8.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS ON WATER RESOURCES

The water resources VC has been included as a VC due to its importance as a potable water resource and other human uses. In this assessment, water resources includes both groundwater and surface water available for human use.

More than 75% of the population of New Brunswick relies on groundwater as a source of drinking water (Statistics Canada 2010), including all the residents of the Fundy Isles; the remainder of the New Brunswick population relies on surface water supplies for drinking water. Groundwater from drilled or screened wells is used for domestic, commercial, institutional, and industrial purposes. Groundwater is most often preferred over surface water as a source of drinking water because, unlike surface water, it can generally be used with little to no treatment to allow for its safe use as a potable water source. Water resources also interact with other VCs such as aquatic resources and wetlands.

8.1 REGULATORY AND POLICY SETTING

The Province of New Brunswick has legislation in place to manage and protect water resources (both surface water and groundwater), including the *Clean Water Act* and the *Clean Environment Act*. Specific regulations under these acts that relate to the protection of water resources include the *Watershed Protected Area Designation Order—Clean Water Act*, the *Wellfield Protected Areas Designation Order–Clean Water Act,* the *Water Well Regulation–Clean Water Act,* and the *Potable Water Regulation–Clean Water Act*.

The *Watershed Protected Area Designation Order* defines restrictions in watershed areas upstream of surface water intakes that are used for public water supply systems. The Designation Order restricts activities that can be carried out within the Watershed Protected Area, thereby reducing the risk of introducing contaminants to the surface water intake.

The *Wellfield Protected Areas Designation Order* defines restrictions in areas around production wells that are used for public water supply systems. The Designation Order restricts the types of activities that can be carried out within the Wellfield Protected Area, thereby reducing the risk of contaminants (e.g., bacteria and viruses, petroleum products, and chlorinated solvents) possibly reaching the wells.

The *Water Well Regulation* defines how public and private water wells are to be constructed in New Brunswick so that water quality is not compromised by local runoff or land use activities. The *Potable Water Regulation* requires water quality testing for all new water wells installed in the province, and for regulated water supply systems. The *Water Well Regulation* applies to all water wells in the local assessment area (LAA, defined later), including future water wells.

Although groundwater resources in Canada are generally managed by provincial regulatory bodies as described above, the Guidelines for Canadian Drinking Water Quality (GCDWQ) published by Health Canada are also applicable to groundwater across Canada; however, these have no force of law unless adopted through a regulatory instrument. The GCDWQ are "*established based on current published scientific research related to health effects, aesthetic effects and operational considerations*" (Health Canada 2017). The New Brunswick Department of Health has adopted many of the GCDWQ that are applicable to municipally and provincially owned and operated water systems (NB OCMOH 2017).

8.2 POTENTIAL ENVIRONMENTAL EFFECTS, PATHWAYS, AND MEASURABLE PARAMETERS

Activities and components associated with the Project could potentially result in adverse environmental effects on the quantity or quality of surface water and groundwater resources. The assessment of Project-related environmental effects on water resources is therefore focused on the following potential environmental effect:

- change in water resources (water quantity or quality).

The environmental effects pathways and measurable parameters for the assessment of this environmental effect are provided in Table 8.1.

Table 8.1 Potential Environmental Effects, Environmental Effects Pathways, and Measurable Parameters for Water Resources

Potential Environmental Effect	Environmental Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in water resources (water quantity or quality)	• The Project may result in changes to the availability or quality of surface water or groundwater as a potable water supply.	• Available drawdown in wells as an indicator of wellbore storage and aquifer yield (water levels in m below ground surface). • Stream flow rates in surface water features with intakes (flow rates in m^3/s). • Groundwater or surface water quality parameters as defined by the GCDWQ (concentrations in mg/L).

8.3 BOUNDARIES

8.3.1 Spatial Boundaries

The Project development area (PDA) is defined in Section 2.1 and is unchanged for the purposes of this assessment. The PDA includes footprint of two new submarine electrical cables, one from Deer Island to Campobello Island (through Head Harbour Passage) and one from Campobello Island to Grand Manan Island (through the Grand Manan Channel). It also includes the footprint of four land-based overhead-to-underground cable riser stations and associated landfall located at Deer Island (at Chocolate Cove), Campobello Island (at Wilsons Beach and Little Whale Cove), and Grand Manan Island (at Long Eddy Point), as well as the footprint of the two existing submarine electrical cables, to be decommissioned at some time in the future when they have reached the end of their service life. For water resources, the focus is on the portions of the PDA that are located on land.

The LAA includes the area of the PDA on land and extends 500 m on either side of the land-based portions of the PDA; the LAA is the maximum area where Project-specific environmental effects can be predicted and measured with a reasonable degree of accuracy and confidence. It can be thought of as the zone of influence of the Project.

The PDA and LAA for the water resources VC is illustrated in Figure 8.1.

8.3.2 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects on water resources include:

- construction – scheduled to begin in the spring of 2018 and last for approximately 16 months; and
- operation – scheduled to begin in late 2019 and continue for the life of the new submarine cables, currently anticipated to be at least 40 years.

Decommissioning pertains to both the existing subsea cables and the proposed new subsea cables. Decommissioning of the existing subsea cables would occur at some time following the successful completion of the proposed installation of the new subsea cables as per current regulations and requirements. Decommissioning of the proposed new subsea cables would occur following the end of their useful service life, and would be carried out in accordance with regulations in place at that time.

8.4 RESIDUAL ENVIRONMENTAL EFFECTS CHARACTERIZATION AND SIGNIFICANCE DEFINITION

For the purposes of this environmental effects assessment, a significant adverse residual environmental effect on a change in water resources is defined as a Project-related environmental effect that results in one or more of the following:

- A long-term or permanent change in the quantity of surface water available for surface water supplies, preventing current users from meeting present and future needs on a sustainable basis
- A long-term or permanent change in groundwater quantity, such that the yield from an otherwise adequate water supply well or spring decreases to the point where it becomes inadequate for intended use.
- The long-term or permanent degradation of surface water or groundwater quality that causes an exceedance of one or more parameters as specified in the Guidelines for Canadian Drinking Water Quality (Health Canada 2017) for potable domestic water supplies.

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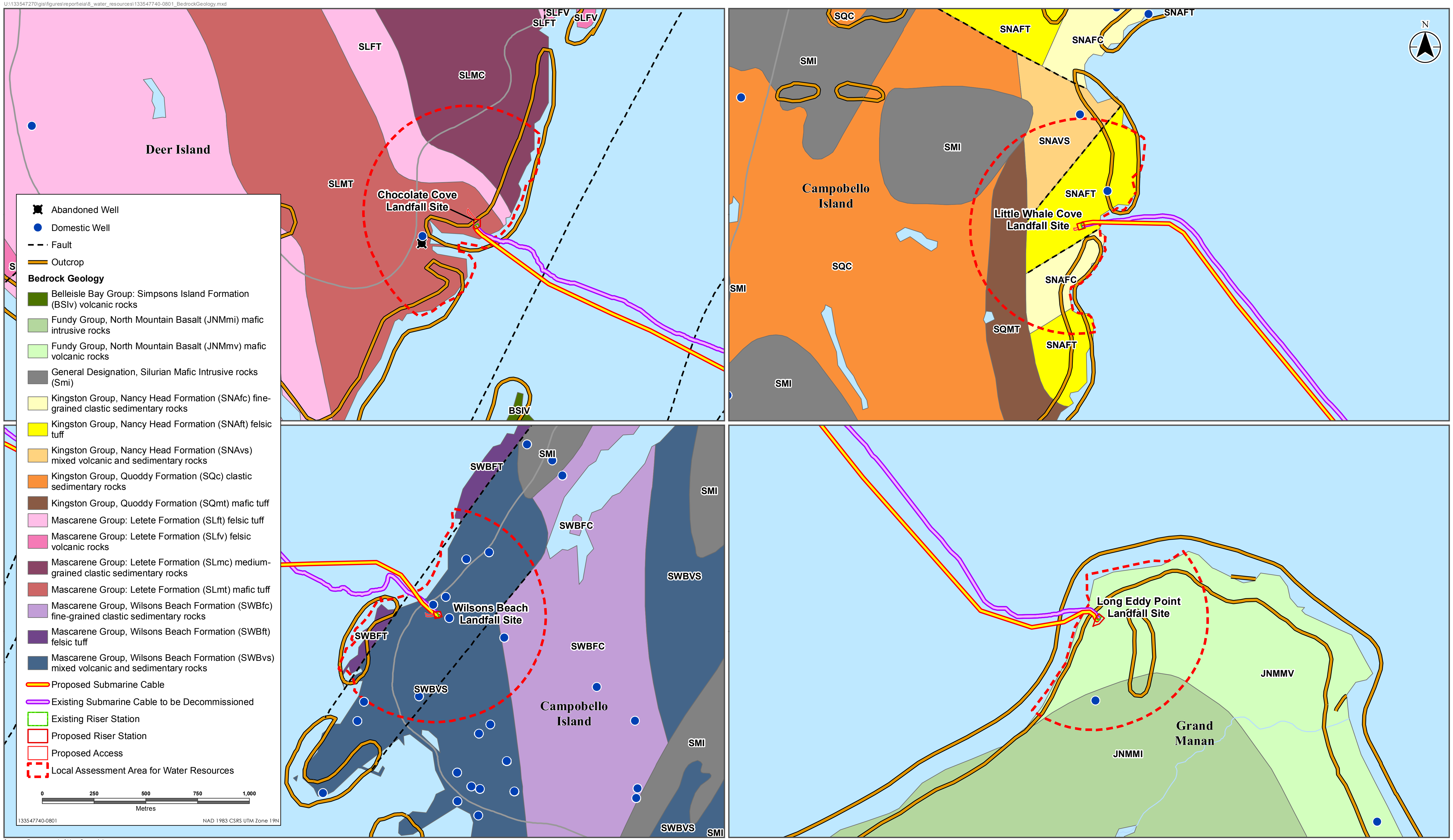

Sources: Government of New Brunswick

Stantec

133547740 - FUNDY ISLES - NB POWER

Water Resources Local Assessment Area

Figure 8.1

Criteria used to characterize and describe residual environmental effects for the assessment of water resources are provided in Table 8.2.

Table 8.2 Characterization of Residual Environmental Effects on Water Resources

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual environmental effect.	**Positive** – a residual environmental effect that increases the availability of water resources as a potable water supply or improves water quality relative to baseline. **Adverse** – a residual environmental effect that reduces the availability of water resources as a potable water supply or degrades groundwater quality relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions.	**Negligible** – no measurable change to the available drawdown in a well, surface water flows, or water quality compared to baseline conditions. **Low** – a measurable change but less than 10% of the lowest available drawdown[1] expected in shallow groundwater wells, or a change in surface water flows of less than 10%, or water quality changes that are degraded compared to baseline conditions, but are less than the GCDWQ. **Moderate** – measurable change more than 10% but less than 25% of the lowest available drawdown[1] expected in shallow groundwater wells, a change in surface water flows greater than 10% but less than 25%, or water quality changes that are degraded compared to baseline conditions, and exceed the GCDWQ for a period less than 30 days. **High** – measurable change of more than 25% of the lowest available drawdown[1] expected in shallow groundwater wells, a change in surface water flows greater than 25%, or groundwater quality that is degraded compared to baseline conditions and exceed the GCDWQ for a period exceeding 30 days.
Geographic Extent	The geographic area in which a residual environmental effect occurs.	**PDA** – residual environmental effects are restricted to the PDA. **LAA** – residual environmental effects extend into the LAA.
Frequency	Identifies how often the residual environmental effect occurs and how often during the Project or in a specific phase.	**Single event** – occurs only once. **Multiple irregular event** – occurs at no set schedule. **Multiple regular event** – occurs at regular intervals. **Continuous** – occurs continuously.
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the residual environmental effect can no longer be measured or otherwise perceived.	**Short-term** – residual environmental effect restricted to duration of specific construction activities in a given location (i.e., dewatering, or directional drilling), typically less than 7 days. **Medium-term** – residual environmental effect extends for a period between 7 and 30 days. **Long-term** – residual environmental effect extends beyond 30 days.

Table 8.2 Characterization of Residual Environmental Effects on Water Resources

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		Permanent – residual environmental effect does not end.
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases.	**Reversible –** the residual environmental effect is likely to be reversed after activity completion and reclamation. **Irreversible** – the residual environmental effect is unlikely to be reversed.
Timing	Timing considerations should be noted when it is important in the evaluation of the environmental effect.	**Applicable** – the residual environmental effect is dependent on the timing during the year (e.g., seasonal). **Not Applicable** – the residual environmental effect is not dependent on the timing during the year (e.g., seasonal).
Ecological and Socioeconomic Context	Existing condition and trends in the area where residual environmental effects occur.	**Unique –** area includes features or characteristics that are unique to the LAA or region. **Common –** area includes features or characteristics that are common to the LAA or region.

NOTES:
1. Measurable change in available drawdown is based on professional judgment and experience with shallow dug wells or low-yield bedrock wells for similar projects.

8.5 EXISTING CONDITIONS FOR WATER RESOURCES

8.5.1 Approach and Methods

Background information on water resources was obtained from published resource materials, maps, and hydrogeological databases including:

- topographical and air photo maps published by GeoNB (2017);
- water well records from the New Brunswick Online Well Log System (NB OWLS; NBDELG 2017);
- Surficial Geology Map (Rampton et al. 1984); and
- Bedrock Geology of the Campobello Island Area Map (McLeod et al. 2005).

No field reconnaissance of water resources was completed as part of this assessment. Water well records are only available from NB OWLS for wells completed during or after 1994. A technical limitation for this assessment is that a well water inventory was not undertaken as the presence of structures from aerial imagery combined with the water well records are considered to provide sufficient detail on potential water well user; however, some wells within the LAA may not have been identified. Since this preliminary assessment identifies areas of potential concern (i.e., areas likely containing potable wells), a residential well water survey will be conducted within 500 m of the PDA prior to construction.

8.5.2 Description of Existing Conditions

The Project is located in the Fundy Isles Composite drainage basin, occupying a drainage area of 237.32 km^2. No mapped freshwater watercourses or waterbodies were identified within 500 m of any of the landfall sites. Surface runoff at the landfall sites flows toward the Bay of Fundy.

8.5.2.1 Geology

The surficial geology of the LAA was reviewed from Rampton et al. (1984), and was identified as bedrock throughout the LAA. The bedrock geology of the LAA consists of the following, as illustrated on Figure 8.1.

At the Chocolate Cove (Deer Island) landfall site and cable riser station, the bedrock consists of early-Silurian aged rocks of the Letete Formation, including green mafic tuff and breccia at the landfall site, surrounded by grey to greyish-green and black feldspathic and quartz wackes, and grey to pink felsic tuft and felsite.

At the Wilsons Beach (Campobello Island) landfall site and cable riser station, the bedrock consists of Silurian aged rocks of the Wilsons Beach Formation, including mixed volcanic and sedimentary rocks at the landfall site, and surrounded by formations of felsic tuft in nearby coastal areas, and fine-grained clastic rocks moving inland.

At the Little Whale Cove (Campobello Island) landfall site and cable riser station, the bedrock consists of Silurian aged rock of the Nancy Head Formation, consisting of felsic tuff at the landfall site, and surrounding by formations of fine-grained sedimentary rocks to the south of the landfall site, and mixed volcanic and sedimentary rocks to the north of the landfall site.

At the Long Eddy Point (Grand Manan Island) landfall site and cable riser station, the bedrock consists of Jurassic aged rock of the North Mountain Basalt, consisting of mafic volcanic rocks at the landing site, with mafic intrusive rock to the south of the landfall site.

8.5.2.2 Surface Water Resources

No mapped surface water features (water bodies or watercourses) are located within the LAA for water resources. No surface water users have been identified within the LAA. Therefore, surface water will not be discussed further in this VC.

8.5.2.3 Groundwater Users

Groundwater users within the LAA were identified from water well records in the LAA, and from properties with a residential or commercial building based on aerial photographs of the area. The results are presented in Table 8.3, with an estimated total of at least 157 water wells within the LAA for all four landfall sites, based on interpretations of the aerial imagery. By contrast, the NB OWLS database only returned 11 water well records in the LAA. The Wilsons Beach landfall site is the most densely populated of the four landfall sites, and is estimated to have at least 128 water wells within the LAA.

Table 8.3 Known and Potential Water Wells within the LAA

Location	Water Well Logs (including abandoned wells) – From NBOWLS Database	Properties Inferred to Have Water Wells – From Aerial Imagery Interpretation
Chocolate Cove	2	18
Wilsons Beach	7	128
Little Whale Cove	1	5
Long Eddy Point	1	6
Total for all Landfall Sites	**11**	**157**

8.5.2.4 Groundwater Quality

The groundwater quality in the LAA was evaluated using the maps for parameters provided in the NB Groundwater Chemistry Atlas (NBENV 2008). In general, the water quality in the LAA is good and meets the GCDWQ (Health Canada 2017), with the exception of occasional exceedances of antimony, arsenic, iron and manganese. These exceedances are presumed to be associated with the interactions with bedrock minerals, as there are no known anthropogenic sources of antimony or arsenic in the LAA.

8.6 PROJECT INTERACTIONS WITH WATER RESOURCES

Table 8.4 identifies, for each potential environmental effect, the physical activities that might interact with the water resources VC and result in an identified environmental effect. These interactions are indicated by check marks and are discussed in detail in Section 8.7, in the context of environmental effects pathways, standard and Project-specific mitigation/enhancement, and residual environmental effects. A justification for no environmental effect is provided following the table.

Table 8.4 Project-Environment Interactions with Water Resources

Physical Activities	Potential Environmental Effects: Change in water resources (water quantity or quality)
Construction	
Landfall construction	✓
Modification to cable riser stations	✓
Cable installation in Head Harbour Passage and Grand Manan Channel	-
Clean-up and revegetation	-
Inspection and energizing the Project	-
Emissions and wastes	✓
Land-based transportation	-
Marine transportation	-
Employment and expenditure	-
Operation	
Vegetation management	-
Access road maintenance	-
Energy transmission	-
Infrastructure inspection, maintenance, and repair	-
Emissions and wastes	-
Land-based transportation	-
Marine transportation	-
Employment and expenditure	-
Decommissioning	
Reclamation	-
Emissions and wastes	-
Land-based transportation	-
Marine transportation	-
Employment and expenditure	-
Notes: ✓ = Potential interaction – = No interaction	

Importantly, the Project is not expected to interact with the surface water component of water resources because there are no known surface water sources used for drinking water in the LAA. Thus, the focus of the assessment that follows is on the groundwater component of water resources. Surface water is thus not discussed further in this assessment.

The following activities during the construction phase are not anticipated to interact with water resources, based on the descriptions below:

- Clean-up and revegetation will be completed within the areas previously disturbed for landfall construction activities, and will not result in additional interactions with water resources.
- Inspection and energizing activities will be completed on the constructed infrastructure, and will not add new interactions with water resources as a result of this Project.
- Land-based transportation activities will occur on existing roads and will not change existing interactions with water resources.
- Marine-based transportation activities will occur in the marine environment, and are not anticipated to interact with onshore water resources.
- Employment and expenditure will not interact with water resources as the temporary workforce will be accommodated in existing nearby lodgings, and are not anticipated to increase new demands for water resources in the LAA.

Similarly, all activities during the operation phase are not anticipated to interact with water resources, based on the descriptions below:

- Vegetation management will be conducted in accordance with government regulations, and will use manual and mechanical methods where possible. As a result, this activity is not considered to interact with water resources.
- Access road management will occur on roads developed during construction and will not result in additional interactions during operation.
- Energy transmission and infrastructure inspection, maintenance, and repair activities will occur within developed infrastructure, and will not interact with water resources.
- Emissions and wastes from operation activities are limited to air contaminant emissions and surface runoff during periodic maintenance activities. Surface runoff during operation will be over vegetated or impervious surfaces and is not anticipated to include appreciable amounts of suspended sediments, and will not interact with water resources.
- Land-based transportation activities will occur on existing roads and will not change existing interactions with water resources.
- Marine-based transportation activities will occur in the marine environment, and are not anticipated to interact with onshore water resources.
- Employment and expenditure will not interact with water resources as the limited workforce will be accommodated in existing nearby lodgings.

As there are no activities during the operation phase that are expected to interact with water resources, the operation phase is not discussed further in this VC.

Decommissioning activities are not anticipated to interact with water resources as the activities are not anticipated to change the physical surface water or groundwater environments. As such, the decommissioning phase is not discussed further in this VC.

Activities during the construction phase for which an interaction with water resources was identified in Table 8.4 above (i.e., landfall construction, modification to cable riser stations, and emissions and wastes) are further assessed in Section 8.7 below.

8.7 ASSESSMENT OF RESIDUAL ENVIRONMENTAL EFFECTS ON WATER RESOURCES

8.7.1 Analytical Assessment Techniques

Environmental effects on water resources are assessed using qualitative descriptions of the changes to the environment, quantitative assessment of anticipated changes to groundwater levels on the available drawdown in wells, and based on experience from other projects and known interactions of similar types of projects. The assessment is based on published data for the Fundy Isles.

8.7.2 Change in Water Resources (Water Quantity or Quality)

8.7.2.1 Project-Environmental Effects Pathways

The installation of cable at the cable landfall sites during landfall construction is expected to be performed using horizontal directional drilling (HDD) through the bedrock at the site. If HDD is not possible, open cut trenching (OCT, discussed below) will be used. This may result in interactions between the Project and groundwater due to the possible introduction of a preferential pathway for groundwater flow. The use of drilling muds to circulate drill cuttings would also serve to hydraulically isolate the borehole as a result of the deposition of drilling mud on the borehole walls. These effects are anticipated to be limited to within the LAA.

Open-cut trenches are proposed as an alternative approach for the installation of cable at the cable landfall sites during the cable installation. These trenches are anticipated to be shallow (i.e., less than 3 m deep) onshore and will be excavated using rock hammers. The trenches may require some limited dewatering during the period of construction. Where dewatering occurs, local water table elevations will be temporarily lowered during dewatering activities. Thus, a temporary and localized interaction between the Project and groundwater resources will occur. The effects of local dewatering in general cannot be mitigated, since dewatering deliberately seeks to create an effect (i.e., temporary lowering of groundwater levels).

The runoff of storm water during construction activities is considered under emissions and wastes. However, the implementation of erosion and sediment control best management practices is expected to control and convey storm water runoff from exposed areas to adjacent surface water bodies during the construction period and is not expected to have an adverse effect on groundwater quality during construction.

8.7.2.2 Mitigation

Standard mitigation and best management practices relevant to groundwater will be implemented prior to or during construction, operation, and decommissioning of the Project. These are based on normal operating procedures and regulatory requirements and include mitigation specific to groundwater. Some examples of standard mitigation are provided below.

- Proper handling, transfer and storage of on-site fuels and chemicals.
- Proper handling, storage and disposal of drilling fluids.
- Conduct a pre-construction water well survey for wells located within 500 m of HDD or OCT and dewatering activities.
- Establishment of a home-owner reporting and response procedure in the unlikely event of a well damage claim.

In the unlikely event of loss of well yield or changes to water quality, mitigation could include deepening of an existing well, replacement of a well, provision of larger capacity indoor water storage tanks, installation of a treatment system to meet the GCDWQ, or a combination of these or other measures. Provision of a temporary alternate source of drinking water (such as bottled water or portable cistern) could also be provided while permanent mitigation measures are being implemented.

8.7.2.3 Characterization of Project Residual Environmental Effects

Landfall construction has the potential to affect water resources by the application of HDD or OCT the bedrock at the site. In the case of HDD, a preferential pathway for groundwater flow may be created, or the use of drilling mud may isolate some water bearing fractures and result in the introduction of sediments in nearby wells, potentially degrading water quality in the wells during these activities. In the case of OCT, temporary dewatering of the trenches, should it be necessary, could result in the temporary lowering of local water table elevations during construction, and could extend to nearby water wells. In the unlikely event that the local dewatering results in the loss of well yield, or HDD construction results in changes to water quality, mitigation could include deepening of an existing well, replacement of a well, provision of larger capacity indoor water storage tanks, installation of a treatment system to meet the GCDWQ, or a combination of these or other measures. Provision of a temporary alternate source of drinking water (such as bottled water or portable cistern) could also be provided while permanent mitigation measures are being implemented.

Modification to cable riser stations during construction may require temporary dewatering in excavations to expand the base of the cable riser stations. Thus, a temporary and localized interaction between the Project and groundwater resources could occur. Where dewatering occurs, local water table elevations will be temporarily lowered during construction, and could extend to nearby water wells. In the unlikely event that the local dewatering results in the loss of well yield or changes to water quality, mitigation could include deepening of an existing well, replacement of a well, provision of larger capacity indoor water storage tanks, installation of a treatment system to meet the GCDWQ, or a combination of these or other measures. Provision of a temporary alternate source of drinking water (such as bottled water or portable cistern) could also be provided while permanent mitigation measures are being implemented.

Emissions and wastes during construction has the potential to affect water resources by surface runoff eroding and transporting sediments, potentially degrading water quality if the sediment could be transported to a water intake. Standard mitigation practices for erosion and sedimentation controls during construction will be implemented to reduce the risk of sediment transport during construction.

The residual environmental effects of the Project have the potential to be adverse, since they may, in most cases, temporarily reduce the availability or quality of water resources in the LAA. However, the application of the mitigation measures described above will further reduce the low-magnitude potential environmental effects of the Project during construction. Best-management practices for HDD or OCT activities will reduce the likelihood of vibration induced turbidity in the groundwater, and the potential changes to reduce the available yield in the aquifer by plugging bedrock fractures in the area from the use of drilling fluids. The magnitude of the environmental effects is predicted to be low during the construction phase, because environmental effects will be limited to the immediate area of the Project excavations and groundwater conditions are expected to return to normal after the construction phase. The environmental effects will be limited in the LAA, where lesser effects will be felt, but mostly concentrated within the PDA during the construction phase. The duration of the environmental effects would be short-term during construction, and would be limited to individual irregular events as construction proceeds. Although seasonal effects of changing water levels could result in variable dewatering rates at different times of the year, this will not result in the Project-related changes to the local shallow or deep aquifers such that timing is not applicable. The environmental effects are characterized as reversible because, as the changes from dewatering will recover once the activity stops, and short-term changes to turbidity in the bedrock due to HDD or trenching will settle out and stabilize once these activities have ceased. The ecological and socioeconomic context is characterized as common due as groundwater resources outside the LAA are similar to those within the LAA. The residual environmental effects of the Project are not anticipated to change this context.

8.8 SUMMARY OF PROJECT RESIDUAL ENVIRONMENTAL EFFECTS

Table 8.5 summarizes the environmental effects assessment and prediction of residual environmental effects resulting from those interactions between the Project and water resources as having a potential interaction in Table 8.4.

Table 8.5 Summary of Project Residual Environmental Effects on Water Resources

Residual Environmental Effect	Residual Environmental Effects Characterization								
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Timing	Reversibility	Ecological and Socioeconomic Context
Change in water resources (water quantity or quality)	C	A	L	LAA	ST	S	N/A	R	C

KEY See Table 8.2 for detailed definitions ***Project Phase*** *C: Construction* *O: Operation* ***Direction:*** *P: Positive* *A: Adverse* ***Magnitude:*** *N: Negligible* *L: Low* *M: Moderate* *H: High*	***Geographic Extent:*** *PDA: Project Development Area* *LAA: Local Assessment Area* ***Duration:*** *ST: Short-term;* *MT: Medium-term* *LT: Long-term* *N/A: Not applicable*	***Frequency:*** *S: Single event* *IR: Irregular event* *R: Regular event* *C: Continuous* ***Timing:*** *A: Applicable* *N/A: Not applicable* ***Reversibility:*** *R: Reversible* *I: Irreversible* ***Ecological/Socioeconomic Context:*** *C: Common* *U: Unique*

Based on the above, the residual environmental effects of the Project during construction are predicted to be adverse, since there could be a change to the groundwater quantity or quality in a negative way. The magnitude is predicted to be low, because of the limited nature of the HDD, trenching and dewatering activities. The geographic extent is limited to the LAA, where lesser effects will be felt, but mostly concentrated within the PDA. The duration and frequency are predicted to be short-term, and single irregular events. Timing is not applicable because seasonal effects will not change the nature or extent of environmental effects due to the Project. The environmental effects are characterized as reversible because, as the changes from dewatering will recover once the activity stops, and short-term changes to turbidity in the bedrock due to HDD or trenching will settle out and stabilize once these activities have ceased. The ecological and socioeconomic context is characterized as common due as groundwater resources outside the LAA are similar to those within the LAA. The residual environmental effects of the Project are not anticipated to change this context.

8.9 DETERMINATION OF SIGNIFICANCE

In light of the lack of interaction of the Project with water resources or the nature and extent of interactions and related mitigation, with the application of proposed mitigation and environmental protection measures, the residual environmental effects of a change in water resources (water quantity or quality) from Project activities and components are predicted to be not significant. This conclusion has been determined with a high level of confidence based on a good understanding of the general effects of construction activities on water resources and the effectiveness of mitigation measures discussed in Section 8.7.2.2.