Transport Canada Transports Canada

A new **bridge** for the St. Lawrence

Environmental Assessment

Summary Report

Project and Environmental Description

November 2012

Canada

Transport Canada

New Bridge for the St. Lawrence Environmental Assessment

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GLOSSARY

Aquatic plant community:	Sea or riverbed with vegetation.
Ash stand:	Area planted with ash trees.
Bathymetry:	Measurement of water depths to determine the topography of sea or riverbeds.
Civil engineering structures:	Bridges and crossing structures.
Deck:	Slab of concrete carrying the roadway of a bridge.
Downstream:	Part of a watercourse located closer to the mouth.
Draught:	Quantity or volume of water displaced by a ship.
Flat:	Piece of land that is relatively level, without a defined water flow network, forming a transition between a relief and a valley bottom or body of water.
Heterogeneous:	Made up of elements differing in nature and form.
Hibernaculum:	Winter habitat of certain small animals and insects.
Lentic:	Characterizing freshwater in which the water circulates slowly or not at all (lakes, ponds, canals, etc.).
Lithophilous species:	Species that spawn on a coarse substrate (gravel, rock, blocks) or in fast-flowing water.
Median:	In a series of data in order of size, the figure in the middle of the series, dividing the two series in equal halves.
Navigation clearance:	Maximum space provided by a navigable waterway for passage of vessels.
Pier:	Term for the intermediate support(s) of a bridge's arches or deck, with the exception of the extreme end supports, called "abutments".
River sand:	Sand carried by a watercourse, characterized by specific forms related to transportation capacity, erosion and sedimentation of the watercourse.
Substrate:	Layer that serves or once served as a support.
Turbidity:	Characteristic of water with reduced transparency due to the presence of fine suspended particles of natural origin or due to pollutants.
Upstream:	Occurring before the point of consideration, in the direction from which a fluid is moving.

1 INTRODUCTION

The details regarding the specifics of the project components presented in this report are provided solely for illustrative purposes. This project description does not constitute a final decision by the proponent. Changes to these details may be made based on the results of this environmental assessment and as the concept for the New Bridge for the St. Lawrence develops.

It should also be noted that this report is the first stage in the environmental assessment process and addresses the project description and the environment. A second report will be published to complete the analysis and will provide a description of the project's effects on the environment and proposed mitigation measures. This report may be modified in order to take into account comments made during the planned public consultation period (please visit the Canadian Environmental Assessment Registry website for more details[1]).

Blank pages have been inserted intentionally to facilitate printing and reading of the report.

1.1 PROJECT BACKGROUND AND LOCATION

The Champlain Bridge has been in operation since 1962 and is the busiest bridge in Canada. It provides a link between the Island of Montreal and the South Shore, the eastern United States and western North America. It is also an important route for transporting freight and a strategic link in the Port of Montreal transportation network, which has an area of influence extending as far as the American Midwest (Transport Canada, 2012).

Given the conclusions of expert reports regarding the current state of deterioration of the bridge and the increasing estimated cost of maintenance to maintain required safety levels, Transport Canada has decided to build a new bridge (hereafter referred to as the "New Bridge for the St. Lawrence") to replace the components of the existing Champlain Bridge.

As such, the Champlain Bridge will be kept in operation for another 10 years while the New Bridge for the St. Lawrence is built. It will then be dismantled in sections.

The Nuns' Island Bridge, built in 1960, sits alongside Champlain Bridge and connects the Island of Montreal and Nuns' Island. The Nuns' Island Bridge has also reached the end of its useful life. Replacement of Nuns' Island Bridge is also therefore unavoidable. It will be deconstructed and a new bridge built in the same location. The corridor of the New Bridge for the St. Lawrence also includes the federal portion of Highway 15 and the Highway 10 bridge approach on the South Shore.

The new bridge for the St. Lawrence will be built approximately 10 metres downstream (to the north) of the Champlain Bridge in order to minimize the impact of the new route on Nuns' Island,

[1] **The registry is available at: http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=65574**

facilitate temporary installation work during construction, facilitate the connection to the existing transportation network and protect the temporary structures from ice. The study area identified for the project covers an area around the existing and planned bridges that is sufficiently broad to take into account the potential direct and indirect effects that the project may cause. The corridor for the New Bridge for the St. Lawrence project is presented in Figure 1.

1.2 LEGAL FRAMEWORK FOR THE ENVIRONMENTAL ASSESSMENT

When it was launched, the New Bridge for the St. Lawrence project was subject to the *Canadian Environmental Assessment Act* (CEAA ; S.C. 1992, c. 37). This legislation was replaced in 2012 by a new version that responds to Canada's current economic and environmental context. *A Canadian Environmental Assessment Act, 2012* (S.C. 2012, c.19, s.52) transitional provision allows the Environment Minister to authorize continuation of the environmental assessment of a project begun before the Act came into effect in 2012. Thus, the federal environmental assessment of the New Bridge for the St. Lawrence project which was designated under the 2003 CEAA must continue under this Act.

The 2003 CEAA applies, among other things, to an undertaking in relation to a physical work (including operation, modification, decommissioning or abandonment). The project for the New Bridge for the St. Lawrence entails the decommissioning of structures and, consequently, meets the definition of "project' within the meaning of the 2003 CEAA. Furthermore, the project is not an excluded project as provided for in Section 7 of CEAA 2003 and the *Exclusion List Regulations, 2007*.

In order for the federal environmental assessment process to apply, there must, in addition to a project, be a trigger within the meaning of subsection 5(1) of CEAA 2003. In this case, a number of triggers are present:

- Transport Canada, pursuant to:
  - Paragraph 5(1)(*a*) of the 2003 CEAA: TC is the project proponent; and
  - Paragraph 5(1)(*d*) of the 2003 CEAA: project approval is required under section 5 of the *Navigable Waters Protection Act*, which is named in the *Regulations on Designated Legislative and Regulatory Provisions*.
- Fisheries and Oceans Canada, pursuant to:
  - Paragraph 5(1)(*d*) of the 2003 CEAA: authorization to modify the fish habitat as a result of the project is required under subsection 35(2) of the *Fisheries Act*, which is subject to the *Regulations on Designated Legislative and Regulatory Provisions*.

- Environment Canada, pursuant to:
  - Paragraph 5(1)(*d*) of the 2003 CEAA: permits are required for the project under subsection 9(1) of the *Migratory Bird Sanctuary Regulations*, which is subject to the *Regulations on Designated Legislative and Regulatory Provisions*.

Lastly, because the project to build a new bridge for the St. Lawrence is not described in the *Comprehensive Study List Regulations*, the environmental assessment must be performed using the screening method and must meet the requirements set forth in Section 18 of 2003 CEAA.

Since the pre-feasibility study completed in 2011 showed how diverse the options are for construction of the New Bridge for the St. Lawrence, Transport Canada decided to opt for an objective-based approach for the environmental assessment. This approach was selected because it is suitable for projects where certain details are not yet defined or will be identified at a later date.

The first preliminary report and the future reports will therefore be completed using this proven approach, which makes it possible to achieve environmental objectives without delaying the project. The mitigation measures are set out in the report in the form of objectives to be achieved rather than specific parameters that must be met. The result, ultimately, is the same, i.e. sensitive environmental components are protected and the environment is taken into consideration in subsequent stages of the project.

Federal Government property limit
Study area
Proposed infrastructure right-of-way
Municipal limit

SOURCE :
- Property and right-of-way limit : Transports Canada, 2012

Client: Transports Canada

Project: New Bridge for the St. Lawrence Environmental Assessment

Title: Figure 1
Project Location for the New Bridge for the St. Lawrence

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Checked	Ghyslain Pothier	Date	2012-11-09
Project manager	Sylvie Côté	Sequence No.	01 of 01

Serv. char.	Project	Wbs	Disc.	Type	Drawing No.	Rev.
068	P-0000810	110	GO	D	0051	0C

SIZE 11x17

2 PROJECT DESCRIPTION

In 2012, Transport Canada accorded the joint venture led by PricewaterhouseCoopers a three-year mandate to complete, among other tasks, the project's preliminary design and costing. The following sections present, for information purposes only, details on elements related to the project components. This project description does not constitute a final decision by the proponent. Changes to these details may be made based on the results of this environmental assessment and as the concept for the New Bridge for the St. Lawrence develops.

Therefore, the environmental assessment for the New Bridge for the St. Lawrence construction project will be based on the engineering and technical information in the reports of the pre-feasibility studies conducted in 2010 and 2011 for Jacques-Cartier and Champlain Bridges Inc. and the Quebec Ministry of Transport (MTQ). The information concerns the construction of the New Bridge for the St. Lawrence and the Nun's Island Bridge, reconstruction and expansion of Highway 15, road work on Nun's Island, alignment with Highway 10 on the South Shore and deconstruction of the existing Champlain and Nun's Island Bridges (see Figure 2). For more information on the project description, please consult the pre-feasibility study, available on the Transport Canada website.[2]

2.1 PLANNED COMPONENTS AND VARIATIONS

2.1.1 Reconstruction and expansion of Highway 15 (Component A)

The federal segment of Highway 15, that part between the Nun's Island Bridge and the Atwater Avenue off and on ramps, will be rebuilt due to structural conditions.

This work would involve enlarging the current highway in order to increase the number of traffic lanes as well as reconfiguring the Atwater Avenue/Wellington Street – Highway 10 East/Downtown interchange. Depending on the route chosen, weaving lanes must also be constructed for use by the public transit system. The decision on the public transit route will be made by the provincial government. The options share the advantage of having been designed with possibility of integrating Light Rail Transit rather than Bus Rapid Transit.

2.1.2 New Nuns' Island Bridge (Component B)

Five road geometry scenarios were developed for the replacement of the Nun's Island Bridge in the pre-feasibility study prepared for Jacques-Cartier and Champlain Bridges Inc. No scenario has yet been adopted. The solution chosen for the new bridge could very well differ from the scenarios developed in the pre-feasibility study.

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[2] **Accessible via: http://www.tc.gc.ca/eng/programs/bridges-new-bridge-for-the-st.lawrence-2775.htm**

The work will involve building a temporary causeway to maintain traffic flow during deconstruction of the existing bridge and construction of the new bridge(s). Jacques Cartier and Champlain Bridges Inc. is responsible for the work associated with the building of the temporary causeway and will therefore be covered by a separate environmental assessment.

The preferred solution for each direction would include:

- Three lanes for automobile traffic;
- One reserved lane for public transit;
- One multi-use path.

2.1.3 Work on Nuns' Island (Component C)

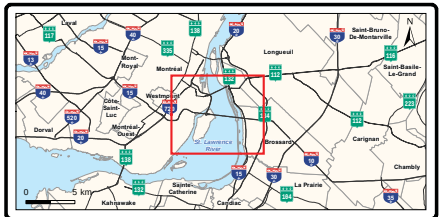
Based on the pre-feasibility studies, there are two construction options for the Nun's Island sector, depending on the scenario finally chosen for public transit service. In principle, the cross-section of the highway on Nun's Island would be similar to the cross-section for the Nun's Island Bridge and for the New Bridge for the St. Lawrence. There would be three traffic lanes.

With regard to the space required for public transit, the route could either follow the Nun's Island Bridge or leave the centre of the highway on Nun's Island, run beneath the highway going west, cross the river via an independent bridge and join the route proposed in the Agence métropolitaine de transport (Montreal Transportation Agency) (AMT) February 2007 preliminary study for the light-rail transit system in the Highway 10 corridor between the South Shore and downtown Montreal.

As the New Bridge for the St. Lawrence is planned to be downstream from the current bridge and the Nun's Island Bridge is to be built along the same route as the existing bridge, the proposal would retain most of the existing infrastructure apart from the partial relocation of René-Lévesque Boulevard.

Project Components
Municipal limit
Borough limit

SOURCES :
-Components : Un nouveau pont pour le Saint-Laurent, Lignes directrices finales pour l'évaluation environnementale (incluant la portée de l'évaluation environnementale) page 11, Transport Canada, 2012
- Orthophotographs : © Montreal Metropolitan Community, 2005-2011
- Satellite images : (c) 2010 Microsoft Corporation and its data suppliers



Client: Transports Canada

Project: New Bridge for the St. Lawrence Environmental Assessment

Title: Figure 2 Project Components for the New Bridge for the St. Lawrence

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Serv. char.	Project	Wbs	Disc.	Type	Drawing No.	Rev.
068	P-0000810	110	GO	D	0053	0C

SIZE 11x17

2.1.4 The New Bridge for the St. Lawrence (Component D)

To date, no solution, either in terms of location (route and profile) or structural solution (bridge type) has been officially chosen. Therefore, all options described below are still possible, and since more detailed studies are or will be undertaken, other solutions may be proposed.

The location proposed for the New Bridge for the St. Lawrence in the pre-feasibility study is approximately 10 m downstream (north side) from the existing Champlain Bridge. It would be about 3.5 km long and could be divided into three segments:

- Section 1: crossing the St. Lawrence River between Nun's Island and the Seaway, approximately 2,300 m;
- Section 2: crossing the Seaway, approximately 400 m;
- Section 3: crossing the Lesser La Prairie Basin, approximately 800 m.

The bridge proposed in the pre-feasibility study would consist of two identical decks each supporting three automobile traffic lanes and one public transit lane.

2.1.4.1 Components D1a and D1b: crossing the St. Lawrence River between Nun's Island and the Seaway and the Lesser La Prairie Basin

The span lengths proposed in the pre-feasibility study for crossing the river and the Lesser La Prairie Basin are 80 m. This was determined based on:

- The reduction in the number of piers compared to the current number (elimination of one pier out of three);
- Economic length for the type of structure considered.

2.1.4.2 Component D2: crossing the Seaway

Based on the data in the pre-feasibility study, the Seaway crossing would require a span of at least 200 m in order to meet the navigation clearance given the angle between the structure and the canal.

2.1.5 Alignment with Highway 10 (Component E)

For this last segment of the corridor under study, which provides a connection to the existing Highway 10 on the South Shore, the planned solution would include three lanes in each direction and two reserved public transit lanes (Light Rail Transit or dedicated bus lane, as on the new bridge). Highway 10 would be brought closer to the residential sector north of the current bridge to align with the New Bridge for the St. Lawrence.

2.1.6 Deconstruction of existing Champlain and Nuns' Island Bridges (Components F and G)

For both bridges, the proposed deconstruction method could be based on the principle of sawing the concrete spans and piers using diamond-encrusted wire cables and dismantling the entire steel spans, and then dismantling various other elements singly. The blocks would then be transported by barge or truck.

The deconstruction of the Champlain Bridge structure would generate approximately 165,000 tonnes of concrete and 13,300 tonnes of steel (6,500 in the structure and 6,800 in the deck). Reclamation would always be the preferred option.

Deconstruction of the Nuns' Island Bridge would occur after a temporary causeway has been built downstream of the existing bridge. There are approximately 16,500 tonnes of concrete decking to be demolished, approximately 18,000 tonnes of concrete in the piers and 16,200 tonnes of concrete in the bases.

2.1.7 Pre-construction work: set-up of jobsites

Regardless of the solution that is ultimately chosen, a project of the scope of the New Bridge for the St. Lawrence will require the establishment of a very large jobsite, which must be carefully planned out in advance. Specific areas have been identified on Figures 3 to 6 by the Dessau-Cima joint venture. A portion of the jobsite will possibly be supplied via the river. The contractor may consider constructing a new wharf near the jobsite. Approvals will be required for all temporary work, and the locations of these sites will need to be submitted for approval, as will their detailed plans.

Figure 3 Jobsite location – Nuns' Island

Figure 4 Jobsite location – Dike

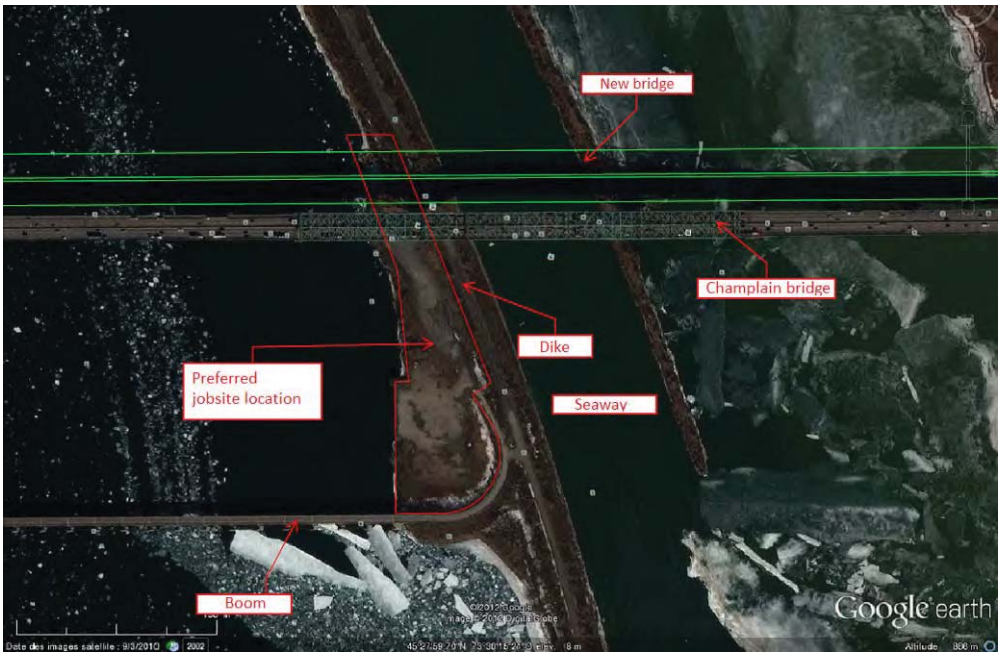

Figure 5 Jobsite location – South Shore

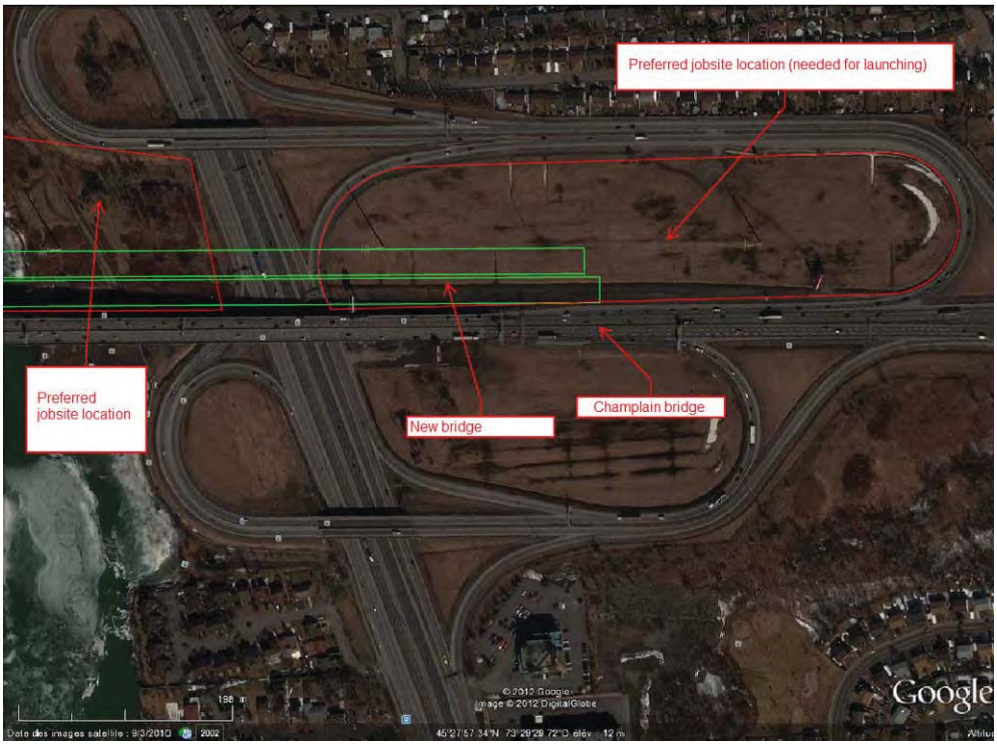

Figure 6 Jobsite location – Montreal and Nuns' Island

2.1.8 Post-construction work

Once construction has been completed (in full or a major section), the jobsite facilities will be dismantled. Areas used by the contractor for its jobsite (pre-fabrication area, launch area, etc.), will have to be returned to their original or equivalent condition, based on requirements set out by the property owners or contained in performance specifications.

2.1.9 Operation of new infrastructure

Inspections will be required at regular pre-defined intervals specified by the operating authorities. As a general rule, there are two inspection levels: general inspections and detailed inspections. General inspections are carried out annually, while detailed inspections are done every four to five years. These inspections make it possible to monitor any changes in the structure and to plan maintenance.

To ensure longevity of the structures, they will require regular maintenance.

Routine maintenance encompasses the routine activities that are carried out at regular intervals on structures, for example:

- Replacement of bearings;
- Replacement of expansion joints;
- Painting.

Heavy maintenance includes repairs, the scope of which require more in-depth investigation and are more difficult to perform:

- Replacement of the slab;
- Replacement of the stay cables;
- Repairs to the concrete.

It is important to note here that a structural design that includes, from the outset, studies on the problems associated with maintenance could greatly simplify future operations, or at least reduce their frequency and the impact on users.

Numerous maintenance operations, such as replacement of the joints or the asphalt, will require traffic on the structures to be interrupted.

2.2 SCHEDULE

The total estimated time required to build the New Bridge for the St. Lawrence is five years. Deconstruction of the existing bridge is estimated to take three years. Figure 7 presents the schedule of the various project stages.

Figure 7 Preliminary schedule

HIGH LEVEL COMPONENTS	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024	
Environmental Assessment																										
Preliminary design and financial analysis																										
Preliminary engineering and development of specifications																										
Invitation to tender for construction and contract award																										
Final plans and specifications and construction (by bridge constructor)																										
Deconstruction of the old bridge (by bridge constructor)																										

* This is a preliminary timeline that will be refined over the coming months

2.3 TRAFFIC MANAGEMENT

The Champlain Bridge corridor is one of the busiest in the country with over 57 million crossings per year. It is essential to maintain traffic flow throughout the entire construction period. As each project component is constructed, traffic management measures will be implemented:

- Partial closing of ramps and lanes while maintaining at least two lanes open in either direction;
- Complete closing at night with detours publicized;
- Temporary lane changes;
- Uninterrupted service on Champlain Bridge during construction;
- Phasing of construction work that could disrupt traffic;
- Development of temporary traffic configurations.

3 DESCRIPTION OF THE ENVIRONMENT AND OF VALUED ENVIRONMENTAL COMPONENTS

3.1 SCOPE OF ENVIRONMENTAL ASSESSMENT

CEAA 2003 specifies the factors that must be considered in a "screening type" environmental assessment:

a) the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;

b) The significance of the effects referred to in paragraph (a);

c) Comments from the public that are received in accordance with this act and the regulations;

d) Measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project; and;

e) Any other matter relevant to the screening […] that the responsible authority […] may require to be considered.

The factors below will also be assessed within the study area as part of the environmental assessment of the New Bridge for the St. Lawrence:

- The effects of the project on the environment
- The effects of the environment on the project;
- Assessment of accidents and malfunctions; and
- Assessment of likely cumulative effects.

The CEAA (2003) defines *environment* as:

All the components of the Earth, including:

a) land, water and air, including all layers of the atmosphere;

b) all organic and inorganic matter and living organisms; and;

c) the interacting natural systems that include components referred to in paragraphs (a) and (b).

Delivering the project will have an impact on environmental components. The environmental assessment will have to demonstrate what impact the project will have on these components. During preparation of the environmental assessment guidelines, 12 components were identified

and will be given special attention throughout the process (table 1). Results of the impact assessment will be presented in a subsequent report.

Table 1 Tentative list of valued environmental components selected for this project

ENVIRONMENT	VALUED ENVIRONMENTAL COMPONENTS
Physical environment	Water quality/hydrology; Soil and sediment quality.
Biological environment	Fish and fish habitat; Migratory birds and their habitats (protected areas); Precarious plant, wildlife and aquatic species; Amphibians and reptiles (herpetofauna).
Human environment	Navigation; Physical and cultural heritage resources; Quality of life*; Aesthetic and visual aspects; Sound environment; Air quality.

* Note that the component "Quality of life" will be approached through other valued environmental components relating to biodiversity and to elements that support it, such as "Water quality" or "Fish and fish habitat", as well as to human activities such as "Navigation" or nuisance factors that may be associated with the sound environment, for example.

Figure 8 shows the study area's overall biological and human environments distribution.

Human environment

Uses
- Residential
- Commercial and services
- Industrial
- Mixed area (commercial/residential)
- Large green space or river park
- Conservation
- Large transport right-of-way
- Public infrastructure
- Convent, monastery or place of worship

Public and private components
- Archaeological site
- Windsurfing area
- Fishing area
- Boat launching ramp
- Marina
- Route Bleue-La Prairie Lower Basin path
- Route Bleue-Nuns' Island Tour path
- Known kayakers' path
- Point de Mire Youth Centre path
- Hovercraft path
- Saute Moutons path
- Bike path
- Bike path - Route Verte
- Railway (CN)

Limits
- Federal government property limits
- Study area
- Planned infrastructure right-of-way
- Municipal limits
- Borough limits

Natural environment

Special status flora and fauna
- Rough bugleweed
- Laurentian Bugleweed
- Brown snake
- Peregrine falcon
- Chimney swift

Areas of special interest for wildlife
- Migratory bird sanctuary
- Waterfowl concentration area

SOURCES :
- Project components: Transport Canada, 2012
- Flora and fauna: Site surveys, CIMA, 2012
- Limits:
Sud-Ouest Borough, City of Montreal Master Plan, May 2012
Verdun Borough, City of Montreal Master Plan, June 2005
City of Brossard, City Plan, October 2001
- Railway: NTDB © Natural Resources Canada
- Orthophotographs: © Montreal Metropolitan Community, 2005-2011
- SatelSite images : © 2010 Microsoft Corporation and its data suppliers

REV.	DATE (Y - M - D)	DESCRIPTION	Prepared By	Checked By
0C	12-11-09	Issue for comments	GL	GP
0B	12-10-16	Issue for comments	GL	GP
0A	12-10-11	Issue for comments	GL	GP

ISSUES - REVISIONS

ALL DIMENSIONS MUST BE TAKEN AND CHECKED BEFORE BEGINNING THE WORKS

Seal

Client: Transports Canada

Client's references: T8080-110362

Project: New Bridge for the St. Lawrence Environmental Assessement

Title: Figure 8 Inventory Map of Natural and Human Environments

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Sequence No.: 01 of 01

Serv. char.	Project	Wbs	Disc.	Type	Drawing No.	Rev.
068	P-0000810	110	GO	D	0076	0C

Projection MTM, zone 8, NAD83

SIZE A1

3.2 GENERAL DESCRIPTION OF THE PHYSICAL ENVIRONMENT

The Champlain Bridge corridor is located between Montreal Island and Nun's Island on one side and the City of Brossard on the other. It crosses, from west to east, the Greater La Prairie Basin, or the main part of the St. Lawrence River, the Seaway and the Lesser La Prairie Basin. The surface of the land adjacent to the bridge is relatively flat. The average elevation above sea level is approximately 16 m on the Island of Montreal, 14 m on Nuns' Island and 15 m on the South Shore.

The geology of the basement rock in the area is identified as Utica black shale dating from the middle Ordovician epoch. Soils are solely composed of glacial till, including on Nuns' Island; zones of till covered by sea clay, including along the natural shoreline of the St. Lawrence on Montreal Island; and zones of limited extent covered by river sand, between 6 and 12 m thick. On the South Shore, the natural unconsolidated deposits over the basement rock are about 8 m in total thickness, and consist of clayey sediment topped by a thin horizon of sand.

Climate conditions are representative of the Montreal region. The annual average daily temperature, recorded at the Montreal-McGill station, is 7.4°C, with an annual average daily maximum of 11.1°C and an annual average daily minimum of 3.6°C. Annual precipitation was just over 1,000 mm. Prevailing winds are from the southwest. Although fairly consistent on an annual average, they are stronger in the winter from November to March. Prevailing winds average between 11.5 km/h and 15.6 km/h depending on the meteorological station. They are mainly west-south-west, west and north-east depending on the time of the year. On average, wind speed of 83 km/h is exceeded once every 10 years, and wind speed of 69 km/h is exceeded once a year. Visibility is generally good, below 1 km less than 1% of the time.

3.2.1 Soil and sediment quality

3.2.1.1 The banks of the Island of Montreal and Nuns' Island

Of all the areas included in the right-of-way of the New Bridge for the St. Lawrence, the soils near the St. Lawrence shore of Montreal Island to the west of Technoparc Montreal potentially represent the most complex environmental conditions by far. These soils contain earth fill and waste materials up to 12 m thick that were placed in the course of the operation of various riverside dumps spanning a period of 100 years (1864-1965).

Soil sampling campaigns have been conducted in some sectors of the Island of Montreal and Nun's Island. In general, most samples (Figure 9) indicate contamination levels higher than the BC range as defined in the *Politique de protection des sols et de réhabilitation des terrains contaminés* (*Policy on Soil Protection and Rehabilitation of Contaminated Land*), issued by the Ministère du Développement durable, de l'Environnement et des Parcs (Quebec Ministry of Sustainable Development, Environment and Parks). Contamination is mainly due to the presence of petroleum hydrocarbons, polycyclic aromatic hydrocarbons and metals.

In addition, anaerobic degradation of waste material on the shore of the Island of Montreal area produces important concentrations of methane gas (CH4).

Several environmental issues were also identified in connection with the lands adjacent to the right-of-way of Highway 15, to the west of Wellington Street. Industrial activity in this area dates back in some cases to the early 20th century (Consumer Glass, Montreal Light Heat & Power, oil depots and metals industries along the Lachine Canal, etc.). No data on these sites are currently available.

Assessment and management of contaminated soils will be clarified in subsequent development stages of the New Bridge for the St. Lawrence.

3.2.1.2 The South Shore

On the South Shore, aerial photos from as early as 1957 indicate that before the highways leading to the bridge were built, the properties under and adjacent to the present-day roads were farmland. Similarly, few environmental concerns are associated with the historical uses on the eastern part of Nuns' Island.

Irrespective of any historical or neighbouring activities, the mere presence of the bridge, on- and off-ramps and the freeways connected to it represent in and of themselves an environmental issue. Residues of metals and hydrocarbons produced by vehicles and the degradation of the bridge structures and coatings are likely to have affected the environmental quality of the surface soils within the right-of-way since it was built about 50 years ago.

3.2.1.3 Sediments

A coarse substrate made up of pebbles and blocks is scattered over the main sector of the Greater Basin. At Nuns' Island, there is a flat of sedimentary rocks downstream from the Champlain Bridge, continuing to a small formation of islets. The section along the other side of these islets is made up of pebbles and blocks and becomes coarser (blocks and sedimentary rocks) the farther you get from the islets. On the left bank of Nuns' Island, between the two bridges, is found a mixture of pebbles and blocks with lenses of coarse sand and small gravel. The substrate downstream from the Clément Bridge gets coarser, ranging from stones and pebbles near the Clément Bridge to pebbles and blocks near the point of Nuns' Island, while blocks and sedimentary rock are characteristic of the extreme east of the island. On the South Shore of the Greater Basin, the substrate is composed of stones, gravel and pebbles (Figure 10).

Results of the various soil characterization campaigns tend to show a significant level of historic contamination on the north shore of the Basin. Heavy metal levels over the minimal effect threshold were found in samples near the study area in 1975. In 2012, during the sampling campaign for the New Bridge for the St. Lawrence project, only one sediment sample could be collected under the Champlain Bridge near the Nuns' Island Bridge. Sediments are scarce in that area because of the rocky substrate. Sample showed heavy metal contamination (chromium, copper, nickel, lead and

zinc, along with polycyclic aromatic hydrocarbons and polychlorinated biphenyls. These contaminants come from the industrial park (Technoparc) developed in the early 1990s on contaminated fill (Bibeault et al., 1997) and leaks of waste oil.

Unlike the Greater Basin, the Lesser La Prairie Basin is composed of a thick, relatively uniform, layer of fine sediments built up since construction of the Seaway dike between 1955 and 1959. A major proportion of these sediments come from the Châteauguay River. Its waters flow along the right bank of the river from the time they enter Lake Saint-Louis (St. Lawrence Centre, 1993). Studies (Hardy et al. (1991) and St. Lawrence Centre (1996)) show that this sector is characterized by lacustrine conditions and heavy sedimentation of fine particles. A silty substrate is scattered throughout the Lesser Basin, and there are shell fragments from the decomposition of zebra mussels. The substrate in the navigation channel is coarser, with a lot of mussels and mussel fragments.

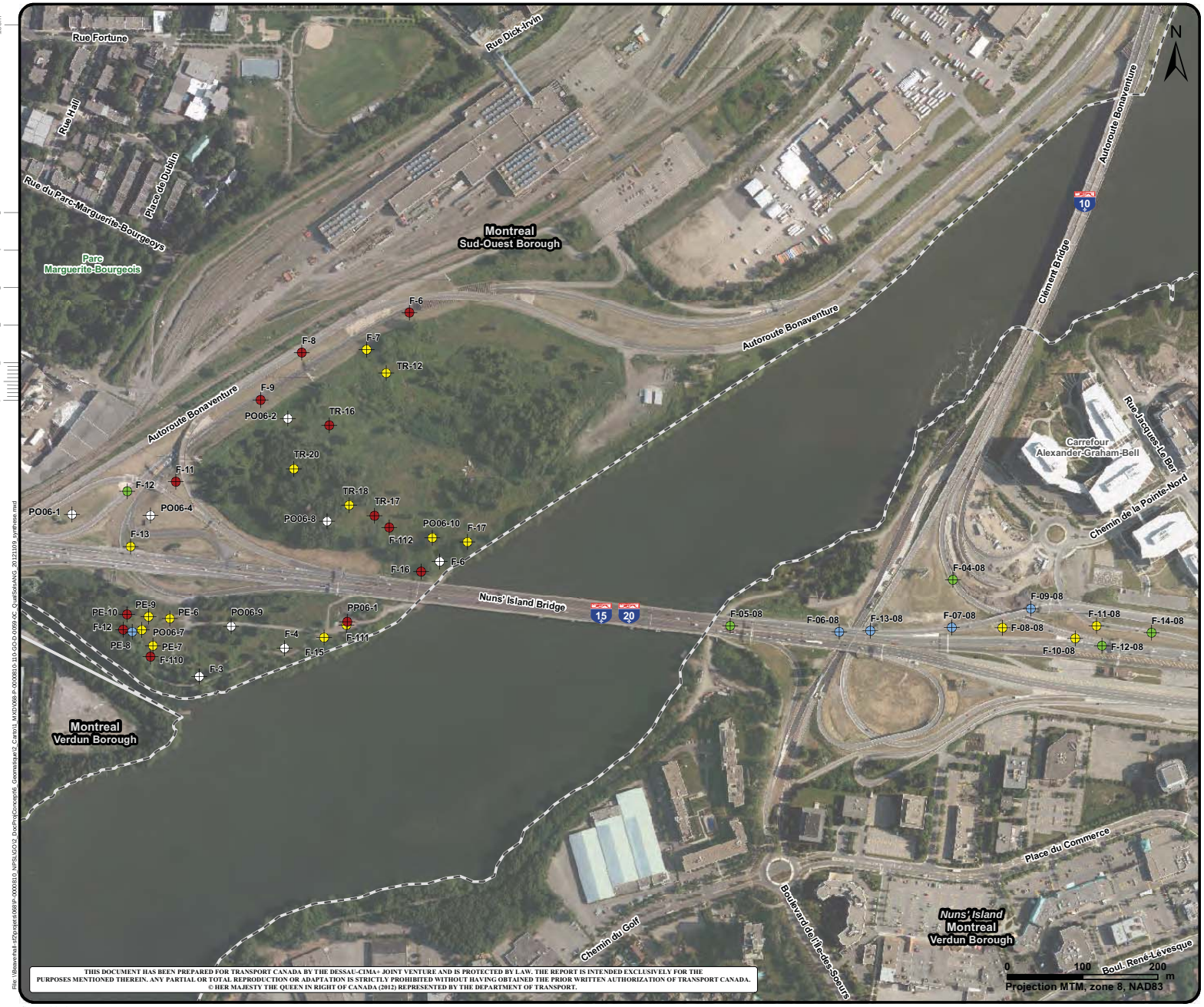
Based on the data from 1976, 1987 and 2012, the portrait of contamination in the Lesser La Prairie Basin indicates the existence of moderate contamination distributed throughout the Lesser Basin with higher individual sources in some places. The main contaminants are heavy metals and polychlorinated biphenyls (see Table 2).

Table 2 Comparison of metal concentrations in sediment samples from the Lesser La Prairie Basin in 1976, 1987 and 2012 with current MDDEP criteria

Parameter	Sérodes, 1978		Hardy *et al.*, 1991		Study for the New Champlain Bridge, 2012		* OME Criterion (mg/kg)	** MDDEP and EnvCan Criterion (mg/kg)				
	Median (mg/kg)	Effective (n)	Median (mg/kg)	Effective (n)	Median (mg/kg)	Effective (n)		≤ COE	COE[2]	> COE and ≤ CFE	CFE[3]	> CFE
Mercury (Hg)	0.46	17	0.34	18	0.21	12	0.3	Class 1	0.25	Class 2	0.87	Class 3
Arsenic (As)	-	-	9.82	18	5.00	12	8		7.6		23	
Cadmium (Cd)	9	17	1	18	1.15	12	0.1		1.7		12	
Chromium (Cr)	73	17	105	18	49.00	12	25		57		120	
Copper (Cu)	55.3	17	62.9	18	57.50	12	25		63		700	
Nickel (Ni)	48.4	17	41.1	18	41.00	12	25		47		-	
Lead (PB)	48	17	137	18	98.50	12	50		52		150	
Zinc (Zn)	315	17	392	18	270.00	12	100		170		770	
PCB (total)	-	-	0.651	18	0.19	12	-		0.079		0.78	

* Criteria from the Ontario Ministry of the Environment, 1979 (used in the report by Hardy et al., 1991).

** Criteria from Environment Canada and the Quebec Ministry of Sustainable Development, the Environment and Parks (MDDEP), 2007.
Class 1- [Substance] ≤ COE: sediments may be released in open water;
Class 2- COE < [Substance] ≤ CFE: release in open water may be considered, but toxicity tests are required;
Class 3- [Substance] > CFE: release of sediments in open water is prohibited.
PCB: Polychlorinated biphenyls



SIZE 11x17

Maximum concentration range[1](all depth intervals and analysis parameter mixed together)

- Not analyzed
- <A
- AB
- BC
- >C
- Municipal limit
- Borough limit

[1] Range of contamination for the soil protection and contaminated land rehabilitation policy, Quebec Ministry of Sustainable Development, Environment and Parks (MDDEP) 1998, revised criteria from the MDDEP e-portal

SOURCES :
- Boreholes : Dessau, 2008; Inspec-Sol, 1993 et 1996; Technorem, 2007 et 2011; Tecsult, 2005
- Orthophotographs : © Montreal Metropolitan Community, 2005-2011

Client: Transports Canada

Project: New Bridge for the St. Lawrence Environmentale Assessment

Title: Figure 9 Environmental Soil Quality

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Surface substrate

- Organic - Sand
- Pebbles - Gravel
- Cobble – Boulder
- Cobble – Boulder - Sand intrusion
- Pebbles - Cobble
- Boulder - Sedimentary rock
- Sedimentary rock

- Bathymetry study area and surface substrate
- Municipal limit
- Borough limit

SOURCES :
- Surface substrate : Environnement Illimité inc., 2012
- Orthophotographs: © Montreal Metropolitan Community, 2005-2011

Client: Transports Canada

Project: New Bridge for the St. Lawrence Environmental Assessment

Title: Figure 10 Composition of the Surface Substrate

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Serv. char.	Project	Wbs	Disc.	Type	Drawing No.	Rev.
068	P-0000810	110	GO	D	0064	0C

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SIZE 11x17

3.2.2 Surface water and groundwater characteristics

Since the 1980s, the water quality has been monitored in the St. Lawrence River. There is no sampling station in the study area; however, stations are located upstream and downstream. Analyses found that none of the measured parameters exceeded the water quality criteria for the protection of aquatic life. (MDDEP, 2012; CCME, 2012).

The La Prairie Basin is divided into two sections, the Greater La Prairie Basin, which includes the main part of the river, and the Lesser La Prairie Basin, including the shipping channel of the St. Lawrence Seaway.

3.2.2.1 Surface water

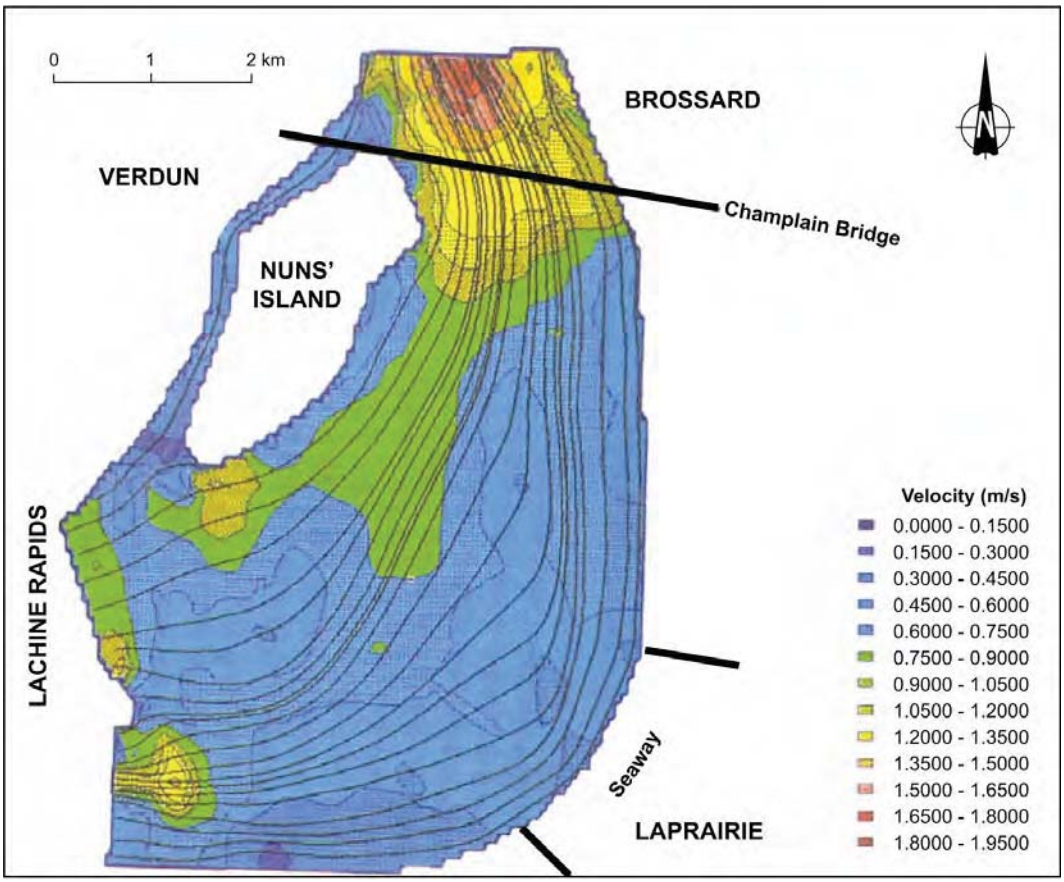
3.2.2.1.1 The Greater La Prairie Basin

The Greater La Prairie Basin flow is influenced by inflow from the St. Lawrence River and the Ottawa River. These are controlled by several dams in their upper reaches. Average streamflow in the St. Lawrence is 7,060 m^3/s (Bouchard et al., 2000), and it can vary from 6,000 to 9,000 m^3/s. As for the Ottawa River, streamflow averages 2,000 m^3/s, and can vary from a low of 800 m^3/s and a peak of 6,500 m^3/s, depending on the season. These bodies of water tend to mix very little. One observes therefore a mass of blended water (Ottawa and St. Lawrence) along the north shore, while the centre and the south shore are characterized by water typical of the Great Lakes

At the Champlain Bridge, current speed in the channel ranges from 1.2 to 1.35 m/s (Leclerc et al., 1987). Outside the channel, the current ranges from 0.9 to 1.2 m/s (Leclerc et al., 1987). Below the bridge lies a zone where speeds range from 1.8 to 1.9 m/s in the channel (Leclerc et al., 1987). In the left arm at Nuns' Island, current speed ranges from 0.3 to 0.45 m/s (Leclerc et al., 1987). Figure 11 presents flow and trajectories.

In this section of the St. Lawrence, current speeds in the centre (flow channels) are over 0.3 m/s and therefore not conducive to the sedimentation of fine particles. As a consequence, fine suspended particles are not deposited at the foot of the rapids, where only coarser materials come to rest: gravel, pebbles or cobbles. Fine particles are deposited in grass beds or close to the banks, where the current speed is under 0.1 m/s. At these current speeds, particles can form sedimentary deposits, but often only temporarily, as the current gains speed during the spring runoff.

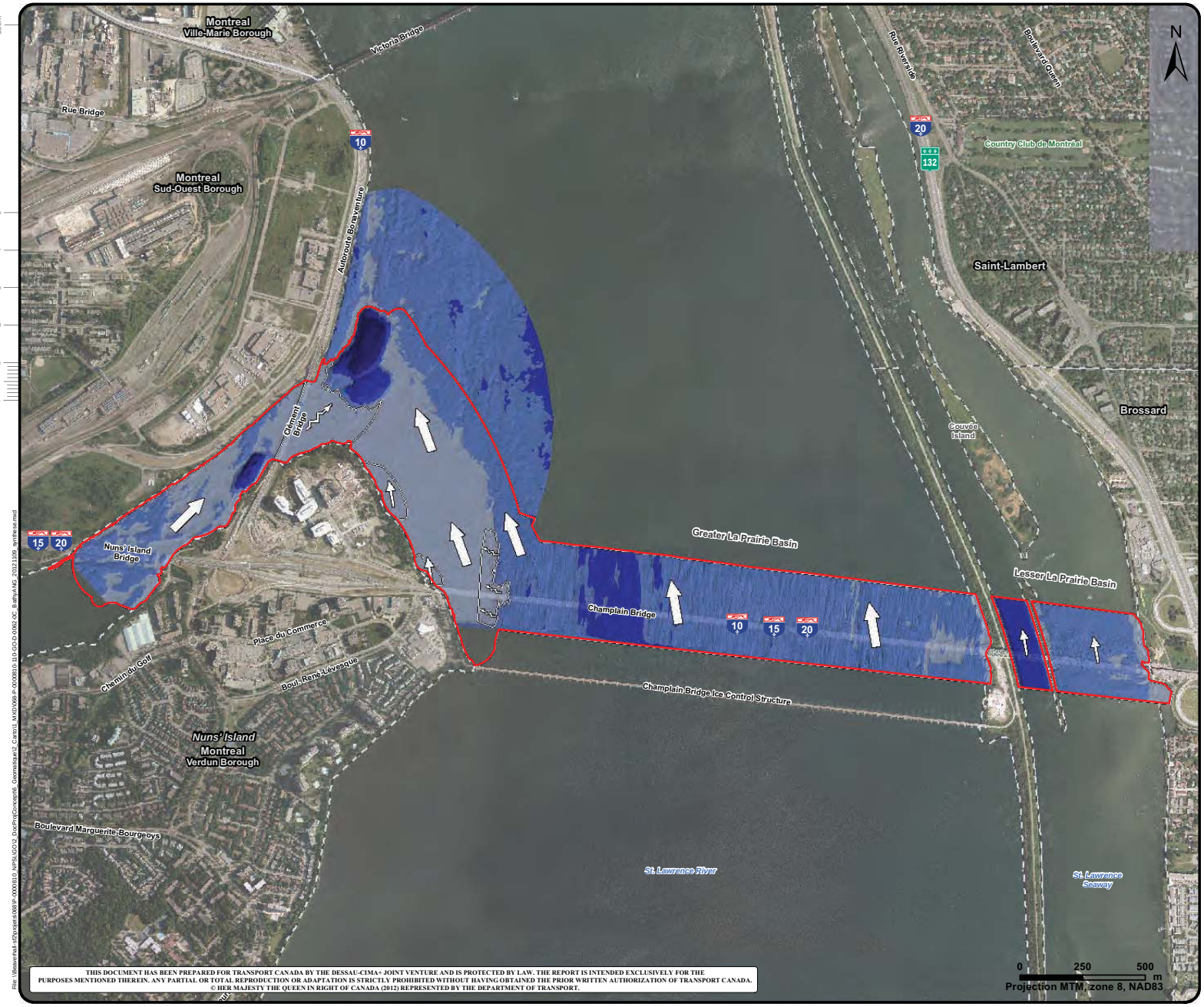
Figure 11 Velocity fields and flow trajectories (Leclerc et al. 1987)



Under the Champlain Bridge, at the time of the surveys the water depth varied from 3 to 6 m on average, from the centre to the left bank, with one main channel varying from 7 to 9 m deep. Along the right bank of the basin, depths varied from 1 to 3 m. The left bank sector, at Nun's Island, shows more variation. Upstream of the island, depths varied from 0 to 2 m, precluding navigation during low-water periods. Under the bridge (left arm), depths varied from 1 to 3 m, in general, allowing careful navigation, as some rocky islets or sills were almost exposed in this area (see Figure 12).

Ice conditions in the Greater La Prairie Basin differ from those in the Lesser La Prairie Basin. Ice concentration is, in fact, lower in the Greater La Prairie Basin for the following reasons:

- In the Seaway, currents are very weak, especially in winter when the locks remain closed;
- In the Greater Basin, the water flows all winter and moves the ice.



Flow facies

- Lotic – Whitewater
- Laminar lotic
- Lentic
- Flow facie limit

Depth (m)

- 0 -2
- 2- 5
- 5 - 15
- Over 15

- Bathymetric study area and surface substrate
- Municipal limit
- Borough limit

SOURCES :
- Bathymetry :
  St. Lawrence Seaway, 2010
  The Jacques Cartier and Champlain Bridges inc., 2007, 2010 et 2011
  Environnement Illimité inc., 2012
- Flow facies : Environnement Illimité inc., 2012
- Orthophotographs : © Montreal Metropolitan Community, 2005-2011

Client: Transports Canada

Project: New Bridge for the St. Lawrence Environmental Assessment

Title: Figure 12 Bathymetry and flow facies

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068	P-0000810	110	GO	D	0062	0C

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SIZE 11x17

3.2.2.1.2 *Lesser La Prairie Basin*

The Lesser La Prairie Basin is separated from the Greater La Prairie Basin by the dyke between Kahnawake and Longueuil and is mainly fed by the Great Lakes. The average streamflow at the inlet of the Lesser Basin is evaluated at 149 m^3/s (St. Lawrence Centre, 1991). Inflow from the three tributaries in the Lesser Basin is minimal, at 7 m^3/s, or less than 7% of the river streamflow (Robitaille, J., 1997). Average current speed is 0.1 m/s (St. Lawrence Centre, 1991).

This is a lentic flow zone. The low current speeds in this area are conducive to the sedimentation of fine particles on the riverbed, forming a layer of silt. The Lesser Basin acts a sort of sediment trap (St. Lawrence Centre, 1996).

A navigation channel with a depth of 8.6 m on average was dredged along the dike that separates the two basins, near the right bank, and the dredged material was used to create islets, thereby separating the shipping channel from the rest of the Lesser Basin (St. Lawrence Centre, 1996). The channel is maintained at a depth of about 8.6 m by the Seaway Management Corporation so that vessels can navigate. The depth of the Lesser Basin at the time of the surveys averaged 2.5 m, with depths ranging from 1 to 3 m (see Figure 12).

3.2.2.2 *Groundwater*

The flow of groundwater on lands adjacent to the Champlain Bridge is directly influenced by the St. Lawrence River, into which this water migrates. As a result, the groundwater flow in the part of Montreal Island concerned here is generally toward the southeast, while the flow on the South Shore is presumed to be toward the west. According to the piezometric data, the average depth of the groundwater is on the order of 6.5 m below grade, which places it generally within the fill materials that characterize the river shore.

The previous characterization studies provide a substantial quantity of relevant hydrogeological information about the lands adjacent to Champlain Bridge on the Montreal side. All groundwater samples collected from the area of fill on the Montreal shore exceed the levels prescribed by the Montreal Metropolitan Community (CMM) for at least one parameter. In most cases, exceedence was noted for metals, manganese and/or barium or polycyclic aromatic hydrocarbons. Similar data do not exist for the South Shore.

3.2.3 Air quality

The New Bridge for the St. Lawrence project is not subject to provincial and municipal regulation, but in the absence of federal regulation these documents may serve as a reference framework (see Table 3).

Present air quality in Montreal is generally acceptable. According to the 2011 Air Quality Report for Montreal, there were 69 days with poor air quality in Montreal in 2011. Fine particles are the main

cause of days with poor air quality (68 of the 69 days declared). This is relatively similar to previous years, with 68 days with poor air quality in 2008, 69 days as well in 2009 and 65 days in 2010.

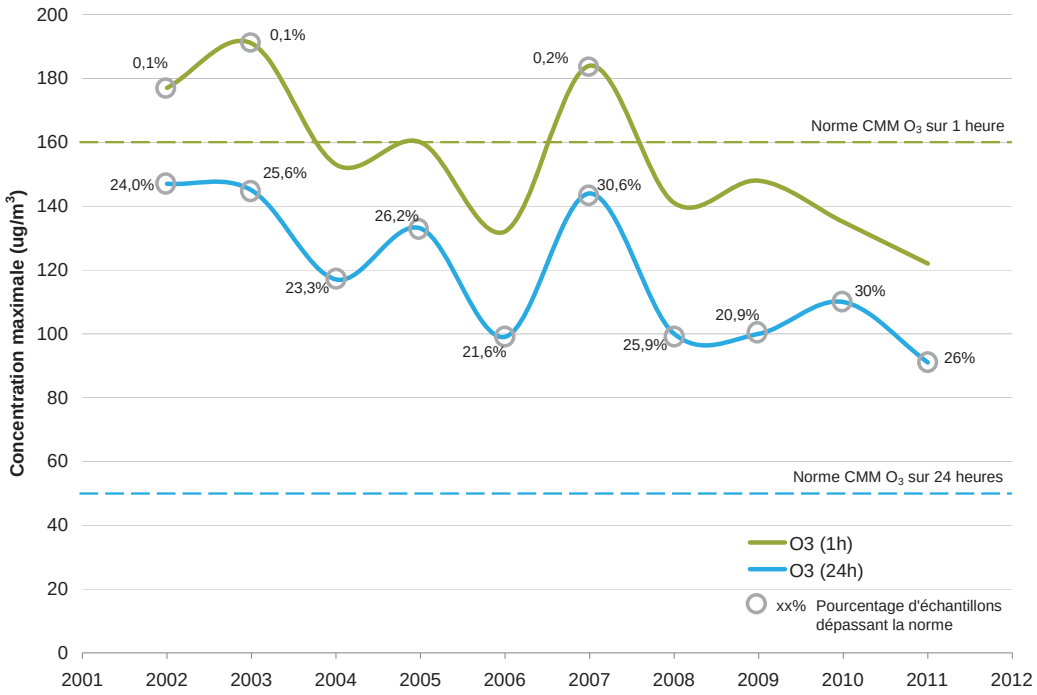
Table 3 Air quality standards in Quebec and in the MMC for the principal contaminants associated with highway transportation

POLLUTANT	PERIOD	CLEAN AIR REGULATION	MMC REGULATION 2001-10
Total particles in suspension	24 hr	120 µg/m³	150 µg/m³
	1 yr	None	70 µg/m³
Particles in suspension under 2.5 microns (PM2,5)	24 hr	30 µg/m³	None [3]
Nitrogen dioxide (NO_2)	1 hr	414 µg/m³	400 µg/m³
	8 hr	None	253 µg/m³
	24 hr	207 µg/m³	200 µg/m³
	1 yr	103 µg/m³	100 µg/m³
Carbon monoxide (CO)	1 hr	34,000 µg/m³	35,000 µg/m³
	8 hr	12,700 µg/m³	15,000 µg/m³
Sulphur dioxide (SO_2)	15 min	None	860 µg/m³
	1 hr	None	1,300 µg/m³
	8 hr	None	490 µg/m³
	24 hr	288 µg/m³	260 µg/m³
	1 yr	52 µg/m³	52 µg/m³
Ozone (O_3)	15 min	None	265 µg/m³
	1 hr	160 µg/m³	160 µg/m³
	8 hr	120 µg/m³	75 µg/m³
	24 hr	None	50 µg/m³
	1 yr	None	30 µg/m³

Sources: Clean Air Regulation (Q-2, r.4.1)
CMM regulation 2001-10 (http://www.cmm.qc.ca/fileadmin/user_upload/reglements/09_1.pdf)

[3] **However, this pollutant is sampled by the City of Montreal's air quality monitoring network and the proposed limit value for a mobile average of three hours is 35 µg/m³.**

Figure 13 Changes in the concentration of ozone (O_3) at Station 68-Verdun on an hourly average and a 24-hour average



3.2.4 Key issues of the physical environment

Although effects and mitigation measures will be covered in the next report, this section provides an overview of the highlights of the environmental components and the factors to be considered in the next steps of the project.

3.2.4.1 Soil and sediment quality

Construction of the new infrastructure does not require decontamination of the land it crosses, particularly the Technoparc. However, the soil and other excavation material that will result from the construction work will need to be managed based on their environmental quality and in compliance with prevailing regulations.

Among the factors to be considered in the design of new infrastructure and during subsequent stages are:

- Identification of excavation/fill zones for the entire construction site is required during the preliminary design phase in order to determine which zones need characterization to ensure adequate environmental management of excavated material;

- The possible presence of methane in the soil must be taken into account in the structural design of the new infrastructure. Situations likely to cause gas to accumulate in an area or in an enclosed space where there is also an ignition source or in a space or premises even occasionally occupied by a worker or any other person must be avoided;
- Construction of the new infrastructure must be preceded by interventions designed to mitigate the problem of contamination in the Technoparc and the migration of contaminants to the river. However, if this sequence is not followed, the design and execution of work for the new infrastructure must not constitute an obstacle to future action to deal with this problem

With regard to work in the water of the Greater La Prairie Basin, it is not an issue with respect to dispersion of contaminated sediment, but careful attention must be paid to the work that will take place in the Lesser La Prairie Basin. Measures to control the resuspension of sediments are required, though this should not be difficult given the low flow conditions.

3.2.4.2 Quality of surface water and groundwater

The main issue with regard to surface water quality relates to variations in turbidity and suspended solids. One year prior to the start of work, when the concept for the new bridge and the construction techniques are more clearly defined, separate sampling on either side of the river as well as a central station should be planned in order to determine the influence of the two bodies of water in the area (the influence of the St. Lawrence River on the left bank and the Ottawa River on the right bank). Following periods of heavy rainfall data on suspended solids should also be gathered in order to learn the high values of the range for suspended solids and for turbidity under natural conditions.

With regard to groundwater, the only factor to be taken into account in the design of the new infrastructure and in subsequent stages associated with groundwater is:

- Any groundwater pumped during construction work in the Montreal shore sector must be treated prior to discharge.

3.2.4.3 Air quality

Despite the direct and indirect effects of transport-related pollution on quality of life and human health, current conditions for both criteria air pollutants and greenhouse gases leave reason to believe that air quality is not an important issue for this project.

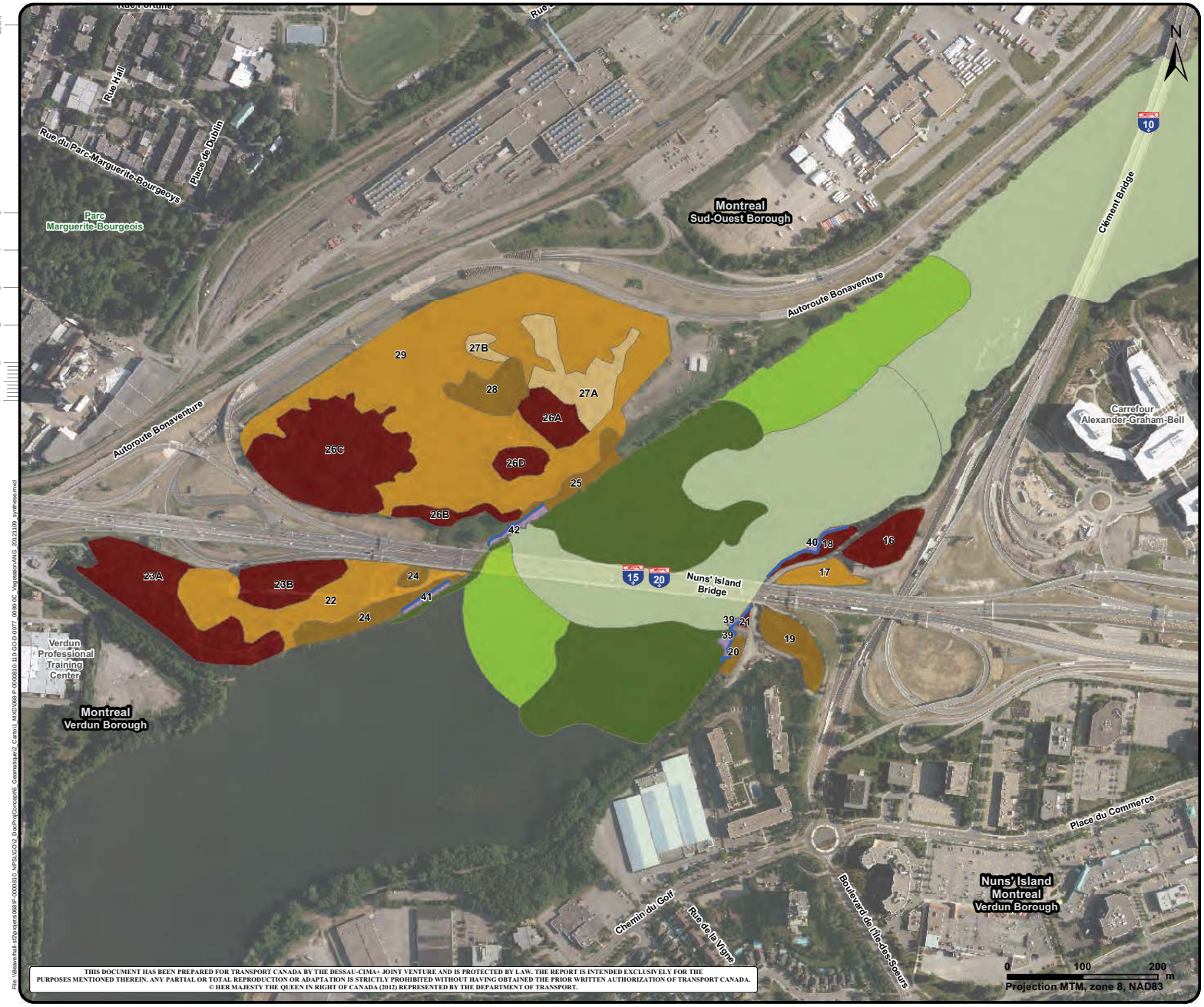
Once the final geometry of the infrastructure is known, a dispersion simulation for criteria air pollutants should be conducted in order to validate whether the project's impact is marginal on pre-defined sensitive areas (schools, seniors' residences, daycares, hospitals), mainly under prevailing winds.

3.3 GENERAL DESCRIPTION OF THE BIOLOGICAL ENVIRONMENT

The area around the Champlain Bridge site consists mainly of herbaceous fields and stands of eastern cottonwood poplar representing, respectively, 46.3% and 21.3% of the vegetated area. Table 4 and Figure 14 present the different plant populations found near the site. Wetlands are found mainly along the river and near the Highway 10 ramps on the South Shore.

Table 4 Description of plant populations in the study area

ENVIRONMENT TYPE	AREA (M^2)	% AREA OF PLANT COVERAGE
Terrestrial environments		
Eastern cottonwood poplar stands	72,450 m^2	21.3%
Black locust stands	33,233 m^2	9.8%
Red ash stands	52,724 m^2	15.5%
Staghorn sumac fields	23,592 m^2	6.95%
Herbaceous fields	157,296 m^2	46.3%
Wetlands		
Aquatic plant communities	n/a	
Pond	1,555 m^2	
Tree swamp	15,458 m^2	
Emergent nearshore marsh	n/a	



SIZE 11x17

- High water line

Wetland
- Pond
- Emergent shoreline marsh
- Common reed marsh
- Treed swamp

Terrestrial environment
- Staghorn sumac shrublands
- Herbaceous fields
- Red ash stands
- Black locust stands
- Eastern cottonwood poplar stands

Aquatic vegetation cover (in %)
- 0-25
- 25-50
- 50-75
- 75-100

SOURCES :
- Vegetation units and High-water line : field inventory, CIMA 2012
- Aquatic vegetation : Environnement Illimité inc., 2012
- Orthophotographs : © Montreal Metropolitan Community, 2005-2011

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Project: New Bridge for the St. Lawrence Environmental Assessment

Title: Figure 14a
Floristic Composition of the
Wetlands and Terrestrial Environments

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SIZE 11x17

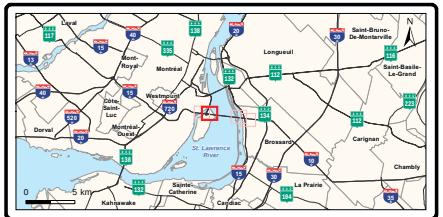
High water line

Wetland
- Pond
- Emergent shoreline marsh
- Common reed marsh
- Treed swamp

Terrestrial environment
- Staghorn sumac shrublands
- Herbaceous fields
- Red ash stands
- Black locust stands
- Eastern cottonwood poplar stands

Aquatic vegetation cover (in %)
- 0-25
- 25-50
- 50-75
- 75-100

SOURCES :
- Vegetation units and High-water line : field inventory, CIMA 2012
- Aquatic vegetation : Environnement Illimité inc., 2012
- Orthophotographs : © Montreal Metropolitan Community, 2005-2011



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Title: Figure 14b
Floristic Composition of the
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Project manager	Sylvie Côté	Sequence No.	01 of 01

Serv. char.	Project	Wbs	Disc.	Type	Drawing No.	Rev.
068	P-0000810	110	GO	D	0078	0C

High water line

Wetland

- Pond
- Emergent shoreline marsh
- Common reed marsh
- Treed swamp

Terrestrial environment

- Staghorn sumac shrublands
- Herbaceous fields
- Red ash stands
- Black locust stands
- Eastern cottonwood poplar stands

Aquatic vegetation cover (in %)

- 0-25
- 25-50
- 50-75
- 75-100

SOURCES :
- Vegetation units and High-water line : field inventory, CIMA 2012
- Aquatic vegetation : Environnement Illimité inc., 2012
- Orthophotographs : © Montreal Metropolitan Community, 2005-2011

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Title: Figure 14c
Floristic Composition of the
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SIZE 11x17

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SIZE 11x17

High water line

Wetland
- Pond
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Terrestrial environment
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- Red ash stands
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Aquatic vegetation cover (in %)
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- 50-75
- 75-100

SOURCES :
- Vegetation units and High-water line : field inventory, CIMA 2012
- Aquatic vegetation : Environnement Illimité inc., 2012
- Orthophotographs : © Montreal Metropolitan Community, 2005-2011

Client: Transports Canada

Project: New Bridge for the St. Lawrence Environmental Assessment

Title: Figure 14d
Floristic Composition of the
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Serv. char.	Project	Wbs	Disc.	Type	Drawing No.	Rev.
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3.3.1 Fish and fish habitat

The waters of the Greater and Lesser La Prairie Basins are home to a wide variety of fish species. Studies in this sector have identified 44 fish species (Table 5) out of the hundred counted in the extended area of 15 km upstream and downstream from the Champlain Bridge corridor.

Table 5 Fish species likely to be found in the study area

SPECIES	FAMILY	SPECIAL STATUS		PRESENCE	
		PROVINCIAL	FEDERAL	GREATER LA PRAIRIE BASIN	LESSER LA PRAIRIE BASIN
Largemouth bass	CENTRARCHIDAE			x	x
Smallmouth bass	CENTRARCHIDAE			x	x
American eel	ANGUILLIDAE	LDTV		x	x
Brown bullhead	ICTALURIDAE			x	x
Channel catfish	ICTALURIDAE				x
White perch	PERCICHTHYIDAE			x	x
Carp	CYPRINIDAE			x	x
Mottled sculpin	COTTIDAE			x	
Tadpole madtom	ICTALURIDAE				x
Rock bass	CENTRARCHIDAE			x	x
Pumpkinseed	CENTRARCHIDAE			x	x
Iowa darter	PERCIDAE			x	
Walleye	PERCIDAE			x	x
Sauger	PERCIDAE			x	x
American smelt	OSMERIDAE				x
Lake sturgeon	ACIPENSERIDAE	LDTV		x	
Banded killifish	CYPRINODONTIDAE			x	x
Logperch	PERCIDAE			x	x
Alewife	CLUPEIDAE				x
Northern pike	ESOCIDAE			x	x
Silver lamprey	PETROMYZONTIDAE			x	
Black crappie	CENTRARCHIDAE			x	x
Muskellunge	ESOCIDAE			x	x
Common shiner	CYPRINIDAE			x	x
Silver minnow	CYPRINIDAE				x
Emerald shiner	CYPRINIDAE				x

SPECIES	FAMILY	SPECIAL STATUS		PRESENCE	
		PROVINCIAL	FEDERAL	GREATER LA PRAIRIE BASIN	LESSER LA PRAIRIE BASIN
Golden shiner	CYPRINIDAE				x
Mimic shiner	CYPRINIDAE				x
White sucker	CATOSTOMIDAE			x	x
Northern sucker	CATOSTOMIDAE			x	
Pearl dace	CYPRINIDAE				x
Longnose dace	CYPRINIDAE			x	
Yellow perch	PERCIDAE			x	x
Bowfin	AMIIDAE			x	
Spottail shiner	CYPRINIDAE			x	x
Johnny darter	PERCIDAE			x	x
Silver redhorse	CATOSTOMIDAE			x	x
Shorthead redhorse	CATOSTOMIDAE			x	x
Rosyface shiner	CYPRINIDAE	LDTV			x
Fathead minnow	CYPRINIDAE				x
Rainbow trout	SALMONIDAE			x	x
Sea trout	SALMONIDAE			x	x
Central mudminnow	UMBRIDAE			x	
Bluntnose minnow	CYPRINIDAE			x	x

Source: Armellin et al. (1994, 1995, 1997), Dumont et al. 2005, Ministère des ressources naturelles et de la faune – MRNF (Ministry of Naural Resources and Wildlife) (2011), Government of Canada, 2012

3.3.1.1 Lesser La Prairie Basin habitats

When characterization was carried in August 2012, the water level in the Lesser La Prairie Basin was nearly 2 m higher than in the Greater La Prairie Basin. There are 36 species from 12 families in the Lesser La Prairie Basin, (Armellin et al. 1997; see Table 5) and these are largely dominated by cyprinids, percidae and centrarchidae.

As stated above, the Lesser La Prairie Basin has a lentic flow and comprises 3 habitat types (figure 15). The substrate is fine-textured, there is little vegetation and the depth ranges from 2 to 5 m in over 63% (122,180 m²) of the area of this sector (see Figure 15). In the shallow areas, there are large aquatic plant communities (16,570 m²) such as the one along the south shore of the basin. This habitat is a favourable breeding zone for many phytolithophil species such as bass, perch and even some members of the carp family. The Seaway canal covers 25% of this sector. The canal is

deeper (8.6 m) and is colonized, for the most part, by zebra mussels on a gravel substrate. Many fish were observed during characterization in the Seaway canal. It is possible that the passage of commercial vessels stirs up particles that attract certain invertebrates, including zebra mussels, which in turn attract fish in search of food.

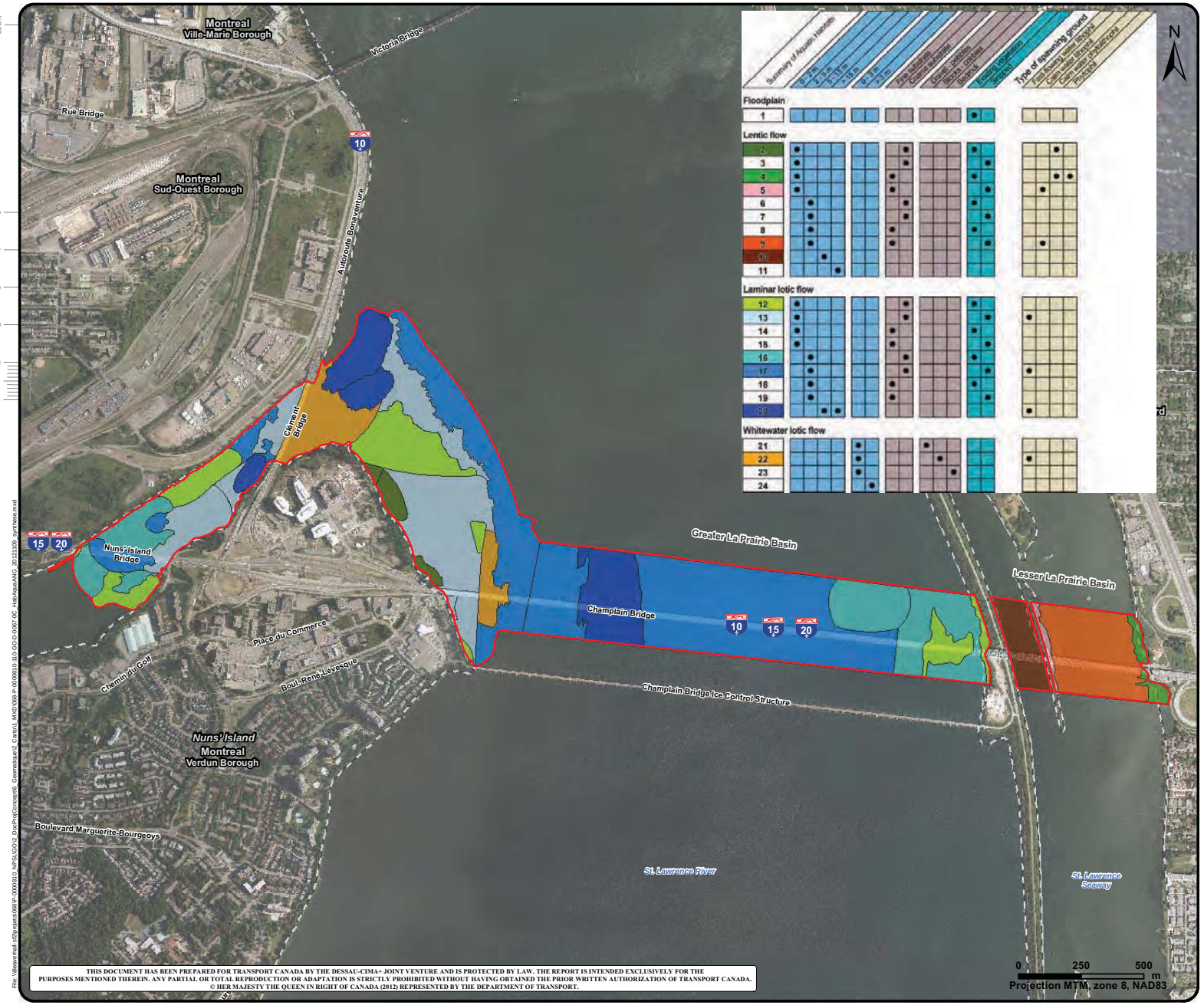
3.3.1.2 Greater La Prairie Basin habitats

The Greater La Prairie Basin, including the channel between Nun's Island and the Island of Montreal, hosts 33 species among 15 families (Armellin et al. 1997; see table 5). The largest families are the percidae, followed by cyprinidae and centrarchidae. Among the species inventoried in the study area, the Lake sturgeon and the American eel are both likely to be designated threatened or vulnerable at the provincial level (table 5).

Approximately 50% of the Greater La Prairie Basin is composed of coarse substrate bare of vegetation, as is the central section extending under the Champlain Bridge (see figure 15). The depth of this sector, which presents a laminar water flow pattern, varies between 2 m and 15 m. Two areas along Nun's Island downstream from Clément Bridge are worthy of note. Effectively, the combination of coarse substrate, a depth of less than 3 m and the fast-flowing cross current has created two zones that are favourable spawning conditions for several fast-flowing water lithophil species such as walleye and catostomidae. There are also several areas of aquatic plant communities in the Greater La Prairie Basin including the South Shore, with a plant bed of approximately 178,360 m². The channel between Nun's Island and Montreal contains a variety of intermingled habitats of varying depths (0 to 5 m) and vegetation density. This diversity has created a favourable feeding area for many fish species. Other areas of plant beds, where the current is slower, are found along Nun's Island, and serve as refuges, feeding areas and even spawning grounds for some phytolithophil species. Two especially deep sectors were also observed, one along Montreal Island and the other, smaller one, along the north shore of Nun's Island. These depressions were probably created artificially during backfilling work.

3.3.1.3 Special status species

Although they have not all been observed in the study area, there are five special status species that could potentially be found in that area. The American eel, the chain pickerel, the lake sturgeon and the rosyface shiner are all likely to be designated threatened or vulnerable at the provincial level while the American shad is designated as vulnerable at the provincial level.



Bathymetric study area and surface substrate

Municipal limit

Borough limit

SOURCES :
- Aquatic habitats : Environnement Illimité inc., 2012
- Orthophotographs: © Montreal Metropolitan Community, 2005-2011

Client: Transports Canada

Project: New Bridge for the St. Lawrence Environmental Assessment

Title: Figure 15 Summary of Aquatic Habitats

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Prepared	Frédéric Burton	Discipline	Geomatic
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Project manager	Sylvie Côté	Sequence No.	01 of 01

Serv. char.	Project	Wbs	Disc.	Type	Drawing No.	Rev.
068	P-0000810	110	GO	D	0067	0C

SIZE 11x17

3.3.2 Amphibians, reptiles and their habitats

According to the Atlas of Amphibians and Reptiles of Quebec (AARQ 2011), 20 species of amphibians and 18 species of reptiles have been identified within a 5 km radius encompassing the study area. However, the species inventoried in the study area are less numerous. In fact, only the leopard frog (Lithobates pipiens), the mudpuppy (Necturus maculosus), the common garter snake (Thamnophis sirtalis), the painted turtle (Chrysemys picta) and the brown snake (Storeria dekayi) were identified). Field inventories were carried out in the study area. Table 6 summarizes the inventory results and habitat potential.

In general, habitats suitable for amphibians are not common in the study area. Furthermore, data obtained from the Atlas of Amphibians and Reptiles of Quebec support this conclusion and confirm that there are few amphibian species in the study area.

Table 6 Summary of amphibian and reptile species inventoried and observed in the study area

ORDER	TYPICAL SPECIES	PRESENCE OF	POTENTIAL HABITAT
Anouran	Frogs, toads and tree frogs	No species	Minimal presence outside wetlands near bridge.
Urodela	Salamanders	No species	Minimal presence.
Testudina	Turtles	No species	Not suitable due to rocky shores.
Squamata	Snakes	Common garter snake (*Thamnophis sirtalis*), Red-bellied snake (*Storeria o. occipitomaculata*) Brown snake (*Storeria d. dekayi*	Habitat suitable, including fields and woodland edge as well as rocky banks of the St. Lawrence River, mainly on the Island of Montreal and Nuns' Island.

3.3.3 Migratory birds and their habitats

Previous studies have counted up to 254 bird species near the Champlain Bridge corridor. During inventories conducted for this project, 41 bird species were observed. They are, for the most part, species common to Quebec and representative of open urbanized environments. (Table 7). Bird habitats observed are usually shrublands and abandoned fields. Deciduous groves are also suitable, mainly poplars, which make up the strip along the shore of the St. Lawrence River, and the water itself, mainly used by aquatic fauna.

In 2012 surveys, the greatest number of individuals was found in the Nun's Island sector (east and west), whereas the greatest number of breeding pairs was found on the Seaway canal dyke and in the western sector of Nun's Island. Lastly, the Brossard shore held the lowest number of individuals and breeding pairs.

3.3.3.1 *Migratory bird sanctuary and other protected habitats*

The study area is characterized by the presence of a migratory bird sanctuary, protected under federal jurisdiction, called "Couvée Islands" (IBA 2012). The Couvée Islands are located within the South Shore Canal along the south bank of the St. Lawrence River, between the Champlain and Victoria Bridges. The islands were created from sediment dredged from the canal. From 1970 to 1990, the largest island sheltered a significant colony of ring-billed gulls, with approximately 30,000 pairs counted, as well as a small number of herring gulls and common terns. Since then, the colony has been in continuous decline due in part to the presence of a family of red foxes (IBA 2012).

The study area also includes the Nun's Island La Prairie Basin waterfowl concentration area (habitat number: 02-06-0167). The principal species using this area, inventoried in the fall and spring, are dabblers, such as the American wigeon, the northern pintail, the mallard and the American black duck, as well as diving ducks such as the bluebill and the common goldeneye, in addition to the ring-billed gull.

Table 7 Bird inventory result per observed species

		NUMBER OF INDIVIDUALS			NUMBER OF BREEDING PAIRS			BREEDING PAIRS / HECTARE
ENGLISH NAME	LATIN NAME	June 5	June 20	Best result	June 5	June 20	Best result	
Canada goose	*Branta canadensis*	7	40	40	3.5	0	3.5	0.08
Black-crowned night-heron	*Nycticorax nycticorax*	1	3	3	0	0	0	0.00
Song sparrow	*Melospiza melodia*	45	37	45	42	34	42	0.93
Swamp sparrow	*Melospiza georgiana*	1	0	1	1	0	1	0.02
Gadwall	*Anas strepera*	2	1	2	1	0,5	1	0.02
Mallard	*Anas platyrhynchos*	12	59	59	6	0	6	0.13
Northern cardinal	*Cardinalis cardinalis*	0	1	1	0	1	1	0.02
Red-winged blackbird	*Agelaius phoeniceus*	149	118	149	129.5	102	129.5	2.88
American goldfinch	*Spinus tristis*	2	13	13	2	12	12	0.27
Spotted sandpiper	*Actitis macularius*	0	1	1	0	0.5	0.5	0.01
Double-crested cormorant	*Phalacrocorax auritus*	1	1	1	0	0	0	0.00
American crow	*Corvus brachyrhynchos*	11	2	11	5.5	0	5.5	0.12
European starling	*Sturnus vulgaris*	29	159	159	10.5	4.5	10.5	0.23
Peregrine falcon[1]	*Falco peregrinus anatum*	1	3	1	1	0	1	0.02
Ring-billed gull	*Larus delawarensis*	98	69	98	2.5	5.5	5.5	0.12
Herring gull	*Larus argentatus*	9	0	9	0.5	0	0.5	0.01
Great black-backed gull	*Larus marinus*	2	1	2	0	0	0	0.00
Great blue heron	*Ardea herodias*	4	2	4	1.5	0	1.5	0.03
Great egret	*Ardea alba*	1	1	1	0	0	0	0.00

ENGLISH NAME	LATIN NAME	NUMBER OF INDIVIDUALS			NUMBER OF BREEDING PAIRS			BREEDING PAIRS / HECTARE
		June 5	June 20	Best result	June 5	June 20	Best result	
Cliff swallow	*Petrochelidon pyrrhonota*	77	39	77	3.5	16.5	16.5	0.37
Tree swallow	*Tachycineta bicolor*	8	13	13	5	2.5	5	0.11
Cedar waxwing	*Bombycilla cedrorum*	74	12	74	50	11	50	1.11
Chimney swift [1]	*Chaetura pelagica*	2	0	2	1	0	1	0.02
American robin	*Turdus migratorius*	10	7	10	4	5.5	5.5	0.12
Gray catbird	*Dumetella carolinensis*	0	2	2	0	2	2	0.04
Baltimore oriole	*Icterus galbula*	3	5	5	2.5	3	3	0.07
Black-throated blue warbler	*Dendroica caerulescens*	3	0	3	2.5	0	2.5	0.06
American redstart	*Setophaga ruticilla*	0	1	1	0	1	1	0.02
Yellow warbler	*Dendroica petechia*	87	54	87	86	53.5	86	1.91
Common yellowthroat	*Geothlypis trichas*	1	1	1	1	1	1	0.02
Downy woodpecker	*Picoides pubescens*	1	2	2	0.5	2	2	0.04
Rock dove	*Columba livia*	7	3	7	3.5	1.5	3.5	0.08
Killdeer	*Charadrius vociferus*	1	0	1	1.5	0	1.5	0.03
Common grackle	*Quiscalus quiscula*	2	3	3	2	1.5	2	0.04
House finch	*Carpodacus mexicanus*	0	1	1	0	0.5	0.5	0.01
Common tern	*Sterna hirundo*	10	16	16	0	0	0	0.00
Mourning dove	*Zenaida macroura*	2	0	2	1.5	0	1.5	0.03
Eastern kingbird	*Tyrannus tyrannus*	4	3	4	2.5	1.5	2.5	0.06
Brown-headed cowbird	*Molothrus ater*	2	0	2	2	0	2	0.04
Red-eyed vireo	*Vireo olivaceus*	2	2	2	2	2	2	0.04
Warbling vireo	*Vireo gilvus*	10	15	15	10	14.5	14.5	0.32
Total		**681**	**690**	**930**	**387.5**	**279.5**	**426.5**	**9.48**

1: Special status species (see Section 4.2.2.4 for more detail)

3.3.4 Special status flora and fauna species

Some special status flora and fauna species were observed in the study area. The tables below identify the species that have been either listed or inventoried and indicates their legal status in Quebec and Canada.

Table 8 CDPNQ list of occurrences of special status plant species and possible use of study area based on habitat availability

VERNACULAR NAME *(LATIN NAME)*	OCCURRENCE	STATUS IN CANADA*	STATUS IN QUEBEC **	HABITAT	HABITAT AVAILABLE IN STUDY AREA
Green dragon (*Arisaema dracontium*)	1	SC	T	Floodplains, natural high-water mark, silver maple stands and red ash, reed phalaris alluvial meadows	YES
American water-willow (*Justicia americana*)	1	T	T	Stream and pond banks on gravel, sand or organic matter substrate. Prefers hard water, i.e., rich in dissolved carbonates and bicarbonates, soil rich in organic matter and swift currents	YES
Downy wildry (*Elymus villosus*)	1	-	LDTV	Open, rocky woodlands, shores	YES
Common hackberry (*Celtis occidentalis*)	1	-	LDTV	Tolerant deciduous forest in rich, cool limestone soil, gravel or rocky riparian gradients, steep banks; calcicole	YES
Switchgrass (*Panicum virgatum*)	1	-	LDTV	Dry shores and alluvial deposits	YES
St. Lawrence waterhorehound (*Lycopus americanus var. laurentianus*)	2 (2012 inventory)		S	Shorelines and shingle beaches	YES
Rough waterhorehound (*Lycopus asper)*	7(2012 inventory)		S	Shorelines	YES

* Status in Canada: SC: Special Concern, T: Threatened, E: Endangered
** Status in Quebec: V: Vulnerable, LDTV: Likely to be Designated Threatened or Vulnerable, T: Threatened

Table 9 List of special status species listed by the CDPNQ and identified in the inventories

	ENGLISH NAME	LATIN NAME	STATUS		OBSERVATIONS	
			Provincial	Federal	CDPNQ[1]	2012
Amphibians and reptiles	Chorus frog	*Pseudacris triseriata*	Vulnerable	Threatened	X	
	Pickerel frog	*Lithobates palustris*	LDTV	Not at risk	X	
	Spiny softshell	*Apalone spinifera*	Threatened	Threatened	X	
	Map turtle	*Graptemys geographica*	Vulnerable	Special concern	X	
	Ringneck snake	*Diadophis punctatus*	LDTV	None	X	
	Milk snake	*Lampropeltis triangulum*	LDTV	Special concern	X	
	Brown snake	*Storeria dekayi*	LDTV	Not at risk	X	
	Smooth green snake	*Opheodrys vernalis*	LDTV	None	X	
Birds	Least bittern	*Ixobrychus exilis*	Vulnerable	Threatened	X	
	Bald eagle	*Haliaeetus leucocephalus*	Vulnerable	Not at risk	X	
	Tundra peregrine falcon	*Falco peregrinus anatum*	Vulnerable	Special concern	X	X
	Yellow rail	*Coturnicops noveboracensis*	Threatened	Special concern	X	
	Red-headed woodpecker	*Melanerpes erythrocephalus*	Threatened	Threatened	X	
	Grasshopper sparrow	*Ammodramus savannarum*	LDTV	None	X	
Fish	Bridle shiner	*Notropis bifrenatus*	Vulnerable	Special concern		X
	Lake sturgeon	*Acipenser fluvescens*	LDTV	None	X	
	Atlantic sturgeon	*Acipenser oxyrinchus*	LDTV	None	X	
	River redhorse	*Maxostoma carinatum*	Vulnerable	Special concern	X	
	Copper redhorse	*Maxostoma hubbsi*	Threatened	Endangered	X	
	Longear sunfish	*Lepomis megalotisi*	LDTV	None	X	
	American shad	*Alosa sapidissima*	Vulnerable	None	X	
	American eel	*Anguilla rostrata*	LDTV	Special concern	X	
	Stonecat	*Noturus flavus*	LDTV	None	X	
	Channel darter	*Percina copelandi*	Vulnerable	Threatened	X	
	Chain pickerel	*Esox niger*	LDTV	None	X	
	Grass pickerel	*Esox americanus vermiculatus*	LDTV	Special concern	X	
	Rainbow darter	*Etheostoma caeruleum*	LDTV	None	X	
	Rosyface shiner	*Notropis rubellus*	LDTV	None	X	
Mollusk	Spike	*Elliptio dilatata*	LDTV	None	X	
	Elephantear	*Elliptio crassidens*	LDTV	None	X	

* Status in Canada: SC: Special Concern, T: Threatened, E: Endangered; NA: not at risk for COSEWIC, NE: not evaluated
** Status in Quebec: V: Vulnerable, LDTV: Likely to be Designated Threatened or Vulnerable, T: Threatened
1 CDPNQ observations are listed in an 8 km radius comprising the study area.

3.3.5 Key issues of the biological environment

Although effects and mitigation measures will be covered in the next report, this section provides an overview of the highlights of the environmental components and the factors to be considered in the next steps of the project.

3.3.5.1 Flora

During the planning phase for construction work, the location of the St. Lawrence waterhorehound and the rough water-horehound should be taken into account. As far as possible, these specimens should be protected from impact. If this is unavoidable, that impact should be minimized by, for example, transplanting the specimens outside the construction zone. These species are perennials.

Consideration should also be given to renaturalizing the natural environments disturbed by the work carried out on the shore and at the shoreline. Indigenous plant species must be available for renaturalization work to move ahead quickly with seeding and planting in order to prevent invasive species form colonizing the area.

3.3.5.2 Fish and fish habitat

The study area possesses a range of habitats used by as many as 67 fish species, including 5 special status species. The spawning grounds in the fast-flowing water near Nun's Island and the aquatic plant communities in the study area are the habitats with the greatest potential. The spawning grounds are used in April and May while the plant beds are used year round for spawning, rearing and feeding. Limiting work in water, and respecting the crucial spring spawning periods are two measures planned to mitigate the impact of the work. In the event of permanent encroachment, compensatory measures will be proposed.

3.3.5.3 Amphibians, reptiles and their habitats

The presence of the brown snake (Storeria dekayi) is the sole noteworthy element with regard to reptiles. This species, whose home range is limited, was surveyed at the stations on Nun's Island, Montreal Island and on the Seaway dyke. Suitable habitats are plentiful (abandoned fields and woodland borders. No hibernation site was confirmed in the area inventoried, but there are rock piles that could be used for hibernation. The brown snake is likely to be designated threatened or vulnerable in Quebec under the Act respecting threatened or vulnerable species (R.S.Q, c. E-12.01). However, based on the COSEWIC assessment, it is not considered endangered in Canada. If necessary, capture and relocation of individuals in suitable habitats unaffected by the work in the study area may be considered as has been done in other projects

3.3.5.4 *Birds and their habitats*

One species is worth mentioning, the peregrine falcon was observed during inventories and nests on the existing bridge. This species is designated vulnerable in Quebec and has the status of a species of special concern in Canada (Appendix 1 of the Species at Risk Act). The peregrine falcon may nest as early as the beginning of April and egg incubation and rearing of the young in the nest takes approximately 75 days. Nesting monitoring, setting a restricted radius of 250 m around the nest and relocation of the artificial nesting box are among the measures being considered to mitigate the impact of the project.

Lastly, for work carried out within the migratory bird sanctuary on Couvée Island, a permit from the federal environmental authorities will have to be obtained beforehand in accordance with the Migratory Birds Convention Act, 1994 and the Regulations Respecting the Protection of Migratory Birds C.R.C., c. 1036).

3.4 GENERAL DESCRIPTION OF THE HUMAN ENVIRONMENT

The study area is located in the city of Montreal's boroughs of Sud-Ouest and Verdun — the borough of Verdun, it should be noted, includes Nuns' Island — and in the city of Brossard. Both cities are part of the Montreal Metropolitan Community. Demographic data on the territories are presented in table 10.

Table 10 Overview of the main features of the human environments in the study area

		BOROUGH OF SUD-OUEST	BOROUGH OF VERDUN	MONTREAL AGGLOMERATION	CITY OF BROSSARD	MONTÉRÉGIE
Population (2011)		71,546	66,158	1,886,481	79,273	1,456,743
Density (inhab./km^2)		4,562	6,809	3,779	1,753	129
Age group	0-19	18.8	18.0	20.7	21.6	23.5
	20-39	35.3	32.2	30.3	26.6	23.9
	40-59	27.7	28.9	27.8	28.6	30.7
	60-79	17.4	16.9	16.3	19.7	18.1
	80+	3.5	4.2	4.8	3.2	3.5
Average number of persons per household		2.1	2.0	2.2	2.7	2.4
Educational attainment (at least one diploma)		71%	80%	79%	83%	76%
Average personal income ($)		26,151	36,407	32,970	26,326	26,967
Employment rates (%)		54	57	58	61	64

The residential area designation covers the largest portion of the study area but some other designation may be encountered. Figure 8 presents the various land uses and infrastructure found in the study area.

Housing stock in the Sud-Ouest and Verdun boroughs consists principally of apartments while Brossard is mainly detached and semi-detached.

The study area includes several segments of bike paths. The bike paths affected by the project are part of the #1 and #5 Route Verte (Green Route), the network of the City of Montreal and South Shore bike paths. In total, seven bike paths will be directly affected by the project.

3.4.1 Aboriginal communities

There is one Aboriginal community in the study area: Kahnawake, which is located about 10 kilometres southwest of the New Bridge for the St. Lawrence right-of-way. Specifically, it is located on the south shore of Lake St-Louis, west of the Honoré-Mercier Bridge, north-east of the City of Châteauguay. The reserve covers an area of approximately 55 square kilometres.

3.4.2 Navigation

3.4.2.1 Seaway

The Great Lakes St. Lawrence Seaway System is a deep-draught waterway extending 3,700 km from the Atlantic Ocean to the head of the Great Lakes. The St. Lawrence Seaway portion of the System extends from St. Lambert (upstream of Montreal) to Lake Erie. The Seaway includes 13 Canadian and 2 U.S. locks.

Annual commerce on the Seaway exceeds 50 million metric tonnes. Almost 25% of the Seaway's traffic travels to and from overseas ports, primarily in Europe, the Middle East and Africa.

The ships transiting the St. Lawrence Seaway are required to adhere to certain requirements, as set out in Table 11.

Table 11 Requirements for ships transiting the Seaway

MAXIMUM BEAM	MAXIMUM LENGTH	MINIMUM LENGTH	TIRANT D'EAU MAXIMAL	MINIMUM WEIGHT	MAXIMUM HEIGHT
23.2 m	222.5 m	6 m	79,2 dm	900 kg	35.5 m above water level

Source: Joint practices and procedures respecting the transit of ships on the St. Lawrence Seaway (2012)[4]

[4] http://www.media-seaway.com/seaway_handbook/seaway-handbook-fr/reglements.pdf

Each year, the St. Lawrence Seaway records over 4,000 vessel movements, the majority carrying mining products (Tables 12 and 13). Pleasure craft also transit the Seaway. These craft must also meet transit requirements (Table 11).

Table 12 Commercial vessel and pleasure craft traffic

YEAR	COMMERCIAL VESSELS	PLEASURE CRAFT
2011	2,889	2,306
2010	2,631	2,201
2009	2,273	2,349
2008	2,664	2,129
2007	2,824	2,369
Average	2,656	2,271

Table 13 Commercial traffic, Montreal-Lake Ontario section

TYPE OF VESSEL		VESSEL TRANSITS	CARGO TONNES		
			Mining commodities	Agricultural commodities	Processed commodities
Ocean	Cargo	511	13,497,350 (47%)	8,303,839 (28.9%)	6,920,355 (24.1%)
	Barge	2			
	Tanker	226			
Laker	Cargo	1,135			
	Barge	327			
	Tanker	276			
Non-cargo		470			
Passenger		53			
TOTAL		3,000	28,721,544 tonnes (100%)		

Source: The St. Lawrence Seaway 2011 Traffic Report (SLSMC, 2011)

According to information obtained from the St. Lawrence Seaway Management Corporation, over the last eight years, there has been only one incident in the section between the Côte Sainte-Catherine and Saint-Lambert locks. A vessel struck bottom owing to excessive speed (St. Lawrence Seaway Management Corporation, September 24, 2012).

3.4.2.2 *Greater and Lesser La Prairie Basins*

Given the shallow water and strength of the current, the La Prairie Basins are not open to navigation and charted. However, Canadian Coast Guard hovercraft, Saute-Moutons Inc. jet boats and dozens of motor launches operate in this sector of the river. Canadian Coast Guard and Saute-Moutons vessels navigate under the Champlain Bridge and under the ice control structure, approximately at the middle of these structures because the three central piers of the ice control

structure are spaced further apart than the other piers. Other vessels that navigate under the Champlain Bridge in these sectors do so by drawing primarily on local navigation knowledge. On the Lesser La Prairie Basin, pleasure boating mainly uses the Seaway channel to cross the study zone.

3.4.2.3 Fishing and nautical activities

In addition to pleasure craft, water activities such as kayaking, canoeing, rabascaw, windsurfing, water skiing and sport fishing were identified in the study area. The Champlain Bridge Park in Brossard has been identified as an excellent location for windsurfing. Figure 8 presents the main sectors for boating and sport fishing.

3.4.3 Sound environment

A number of sensitive areas were identified within the three following areas

- **City of Montreal (three areas**);
  - Area 1 is located between Atwater Avenue and Mullin Street (Argenson Park and residential use);
  - Area 2 is located north of the highway axis, between Reading Street on the west and Wellington Street on the east (residential use);
  - Area 3 is located between Lasalle Boulevard and extends as far as the Nuns' Island Bridge (Mgr. Richard High School and residential use).
- **Nuns' Island: (1 area**);
  - Area 4: located on the north shore of the island (residential and commercial use);
- **City of Brossard: (3 areas**);
  - Area 5 is located on the south side of the axis for highways 10/15/20, between the river and the axis for Highway 15/Route 132 (residential use);
  - Area 6 is located south of the axis for highways 10/15/20, on Tisserand Avenue, Turgeon Crescent and Tchad Place (residential use);
  - Area 7 is located north of Highways 10-15-20, between Highway 20 on the west and Pinard Street on the east (residential use).

An assessment of the current sound environment will be conducted in the coming months from 12 locations within the study area.

3.4.4 Heritage resources

The study area contains sites of prehistoric and historic archaeological interest (Table 14). Only the sector on the eastern edge of Nuns' Island contains known prehistoric sites, i.e. BiFj-1 and BiFj-49.[5] 21 currently known prehistoric archaeological sites are in the immediate vicinity of the study area, which indicate more intensive occupation over the past three to four thousand years.

Three historic archaeological sites are within the study area. The Nuns' Island area directly affected by the future work holds one historical archaeological site (BiFj-1: Le Ber site) that is extremely important due to its uniqueness in the Montreal area. The two other sites, located in the Verdun (BiFj-78) and Sud-Ouest (BiFj-35) boroughs will not be appreciably affected by the project.

The South Shore contains no known site.

Table 14 Known archaeological sites in the study area

BORDEN CODE	LOCATION	DISTANCE FROM PROJECT (KM)	CULTURAL AFFILIATION
BjFj-1	Le Ber site, Nuns' Island	0	Prehistoric (Middle and Late Woodland); Euro-Quebec, 17th and 18th centuries
BiFj-35	Maison Saint-Gabriel	0.5	Euro-Quebec (1608-1950)
BiFj-49	Le Ber site, northern tip of Nuns' Island	0	Prehistoric (Archaic, Middle and Late Woodland); Euro-Quebec, 17th and 18th centuries
BiFj-78	Verdun Dyke	0.1	Euro-Quebec (1800-1950)

In light of past disturbance and the nature of the soil, the archaeological potential is considered low for the affected sectors of Montreal. On Nun's Island, known sites indicate archaeological potential along the new route of René-Lévesque Boulevard. The same is true near site BiFj-78 and near the Aqueduct Canal in the Borough of Verdun.

The current area of Brossard where the right of way for the new bridge and the access roads is located holds historical archaeological potential associated solely with an agricultural occupation dating back to the 19th century.

3.4.5 Aesthetic and visual aspects

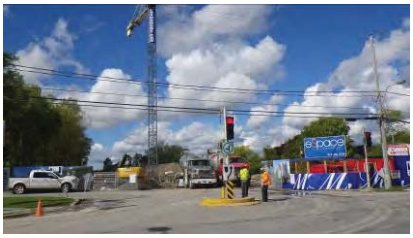
The Champlain Bridge has been an icon of the Montreal landscape. For users, it provides an eloquent gateway that introduces the city's morphology, with the business centre and Mount Royal as the backdrop.

[5] **Canadian archaeological sites are assigned an alphanumeric code number, referred to as a Borden Site Number, used to identify findspots.**

The study area has four landscape units whose boundaries are broadly determined by the presence of the St. Lawrence River:

Landscape unit 1, gateway to the city of Brossard. This unit has two sub-units: the suburb and the shore. The suburb sub-unit is an essentially homogenous bedroom community on both sides of the bridge and Highway 10. The "shore" sub-unit is heterogeneous urban environment that is in a state of transformation; it fronts the Lesser La Prairie Basin.



Landscape unit 2, the river is a landscape sequence that is emblematic of the nature of the Island of Montreal. The existence of the bridge and traffic across it attest to this.



Landscape unit 3, Nuns' Island is divided into two sub-units because of the diverse uses to each side of the bridge. The southern part is dominated by a homogeneous low-density residential area, while the northern part is currently developing, with mixed uses and imposing large-scale and high-density bungalow developments.






Landscaping unit 4, gateway to the city of Montreal, includes three landscape sub-units, distinguished by their uses and the historical nature of the built environment. Overall, the unit is divided into three strips:

- The first, riverfront strip includes industrial, commercial and recreational uses.


- The second, middle strip is defined by an urban residential heritage area, the residential neighbourhood.



- The final, westernmost strip includes mixed uses around the Lachine Canal, an area dominated by industrial uses and a residential redevelopment in the vicinity of the Atwater Market.



3.4.6 Key issues of the human environment

Although effects and mitigation measures will be covered in the next report, this section provides an overview of the highlights of the environmental components and the factors to be considered in the next steps of the project.

3.4.6.1 Navigation

The elements to be considered for the Seaway are essentially obtaining the authorization by the St. Lawrence Seaway Management Corporation for work above the Seaway during the navigation season and the positioning of the new infrastructure's piers on each side of the Seaway.

For construction purposes, a technical response protocol should be developed so that an agreement on work during the navigation season can be established with the St. Lawrence Seaway Management Corporation. Concerning the location of the piers, it will be important to ensure that their installation does not affect the water-tightness of the dike and that it does not reduce the width of the current template.

With regard to river navigation, some elements to be considered include the limited knowledge of hydraulic conditions to the right of the bridge; these conditions could be altered by the presence of new piers and the removal of existing piers. The new arrangement of piers (existing and future) could also impact the sedimentary regime (erosion / sedimentation), the position and depth of the channels, and the ice regime, to say nothing of the negative impacts on navigation. These elements should be given particular attention during the next steps in the project.

Recreational boating could be maintained while work is being carried out but will require an information campaign targeting organizations and users and conducted in co-operation with the relevant authorities, as well as the application of strict navigation measures and the co-operation of monitoring and enforcement agencies to ensure the safety of boaters and workers.

3.4.6.2 Recreational/tourist activities

Like recreational boating, sport fishing could be maintained during construction but will require an information campaign targeting fishers, conducted in co-operation with the relevant authorities, as well as strict navigation measures and the co-operation of monitoring and enforcement agencies to ensure the safety of boaters and workers.

The project could result in the closure of some bike paths for fairly long periods of time, and the temporary or permanent relocation of some paths. Particular attention will have to be paid to keeping bike paths open during construction.

3.4.6.3 Sound environment

Ambient noise will be measured for different periods within the various sensitive areas. Survey results, combined with traffic counts for the same periods, will serve to calibrate a computer model that will be used to evaluate the configurations of current and planned roads. The results of the traffic noise simulations will be calculated based on average summer traffic flows. The project's sound impact will be determined in this fashion in each noise-sensitive area, making it possible to locate places where noise-abatement measures may need to be implemented.

3.4.6.4 Heritage resources

Four archaeological sites have been inventoried in the project right-of-way and areas of archaeological potential have been defined in a preliminary fashion at this stage of the project. The identification of the areas of potential makes a pre-construction archaeological inventory necessary during the next stages of the project; this will allow archaeologists to verify the presence of soil that is undisturbed by land use and the construction of the Champlain Bridge and to search for any archaeological indicators.

3.4.6.5 Aesthetic and visual aspects

The river shapes the landscape, allowing sweeping, open perspectives of the structures from the city and, conversely, of the city from the highway. With this in mind, two fundamental objectives should be considered, which are:

- The need to maintain the views of Montreal from the bridge;
- A concern for developing an infrastructure design process that ensures that infrastructure contributes in a positive way to the quality of the landscape composition of Montreal and its surrounding area.

Further, the environments and landscapes already exist in a compromise with the proximity of the transportation route that crosses them. It is likely that local residents have become used to the situation over the past two generations. The Champlain Bridge is a landmark feature of the landscape. However, replacing the bridge provides an opportunity to strengthen the urban integration by developing the approaches adequately and introducing civil engineering structures

that ensure greater connectedness with the residential areas. Lastly, a number of strategic viewpoints should be taken into consideration in the project, including those from the bike path (the ice control structures, for example) and from the parks in Brossard and Montreal. The contexts of Montreal and Nuns' Island suggest that particular attention should be paid to integrating the infrastructure (site design and civil engineering structures) in order to enhance living environments that are very different but highly valued.

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