for the project. The QPA's process has been guided by a structured program, the purpose of which is to help the Aboriginal groups understand the project and have access to relevant information so that they can assess its effects on their communities, activities, potential or established Aboriginal or treaty rights, and greater interests.

The first series of activities began in the fall of 2015, when an informational letter was sent by email in October 2015 describing the project and providing links to websites with additional information about the project. Following this, all affected First Nations were contacted by the QPA to further inform them of the nature of the project, propose information and discussion meetings and invite them to submit their concerns or comments about the project. Depending on the level of interest shown by each First Nation, different formulas for discussion and follow-up were put forth by the QPA to establish and maintain dialogue with those who wanted to do so, including working meetings, telephone or email conversations and the sharing of information and documents.

The QPA started holding a second series of activities in June 2016. The First Nations—except the HWN, which came to an agreement with the QPA to conduct its own study—were then invited to complete a survey questionnaire in the language of their choice. This questionnaire covered the current use of lands

and resources for traditional purposes; the presence of items or sites of historical, cultural or archaeological significance; commercial and recreational use of the wider study area by Aboriginal groups; the Aboriginal groups' comments and concerns about the project; and the identification of the project's potential effects on the various concerned communities and measures to mitigate those effects.

The consultation process was led so as to provide maximum flexibility (in terms of language, means of communication used and meeting times) and sufficient time and information for the affected Aboriginal communities to voice their concerns in an informed manner. After this version of the EIS is submitted, the QPA will maintain contact with the ten First Nations identified for the project.

The Huron-Wendat First Nation, since it is located near the project site, has been involved in a process of closer consultation with the QPA. In the spring of 2015, before the project was even considered designated within the meaning of the CEAA, the QPA initiated the consultation process with members of the Nionwentsïo Office of the HWN in order to present the Beauport 2020 project to them. A standing working group was formed in the spring of 2015 with the goal of maintaining dialogue and ongoing and constructive discussions between the HWN and the QPA. The working group is made up of members of the Nionwentsïo Office and QPA management. Meetings were held on July 6, November 6 and November 26, 2015, as well as on March 30, May 11 and May 25, 2016. In addition to these meetings, there were many conversations by telephone and email between the Nionwentsïo Office representatives and the QPA in order to maintain regular and effective communication. To improve the information in the EIS about the current use of the land and water under QPA management, the QPA and the Nionwentsïo Office agreed in January 2016 that the Nionwentsïo Office would conduct a complementary study. After the EIS is submitted, additional meetings of the standing working group are planned to continue the work that was started and ensure that any concerns on the part of the Huron-Wendat First Nation that may arise during the process are fully understood, considered and addressed.

The information obtained from discussions with the First Nations has helped us fully describe them and assess how the project will affect them. These discussions also provided a way to solicit their comments and concerns about the project.

5.2 COMMENTS AND CONCERNS OF THE FIRST NATIONS

Among the ten First Nations that were consulted through the information and consultation activities initiated by the QPA, six of them shared their knowledge, comments, questions and concerns about the Beauport 2020 Project. Their concerns pertain mainly to the following topics:

The biological and physical environment:

- The six communities who agreed to be actively involved in the consultations have expressed an interest in knowing the potential effects of the project on fish species, namely migratory species such as lake sturgeon, Atlantic sturgeon, and striped bass;
- Huron-Wendats are particularly interested in knowing the potential effects of the project on the American eel in the context of its decline and historical fishing of this species by the members of the community;
- Huron-Wendats showed their interest for the impacts of the project on tides and currents while Mohawks asked information about the impact of the project on the winds;
- Huron-Wendats and Innus from Essipit and Mashteuiasth are concerned with the dredging activities (the quality of sediments to be dredged and the disposal of the contaminated sediments, the release of the contaminants in the hydric environment due to the dredging activities, the use of sediments as filling material);

- Huron-Wendats and Innus from Essipit and Mashteuiasth, and Mohawks from Kahnawake are concerned with the risks of spill from harbour operations or during transportation on the River (e.g.: risk of collision of vessels);
- Huron-Wendats showed their interest for the compensatory plan on the loss of the fish habitat. The HWN wishes to provide APQ with the expertise of a Huron-Wendat company specialized in this matter.

The current use of lands and resources for traditional, commercial and recreational purposes:

- HWN is concerned with the potential effects of the Beauport 2020 Project on the fishing of resident fish species (mainly bass, walleye, bullhead, pike and brook trout) and migratory fish species (mainly sturgeon), particularly in the Beauport Bay; its effects on migratory game bird hunting (snow goose, Canada goose and various duck species);
- HWN is also concerned with the potential effects of the Project on migratory bird hunting (snow goose, Canada goose and various duck species);
- Innus from Essipit and and Mashteuiasth are concerned with the potential effects of the Project resulting from the possible increase of the marine traffic and the risks of spills of hazardous material on their commercial activities on St. Lawrence River, sea urchin, crab and bottomfish fishing, as well as migratory bird and mammal hunting, observations of sea mammals (whale cruises) and sea kayak excursions.

Economic impacts:

- HWN wishes to profit from economic opportunities related to the project and considers this aspect as a factor of social acceptability of the project;
- Mohawks from Kahnawake asked for more information on the economic impacts of the project and the type of jobs generated, as well as details on the economic and strategic motivations related to the Port of Québec's expansion.

The potential effects on environmental, cultural and archaeological heritage:

- HWN mentions the presence of four specific sites nearby, in the wider study area that are part of their heritage: the former village of Stadaconé (also known as Teyiatontariyih), the former Huron-Wendat village of Sainte-Pétronille, the mission of Sillery and the historic eel fishing site of Pointe à Puiseaux;
- Mohawks from Kahnawake showed an interest on the archeological potential of the study area and the measures implemented in case of artifact findings.

The cumulative effects of the projects on aquatic environment (namely fish habitat):

- Huron-Wendat, Abnaki and Innus from Essipit and and Mashteuiasth are concerned with the cumulative effects of the Beauport 2020 Project since the aquatic environment in St. Lawrence River underwent several previous modifications and could undergo some more in a near future since, and due to other future projects, namely enlargement projects of the Port of Trois-Rivières and Port of Montréal.

Finally, few communities asked general questions on the QPA and the project:

- The role and organization of the QPA, including its port operations and monitoring of operations;
- The role of the Port of Québec within the context of the *Stratégie maritime de Québec;*

- The project funding;
- The planned schedule of the project and environmental assessment process;
- The impacts on the related transport infrastructure (road and rail network).

NHW also suggested mitigation measures that could potentially be adopted by the QPA to limit the impact of the Beauport 2020 Project or even enhance some aspects of the environment.

- Drafting plain language documents including environmental measures existing at Port of Québec and the ones that will be implemented and concerning fish, flora and bird preservation
- Showcasing or commemorate in different ways the historic and current present of the Huron-Wendat Nation's culture and history on the project site to highlight their historic and cultural heritage (e.g.: installation of interpretation panels);
- Implementing a monitoring program for exploited species (fisn and migratory birds) and and huron-wendat traditional activities including fishing and hunting prior to the project and during the construction and operating phases.

It should be noted that Mohawks from Kanesatake and Akwesasne have not submitted any particular questions or concerns since they have stated that the project is located outside of their traditional territory. The Maliseet of Viger First Nation and Innu First Nation of Pessamit have not submitted any particular questions or concerns regarding the project so far.

6 ENVIRONMENTAL EFFECTS EVALUATION METHODOLOGY

6.1 LEGAL FRAMEWORK

The Port of Québec's territory and activities are on federal land and therefore subject to federal legislation. In order to begin construction work on a multifunctional deep-water terminal, the QPA must obtain authorization under the *Canadian Environmental Assessment Act* (CEAA), the *Fisheries Act* and the *Species at Risk Act.* Other federal laws and regulations also govern the activities planned in the context of the Beauport 2020 project.

While federal legislation applies, the standards set out in provincial and municipal environmental laws have also been considered as guideline values to help assess the project's anticipated potential effects. However, the administrative aspects of these laws do not apply, which means that no authorization is required at the provincial, regional or municipal level.

Other legal documents have also been considered within the framework of the EIS, such as the Port of Québec's land-use plan and various guides, policies, codes and recommendations by the federal and provincial governments.

6.2 METHODOLOGY

The methodological approach used to assess the project's environmental effects was developed based on the legal framework and the concerns raised by regulatory bodies and stakeholders. It integrates engineering design, mitigation measures and the monitoring and follow-up program into a comprehensive environmental planning process.

The approach used for this assessment includes the following steps:

1. Identify the valued environmental components (VECs) and the sources of potential environmental effects, and define the interrelations between the sources of environmental effects and the VECs

2. Identify and describe the potential negative effects on the VECs in terms of magnitude, duration, scope, frequency and reversibility
3. Identify mitigation measures for negative effects and improvement measures for positive effects
4. Identify any remaining negative effects in terms of magnitude, duration, scope, frequency and reversibility
5. Assess the extent of the remaining negative effects considering their probability of occurrence
6. Implement a compensation or development program, if necessary
7. Identify and assess cumulative effects
8. Develop an environmental monitoring and follow-up program

6.3 IDENTIFICATION OF VALUED ENVIRONMENTAL COMPONENTS (VECS) AND SOURCES OF POTENTIAL ENVIRONMENTAL EFFECTS, AND DEFINITION OF THEIR RELATIONSHIP

VECs are of particular value or interest to regulatory bodies and other stakeholders. According to the CEAA, VECs are defined as being “any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concern.”

In order to meet the CEAA’s requirements, a total of 25 VECs have been identified and selected based on the consultation and information activities led with stakeholders, the judgment and experience of the project team members, input of experts, work performed on the land, the document review and the guidelines for preparing an EIS issued by the CEAA in 2015.

The sources of potential effects are elements or activities that may disturb one or more VECs and are identified for the construction and operating phases, including facility maintenance. As previously mentioned, the operating phase is assessed solely based on hypothetical scenarios, since the future users of the new wharf are not yet known. When identifying sources of environmental effects, it is important to understand the technical characteristics of the planned work and infrastructure, define and understand the prescribed work methods, and know the sequence of activities and when the activities will be carried out.

Once the VECs have been selected and the project’s components and activities identified, a matrix is used to determine the potential relationships between the two elements (Table 3).

Table 3 Relationships between the VECs and the components of the project

PROJECT ACTIVITIES	VALUED ENVIRONMENTAL COMPONENTS																								
	BIOPHYSICAL ENVIRONMENT												BIOLOGICAL ENVIRONMENT						HUMAN ENVIRONMENT – ABORIGINAL PEOPLES			HUMAN ENVIRONMENT – OTHER THAN ABORIGINAL			
	ATMOSPHERIC ENVIRONMENT				GEOMORPHOLOGY AND RIVER CHARACTERISTICS				RIVERSIDE AND TERRESTRIAL SOILS AND HABITATS																
	AIR QUALITY	SOUND ENVIRONMENT	NOCTURNAL BRIGHTNESS	SURFACE WATER QUALITY	SEDIMENT QUALITY	UNDERWATER SOUND ENVIRONMENT	RIVER ENVIRONMENT	TERRESTRIAL AREAS	RIVERSIDE AREAS	SOIL QUALITY	GROUNDWATER QUALITY	FISH AND THEIR HABITAT	BIRDS AND THEIR HABITAT	TERRESTRIAL VEGETATION	RIVERSIDE AND AQUATIC VEGETATION	TERRESTRIAL FAUNA AND ITS HABITAT	SPECIAL STATUS SPECIES AND THEIR HABITAT	HEALTH AND SOCIO-ECONOMICS	NATURAL, CULTURAL AND ARCHEOLOGICAL HERITAGE	CONTEMPORARY LAND AND RESOURCE USE FOR TRADITIONAL	USE OF WATERWAYS (MARINE TRAFFIC) AND THE BODY OF WATER (RECREATIONAL NAVIGATION)	USE OF THE LAND (RECREATIONAL ACTIVITIES) AND ITS RESOURCES (RECREATIONAL AND COMMERCIAL FISHING), AND RIVER	HEALTH (QUALITY OF LIFE / HUMAN HEALTH) AND SOCIOECONOMICS	VISUAL ENVIRONMENT AND LANDSCAPE	NATURAL, CULTURAL AND ARCHEOLOGICAL HERITAGE
CONSTRUCTION PHASE																									
Preparation of the site (work site, road and rail access routes, deforestation, demolition of the bank, preparation of pond sites)	X	X	X	X	–	–	X	X	–	–	–	–	X	X	X	X	X	X	X	–	–	X	X	X	X
Construction and installation of reinforced concrete cribs	X	X	–	X	–	X	X	–	–	–	–	X	–	–	–	–	X	–	X	–	X	–	–	–	X
Installation of sheet piling (closed enclosure)	X	X	–	–	–	X	–	–	–	–	–	X	–	–	–	–	X	–	X	–	X	–	X	–	X
Filling and backfilling of reinforced concrete cribs	X	X	–	X	–	X		–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–
Construction of the cope wall	–	X	–	X	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Construction of the retaining dike and breakwater	X	X	–	X	–	X	X	–	X	–	–	X	X	X	X	X	X	–	X	–	X	X	X	X	X
Dredging of sediments	–	X	X	X	X	X	X	–	–	–	–	X	–	–	–	–	X	–	X	–	X	X	X	–	X
Storage and dewatering of sediments	X	X	–	X	–	–	X	X	–	X	X	–	–	–	–	–	–	–	–	–	–	–	X	–	–
Management of sediments – Backfilling of the area behind the wharf	X	X	–	X	–	X	X	–	–	–	–	X	–	–	–	–	X	–	–	–	–	–	–	–	–
Management of sediments – Rebuilding of the beach	X	X	–	X	–	X	X	–	X	–	–	X	X	–	–	–	X	–	–	–	–	X	X	–	–
Management of contaminated sediments	–	X	–	X	–	–	X	X	–	X	X	–	–	X	–	X	–	–	–	–	–	–	X	X	–
Extension of the railway	X	X	–	X	–	–	X	X	–	X	X	–	–	X	–	–	–	–	–	–	–	X	X	–	–
Management of demolition debris, if necessary	X	–	–	X	–	–	X	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Management of runoff waters and wastewaters*	–	–	–	X	–	–	X	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Extension of the emergency outfall from the City of Québec's wastewater treatment plant	–	X	–	–	–	X	–	–	–	–	–	X	X	–	–	–	X	–	–	–	–	–	X	–	–
Management of waste and hazardous materials*	–	–	–	X	–	–	X	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Management of waste snow*	–	–	–	X	–	–	X	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Environmental accidents and failures*	X	–	–	X	X	–	X	X	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–
Presence, use and maintenance of machinery (marine or land)*	X	X	X	–	–	X	–	X	–	X	–	X	X	–	–	–	X	–	–	–	X	X	X	X	–
Closure of the work site**	X	X	–	X	–	–	X	X	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PRESENCE OF NEW PORT INFRASTRUCTURE AND THE REBUILT BEACH																								
Wharf and area behind the wharf	–	–	X	–	–	–	–	X	–	–	–	X	X	–	–	X	–	–	X	X	X	–	–	X	–
Beach and breakwater	–	–	X	–	–	–	–	X	X	–	–	X	X	X	–	X	–	–	X	X	X	X	–	X	–
Manoeuvering zone (-16 m)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
DEVELOPMENT OF THE AREA BEHIND THE WHARF																								
Cementitious matrix	X	X	–	X	–	–	X	X	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Running surface	X	X	–	X	–	–	X	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Permanent and temporary linear infrastructure (water, storm drainage and electrical systems)	X	X	–	X	–	–	X	–	–	–	X	–	–	–	–	–	–	–	–	–	–	X	–	–	–
Installation of wharf accessories	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Construction of port infrastructure (domes, tanks, marshalling yard, etc.)	X	X	–	X	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PRESENCE OF NEW PORT FACILITIES																								
Domes, tanks, marshalling yard	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
OPERATION PHASE																								
Transhipment, storage and handling	X	X	–	X	–	–	X	–	–	–	X	X	–	–	–	–	–	–	–	–	X	–	X	–	–
Maintenance of structures and the facilities' amenities	–	X	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Maintenance dredging and management of sediments on land	–	X	–	X	X	X	X	–	–	–	–	X	–	–	–	–	–	–	–	–	X	–	X	–	–
Maintenance of the beach	X	X	–	X	–	X	X	–	–	–	–	X	–	–	–	–	X	–	–	–	–	X	X	–	–

6.4 PROCESS FOR EVALUATING THE POTENTIAL EFFECT AS WELL AS THE RESIDUAL EFFECT AND ITS IMPORTANCE

6.4.1 Determination of potential effects

Each of the relationships identified in the matrix is analyzed to determine whether there are potential effects and residual effects, and then their importance is assessed.

The potential and residual effects are evaluated in terms of five main criteria:

- Magnitude
- Scope
- Duration
- Frequency
- Reversibility

The value of the potential effect and the residual effect is assessed at one of three levels:

- Major
- Average
- Minor

Following the evaluation of the potential effect, mitigation measures are implemented with the goal of reducing the effect, whether it is major, average or minor. The implementation of a mitigation measure, where possible, helps to define the residual effect.

6.4.2 Probability of occurrence of the residual effect

The probability of an effect's occurrence helps to appropriately prioritize the mitigation measures to be implemented when two negative residual effects have the same level of importance. The probability can be described as:

- Unlikely
- Likely
- Very likely

6.4.3 Scientific uncertainty or level of confidence in the prediction

Scientific uncertainty, or the level of confidence in the prediction, means that the probability of achieving a particular objective or outcome, or the way in which this might be achieved, cannot be known or determined in advance based on experience or commonly available scientific knowledge. A level of confidence in scientific uncertainty or the prediction can be classified at one of three levels:

- Weak
- Average
- High

6.4.4 Evaluation of the importance of residual effects

The evaluation of the importance of a residual effect includes the probability of occurrence. The residual effects that may remain following the application of mitigation measures are classified as either important or unimportant effects.

7 BASELINE CONDITIONS

Baseline conditions describe different parameters of the current conditions of the Beauport 2020 project's building zone (BZ) and extended study area (ESA) in order to identify the context in which the project is being developed. A detailed description is presented in chapters 7, 8, 9, and 10 of the EIS, and some of the highlights are presented here.

7.1 PHYSICAL ENVIRONMENT

7.1.1 Climate and air quality

Québec's climatic and meteorological conditions are measured at the weather station at the Québec City Jean-Lesage International Airport, including annual average temperature (4.2℃), precipitation (889.3 mm of rain and 303.4 cm of snow) and relative humidity (78.7%). More specifically, for the Beauport sector, the prevailing winds follow the axis of the St. Lawrence River due to the valley effect that creates a SW-NE corridor, with the strongest winds blowing ENE at 22.5 km/h. Foggy conditions are observed predominantly in November, December and March, while blowing snow is seen primarily from December to February. Stormy conditions are observed between May and September. In this context, annual visibility is generally high in the sector, and reduced visibility conditions primarily occur during the winter months.

Air quality in the ESA is affected by many industrial activities, urban activities, highways and port activities that emit different contaminants. The «Des Sables» air quality monitoring station in the southern part of the Limoilou neighbourhood measures the air quality in the sector. The elements of air quality fall below the threshold values. However, the annual average concentrations of $PM_{2.5}$ vary between 9.56 µg/m^3 and 10.42 µg/m^3, with a three-year average slightly higher than the CCME's standard of 10 µg/m^3. It should be noted that the GHG emissions generated at Beauport are estimated at 7,966 tonnes of CO_2 equivalent per year for current sources.

7.1.2 Acoustic and light environment

The acoustic environment was evaluated by means of field surveys in June 2014 in five sensitive sectors of the cities of Québec and Lévis. The ambient noise index value, L_{dn} or day-night average sound level over 24 hours, currently varies from 57 to 60 dBA, while the %HA varies from 5.2% to 7.7%. Common noises in the sectors within the study area include noise coming from the existing port sector, the operations of the White Birch Paper mill, CN rail traffic, road traffic on Autoroute Dufferin-Montmorency and noise from the residents themselves or neighbourhood noise.

The light environment at night was evaluated by means of surveys carried out in September 2015 from four points of view in Québec, Lévis and Île d'Orléans. The main light fixtures located on or near wharves 52 and 53 are the following: 1000 W metal halide (MH) projectors, 1000 W high pressure sodium projectors, 70 W MH wall floodlights, and projectors with light shades (shades). The results showed that the light intensity exceeded the guideline values, with the exception of the light at the Île d'Orléans site. There is, therefore, an annoyance caused by the light sources that are directly visible from the measuring points. Furthermore, the light emitted by the Port's light fixtures is not contained inside the site and pollutes, to some extent, its immediate surroundings.

7.1.3 Geomorphology and river characteristics

There are five distinct sectors inside the ESA. The *Québec Promontory* is made up of a steep promontory (Cap Diamant) with an elevation of around 100 m. *Point Lévis* is a hill with an elevation of around 110 m that has much gentler slopes than the Québec Promontory. *Île d'Orléans Point* has a slight elevation of around 30 m on average. Just north of Île d'Orléans Point is the *Beauport elevation*, which reaches a height of around 100 m at the limits of the ESA. Finally, the *Limoilou plain* sector is located between the Beauport elevation and the Québec Promontory. This sector is intersected by the Saint-Charles River in the area that concerns us and has an average elevation of around 10 m.

The ESA is situated in the section downstream from the riverine estuary area, or more precisely, at the eastern edge of the drainage basin of the fluvial portion of the St. Lawrence River. The riverine estuary is the last portion of the St. Lawrence River to be influenced by the tides, which, by this point, are fresh water and semi diurnal, and have very high ranges, with delayed effects compared to the tides of the Gulf of St. Lawrence. The water level goes above 5.70 m just one day per year and above 6.21 m just one hour per year. The low levels of -0.04 m and -0.42 m are reached one day and one hour of the year, respectively.

Within the limits of the ESA, the stream network includes three tributaries on the north shore, namely the Saint-Charles River, the Du Moulin Brook and the Beauport River. Downstream from Québec, the St. Lawrence River flows on both sides of Île d'Orléans via the Grands Voiliers channel (to the south) and the Île d'Orléans channel (to the north). The Grands Voiliers channel is deeper and receives the majority of the discharge from the St. Lawrence River. The St. Lawrence Seaway navigation channel also passes through the Grands Voiliers channel. A more detailed description of the average discharge and the water level of these watercourses are presented in chapter 7 of the EIS.

The elevation of the sea floor was characterized by means of bathymetric surveys in order to plan the stages of the project design. The deepest area corresponds to the St. Lawrence Seaway's navigation channel, which passes to the south of Île d'Orléans and immediately to the south of the BZ. In some places, the channel is more than 50 m deep. There is a shallower area (0–4 m) in the area of the Beauport Flats, where the future Beauport beach will be located. The fluvial portion to the north of Île d'Orléans is less deep (6–8 m) than the southerly portion (> 25 m).

A follow-up study on the currents and a simulation were carried out in order to obtain details about the present condition of the current and the transport of sediment. The simulation of the current over the whole ESA showed the importance of circulation in the channel to the south of Île d'Orléans. In the port area, the currents are slightly reduced but remain strong. At the edge of the Beauport beach, the currents reach as far as the shoal area at the northeastern part of the beach. The simulation also shows that the currents remain strong at the entrance of the Saint-Charles River basin but continue only slightly toward the inside of the basin, and highlights the fact that the tidal current is strong enough to reverse the direction of the natural flow of the St. Lawrence River. Waves from the west and west-southwest are most frequent, followed by those from the east and east-northeast. These waves correspond to the prevailing winds that follow the longitudinal axis of the St. Lawrence River. Among these waves, those with the highest amplitude come from the east and east-northeast.

Finally, the Beauport Bay recreational beach underwent significant morphological changes between 1987 and 2005. The southern portion of the point progressively eroded, and the sand migrated to the north, while a portion of the sand accumulated in the calm areas of the southwest re-entrant. There was also a significant decline in the banks at the top of the beach in this area. The grade of the substratum found in different sections of the beach confirms that fine sediments are transferred from the south toward the north. According to the observed sediment transport, the driving force of erosion lies in the agitation and longshore currents created by storm surges from the east and east-northeast.

7.1.4 Ice conditions and water quality

The Beauport Flats sector is usually covered in ice starting in December. The ice extends from the Beauport Bay beach to Île d'Orléans Point, and is carried away by the tide starting in March. A few blocks are left to melt on the flats. In the Saint-Charles River estuary sector, there is ice from December to April. This ice is made up of small blocks. The estuary's ice cover is affected mainly by maritime traffic. The thickness of the floating ice is not well documented, but blocks of ice measuring 5 m can be found. In more sheltered areas, the ice is typically smooth, with occasional accumulations not exceeding half a metre above the water. Taking the accumulation of cold days into consideration, the maximum thickness of ice in a severe winter (occurring once every 50 years) has been calculated to be 0.96 m.

The water of the Saint-Charles River upstream from the project is classified as being of dubious quality according to the MDDELCC's guideline values, which may compromise some uses, while the river water in the ESA is classified as being of satisfactory quality, which usually allows for all uses. A comparison of the results of the water analyses to the CCME's criteria shows that neither the average, median or maximum concentrations are exceeded.

Data on the water quality of the St. Lawrence River and the Saint-Charles River is presented in chapter 7 of the EIS. It may be noted that, for example:

- There is a seasonal fluctuation in temperature, from over 25℃ in summer to temperatures close to freezing in winter.
- The pH tends to increase with significant seasonal variations and is usually lower in the St. Lawrence River than in the Saint-Charles River.
- The water of the Saint-Charles River is considered clear, with an average SS concentration of 11.2 mg/L.

The groundwater was also analyzed. The concentrations detected were within the guideline values according to the criteria and standards, with the exception of the concentration of sulfides, which was found to be in excess in some wells. These high levels of sulfides could be caused by the anaerobic biodegradation of organic matter present in the dredged sediments that make up the existing deposits, among other reasons.

7.1.5 Underwater noise

Underwater noise was assessed by means of the surveys conducted in September 2015. The sources and intensity of the noise can vary considerably throughout the year and throughout the day. The sources of loud noises are essentially connected to port activities and the passage of vessels. The maximum pressure measured during the passage or transhipment of vessels was comparable to that which has already been measured elsewhere in the St. Lawrence.

7.1.6 Soil and sediment quality

An environmental characterization of the soil was carried out to discover its level of contamination. In the beach sector (port area), the soil met criteria “B” and “C” of the MDDELCC’s Soil Protection and Contaminated Sites Rehabilitation Policy, while at the entrance of the Beauport sector, the soil met criteria “A,” “A-B,” “B-C,” and “C.” Finally, it should be noted that the soil to be excavated in the railway sector presented different degrees of contamination; 6,058 m^3 of this soil had a level of contamination higher than that recommended in the Canadian Environmental Quality Guidelines for industrial use.

Sediment samples were also collected. The sediment samples collected off of wharves 50, 51 and 52 are primarily made up of clayey silts and a mixture of fibrous materials, sand and clay in varying proportions, as well as wood chips. The sediments from the project’s sectors are mostly made up of sand. They contain little organic matter, and their pH varies from 7.14 to 8.32. This sediment generally does not exceed the limits of the selected criteria. However, the results of studies from 2012 and 2015 show that, in some areas, there are class 3 contaminated sediments, or sediments that are above the “C” value of the general criteria for soil and the “CEF” value of sediment quality criteria (site-specific quality criteria). These were mostly areas with fine sediments that were richer in organic matter. This soil is potentially toxic. Precautions should be taken when dredging sediments in these sectors in order to limit adverse biological effects on the St. Lawrence River ecosystem.

7.1.7 Sea floor characterization

Drilling and sounding did not indicate the presence of backfill at the bottom of the river. The superficial deposits are made up of deep coarse or silty sand. The soil’s compactness varies from loose to dense and increases more or less steadily with depth. Basement rock was met at elevations between -53.05 and -67.26 m. It is mainly made up of very fractured and deteriorated shale. The appearance of the samples is typical of rock found in a fault zone. Drilling was carried out in the wharf extension area, the retaining dike area, the breakwater area and the area off wharves 50 and 52.

7.2 BIOLOGICAL ENVIRONMENT

The habitats and the animal and plant species present, as well as at-risk species that could potentially be present in the BZ and the ESA, were documented by means of many inventories, surveys and characterizations, as well as monitoring.

7.2.1 Terrestrial environment and vegetation

The project’s BZ is located in the sugar maple-basswood bioclimatic domain. However, because of the urban and industrial character of the BZ, the terrestrial biological environments are not well represented. They are essentially made up of forest tracts, the largest of which corresponds to the Domaine de Maizerets. Among the terrestrial environments found in the BZ, there is an herbaceous meadow, a forest and a wildland.

7.2.2 Wetlands, beach and riverside and aquatic vegetation

Wetlands, especially marshes, occupy the intertidal level of almost all of the north shore of the St. Lawrence River between the QPA's port facilities and the mouth of the Montmorency River, as well as the north shore of Île d'Orléans and the south shore of the St. Lawrence in Anse Gilmour. The following environments were identified and characterized in the southeast re-entrant: two American bulrush marshes, a broadleaf arrowhead marsh, a northern wild rice marsh, a shrub swamp and a tree marsh. Other wetlands were recorded, particularly in the bay of the Montée des 50 Nord sector, which includes thin areas of hydrophilic trees and shrubs, as well as the Beauport beach, which, although not classified as a wetland, is an aquatic habitat.

7.2.3 Terrestrial fauna, aquatic fauna and birds

The terrestrial fauna likely to be present in the BZ includes many species of land mammals, amphibians and reptiles.

Numerous species of fish also use the waters of the St. Lawrence River and the Saint-Charles River in this area. The environments found there are favourable to feeding (Beauport Bay, southwest re-entrant, central area of the Saint-Charles River estuary), growth (Beauport Bay), movement (channels formed in the silt by receding water in the southwest re-entrant, the wharf 53 extension and the confluence of the mouth of the Saint-Charles River, the St. Lawrence River and Beauport Bay) and reproduction (downstream from the Joseph-Samson containment barrier). Many at-risk species have been observed in the sector. Particular species and issues are monitored and subject to different studies.

Other aquatic species also colonize this section of the St. Lawrence, particularly amphipods, arthropods, molluscs (bivalve and gastropod), oligochaetes (tubifex, segmented worms) and insect larvae. There are also many species of mussels and freshwater mussels.

As for birds, depending on the species, they use the BZ during nesting periods and spring and fall migrations, as well as for wintering. Shorebirds, waterfowl, other aquatic birds, passeriformes and other terrestrial birds have been observed.

Special-status or at-risk species that are highly likely or likely to be present in the BZ are identified in Table 4.

Table 4 At-risk species that are highly likely or likely to be present on the site

COMPONENT	SPECIES	POTENTIAL
Vascular flora	Victorin's water-hemlock, Parker's pipewart, trailing wild bean, estuarine wild rice	Highly likely
	Victorin's gentian, wild yellow lily	Likely
Land mammals	Least weasel, hoary bat	Likely
Reptiles	Smooth green snake	Highly likely
	Common snapping turtle	Likely
Arthropods	*Trechus crassiscapus*, two-spotted lady beetle, nine-spotted lady beetle, variegated fritillary, monarch butterfly	Likely
Birds	Common Nighthawk, Bank Swallow, Barn Swallow, Hudsonian Godwit, Eastern Whip-poor wills, Peregrine Falcon (*Falco peregrinus anatum* subspecies), Barrow's Goldeneye (eastern population), Short-eared Owl, Chimney Swift, Canada Warbler, Red-necked Phalarope, Eastern Wood Pewee, Bald Eagle, Rusty Blackbird, Caspian Tern	Highly likely
Fish	American shad, Atlantic sturgeon, lake sturgeon, striped bass, rainbow smelt	Highly likely
Molluscs	Mussels and freshwater mussels	Highly likely

7.2.4 Designated Environmentally Sensitive Area

Along with the different wetlands that fulfill many ecological functions by serving as a habitat for a large variety of wildlife species and being used during migration, reproduction, feeding and wintering, there are many types of environmentally sensitive areas inside the administrative boundaries of the QPA:

- The habitat of the Victorin's gentian in the Lévis–Pointe de la Martinière sector
- The plant habitats of Parc de la Plage-Jacques-Cartier and Marais-de-la-Pointe-de-La Durantaye
- The eight aquatic birds concentration areas (ABCAs) on the north and south shores of the St. Lawrence River, as well as on Île d'Orléans
- The Beauport Flats important bird area (IBA)
- Parc de la Chute-Montmorency
- The Polatouche-de-Villieu and Bois-Barré-de-Villieu nature reserves

7.3 FIRST NATIONS

Ten First Nations were considered for the Beauport 2020 project evaluation of environmental effects, as identified in Table 5.

Table 5 First Nations considered

FIRST NATIONS	POPULATION
Huron-Wendat First Nation	3,943
Abenaki First Nations	Odanak: 2,428 / Wôlinak: 343
Mohawk First Nation of Kahnawake	Around 8,000
Mohawk First Nation of Kanesatake	2,321
Mohawk First Nation of Akwesasne	Around 12,000
Innu First Nations of Essipit and Mashteuiatsh	Essipit: 722 / Mashteuiatsh: 2,081
Innu First Nation of Pessamit	3,933
Maliseet of Viger First Nation	1,171

7.3.1 Traditional territory and sites of interest

The ESA is located at the centre of Nionwentsïo, traditional territory of the Huron-Wendat. It also intersects the ancestral territories of the Abenaki First Nation (the Ndakinna), the Innu of Essipit, Mashteuiatsh and Pessamit (the “Southwestern Part”) and the Maliseet of Viger First Nation (the Wolastoqiyik).

Some Aboriginal heritage or cultural sites of interest are found within the ESA, in particular two Huron-Wendat sites: Stadacona, formerly located at the site of the present city of Québec, and the former Huron-Wendat village of Sainte-Pétronille on Île d’Orléans. Furthermore, the locations of the city of Québec, the Saint-Charles River, Anse de Sillery and Île d’Orléans are places of historical significance for the Innu and other First Nations.

7.3.2 Activities practised

Regarding the contemporary uses of the ESA, the members of the Huron-Wendat First Nation, as well as two members of the Innu First Nation of Essipit, declared they hunt and fish in the area. The Abenaki First Nations reported that navigation is an important traditional activity still practised in the ESA. Furthermore, all nations that provided information catch many species of fish, migratory species in particular, either upstream or downstream from the project, and some practise other activities like crafts and migratory bird hunting.

7.4 HUMAN ENVIRONMENT – OTHER THAN ABORIGINAL

The Port of Québec’s Beauport sector is part of an active industrial port area, bordered by other industrial activities. The sector is relatively far from inhabited areas; the closest residences are 1.8 km from the wharf line in the Limoilou sector and 1.9 km away in the Beauport sector. The Beauport Bay recreation park is located at the edge of the current port facilities.

The ESA crosses the limits of the city of Québec, the city of Lévis and the municipality of Sainte-Pétronille (Île d'Orléans). It is made up of urban and suburban areas, primarily in the cities of Québec and Lévis, as well as a rural area (Sainte-Pétronille). Areas of high density and mixed tenure, as well as areas with less human activity can be found within the ESA. Several places of interest are located in the area, including schools, churches and places of worship, early childhood centres and daycares, hospitals and parks.

7.4.1 Activities practised

Many recreational activities take place in the ESA. The Beauport Bay beach is used for water sports (canoeing, kayaking, rabaska canoeing, boardsailing, kitesurfing, etc.), as well as birdwatching and swimming. In the Pointe-à-Carcy sector, there is a sailing school, the Naval Museum of Québec, maritime excursion facilities, outdoor performances (Agora) and the multipurpose venue Espaces Dalhousie. The Domaine de Maizerets offers many recreational and tourist activities such as hiking, cross-country skiing and snowshoeing. Finally, other activities such as sportfishing, cycling and yachting are also pursued throughout the ESA.

There are also commercial activities that take place in the ESA, in particular commercial fishing and the different activities of the tourism industry. The Ross Gaudreault Cruise Terminal welcomes close to 30 cruise ships and over 150,000 passengers every year.

7.4.2 Quality of life, human health and socioeconomic contribution

The influence of the Port of Québec's activities in the Beauport sector on quality of life in the area and human health concerns the nuisances created by ground traffic and the acoustic, atmospheric, visual and nocturnal brightness aspects. The population may currently be inconvenienced by the port activities, but the impact is very limited, generally because of the distance from residences.

In addition, the Port of Québec has many positive socioeconomic impacts on the region, the province and the country. At the regional level, it equates to 2,911 well-paying jobs and $270 M in economic benefits that contribute to the quality of life of the residents of the greater Québec area.

7.4.3 Landscape, heritage and archaeological potential

The composition of the landscape in the Beauport port sector is characterized by the usual elements of an industrial area, with large buildings. Visual simulations were created by Graph Synergy in 2014 to better assess the visual impacts of the Beauport 2020 project.

Among the heritage features identified in the WSA, there is Old Québec, which is a UNESCO World Heritage site, the entire Île d'Orléans area, as well as many heritage properties. There is also the Maison Maizerets, located in the Domaine de Maizerets in Limoilou.

There is significant archaeological potential in the Île d'Orléans Point sector, as it is an important Aboriginal and non-Aboriginal historic site. Moreover, the St. Lawrence River has a rich underwater archaeological potential, given the high number of shipwrecks that have occurred there, and the maritime history of the city of Québec. In general, the city of Québec's maritime tradition is inseparable from its history and creation, which means that there are many areas of historical interest near the port facilities.

8 SUMMARY OF THE EVALUATION OF ENVIRONMENTAL EFFECTS

The construction of a multifunctional deep-water terminal and related amenities (the area behind the wharf, beach, retaining dike, breakwater and dredging area) on the Port of Québec site will have many effects on the valued environmental components (VECs). Most of the effects connected to the development work will be subject to mitigation measures proposed by the QPA to limit the project's effects as much as possible.

Despite the planned mitigation measures, the project will have permanent residual effects, attributable to the loss of terrestrial and aquatic areas and wetlands, and thus the loss of habitats for fauna, as well as to the presence of the amenities, among other causes. For the natural environment, the residual effects will mostly be minor and insignificant. Although considered insignificant, the effects on aquatic fauna and special status species will be average. In this regard, a compensation project is proposed by QPA to balance between the gain and loss of habitats.

The effects on the human environment will also be insignificant. They are mainly connected to inconveniences caused by construction work (increase in traffic and sound level, brightness, air quality, etc.).

Effects on the visual environment and the landscape are connected to the presence of the terminal and the related amenities. These effects are considered insignificant because of the industrial nature of the area in which the Beauport 2020 project will be developed.

Finally, the project will also have beneficial effects on the area. The construction activities will create regional economic benefits by creating jobs, both directly and indirectly. The project will also ensure regional economic development by increasing port activity at the Port of Québec.

The residual effects of the Beauport 2020 project are summarized in table 6, which includes the VECs concerned, the sources of the effect, the potential effects and their evaluation, the proposed mitigation measures and the evaluation of residual effects.

As previously mentioned, when the negative residual effect remains significant, the QPA will put amenities or compensation projects in place wherever possible within the territorial boundaries of the Port of Québec.

Table 6 Summary of the project's environmental effects on the VECs

VEC	PHASE OF THE PROJET	SOURCE OF THE EFFECT	DESCRIPTION OF THE POTENTIAL EFFECT	VALUE OF THE POTENTIAL EFFECT	MITIGATION MEASURES	EVALUATION OF THE RESIDUAL EFFECT
BIOPHYSICAL ENVIRONMENT						
1. Air quality	Construction	▪ Anticipated construction methods ▪ Type of equipment ▪ Amount of equipment and operation time	▪ Deterioration of air quality by the emission of fine particulate matter ($PM_{2.5}$) ▪ Emission of greenhouse gas (GHG)	Medium	▪ A dust control agent will be used during construction as necessary, and dust emissions will be measured at the source in order to anticipate additional measures as needed (more frequent applications of dust control agents, etc.).	Average and insignificant
	Operation	▪ Type of equipment ▪ Amount of equipment and operation time	▪ Deterioration of air quality by the emission of VOCs and fine particulate matter	Medium	▪ Traffic routes will be covered with a surface that limits the dispersal of particles and dust (asphalt or concrete). ▪ The speed limit for vehicles will be less than 20 km/h.	Minor and insignificant
2. Sound environment	Construction	▪ Anticipated construction methods ▪ Type of equipment ▪ Amount of equipment and operation time	▪ Effect on the quality of life of neighbouring populations	Low	▪ Sound levels will be monitored in real time. If federal criteria are exceeded, the QPA will require the contractor to use an alternative method, such as vibratory driving or hydraulic system instead of impact driving. ▪ Sheet-pile sinking will be limited to the hours between 7:00 a.m. and 7:00 p.m. ▪ Equipment will be fitted with the original mufflers provided by the manufacturer when possible. ▪ Electrical or mechanical equipment not in use will be shut off, as well as trucks awaiting a load. ▪ The use of engine brakes on the work site will be minimized. ▪ The slamming of the back panels of trucks when materials are being unloaded will be kept to a minimum. ▪ A sound barrier will be used between the noisiest work and the residences when possible. ▪ Equipment like shovels and front-end loaders will be fitted with white noise back-up alarms.	Minor and insignificant
	Operation	▪ Type of equipment ▪ Amount of equipment and operation time	▪ Effect on the quality of life of neighbouring populations	Low	▪ New generators will have mufflers that are reactive to gas exhaust. ▪ Mechanical equipment (pumps, motors, etc.) will be operated inside buildings when possible. ▪ Containers and fixed equipment will be used in such a way so as to prevent sound from reaching the residences, particularly those in Lévis. ▪ Electrical and mechanical equipment not in use will be shut off, as well as railway trains awaiting a load. ▪ As much equipment as possible will be fitted with white noise back-up alarms.	Minor and insignificant
3. Nocturnal brightness	Construction	▪ Floating equipment (dredges and tow boats) and land-based equipment (trucks, machinery and equipment necessary for construction)	▪ Quality of life of neighbouring populations ▪ Attraction of some wildlife species	Low	▪ A program will be put in place to decrease light pollution over a five-year period, in order to reduce the noted adverse effects in both winter and summer. ▪ Particular attention will be paid to the location of lighting systems when evening and night work is required.	Minor and insignificant
	Operation	▪ Transfer of dry and liquid bulk and containerized general merchandise	▪ Quality of life of neighbouring populations ▪ Attraction of some wildlife species	High	▪ An LED lighting fixture with adapted photometry will be used. ▪ Shades will be used. ▪ The upward inclination of lighting fixtures will be limited. ▪ Towers/stand poles will be raised. ▪ Towers will be added. ▪ Projectors with the latest technology will be used. ▪ Full cutoff lighting fixtures will be used. ▪ A control system will be used. ▪ The goals of beautification and enhancement will be encouraged.	Average and insignificant
4. Sediment quality	Construction	▪ Dredging	▪ Effect of sediment quality on river water quality and on fish and their habitat	Medium	▪ Sediment located directly below the contaminated area to a depth of 0.3 m will be separately dredged and separately segregated on land. ▪ Monitoring of the work site must include preventive actions, plume dispersion measures (automated, real-time measures or one-off measures) and an effective chain of communication (with an automatic alarm, if possible) to announce the temporary stoppage of work in the event that the set criteria are exceeded.	Minor and insignificant

VEC	PHASE OF THE PROJET	SOURCE OF THE EFFECT	DESCRIPTION OF THE POTENTIAL EFFECT	VALUE OF THE POTENTIAL EFFECT	MITIGATION MEASURES	EVALUATION OF THE RESIDUAL EFFECT
					▪ Absorbent socks and booms will be placed around the dredge to prevent oil from being released during dredging operations. ▪ Dredging equipment operators will be trained to avoid needlessly resuspending sediment. ▪ Dredging activities will be ceased in unfavourable weather conditions to avoid the dispersion of dredged or suspended material outside of the work area. ▪ Sediment will not be dredged outside of the prescribed dredging areas. ▪ When filling the barge, the dredge bucket must be lowered into it as much as possible. ▪ Overfilling the barge containing the dredged sediment must be avoided.	
	Operation	▪ Maintenance dredging	▪ Effect of sediment quality on river water quality and on fish and their habitat	Medium	▪ The same measures as in the construction phase will be taken.	Minor and insignificant
5. Surface water quality	Construction	▪ All construction phases of the project	▪ Contamination due to leaks or spills ▪ Resuspension of fine sediment	Medium	▪ The customary measures required to avoid, contain and report any contamination of the water environment will be taken. ▪ Wash water from concrete mixers and similar equipment will be either treated on site or collected and sent for treatment off site. ▪ Emergency response kits (including a suspended phase detection device) will be available everywhere. ▪ Increases in the concentration of SS in the water column downstream from the work will be continuously monitored. ▪ There will be an automated work stoppage alarm. ▪ A dewatering basin will be built, if needed. ▪ The opening velocity of the spillway gates on the hydraulic dredge and/or the discharge velocity of the dredge pumps will be continuously monitored. ▪ Silt curtains will be installed, if conditions allow. ▪ Dredging operations will be stopped in the case of unfavourable weather conditions.	Minor and insignificant
	Operation	▪ All operation phases of the project	▪ Contamination due to leaks or spills ▪ Resuspension of fine sediment	Medium	▪ Material will be stored on paved areas, and waste will be disposed of in accordance with the standards in effect. ▪ The customary measures required to avoid, contain and report any contamination of the water environment will be taken. ▪ During dredging operations or operations with potential effects from salting out sediment, the mitigation measures cited under the construction phase will be applied.	Minor and insignificant
6. River environment	Construction	▪ Construction of the new multifunctional deep-water terminal, the beach and the breakwater	▪ Effect on hydrodynamic conditions	Low	▪ No mitigation measure will be applied.	Minor and insignificant
			▪ Effect on the sedimentological regime	Low	▪ No mitigation measure will be applied.	Minor and insignificant
	Operation	▪ Presence of the new multifunctional deep-water terminal, the beach and the breakwater	▪ Hydrodynamic conditions	Low	▪ No mitigation measure will be applied.	Minor and insignificant
			▪ Effect on the sedimentological regime	Medium	▪ The design of structures is optimized to reduce the effects on the sedimentological regime.	Average and insignificant
			▪ Effect on the ice	Low	▪ No mitigation measure will be applied.	Minor and insignificant
7. Underwater sound environment	Construction	▪ Pile driving and sheet-pile driving ▪ Vibration drilling	▪ Escape of species and/or exceeding the guideline value threshold for physical damage and having irreversible effects on aquatic fauna	Low	▪ Sheet-pile sinking operations will gradually and steadily start up over a period of 20 to 30 minutes, in order to allow any fish present to distance themselves from the noise source. ▪ Driving parameters will be adjusted so as to reduce the intensity of the noise generated. ▪ A program will be implemented to monitor the noises emitted by work site activities in real time. ▪ In the event that safe noise levels are exceeded when impact driving the sheet pile wall, vibration driving (or an equivalent method) will be required.	Minor and insignificant
	Operation	▪ Increase in traffic	▪ Escape of wildlife species	Medium	▪ No mitigation measure will be applied.	Average and insignificant
8. Terrestrial areas	Construction	Development of the area behind the wharf Storage, dewatering and on-land management of sediments Environmental incidents	▪ Loss of 4.4 ha of land: 0.4 ha of herbaceous meadow, 1.4 ha of forest and 2.6 ha of wildland ▪ Disturbance of the wildland (parcel 3) ▪ Risk of contamination in the event of an accidental oil spill	Low	▪ Landscaping will be performed on top of the bank that will be cleared, using species that are already present (e.g., staghorn sumac). ▪ Any spills in the environment must be reported to the Port of Québec harbour services. ▪ Refuelling must be done at least 30 m from the river, on a smooth, non-porous surface where any accidental spill can be recovered.	Minor and insignificant

VEC	PHASE OF THE PROJET	SOURCE OF THE EFFECT	DESCRIPTION OF THE POTENTIAL EFFECT	VALUE OF THE POTENTIAL EFFECT	MITIGATION MEASURES	EVALUATION OF THE RESIDUAL EFFECT
					▪ The on-site presence of equipment for responding to an accidental spill (spill recovery material: absorbents, leaktight containers, etc.) throughout the duration of the work will be provided for. ▪ Any volume spilled, however minimal, must be recovered. ▪ All washing of heavy machinery is prohibited, except in washing areas authorized by the QPA and constructed for this purpose. ▪ Traffic zones will be defined and restricted to avoid encroachment on the area. ▪ Travel must take place on the designated routes. ▪ Trucks and equipment used must be in good condition.	
	Operation		▪ No potential effect is anticipated.			
9. Riverside areas	Construction	▪ Rebuilding of the beach	▪ Loss of 0.03 ha of Eastern cottonwood treed swamp located on the southern tip of the southwest re-entrant ▪ Risk of contamination		▪ Any spill in the environment must be reported to the Port of Québec harbour services. The on-site presence of equipment for responding to an accidental spill (spill recovery material: absorbents, leaktight containers, etc.) throughout the duration of the work will be provided for. ▪ Any volume spilled, however minimal, must be recovered. ▪ All washing of heavy machinery is prohibited, except in washing areas authorized by the QPA and constructed for this purpose. ▪ Traffic zones will be defined and restricted to avoid encroachment on the area. ▪ Travel must take place on the designated routes. ▪ Trucks and equipment used must be in good condition.	Minor and insignificant
	Operation		No significant potential effect is anticipated.			
10. Soils	Construction	▪ Excavation, storage and dewatering of sediments	▪ A change in the soil could have an effect on the quality of surface water and groundwater	Low	▪ Construction work on the basin during periods of high wind is to be avoided. ▪ All equipment that has travelled in the work area (storage basin) must be cleaned. ▪ A spill response plan will be implemented. ▪ All necessary precautions must be taken to minimize the soil becoming airborne. ▪ Excavation work will be monitored so as to not cause cross-contamination. ▪ Excavation work during periods of heavy rain is to be avoided. ▪ The work site must be secured, and work areas must be defined with adequate signage.	Minor and insignificant
	Operation		No significant potential effect is anticipated.			
11. Groundwater quality	Construction	▪ The storage, dewatering and management of sediment on land, as well as the management of soil ▪ Environmental incidents	▪ Effect on the drinking water supply	Medium	▪ All mitigation measures presented for VEC 5 (surface water) are applicable. ▪ Groundwater will be monitored on site using integrating parameters.	Minor and insignificant
	Operation	▪ All operation phases of the project	▪ Contamination due to leaks or spills ▪ Resuspension of fine sediment	Medium	▪ All mitigation measures presented for VEC 5 (surface water) are applicable.	Minor and insignificant
BIOLOGICAL ENVIRONMENT						
12. Aquatic fauna and its habitat	Construction	▪ The construction and placement of concrete cribs ▪ The installation of sheet piling ▪ The filling and backfilling of the cribs ▪ The construction of the retaining dike and breakwater ▪ The dredging of sediments ▪ The backfilling of the area behind the wharf ▪ The storage and dewatering of sediments ▪ The rebuilding of the beach ▪ The management of contaminated sediments ▪ The extension of the outfall	▪ Effect on reproduction	Low	▪ Water quality and sediment resuspension around the dredge and in known rearing habitats will be continuously monitored when work is performed outside of the proposed restriction period but between mid-June and late August, so that corrective measures can be quickly applied as needed. ▪ Dredging speed must be restricted to less than 0.6 m/s to ensure that the guideline values are respected (increase of 25 mg/L at a distance of 100 m from the dredge compared with natural conditions). ▪ An SS monitoring system will be installed with an automatic alarm to verify concentrations of SS before they reach their maximum values. ▪ Silt curtains will be installed, if needed and under certain conditions. However, the curtains' material type, anchors and height must be adapted to the site to withstand changes in flow velocity and the relatively high water level.	Minor and insignificant
			▪ Effect on rearing habitat	Medium		Minor and insignificant

VEC	PHASE OF THE PROJET	SOURCE OF THE EFFECT	DESCRIPTION OF THE POTENTIAL EFFECT	VALUE OF THE POTENTIAL EFFECT	MITIGATION MEASURES	EVALUATION OF THE RESIDUAL EFFECT
					▪ Water quality will be monitored in the walleye spawning grounds located in the section upstream from the Saint-Charles Riverestuary, and in the white perch spawning grounds located downstream from the BZ, in order to ensure their quality. ▪ Rockfill work on the retaining dike and breakwater will be performed so as to minimize sediment resuspension. ▪ Settling time will be enforced between deposits when filling the area behind the wharf and the onshore sediment pond. ▪ Fishing to deter and relocate species will be performed before the enclosure for the area behind the wharf is closed, in order to limit fish kills in said enclosure. Furthermore, the enclosure will be emptied of fish one last time before it is filled. ▪ The beach will be rebuilt high and dry, with the exception of the area located below the low-tide bank. Silt curtains may be used as needed. ▪ Work areas will be developed and work will be performed so as to avoid any runoff or discharge of wastewater into the river. ▪ A restriction period will be enforced during dredging work spanning July 1 to 30 to ensure the protection of the young-of-the-year fish that are the most abundant during this period.	
	Operation	▪ Transhipment, storage and handling, the maintenance of structures and amenities, the management of sediments on land and maintenance of the beach	▪ Habitat loss ▪ Hydraulic changes ▪ Potential changes to the food web ▪ Anticipated changes in the composition and characteristics of populations	High	▪ The existing channel will be moved to the north end of the current beach, along the breakwater that makes it easier for fish to access the Beauport Bay Flat.	Average and insignificant
13. Birds and their habitat	Construction	▪ All construction phases of the project	▪ Habitat loss	Medium	▪ Clearing will be performed prior to the nesting period (before April 14) in order to avoid destroying migratory bird nests, in accordance with the *Migratory Birds Regulations*. ▪ It must be ensured that no nests are present on the work site before construction activities begin. ▪ The bank swallow birdhouse will be moved to or rebuilt in a place conducive to this species's nesting. ▪ The mitigation measures described for VEC 14 (terrestrial vegetation) are applicable.	Average and insignificant
			▪ Noise and traffic disturbance	Low		Minor and insignificant
			▪ Habitat contamination	Low		Minor and insignificant
	Operation	▪ Ongoing operations (transhipment, storage, handling, traffic) ▪ Maintenance work (dredging) and rebuilt beach	▪ Noise and traffic disturbance ▪ Light disturbance	Low	▪ The beach will be maintained outside of the fall period of shorebird migration. ▪ The mitigation measures described for VEC 2 (sound environment) and 3 (nocturnal brightness) are applicable.	Minor and insignificant
14. Terrestrial vegetation	Construction	▪ Encroachment related to preparing the site	▪ Loss of land area ▪ Contamination	Low	▪ Landscaping will be performed on top of the bank that will be cleared, using species that are already present (e.g., staghorn sumac). ▪ Any spills in the environment must be reported to the Port of Québec harbour services. ▪ Refuelling must be done at least 30 m from the river, on a smooth, non-porous surface where any accidental spill can be recovered. ▪ The on-site presence of equipment for responding to an accidental spill (spill recovery material: absorbents, leaktight containers, etc.) throughout the duration of the work will be provided for. ▪ All washing of heavy machinery is prohibited, except in washing areas authorized by the QPA and constructed for this purpose. ▪ Traffic zones will be defined and restricted to avoid encroachment on the area. ▪ Trucks and equipment used must be in good condition, and a record of the quantities of fuel used on the work site will be kept.	Minor and insignificant
	Operation		No potential effect is anticipated.			
15. Riverside and aquatic vegetation	Construction	▪ Rebuilding of the existing beach	▪ Loss of land area ▪ Contamination	Low	▪ The mitigation measures described for VEC 14 (terrestrial vegetation) are applicable.	Minor and insignificant
	Operation		No potential effect is anticipated.			
16. Terrestrial fauna and its habitat	Construction	▪ All land-based phases of the project	▪ Habitat loss	Low		Minor and insignificant
			▪ Noise disturbance	Low	▪ Mufflers will be used on equipment when possible.	Minor and insignificant

VEC	PHASE OF THE PROJET	SOURCE OF THE EFFECT	DESCRIPTION OF THE POTENTIAL EFFECT	VALUE OF THE POTENTIAL EFFECT	MITIGATION MEASURES	EVALUATION OF THE RESIDUAL EFFECT
					▪ Electrical or mechanical equipment that is not in use and trucks that are waiting longer than normal to be loaded will be turned off. ▪ The use of engine brakes on the work site will be minimized. ▪ Banging of the back panels of trucks when unloading materials will be minimized. ▪ Equipment (e.g., shovel loaders) will be fitted with a white-noise back-up alarm, adjusted so that the sound level reaches a maximum of 10 dBA above the work site's ambient noise, while meeting health and safety standards.	
			▪ Contamination	Low	▪ The mitigation measures described for VEC 14 (terrestrial vegetation) are applicable.	Minor and insignificant
	Operation	▪ Transhipment, storage and handling, the maintenance of structures and amenities, the management of sediment on land and maintenance of the beach	▪ Noise disturbance and contamination	Low	▪ Maintenance dredging will be performed using suitable equipment that will reduce sediment resuspension. ▪ The mitigation measures described for the construction phase are applicable.	Minor and insignificant
17. Special status species and their habitat	Construction	▪ The construction and placement of concrete cribs ▪ The installation of sheet piling ▪ The filling and backfilling of the cribs ▪ The construction of the retaining dike and breakwater ▪ The dredging of sediments ▪ The backfilling of the area behind the wharf ▪ The storage and dewatering of sediments ▪ The rebuilding of the beach ▪ The management of contaminated sediments ▪ The extension of the emergency outfall	▪ Effect on rearing habitat ▪ Effect on juveniles ▪ Effect on migration	Medium	▪ The mitigation measures described for VEC 12 (aquatic fauna) are applicable. ▪ A restriction period will be enforced during dredging work spanning from May 25 to June 10 to ensure the protection of migrating striped bass spawners and from July 1 to 30 to protect young-of-the-year American shad, some striped bass (young of the year and juveniles) and other occurring species. ▪ Water quality and sediment resuspension around the dredge and in known striped bass rearing habitats (along the beach, in Beauport Bay and in the bay north of the Saint-Charles River estuary) will be continuously monitored when work is performed outside of the proposed restriction period but between August 1 and 30, so that the corrective measures below can be quickly applied as needed. ▪ Dredging speed must be restricted to less than 0.6 m/s to ensure that the guideline values are respected (increase of 25 mg/L at a distance of 100 m from the dredge compared with the natural conditions). ▪ An SS monitoring system will be installed with an automatic alarm to verify concentrations of SS before they reach their maximum values. ▪ Silt curtains will be installed, if needed and under certain conditions. ▪ The presence of juvenile striped bass will be limited in August near the dredging area by covering, with sand, the small underwater grass bed located near (less than 100 m from) where the cribs are to be placed, which seems to attract these juveniles. This measure may go along with the installation of floating wharves in the north section of the beach.	Average and insignificant
	Operation	▪ Transhipment, storage and handling, the maintenance of structures and amenities, the management of sediment on land and maintenance of the beach	▪ Habitat loss ▪ Hydraulic changes	Medium	▪ No mitigation measure will be applied.	Average and insignificant
HUMAN ENVIRONMENT – ABORIGINAL PEOPLES						
HURON-WENDAT NATION (HWN)						
18. Health and socio-economics	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
19. Natural, cultural and archeological heritage	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
20. Contemporary land and resource use for traditional purposes	Construction	▪ The presence, use and maintenance of machinery ▪ Preparation of the site ▪ The dredging and management of sediments ▪ The construction of infrastructure (wharf and area behind the wharf, beach and breakwater, etc.)	▪ Disruption of traditional activities (fishing and migratory game bird hunting) and recreational activities (e.g., navigation in Beauport Bay and on the St. Lawrence River) in certain parts of the wider study area (WSA)	▪ Medium	▪ The standing working group's work with representatives from the Nionwentsïo Office and the QPA will continue. ▪ A program to monitor fish species and traditional Huron-Wendat activities (including fishing) will be developed in collaboration with the HWN. ▪ Once the construction work timeline is approved and official, the QPA will submit it to the HWN representatives to distribute. ▪ The QPA has demonstrated openness about free access to the Beauport Bay site for boat launching and traditional activities.	Minor and insignificant

VEC	PHASE OF THE PROJET	SOURCE OF THE EFFECT	DESCRIPTION OF THE POTENTIAL EFFECT	VALUE OF THE POTENTIAL EFFECT	MITIGATION MEASURES	EVALUATION OF THE RESIDUAL EFFECT
	Operation	▪ The presence of new infrastructure ▪ Maintenance and dredging ▪ The increase in port activities ▪ The change in marine traffic	▪ Adjustment of Huron-Wendat users to the presence of infrastructure and the change in marine traffic	Low	▪ The standing working group's work with representatives from the Nionwentsïo Office and the QPA will continue. ▪ A program to monitor fish species and traditional Huron-Wendat activities (including fishing) will be developed in collaboration with the HWN. ▪ The QPA has demonstrated openness about free access to the Beauport Bay site for boat launching and traditional activities.	Minor and insignificant
WABAN-AKI NATION						
18. Health and socio-economics	Construction		No potential effect is anticipated.			
	Operation		No potential effect is anticipated.			
19. Natural, cultural and archeological heritage	Construction		No potential effect is anticipated.			
	Operation		No potential effect is anticipated.			
20.Contemporary land and resource use for traditional purposes	Construction	▪ The presence, use and maintenance of machinery ▪ Preparation of the site ▪ The dredging and management of sediments ▪ The construction of infrastructure (wharf and area behind the wharf, beach and breakwater, etc.)	▪ Potential temporary disruption of navigation activities on the St. Lawrence River in the WSA	Low	▪ No mitigation measure will be applied.	Minor and insignificant
	Operation	▪ The presence of new infrastructure ▪ Maintenance and dredging ▪ The increase in port activities ▪ The change in marine traffic	▪ Potential temporary disruption of navigation activities on the St. Lawrence River in the WSA	Low	▪ No mitigation measure will be applied.	Minor and insignificant
MOHAWK NATION OF KANESATAKE						
18. Health and socio-economics	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
19. Natural, cultural and archeological heritage	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
20. Contemporary land and resource use for traditional purposes	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
MOHAWK NATION OF AKWESASNE						
18. Health and socio-economics	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
19. Natural, cultural and archeological heritage	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
20. Contemporary land and resource use for traditional purposes	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
INNU NATIONS OF ESSIPIT AND MASHTEUIATSH						
18.Health and socio-economics	Construction		▪ No potential effect is anticipated.			
	Operation	▪ The change in marine traffic	▪ Potential disruption of economic activities on the St. Lawrence River	Low	▪ No mitigation measure will be applied.	Minor and insignificant
19.Natural, cultural and archeological heritage	Construction		No potential effect is anticipated.			
	Operation		No potential effect is anticipated.			

VEC	PHASE OF THE PROJET	SOURCE OF THE EFFECT	DESCRIPTION OF THE POTENTIAL EFFECT	VALUE OF THE POTENTIAL EFFECT	MITIGATION MEASURES	EVALUATION OF THE RESIDUAL EFFECT
20. Contemporary land and resource use for traditional purposes	Construction	▪ The presence, use and maintenance of machinery ▪ Preparation of the site ▪ The dredging and management of sediments ▪ The construction of infrastructure (wharf and area behind the wharf, beach and breakwater, etc.)	▪ Disruption of fishing activities in the area near the building zone and outside the WSA	Low	▪ No mitigation measure will be applied.	Minor and insignificant
	Operation	▪ The presence of new infrastructure ▪ Maintenance and dredging ▪ The increase in port activities ▪ The change in marine traffic	▪ Increase in marine traffic and risk of spill and collision on the St. Lawrence River	Low	▪ No mitigation measure will be applied.	Minor and insignificant
INNU NATION OF PESSAMIT						
18. Health and socio-economics	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
19. Natural, cultural and archeological heritage	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
20. Contemporary land and resource use for traditional purposes	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
MALISEET OF VIGER FIRST NATION						
18. Health and socio-economics	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
19. Natural, cultural and archeological heritage	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
20. Contemporary land and resource use for traditional purposes	Construction		▪ No potential effect is anticipated.			
	Operation		▪ No potential effect is anticipated.			
HUMAN ENVIRONMENT – OTHER THAN ABORIGINAL						
21. Use of waterways and the body of water	Construction	▪ The presence, use and maintenance of machinery ▪ The construction and placement of concrete cribs ▪ The installation of sheet piling ▪ The construction of the retaining dike and breakwater ▪ The dredging of sediments	▪ Likely disruption in the transit of large commercial vessels going to the Beauport and Estuary sectors	Medium	▪ A safety perimeter around the work site will be defined to ensure safe navigation. ▪ Monitoring and response organizations as well as users will be informed on a regular basis, to ensure boater safety. ▪ Commercial users of the Port of Québec will be informed of the project's work period and area by means of notices to shipping issued by Marine Communications and Traffic Services (MCTS) or news releases. ▪ Effective communication will be ensured to coordinate the activities of the contractor, the operators of floating and land-based equipment, the work supervisor and Port of Québec management to prioritize and avoid encumbering port activities. ▪ Available navigation aids (visual aids, aural aids, radar aids, etc.) will be used to ensure safe navigation and manoeuvrability.	Minor and insignificant
	Operation	▪ The presence of the wharf and the area behind the wharf ▪ The presence of the beach and breakwater ▪ Transhipment, storage and handling activities ▪ Maintenance dredging and the management of sediments on land	▪ Increased marine traffic	High	▪ A safety perimeter around the work site will be defined to ensure safe navigation. ▪ Monitoring and response organizations as well as users will be informed on a regular basis, to ensure boater safety. ▪ Commercial users of the Port of Québec will be informed of the project's work period and area by means of notices to shipping. ▪ Effective communication will be ensured to coordinate the activities of the contractor, the operators of floating and land-based equipment, the work supervisor and Port of Québec management.	Average and insignificant

VEC	PHASE OF THE PROJET	SOURCE OF THE EFFECT	DESCRIPTION OF THE POTENTIAL EFFECT	VALUE OF THE POTENTIAL EFFECT	MITIGATION MEASURES	EVALUATION OF THE RESIDUAL EFFECT
					▪ Available navigation aids will be used to ensure safe navigation and manoeuvrability. ▪ Navigation aids will be installed to guide merchant shipping operators and boaters, either on the pierhead of the breakwater or directly in the water on a buoy. ▪ Transport Canada will be notified of the presence of new port infrastructure. ▪ A vessel movement planning software program will be developed to help the various stakeholders note the Traverse du Nord's technical aspects.	
22. Use of the land and its resources	Construction	▪ Preparation of the site ▪ The presence, use and maintenance of machinery ▪ The construction of the retaining dike and breakwater ▪ The dredging and management of sediments (rebuilding of the beach)	▪ Disruption of recreational and touristic activities	Low	▪ Discussions with the Beauport Bay user forum will continue throughout the project. ▪ In collaboration with the Beauport Bay user forum, an alternative area will be identified on or near QPA territory to store sailboats. ▪ Public areas that are accessible during the work will be defined to ensure user safety and temporarily harmonize their uses during construction.	Minor and insignificant
			▪ Disruption of recreational and commercial fishing	Low		Minor and insignificant
	Operation	▪ Transhipment, storage and handling activities ▪ The beach and breakwater, and maintenance of the beach ▪ Permanent and temporary linear infrastructure (water, storm drainage and electrical systems)	▪ Disruption of recreational and touristic activities	Low	▪ Landscaping will be performed on top of the bank that will be cleared, using species that are already present (e.g., staghorn sumac). ▪ The bank swallow birdhouse will be moved to or rebuilt in a place conducive to this species's nesting.	Minor and insignificant
23. Health and socio-economics	Construction	▪ Preparation of the site ▪ The presence, use and maintenance of machinery ▪ The installation of sheet piling ▪ The construction of the retaining dike and breakwater ▪ The dredging of sediments ▪ The storage and dewatering of sediments ▪ The management of sediments (rebuilding of the beach) ▪ The management of contaminated sediments ▪ The extension of the railway ▪ The extension of the emergency outfall from the City of Québec's wastewater treatment station	▪ Noise disturbance ▪ Impact on physical and mental health ▪ Risk to safety ▪ Contamination of drinking water sources	Low	▪ In collaboration with the City of Québec and the Ministère des Transports du Québec, a route for heavy traffic will be established to give quick access to major streets in order to minimize traffic in nearby residential neighbourhoods. ▪ Traffic will be prohibited on Henri-Bourassa Boulevard North. Priority will be given to service roads providing access to Autoroute Dufferin-Montmorency and then Autoroute Félix-Leclerc. ▪ Trucks will be prohibited from travelling toward Dalhousie Street and Champlain Boulevard. Priority will be given to a route follows Abraham-Martin Street, Saint-Paul Street and Charest Boulevard East. ▪ Adequate signage must be provided for to minimize the risk of accidents involving trucks. ▪ Speed limits must be respected. ▪ Any loads that may release particles into the air will be covered with tarps. ▪ Trucks used must be in good condition. ▪ Traffic areas will be kept clean to minimize dust during truck circulation. ▪ Engines should not be left idling if not necessary. ▪ If needed, water will be applied to traffic routes to minimize dust during truck circulation, or traffic routes will be paved. ▪ The site and its surroundings will be cleaned of any materials that may have been released during truck circulation. ▪ The main traffic routes will be paved with asphalt or concrete. ▪ The previously cited mitigation measures pertaining to the sound environment, air quality, nocturnal brightness and drinking water components (VECs 1, 2, 3 and 11) also apply here.	Minor and insignificant
	Operation	▪ Transhipment, storage and handling activities ▪ Maintenance dredging and the management of sediments on land ▪ Maintenance of the beach	▪ Increase in traffic	Medium	▪ Speed limits must be respected. ▪ Any loads that may release particles into the air will be covered with tarps. ▪ Trucks used must be in good condition. ▪ Traffic areas will be kept clean to minimize dust during truck circulation. ▪ Engines should not be left idling if not necessary. ▪ The site and its surroundings will be cleaned of any materials that may have been released during truck circulation.	Minor and insignificant
			▪ Noise disturbance	Medium	▪ The mitigation measures pertaining to the sound environment (VEC 2) also apply here.	Minor and insignificant
			▪ Air quality	High	▪ The mitigation measures pertaining to air quality (VEC 1) also apply here.	Minor and insignificant
			▪ Light disturbance	Low	▪ The mitigation measures pertaining to nocturnal brightness (VEC 3) also apply here.	Minor and insignificant

VEC	PHASE OF THE PROJET	SOURCE OF THE EFFECT	DESCRIPTION OF THE POTENTIAL EFFECT	VALUE OF THE POTENTIAL EFFECT	MITIGATION MEASURES	EVALUATION OF THE RESIDUAL EFFECT
			▪ Potential contamination of drinking water sources	Low	▪ No mitigation measure will be applied.	Minor and insignificant
	Construction	▪ The project as a whole	▪ Socio-economic impact	Positive	▪ No improvement measure will be applied.	Positive
	Operation	▪ The project as a whole	▪ Socio-economic impact	Positive	▪ No improvement measure will be applied.	Positive
24. Visual environment and landscape	Construction	▪ Preparation of the site ▪ The construction of the retaining dike and breakwater ▪ The dredging of sediments ▪ The storage and dewatering of sediments ▪ The management of contaiminated sediments ▪ The presence, use and maintenance of machinery	▪ The presence of various equipment with a visual impact	Low	▪ No mitigation measure will be applied.	Minor and insignificant
	Operation	▪ The presence of the wharf and the area behind the wharf ▪ The presence of the beach and breakwater ▪ The presence of domes, tanks and the marshalling yard	▪ Visual landscape change	High	▪ Landscaping will be performed on top of the bank that will be cleared, using species that are already present (e.g., staghorn sumac). ▪ During planning, preference will be given to the use of materials and colours that ensure the facilities are visually integrated with the landscape.	Average and insignificant
25. Natural, cultural and archeological heritage	Construction	▪ The construction and placement of concrete cribs ▪ The installation of sheet piling ▪ The construction of the retaining dike and breakwater ▪ The dredging of sediments	▪ Disturbances/changes to potential sites	Low	▪ Should a terrestrial archeological site or shipwreck happen to be discovered while working, the work must immediately be stopped and the Ministère de la Culture et des Communications du Québec must promptly be notified.	Minor and insignificant

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9 IMPACTS OF THE ENVIRONMENT ON THE PROJECT

The risks related to the potential effects of the environment on the Beauport 2020 project have been taken into account for the planning, design, and operation phases. Appropriate mitigation measures have been applied.

9.1 GEOLOGICAL CONDITIONS

- Risks Related to Seismic Activity

Earthquakes are unpredictable and can occur anywhere in Québec. There are hundreds of earthquakes in the province each year on average, but most of them are of low magnitude and cause little, if any, damage. According to the seismic hazard data, the seismic risk for the Port of Québec sector is weak to moderate. The new wharf was designed to design standard CAN-S6-06. The Québec Port Authority (APQ) will require future users to adhere to that same standard for any structures erected on the area behind the wharf.

- Potential for Seismically Induced Liquefaction

There is no risk of seismically induced soil liquefaction for the planned wharf. As for the area behind the wharf, the applicable design standards will be used to design any structures built on the site. The foundations of these structures will be built to withstand any potential liquefaction of the upper fill. The standard methods that could be used are either dynamic compaction, vibro compaction, or overloading or the use of piles for the foundations so that a competent soil layer provides support.

- Ground Movement, Subsidence, and Settlement

No ground movement or settlement has been observed anywhere in the Beauport sector (recreation and port sectors) over the years. Effects of the environment arising from ground movement or subsidence would therefore be limited. The potential for ground movement, subsidence, or settlement would rather be generated by the installation of the new structure. For example, ground settlement is expected under the new reinforced concrete caissons because of the weight of the structure.

Potential ground movement or subsidence was taken into account when designing the structure, as per the standards in effect and the results of the geotechnical investigation. Settlement of the area behind the wharf (decanted dredged sediment fill) was considered during the engineering design phase. A number of factors were considered, including the water level and the type of fill necessary. Given the impossibility of consolidating the sediment when it is laid because of the tides, the design needs to allow for settlement in the first year after the end of the construction phase. The ground will settle naturally to a certain degree due to the weight of the materials themselves. For this reason, no construction (underground network, cementitious matrix) in the area behind the reinforced concrete caissons will be allowed during the year set aside for filling. Any settlement that occurs will be corrected during installation of the underground infrastructure and construction of the works in the area behind the wharf (roadwork, paving).

- Landslide Resistance

The Beauport sector is located in a fairly flat area where landslides are not a risk. Moreover, the overall stability of the reinforced concrete caissons is a function of their weight, the geotechnical properties of the foundation, and the storage loads, i.e., not directly related to the effects of the environment on the project.

Landslide resistance was taken into account when calculating the stability of the wharf's reinforced concrete caissons based on the parameters of natural soil and applicable safety factors. Landslide risk, projected settlement, excess loads on the wharf deck, berthing and mooring loads, and the effects of potential earthquakes were also considered when engineering the reinforced concrete caissons. Wave loads weren't considered because they induce very little stress. The reinforced concrete caissons will be filled with quarry stone, which will give them sufficient weight to withstand the horizontal loads created by the fill that goes in behind the caissons. The soil beneath the reinforced concrete caissons will be consolidated according to the consistency of the sediment at the base of the reinforced concrete caissons and the live loads that will be applied to the reinforced concrete caissons.

9.2 HYDRODYNAMIC CONDITIONS

- Shoreline Erosion

Shoreline erosion is a natural phenomenon that can be caused by the action of waves, wind, or tides. Erosion has been observed in northern and southern sections of the Beauport sector. In the southern section of the Beauport sector, at the end of wharf 53, significant shoreline erosion caused by the combined action of waves and wind was observed between 1999 and 2011. In the northern section, the central part of the peninsula is characterized by the presence of vegetation, which would indicate that the shoreline is more stable. The public beach, on the other hand, underwent significant morphological changes between 1987 and 2005. Judging by the observed sediment transport, the main driver of erosion is wave agitation and longshore currents created by storm surges.

As part of the project, a dike and a breakwater will be built in the Baie de Beauport sector. The new configuration will protect the shoreline from the effects of hydrodynamic conditions, ensuring their longevity. As for the new wharf, exposure to successive flooding and drying, combined with winter freeze-and-thaw cycles, creates constraints for the concrete in the reinforced concrete caissons. The concrete used for the caissons will therefore have high compression resistance and include certain additives that will increase its durability.

- Ice-Related Interference with Construction and Operations

There is a recent trend toward decreasing ice thickness on the St. Lawrence. However, ice thickness can vary greatly from year to year, and therefore reduced ice thickness measurements aren't currently recommended for the purpose of dimensioning port structures.

The new wharf will be built with high-quality concrete to withstand the effects of ice. The first major repairs will likely be required some 75 years after the structure is built. Structures built on the wharf will also need to allow ice to flow freely. Moreover, the orientation of the new wharves, which form a 17 degree angle in relation to wharves 50–53, was primarily chosen to facilitate the flow of floating ice.

9.3 EXTREME WEATHER

- Cold Waves, Seasonal Storms, Heavy Rain, Thunderstorms, and Tornadoes

Cold waves, seasonal storms, heavy rain, thunderstorms, and occasional tornadoes are recurring phenomena in the Québec City region. These events can affect project construction and operations in a number of ways, causing equipment breakdowns, making it impossible to do certain jobs (pouring concrete, for example), shutting down transportation and electrical distribution networks, causing accidents due to ice buildup, slowing or interrupting public services, delaying construction due to snow removal and so on.

It will be the general contractor's responsibility to ensure workplace health and safety on the site by responding appropriately to weather conditions. In the operational phase, users will be responsible for monitoring weather conditions in collaboration with Harbour Services and adjusting their work methods accordingly. Possible mitigation measures in response to extreme weather conditions include temporarily interrupting work, creating an extreme weather response plan, adjusting the construction schedule , postponing work, drafting a power outage response plan, putting evacuation and fire fighting measures in place for evacuation and fire prevention, and creating an emergency response and evacuation plan.

- Floods and Droughts

The Beauport 2020 project sector is not located in a flood zone. There will therefore be no effects on the project due to flooding. Drought is a complex phenomenon for which there is no precise definition. Drought is characterized as a prolonged period of abnormally dry weather. There was a 15-day drought in southern Quebec in September 2008. A drought would have little or no effect on the water table in the area behind the wharf and would have no effect on the current structures other than the vegetation planted on the slope between the area behind the wharf and Baie de Beauport, which could dry out. Beauport site records show that a drop in the river level caused by severe drought would have no effect on construction, operations, or marine operations.

9.4 CLIMATE CHANGE

Generally speaking, the literature on climate change and port operations deals mostly with changes in water levels, droughts/floods, the likelihood and intensity of storms, infrastructure exposure and vulnerability, coastal erosion, manoeuvrability issues, and social impact (municipal, industrial, and other water intakes). The effects of climate change on port activities are not yet well known. Many groups are currently investigating the issue in order to add to knowledge and allow key stakeholders to develop mitigation and adaptation measures. APQ is involved in a number of research efforts that aim to expand the body of knowledge on the impact of climate change on port environments.

In the event of a significant drop in water levels, navigation logistics (channel, navigation aids) could be impacted. Should the water level rise significantly, on the other hand, certain project parameters will need to be revised, including measures to safeguard the beach and raise the beach crest, which could involve more extensive or frequent maintenance operations.

9.5 RESIDUAL EFFECTS, DETERMINING THEIR IMPORTANCE

Geological conditions, the hydrodynamic conditions of the site, and extreme weather events have all been taken in to consideration in the detailed engineering for the project. Mitigation measures have also taken to counter the possible effects of these elements. The level of confidence in these measures is high due to the experience acquired in prior projects and the application of best management and engineering practices that meet or exceed the industry standard.

The potential effects of climate change on the project are being studied, but the application of mitigation and adaptation measures and best management and engineering practices will allow us to deal effectively with the potential effects that are identified. The level of confidence is, however, less certain, so despite the mitigation and adaptation measures to be developed, the residual effects and their importance will be assessed regularly.

10 ACCIDENTS AND FAILURES

The EIS identifies accidents or failures that could occur during the construction or operation phase of the Beauport 2020 project, assesses their potential seriousness, and presents existing mitigation and prevention measures, and the baselines that will be used to update the emergency response plan for the new facilities.

10.1 TECHNOLOGICAL RISKS ON LAND

APQ's risk management system will be founded on the use of safe technology, safe and rigorous management, land-use planning, implementation of an emergency response plan, inspections, performance measurement, information sharing, and consultation and collaboration. APQ's goal in terms of risk management is to bring risk levels down to the lowest level possible. A HAZID study has been used to identify the project's inherent technological risks. This method systematically determines the potential seriousness of failures in operations, activities, and processes as well as the measures used to prevent and manage hazards.

The greatest technological risks identified are those related to the possibility of a fire or explosion in the following situations:

- Hose breakage, reservoir spillage, or spillage from a tank truck or tank car when loading or unloading a vessel
- Collision with a line during a transfer from one reservoir to another
- Accumulation of vapors between the floating and fixed roofs of a reservoir

The consequences of worst case scenarios and standard scenarios are presented in detail in Chapter 12 of the EIS. For each technological risk identified in the operations phase, a set of prevention and mitigation measures have been identified and already implemented as part of the Port of Québec's regular activities. They are considered industry best practices. Additional measures are also identified in Chapter 12 of the EIS. They will need to be applied to operations with the highest risk severity.

10.2 RISK OF MARINE INCIDENTS

APQ was involved in the full, voluntary *Technical Review Process of Marine Terminal Systems and Transshipment Sites* (TERMPOL). One of the review requirements was a quantitative risk assessment of the incidents likely to take place during navigation at sea or when petroleum products are loaded or unloaded at a wharf (DNV, 2014).The likelihood of the following events was assessed: collision, grounding, a collision between a vessel and a fixed object, an incident arising from a cargo transfer problem, a fire, or an explosion. The final TERMPOL report and its conclusions will be tabled in the fall of 2016. Once commissioned, the Beauport 2020 project will add 200–250 vessels per year to the current annual total of some 5,000 vessels—not a significant increase. In terms of worst case scenarios, the current evaluation of marine risks is representative of the situation once the wharf is in operation. A two-part HAZID study examined possible incidents related to navigation at sea and possible incidents during loading and unloading operations at the wharf.

For safety reasons, operations involving oil tankers and vessels with dangerous cargo will be scheduled so as not to coincide with cargo transfer operations. No two activities are carried out at the same time on a single vessel. Whenever a petroleum product or dangerous cargo is being loaded or unloaded from a vessel, the operation is supervised. APQ Harbour Services and the Terminal Operator will use a checklist to ensure the ship's crew is aware of the surrounding hazards and safety risks and that a dedicated operations team has been assigned to supervise the activity.

Moreover, in order to prevent each risk, the following services will be implemented:

- Support for vessels
- Pilotage
- Towing
- Ice management
- Anchoring
- Safe berthing procedures
- Spill management

Finally, under the *Canada Shipping Act, 2001* (SC 2001, ch. 26), vessels are required by the regulations to have a shipboard pollution emergency plan and must take reasonable measures to implement the plan in the case of an oil pollution incident.

10.3 OTHER SAFETY MEASURES

The Port of Québec has additional safety measures at its disposal in the case of an emergency.

If there is a fire, the Beauport sector can call on Québec City's firefighting system and the Ocean Group response team. Ocean Group has tugboats equipped with pumps that can pull water from the St. Lawrence River to fight fires on the water's edge. The future wharf will also be equipped with an effective fire protection system designed for wharf facilities.

APQ also has an emergency response plan (ERP) that applies to the entire port site and is updated annually. The ERP is a management tool for dealing with emergency situations that could occur within Port of Québec boundaries. Before work starts on the Beauport 2020 project, the ERP will be updated to include the construction activities. It will also be updated prior to the arrival of a new user or the commencement of new operations at the multipurpose wharf and its attendant structures.

For the safety of all, APQ has formed committees and working groups to establish emergency prevention and preparedness measures and oversee their implementation. Along with stakeholders from the municipal, provincial, and federal governments and parapublic services, the port is on an emergency measures strategic committee (CSMU). The committee uses global risk analyses, as well as the measures taken by its public partners to prepare for emergency situations. In an approach focused specifically on operations that take place on Port lands, APQ also created an emergency measures committee (CMU) of Port users.

11 CUMULATIVE EFFECTS

Cumulative effects are the effect of a particular project on valued social and environmental components (VEC) when the effect of past, current, and future projects on those same components are also taken into account. They concern specific valued components (VEC) identified in this EIS or raised as issues by the public.

Past projects considered in the analysis include the construction of wharves 50 to 53, the Dufferin-Montmorency Highway, and other shoreline developments. Current and future projects considered include various roadworks and developments along the St. Lawrence River between the bridgeheads and Montmorency Falls, the proposed biomethanization plant, construction of the D'Estimauville Ecodistrict, the Energy East pipeline, and the Île d'Orléans bridge.

11.1 AIR AND WATER QUALITY

Cumulative effects on air and water quality will be minor.

Although past projects had cumulative effects on air quality, and other current and future projects could affect the overall state of VEC, air quality components (VOCs, dust, and combustion products) estimated through modeling will not be above threshold values. However, threshold for PM2.5 particles could be exceeded once the Beauport 2020 project is completed due to baseline conditions in the area.

In terms of water quality, despite an expected increase in industrial port activities and water traffic following completion of Beauport 2020, the residual effects on water quality will be minor during the construction and operating phases, since dredging creates only a temporary, reversible effect and the activities that will be carried out at the port are subject to environmental criteria and to monitoring under the QPA. The cumulative effects of this project are minor since the impact of events likely to have major effects will be short term.

11.2 NATURAL HABITATS AND AT-RISK SPECIES

The cumulative effects on natural habitats and at-risk species are for the most part minor. Urbanization, various past and future projects in the sector, and pressure from human activities are the main causes of the destruction of wetlands and other wildlife habitats and the decrease in the number of certain at-risk species. However, the operations planned as part of Beauport 2020 will not dramatically increase such pressure.

Less than 1% of classified wetlands will be lost. Therefore, the cumulative effects are minor for the loss of the wetlands and the birds who depend on them. Although fish in the area have largely been able to adapt in the past, the presence of new equipment will further disturb the fish population. Therefore, the residual cumulative effect of the project on ichtyofauna is medium.

The project's cumulative effects on at-risk fish species such as the lake sturgeon, Atlantic sturgeon, and rainbow smelt are minor since the area is not listed as a spawning ground and is rarely visited by these species. Only the American shad and the striped bass may be affected by the project. The striped bass was reintroduced in the St. Lawrence River in 2002. However, mitigation measures were planned to ensure that quality natural habitats are maintained and are as productive as those in place. The cumulative effect for those species will therefore be non significant.

As for at-risk bird species, the common nighthawk and chimney swift will be largely unaffected by the project since they are not very present in the area. The bank swallow may be disturbed by the riprapping and development in the Beauport flats sector and by the crowds at Beauport Bay Beach during the summer. QPA will relocate the bank swallow artificial habitat in order to decrease the anticipated effects on this species. The cumulative effect is therefore expected to be non significant.

11.3 CUMULATIVE EFFECTS ON HUMAN ENVIRONMENTS

Several issues were raised that could be considered problematic for humans, including light levels at night, accessibility and use of the area, and public security.

The increased light intensity could disturb birds and neighboring residents. However, the Port of Québec's activities have not raised any complaints. Beauport 2020's cumulative effect is therefore considered minor.

Concerns about accessibility and leisure use of the area by the Huron-Wendat and visitors to Beauport Bay were raised during the consultations. However, the mitigation measures and positive results from preserving the beach means these residual cumulative effects can be considered minor.

Lastly, public safety has been affected gradually by past projects in the area and could be affected by Beauport 2020 and other projects in the future. However, the measures identified in Chapter 12 indicate that the risks can be considerably reduced, and the cumulative effect is therefore minor.

12 MONITORING AND FOLLOW-UP

An environmental monitoring and follow-up program aimed at ensuring compliance with environmental provisions during the construction and operation phases of the project will be developed together with the competent authorities and implemented as part of Beauport 2020. The program also provides for change management and unforeseen events that could affect the environment. QPA will issue an annual report and a final summary report showing the results of the monitoring and follow-up program. QPA will regularly share these results with government authorities.

12.1 ENVIRONMENTAL SURVEILLANCE

The surveillance program is primarily aimed at ensuring compliance with all applicable acts and regulations, conditions set by regulatory authorities, QPA commitments contained in authorizations, and measures suggested in the EIS, including mitigation measures during the construction and operating phases. It will be based on the existing program for QPA lands, but adapted to the project's needs and supplemented with a series of surveillance activities. It will then be updated for the operating phase once the infrastructure and operations are known.

If the environmental conditions are not met, QPA may require contractors to change their work methods to conform with mitigation measures. Should unforeseen environmental degradation occur, QPA will demand that corrective measures are taken that address the level of degradation. At all times during construction, the community will be able to ask questions or make comments or suggestions via a dedicated project line or email address.

The surveillance program will apply to all steps, including:

- Preconstruction activities (plans and specifications, obtaining the required authorizations)

QPA will ensure that the contractor in charge of the work is responsible for training its employees and subcontractors on the specific constraints of the site, the environmental requirements, and the steps to take in case of a spill or other environmental emergency. An experienced inspection team will be assembled before construction begins to oversee the work.

- Construction

Once construction has begun, members of the inspection team will conduct daily inspections to ensure the conditions set out in authorizations are met, including general and special mitigation measures. A number of components may be subject to environmental inspection, including air quality, noise levels, waste elimination, plants and wildlife, suspended matter, oil transportation, incident management, and accidental spill protection.

- Decommissioning of the worksite

Once construction is finished, the inspection team will ensure that the temporary work sites are restored in compliance with the planned measures and any special requests owners may make.

- Operations

Some aspects of the surveillance program may apply to activities that are carried out as part of the port's operations, such as repair work; maintaining the breakwater; managing road, railway, and maritime traffic; transshipment activities; and storing and handling merchandise.

- Change management

Once the project is underway, changes may be made to the initial design in order to deal with unplanned or unexpected conditions or situations. A management procedure for changes will be put in place to ensure that changes have minimal effects on the environment.

- Residual material (RM) management, contaminated soil, and sanitary facilities

The construction site will produce residual materials (wood, metal, and concrete waste, domestic garbage, paper, cardboard, oils, lubricants). The residual material management plan for the worksite will conform with the principles of the 4Rs: reduce, reuse, recycle, and recover. Onsite sanitary facilities must also be managed. The contractor's environmental officer must ensure residual materials are properly managed.

- Hazardous materials (HM) management and hazardous residual materials (HRM)

During construction, a management plan for hazardous materials (e.g., chemical products, combustibles) and hazardous residual materials (e.g., waste oil) will be implemented to facilitate the safe management, delivery, storage, handling, and elimination of such products and avoid any uncontrolled release into the environment. Proper management minimizes the risk of contamination in case of an accidental spill. The environmental officer will ensure HM and HRM are properly managed.

- Nuisance management

The contractor's environmental officer will ensure the proper management of particles (e.g., water spraying, use of clean, covered trucks), drainage water (e.g., ensure sediment barriers are effective, suggest alternative options as needed), noise levels (e.g., ensure requirements are met, respect time restrictions, make sure equipment is in proper working order and strategically located), and lighting (e.g., direct lighting on the worksite in a way that minimizes the impact on neighboring residents).

- Spills

In order to limit any accidental spills, the contractor’s and QPA’s environmental officers will develop an environmental emergency plan that will designate who is in charge, provide their contact information, and identify actions to be taken immediately and the responsibilities of all parties. In addition to this plan, response procedures must be drawn up for accidental spills of contaminants specific to each contractor, and enough emergency response kits must be placed in the appropriate locations in case of a spill.

12.2 ENVIRONMENTAL MONITORING PROGRAM

The monitoring program is primarily aimed at determining how accurately certain effects have been assessed and how efficient EIS mitigation measures are based on actual onsite data. The program is designed to ensure quick action is taken as soon as results point to a need and to manage foreseeable events. The program will be implemented during the preconstruction phase and will continue for the life of the project. QPA will conduct some of the monitoring itself and other monitoring in cooperation with specialists or First Nations groups under QPA supervision.

For each valued ecosystem component (VEC), the program will set out the monitoring objectives, the methodology, the response mechanism in case an unforeseen environmental degradation, the method for sharing results with affected populations, and how First Nations groups, concerned parties, and local and regional organizations can be involved.

The VECs to be included in the monitoring and follow-up program are as follows:

- For the physical environment: air quality, noise levels, underwater noise levels, nighttime brightness and visual impact, quality of dredged sediments, suspended matter in the river water, suspended matter in water and uncontaminated dredged sediments settling in sedimentation basins, contaminant levels in water from treated contaminated sediments, beach consolidation and silting of the southwest re-entrant, wind conditions, bathymetry of the seabed, and the ice regime
- For the biological environment: birds, vegetation, aquatic wildlife, mussels, and freshwater pearl mussels
- For the human environment: community consultation, road traffic, and consultations with First Nations