6.0 Valued Environmental Components (VECs)

6.1 Physical VECs

6.1.1 Atmospheric Environment

6.1.1.1 Weather Conditions

The project is located within the Cobequid Hills Ecodistrict of the Nova Scotia Upland Ecoregion (NSDNR 2015). The Ecodistrict runs largely east-to-west, in an elongated shape, stretching approximately 150 km across three counties – Cumberland, Colchester, and Pictou (NSDNR 2015).

On average, the Ecodistrict ranks amongst the highest within mainland Nova Scotia with respect to annual snowfall with roughly 300 cm falling per annum (NSDNR 2015). Conversely, within the Uplands Ecoregion, the Hills Ecodistrict ranks amongst the driest relative to total precipitation with an average of around 1,200 mm per annum (NSDNR 2015). During the summer months, a moisture deficit is anticipated in the area of around 45 mm (Webb and Marshall 1999).

The Ecodistrict is characterized by relatively average spring and summer temperatures for Nova Scotia, while winter temperatures are colder than average (Webb and Marshall 1999). During the summer months, the area experiences an average temperature of 16.5°C, in the winter months -5.8°C and an average annual temperature of 5.5°C (Webb and Marshall 1999).

The Nova Scotia wind atlas was used in the site finding stage and indicates the approximate wind speed at the PDA is between 6.5-8.0 m/s at a height of 80 m, with the predominant wind direction from the southwest. A site-specific wind monitoring campaign is underway and confirms the southwesterly wind direction, as shown in the site wind rose in **Figure 4**.

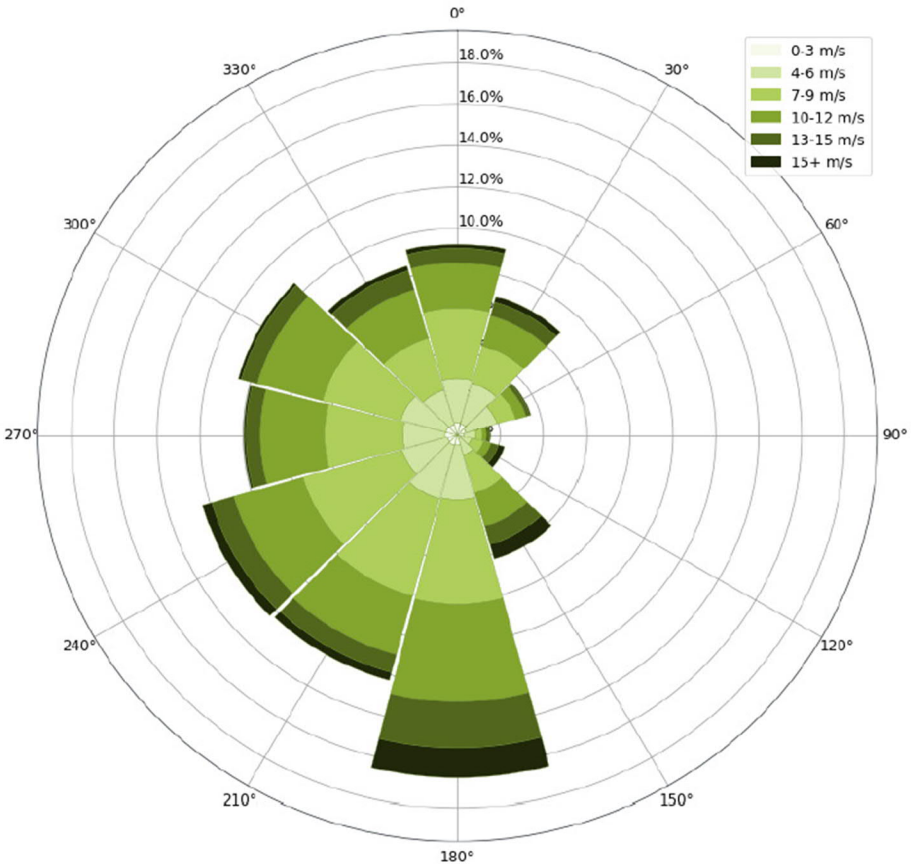


FIGURE 4: WIND ROSE GENERATED FROM WIND DATA COLLECTED ON THE PROJECT SITE.

6.1.1.2 Climate and Climate Change

Current climate conditions are generally described by the most recent 30-year period for which Environment and Climate Change Canada (ECCC) has developed statistical summaries referred to as climate normals. The nearest weather station relative to the Project with available historical data is the Debert (ECCC ID No. 8201380) weather station, which is located approximately 22 km southeast of the Project. The Debert weather station provides historical data for temperature and precipitation, amongst a limited number of other parameters, but does not provide historical data for wind. Further, the most recent climate normals data from the Debert station spans between 1982 and 2001. The nearest available wind data is from the Truro (EC ID No. 8205990) weather station, located over 40 km southeast of the Project. Based upon the variability in elevation, and proximity to the Minas Basin/Cobequid Bay, between the Westchester site and the Truro weather station, it was concluded that the Truro weather data would not be representative of conditions at the Westchester site.

Canadian Climate Normals recorded from 1981 to 2010 and reported from the Debert weather station, including yearly averages, maximum extremes for precipitation and temperature are presented in **Table 10**. Based on the data, the average annual daily temperature was 6.1°C. The lowest observed daily average temperature was in January at -6.7°C, while the highest was July at 18.6°C (ECCC 2022a). The extreme maximum temperature was 34.0°C observed on August 18, 1987, while the extreme minimum temperature was -35.0° recorded on January 31, 1993 (ECCC 2022a). Precipitation amounts, on average,

were highest between September and November. Extreme maximum daily precipitation events ranged from 39.4 mm (February 16, 1996) to 89.4 mm (August 15, 1999) (ECCC 2022a).

TABLE 10: 1981 TO 2010 CANADIAN CLIMATE NORMALS – DEBERT STATION DATA (ECCC 2022A)

Parameter	Monthly Range	Annual Average	Extreme Daily Maximum	Extreme Daily Minimum
Daily Average Temperature (°C)	-6.7 – 18.6	6.1	34.0	-35.0
Total Precipitation (mm)	79.4 – 111.9	1168.3	89.4	0

Climate change is an acknowledged change in climate that has been documented over two or more 30-year periods. Some of the long-term effects of global climate change include rising temperatures, changes in precipitation patterns, increases in droughts and heatwaves, stronger and more intense hurricanes and in increase in sea level (NASA 2021).

The Climate Atlas of Canada (CAC) uses the Pacific Climate Impacts Consortium (PCIC) data (BCCAQv2) to provide climate projections for two future 30-year periods (2021-2050 and 2051-2080) and a baseline period (1976-2005) (CAC 2019). According to the CAC, the region of Oxford is projected to experience an increase in the mean annual temperature and the number of very hot (i.e., +30°C temperature) days from the baseline period to 2021-2050. The mean annual temperature between 1976 and 2005 was 5.8 °C is projected to increase to 7.8°C between 2021 and 2050 and the number of days with temperatures of +30°C is projected to increase from 1.9 to 8.6 (CAC 2019).

The number of days with or without precipitation is not projected to change with the region of Oxford from a baseline period of 1976-2005 and the period of 2021-2050; however, the projected number of heavy precipitation days (days with 10 mm of precipitation or more) per year is expected to increase by 2.4 days (CAC 2019). This may contribute to an increase in flash flooding, erosion and sedimentation of watercourses.

6.1.1.3 Ambient Air Quality

Nova Scotia Environment and Environment Canada monitor the outdoor air quality at seven sites across the province (NSE 2022, ECCC 2022b). Environment Canada generates the Air Quality Health Index (AQHI) which is based on the measurement of three key air pollutants: ground-level ozone, nitrogen dioxide, and particulate matter. The associated health risk is represented by the AQHI scale, which ranges from 1 to 10+. AQHI index values are also grouped into health risk categories, ranging from Low (AQHI 1-3) to Very High (AQHI 10+).

The closest Air Quality Health Index monitoring site is located in Pictou, Nova Scotia, which is located approximately 75 km east of the Project. The AHQI of Pictou was low in January 2022 (ECCC 2022b). Based on the lateral distance and the nature of the Town of Pictou (i.e., developed area with various industrial facilities), the air quality of the Westchester project area, (which is rural with seasonal

agricultural activity and occasional forestry), in comparison is therefore anticipated to have a low AQHI rating.

6.1.1.4 Ambient Sound Levels

The proposed Project is located in a rural area with an active forestry and agricultural industry and recreational use. Due to the site elevation, wind resource, industrial activity and recreational uses, ambient noise levels in the area may be elevated during short periods of time. As the site was chosen for its excellent wind resources, particularly windy days can greatly increase existing ambient sound levels.

The Proponent has undertaken a sound level impact assessment study to assess the impact of the sound emissions on the dwellings, seasonal residences, and local businesses surrounding the Project during both construction and operation. The study, which is presented in **Appendix C,** concluded that, while heightened sound levels during construction activities are unavoidable, the sound level assessment for the construction period shows that sounds levels at nearby residences are not expected to be significant. The operational sound level modelling for the Project demonstrates that the sound levels expected to be experienced at local receptors under worst case conditions adhere to the Nova Scotia guidance.

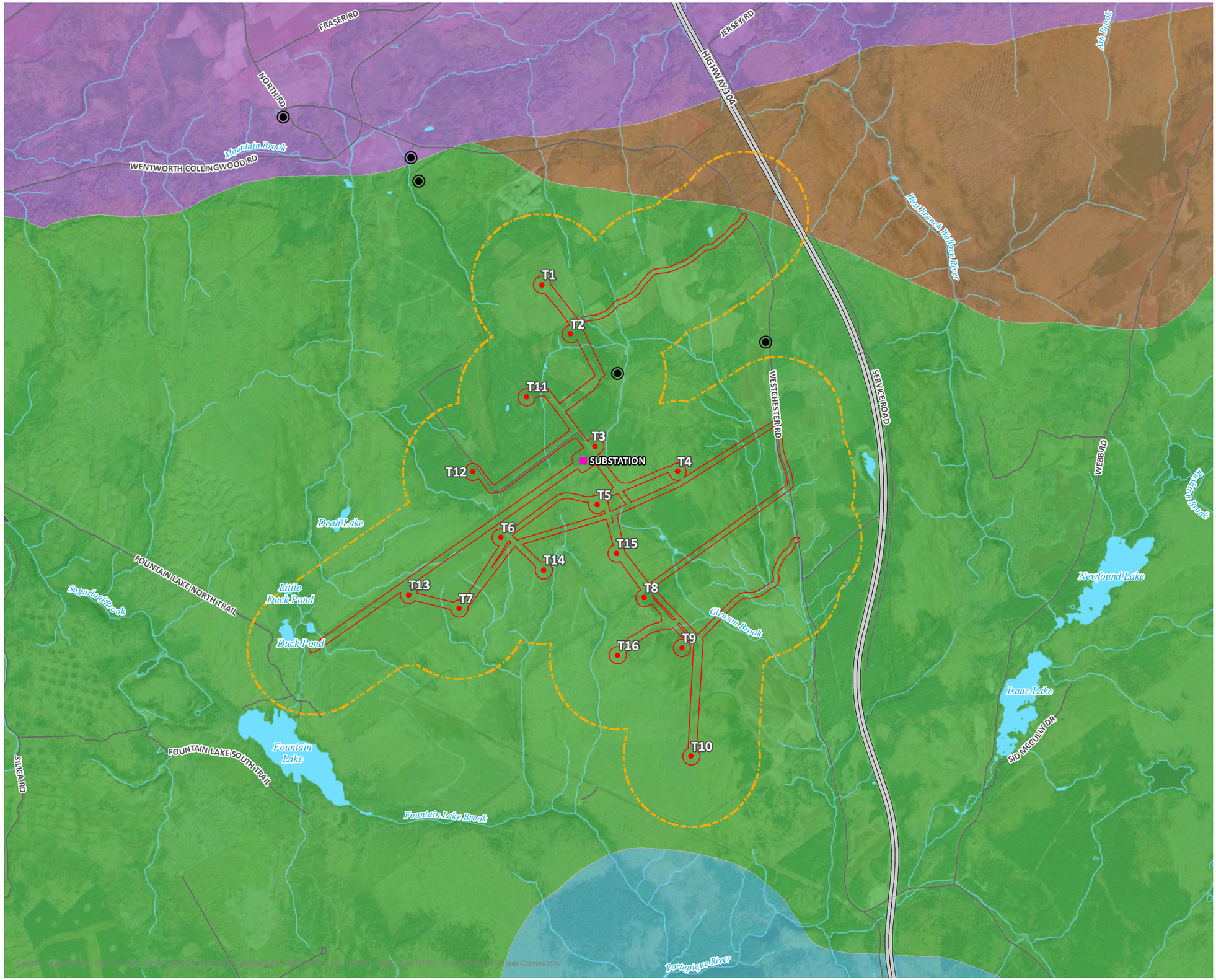
6.1.2 Physical Environment

6.1.2.1 Geology

The surficial geology in the Cobequid Hills Ecodistrict is dominated by a thin, stony, moderately coarse-textured glacial till with bedrock outcrops observed throughout (NSDNR 2015). Glacial fluvial sands and gravel deposits are observed along select ridges and valleys (NSDNR 2015). Based on the NSDNR Surficial Geology Map of Nova Scotia (Stea, Conley, and Brown 1992), the surficial geology across the majority of the Project area is identified as a last glaciation (Wisconsinan), silty till plain with material from local and distant bedrock sources. Portions of the area, closer to the Trans-Canada Highway 104, are identified as last glaciation (Wisconsinan), glaciofluvial kames and eskers consisting of gravels, sands, and silts (Stea, Conley, and Brown 1992). This is consistent to observations of sandy-soils observed during the 2021 field surveys being the dominant soil texture on the site.

In Nova Scotia, Contaminated Sites Regulations came into effect in July 2013. The regulations clarify the procedures around contaminated sites and ensure cleanups are consistent province-wide. A search of the Environmental Registry was not requested as part of the scope of this EA registration document. No soil contamination or signs of soil contamination were observed during the field surveys within the PDA. The lands within the PDA have been, and still are used for agricultural and industrial forestry operations, as a result, there is a potential for reported or unreported existing soil contamination to be present in isolated pockets within the Project area from historical spills, leaks, and releases from farming and forestry machinery that may have occurred.

The local geology is presented on **Figure 5**. A complex system of bedrock faults are located nearby and throughout the Cobequid Hills Ecodistrict. The faults control topography and are responsible for the



Natural Forces

WESTCHESTER WIND PROJECT

BEDROCK GEOLOGY

FIGURE 5

- Potential Turbine Location
- Substation
- Domestic Drilled Well within 2 km of PDA
- Project Development Area
- Local Assessment Area
- Highway
- Local Road
- Watercourse
- Waterbody

Bedrock Geology

- Boss Point Formation
- Devonian - Carboniferous diorite - grabbro
- Devonian - Carboniferous granite
- Fountain Lake Group

0 0.25 0.5 1 km

N W E S

SCALE 1:30,000

MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON CONSULTING, GEONB, NATURAL FORCES

MAP CREATED BY: MEC
MAP CHECKED BY: KB
MAP PROJECTION: NAD 1983 UTM ZONE 20N

DILLON CONSULTING

PROJECT: 21-1329
STATUS: DRAFT
DATE: 2022-02-11

FILE LOCATION: K:\2021\211329\Product\Client\EA_WC\WC_Geology.mxd

elevational changes between the highlands of the Ecodistrict and the lowlands to the south. (NSDNR 2015). A wide variety of bedrock types are also encountered throughout the area; including, granitic, gabbroic, gneissic, plutonic, volcanic, siltsone, sandstone, and agglomerate stratified rocks (NSDNR 2015). Based on the NSDNR Geological Map of the Cobequid Highlands (Donohoe and Wallace 1982) the bedrock geology in the Project area consists of dark grey to pale tan hornblende pyroxene diorite.

6.1.2.2 Surface Water

Surface water flow across the PDA is expected to be guided by topography. The general topography in the Cobequid ecodistrict (340) is characterized as having rolling hills with steep slopes (Neily et al. 2017). The highest points on the mainland of Nova Scotia are found in the Cobequid Hills at Nuttby Mountain and Dalhousie Mountain, which rise to 335 metres above sea level (m asl), and are located approximately 40 and 60 km east of the PDA, respectively. The PDA is situated on a ridge that is broken up by steep valleys and surface water flow is directed towards watercourses which are contained within their watersheds by the surrounding topography. The elevation within the PDA ranges from 280 m above sea level in the eastern portion of the PDA to maximum peaks approximately 330 m above sea level in the center of the PDA.

The Cobequid ecodistrict includes multiple large river systems (NSDLF 2019). The PDA is located within the Economy (1DJ) and Phillip/Wallace (1DN) primary watersheds. The largest portion of the PDA falls within the Economy watershed, specifically, the Portapique River secondary watershed (IDJ-7) which flows south towards Minas Basin. Some areas of the PDA to the west and north are located within the River Philip (1DN-1) and Wallace River (1DN-3) secondary watersheds, respectively, which both flow north and eventually to the Northumberland Straight.

The following watercourses and water bodies are located within the LAA for the physical environment, which includes the PDA as well as a 500 m buffer around project components and shown on **Figure 6**:

<u>River Phillip (1DN-1):</u>

- Unnamed tributaries to Mountain Brook

<u>Wallace River (1DN-3):</u>

- An unnamed tributaries to the West Branch Wallace River

<u>Portapique River secondary watershed (IDJ-7):</u>

- Duck Pond
- Little Duck Pond
- Tributaries to Fountain Lake
- Fountain Lake
- Tributaries to Fountain Lake Brook
- Tributaries to Gleason Brook
- Gleason Brook

An assessment of potential watercourse crossings within the proposed PDA was conducted in 2021 in conjunction with the aquatic habitat assessment. Details of the field and desktop watercourse assessments are provided in **Section 6.2.6**. The PDA intersects watercourses at approximately 30

Natural Forces

WESTCHESTER WIND PROJECT

FIGURE 6

- Proposed Turbine Location
- Substation
- Project Development Area
- Local Assessment Area
- Highway
- Local Road
- Field Delineated Watercourse
- Watercourse
- Contour
- Waterbody
- Wetland
- Portapique River Secondary Watershed
- River Philip Secondary Watershed
- Wallace River Secondary Watershed

0 0.25 0.5 1 km

N W E S

SCALE 1:24,000

MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON CONSULTING, GEONB, NATURAL FORCES

MAP CREATED BY: MEC
MAP CHECKED BY: KB
MAP PROJECTION: NAD 1983 UTM ZONE 20N

DILLON CONSULTING

PROJECT: 21-1329
STATUS: DRAFT
DATE: 2022-02-11

FILE LOCATION: K:\2021\211329\Product\Client\EA_WC\WC_SurfaceWater_20220208.mxd

locations, of these, 22 locations were verified during the field assessments conducted in 2021. Of the 30 crossings identified within the PDA, seven occur on proposed new roads. The remaining crossings in the PDA occur on existing roads, the proposed collector network, or the transmission lines which will likely not require new watercourse crossing construction. A summary of the existing and proposed conditions of watercourses identified near the PDA is in **Table 11**. Field assessments conducted in 2021 included watercourses within the Portapique River secondary watershed (IDJ-7). In general, these watercourses were found to flow towards Gleason Brook, which then flows south/southeast to the Portapique River.

TABLE 11 EXISTING AND PROPOSED CONDITIONS OF WATERCOURSES IDENTIFIED NEAR THE PDA

Watercourse ID	Characterization of Watercourse	Existing Conditions
WC1	Ephemeral tributary to Fountain Lake Brook	No development, proposed new road crossing
WC2	Intermittent/ephemeral tributary to Fountain Lake Brook	No development, proposed new road crossing
WC3	Small permanent tributary to Gleason Brook	No development, proposed new road crossing
WC3a	Small permanent tributary to Gleason Brook	No development, proposed new road crossing
WC3b*	Intermittent/ephemeral tributary to Gleason Brook	Existing road
WC4	Intermittent tributary to Gleason Brook	Existing road
WC5	Intermittent/ephemeral tributary to Gleason Brook	No development, proposed collector network
WC6	Permanent channel - Gleason Brook	No development, proposed collector network
WC7	Small permanent tributary to Gleason Brook	Existing road
WC7a	Small permanent tributary to Gleason Brook	No development, proposed collector network
WC7b	Small permanent tributary to Gleason Brook	No development, proposed collector network
WC7c*	Small permanent tributary to Gleason Brook	Existing road
WC8	Intermittent tributary to Gleason Brook	No development, new crossing
WC9	Small permanent tributary to Gleason Brook	No development, adjacent to proposed road location
WC9a	Permanent channel - Gleason Brook	Existing road
WC10	Intermittent tributary to Gleason Brook	No development, proposed collector network
WC10a	Intermittent tributary to Gleason Brook	No development, proposed collector network
WC11	Small permanent tributary to Gleason Brook	No development, proposed collector network
WC11d	Ephemeral tributary to Gleason Brook	No development, proposed collector network

Watercourse ID	Characterization of Watercourse	Existing Conditions
WC11a	Small permanent tributary to Gleason Brook	No development, proposed collector network
WC11b	Small permanent tributary to Gleason Brook	Existing road
WC11c	Small permanent tributary to Gleason Brook	Existing road
WC11z	Intermittent tributary to Gleason Brook	No development, proposed collector network
WC12	Intermittent tributary to Gleason Brook	No development, within 100m of proposed turbine
WC13	Permanent channel - Gleason Brook	No development, proposed collector network
WC14	Intermittent/ephemeral tributary to Gleason Brook	Existing road
WC15*	Intermittent/ephemeral tributary to Gleason Brook	No development, proposed new road crossing
WC16a*	Intermittent/ephemeral tributary to Gleason Brook	No development, proposed collector network
WC16b*	Intermittent/ephemeral tributary to Gleason Brook	No development, within 100m of proposed turbine
WC17*	Intermittent/ephemeral tributary to Gleason Brook	Existing road
WC18*	Intermittent/ephemeral tributary to Gleason Brook	Existing road
WC19*	Intermittent/ephemeral tributary to Duck Pond	No development, proposed transmission line
WC20*	Intermittent/ephemeral tributary to Mountain Brook	No development, proposed transmission line

*Based on desktop assessment

6.1.2.3 Groundwater

Approximately 34% of municipal water supplies in Nova Scotia obtain their water from groundwater sources and 12% use a combination of groundwater and surface water (NSE 2017a). Wells in Nova Scotia are either shallow dug wells sourcing the overburden aquifers, or deeper drilled wells sourcing the bedrock aquifers. The most common water supply for homes not served by a public system is a drilled well. The Nova Scotia Department of Environment and Climate Change has developed several initiatives to protect the quality of groundwater by minimizing the potential for contamination from human activities. The department works with municipalities and stakeholders to develop source water protection plans and to delineate Protected Water Areas and Wellhead Protection Areas (WHPA) in Nova Scotia. In Nova Scotia, a minimum of three WHPA zones are recommended. Protection applied to the various zones of a designated wellhead are not particularly onerous for residential zoned properties; however, they are fairly restrictive for other uses.

The Project area is not located in a Wellhead Protection Area or a designated Protected Water Area under the *Nova Scotia Environment Act*. The nearest Wellhead Protection Area relative to the site is anticipated to be located near the Debert Industrial Park, approximately 24 km southeast of the subject property.

A query was completed using the NSE Online Well Logs Database with the NSDNR Nova Scotia Groundwater Atlas (NSDEM 2020). Records for five well logs were found in the database for wells installed near to the Project area and to the north along the Westchester Road, as shown on **Figure 5**. The wells identified ranges from 11.3 m to 62.4 m deep, with between 7 and 13.4 m of casing installed. The well logs indicated that bedrock was encountered between 4.6 and 9.1 m below ground surface. It should be noted that the information provided within the Nova Scotia Groundwater Atlas is not guaranteed for accuracy, however, the identified wells are not anticipated to be located within the PDA.

Twenty river systems are found within the Ecodistrict and the topography throughout the area provides a watershed for water features running to the north and south (NSDNR 2015). Based on this the inferred groundwater flow direction in the Project area is to the south towards the Minas Basin/Cobequid Bay.

6.1.3 Visual Environment

The existing landscape surrounding the PDA consists of a combination of rolling hills, forested areas, lakes, and open fields. There are also solitary houses and buildings to support agricultural activities located over 1 km from the nearest proposed WTG. The immediate Project site is located on an elevated area that is fairly remote. The land is largely cleared of trees and used for growing wild blueberries and therefore has a network of existing access roads throughout and impacted vegetation. Some portions of the Project site are forested near to the agricultural lands.

There are four telecommunication towers near to the Project site that are visible throughout most of the area. The trans-Canada highway (Highway 104) is also visible from the Project site to the east. The existing Nova Scotia Power transmission line running along the southwestern edge of the Project site is also visible in many nearby areas, and the nearby existing wind turbines, which are part of phase 1 of the Higgins Mountain Wind Project, are also visible in the area and can be seen from the Project site.

Figure 7 below shows photos of some of the existing visual environment at the Project site.

The Proponent has undertaken a visual assessment for the Project to assess the impact the Project would have on the visual environment. The details of this assessment are presented in **Appendix D**.

FIGURE 7 PHOTOS OF THE EXISTING VISUAL ENVIRONMENT AT THE PROJECT SITE