Appendix 2-E

Project Nujio’qonik: Baseline Ambient Air Quality Monitoring Study

Project Nujio'qonik: Baseline Ambient Air Quality Monitoring Study

Final Report

January 27, 2024

Prepared for:

World Energy GH2 LP

Prepared by:

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File: 121417575

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Executive Summary

Stantec Consulting Ltd. (Stantec) was contracted by World Energy H2 LP (WEGH2) to conduct an ambient air quality baseline study in 2023, near Stephenville, on the west coast of the Island of Newfoundland where WEGH2 is proposing to develop a new hydrogen and ammonia production facility and wind farm (Project Nujio'qonik).

This baseline study was conducted to support the ongoing planning and development of the Project, and the environmental assessment (EA). The NL Department of Environment and Climate Change (NLDECC) released the Final Environmental Impact Statement (EIS) Guidelines for the Project on December 1, 2022. The EIS Guidelines identify the information required to support the EA including baseline studies of the atmospheric environment, including air quality. The purpose of the ambient air monitoring was to provide information on the baseline conditions (i.e., existing conditions) of air quality in the vicinity of the Project as required under section 4.3.1 of the EIS Guidelines.

Air quality refers to the composition of ambient or outdoor air, including the presence and quantity of air contaminants in the atmosphere, that may have adverse effects on vegetation, wildlife, or human health. The applicable provincial ambient air quality legislation is provided in the Newfoundland and Labrador Air Pollution Control Regulations (NL APCR), amended in 2022. The Regulations contain Ambient Air Quality Standards (AAQS) for acceptable concentrations of various air contaminants over different averaging periods. Federally, the Canadian Ambient Air Quality Standards (CAAQS) were developed by the Canadian Council of Ministers of the Environment (CCME) and contain standards for managing specific air contaminants.

Baseline ambient air quality monitoring was conducted at two separate locations, one at the Stephenville Airport (SA location), and one in the community of West Bay (WB location). The monitoring completed during 2023 was split into four separate monitoring events, one in spring, two in summer, and one in fall/winter to monitor seasonable variability of contaminants. Particulate Matter less than 10 microns (PM_{10}), Particulate Matter less than 2.5 microns ($PM_{2.5}$), Nitrogen Dioxide (NO_2), and Sulphur Dioxide (SO_2) were measured at both locations. Ammonia (NH_3) was only measured at the Stephenville Airport, near the proposed ammonia facility.

PM_{10} and $PM_{2.5}$ were monitored in West Bay and at the Stephenville Airport for three consecutive 24-hour periods during June, August, and November. NO_2 and SO_2 were monitored using passive air samplers in West Bay and at the Stephenville Airport for a period of two weeks during each season (June, September, and November). NH_3 was measured using passive air samplers at the Stephenville Airport for a period of two weeks during June, August, and November. Baseline ambient air quality monitoring was conducted for these air contaminants as they are considered most relevant to characterize the baseline conditions before the construction of the wind farms and ammonia/hydrogen plant.

The results of the field monitoring at the sites, summarized in Table E.1 below, are compared to both the NL AAQS and the CAAQS in this report. The results of the field monitoring are also compared with recent ambient air quality monitoring from the most representative provincially run air monitoring station. This air monitoring station is located in Grand Falls-Windsor, approximately 220 kilometers from the Project Area. The existing conditions for air quality are characterized using a combination of publicly available data and literature, as well as the results of the ambient air monitoring that was conducted.

Table E. 1 Summary of 2023 Monitoring Program Results

Sample ID	Units	Average Concentration Measured at World Energy Site	Grand Falls-Windsor Provincial Air Monitoring Station Average Concentration during Monitoring[B]	Regulatory Criteria for the 24-hour Time Averaging Period	
				Provincial Guideline (NL AAQS)	Federal Guideline (CAAQS)
SA – PM_{10}	µg/m³	<10	11	50	-
WB – PM_{10}	µg/ m³	<15	10	50	-
SA – $PM_{2.5}$	µg/ m³	2.8	3.2	25	27
WB – $PM_{2.5}$	µg/ m³	4.7	3.2	25	27
SA – NO_2	ppb	<0.7[c]	1.1[A]	106	-
	µg/ m³	<1.3[c]		199	
WB – NO_2	ppb	<0.2[d]	1.2[A]	106	-
	µg/ m³	<0.38[d]		199	
SA – SO_2	ppb	0.2	N/A	115	-
	µg/ m³	0.5		301	
WB – SO_2	ppb	<0.2	N/A	115	-
	µg/ m³	<0.5		301	
SA – NH_3	ppb	< 0.2	N/A	144	-
	µg/ m³	<0.14		101	

Notes:

A	NO_2 data unavailable for November sampling, averages are calculated with June and September sampling.
B	Raw monitoring data from Grand Falls-Windsor provided by Barrie Lawrence of the NL ECC.
C	November sample was not blank-adjusted due to lab error, value conservatively kept in average.
D	NO_2 sample media compromised by lab, averages are calculated with June and September sampling results
SA	Stephenville Airport
WB	West Bay
"-"	Indicates no federal criteria for the 24-hour time averaging period
N/A	Indicates contaminant not monitored or data unavailable during sampling period
µg/ m³	Micrograms per cubic meter
ppb	Parts per billion
NL AAQS	Newfoundland and Labrador Ambient Air Quality Standards
CAAQS	Canadian Ambient Air Quality Standards

Averages are reported as "less than" where some of the tests were below the minimum detection limit of the laboratory

None of the measured values exceeded the NL AAQS or the CAAQS during the sampling program. The data collected during 2023 are relatively consistent with the reference values used in the EA and indicate the background concentrations used in the EA are sufficiently representative of the background air quality in the area. This baseline report presents a summary of the applicable regulations, existing air quality conditions, sampling methodology, monitoring activities, meteorological data during sampling, and a detailed discussion on the findings of the 2023 ambient air monitoring program.

Abbreviations

AAQS	Ambient Air Quality Standards
AML	Atlantic Minerals Limited
AQMS	Air Quality Management System
AZMF	Air Zone Management Framework
BV	Bureau Veritas
CAAQS	Canadian Ambient Air Quality Standards
CCME	Canadian Council of Ministers of the Environment
CO	Carbon monoxide
EA	Environmental Assessment
EIS	Environmental Impact Statement
Hi-Vol	High Volume
km	Kilometer
km/hr	Kilometers per hour
kPa	Kilopascals
m	Meter
m^3	Cubic meter
m/s	Meters per second
MSC	Meteorological Services of Canada
NAPS	National Air Pollution Surveillance
NH_3	Ammonia
NL	Newfoundland and Labrador
NL APCR	Newfoundland and Labrador Air Pollution Control Regulations
NL EEC	Newfoundland and Labrador Department of Environment and Climate Change
NPRI	National Pollutant Release Inventory
NO	Nitric oxide
NO_X	Nitrogen oxides
NO_2	Nitrogen dioxide
O_3	Ozone
$PM_{2.5}$	Particulate matter less than 2.5 micrometers in diameter
PM_{10}	Particulate matter less than 10 micrometers in diameter
ppb	Parts per billion
Project	Project Nujio'qonik
Stantec	Stantec Consulting Inc.
SO_2	Sulphur dioxide
TPM	Total particulate matter
µg/ m^3	Micrograms per cubic meter
US EPA	United States Environmental Protection Agency
WEGH2	World Energy GH2 LP

1.0 INTRODUCTION

World Energy GH2 LP (WEGH2) is proposing to develop a new hydrogen and ammonia production facility and wind farm (Project Nujio'qonik , hereafter the "Project") on the west coast of the island of Newfoundland, in the Province of Newfoundland and Labrador (NL) (Figure 1-1). The Project involves the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of two onshore wind farms and a hydrogen-ammonia production plant powered by renewable wind energy.

The Project is subject to provincial environmental assessment (EA) requirements under the NL *Environmental Protection Act* and associated Environmental Assessment Regulations. The NL Department of Environment and Climate Change (NL ECC) released the Final Environmental Impact Statement (EIS) Guidelines for the Project on December 1, 2022. The EIS Guidelines identify the information required to support the EA including baseline surveys of the terrestrial environment. As per section 4.3.1 (Atmospheric Environment) of the Guidelines, pre-construction baseline surveys for the atmospheric environment are required in suitable biophysical and socio-economic environments that could be affected by the Project. On August 22, 2023, WEGH2 filed an EIS with the NL ECC assessing potential Project and cumulative effects. It was indicated in Appendix BSA-1 Atmospheric Baseline Study of the EIS that an air quality field program was on-going and that the data would be collected and presented in a supplementary report. This baseline air quality report is being submitted as the supplementary report to satisfy that commitment.

Stantec Consulting Ltd. (Stantec) was retained by WEGH2 to conduct pre-construction surveys for each of the seasonal variations (spring, summer, and fall/winter) at the Stephenville Airport (representative of the Stephenville area near the location of the hydrogen-ammonia production plant) and in West Bay (representative of the Port au Port area, near the location of some of the wind turbine sites). This report provides baseline information on ambient air quality in the immediate area to support the Environmental Assessment (EA) of the onshore wind farms and the hydrogen-ammonia production plant.

Ambient air quality monitoring was completed during 2023 over four separate monitoring events to monitor seasonal variability of the air contaminants. Particulate Matter less than 10 microns (PM_{10}), and Particulate Matter less than 2.5 microns ($PM_{2.5}$) were measured in June, August, and November in Stephenville and West Bay. Nitrogen Dioxide (NO_2), and Sulphur Dioxide (SO_2) were measured in June, September, and November in Stephenville and West Bay. Ammonia (NH_3) was only monitored in Stephenville in June, August, and November. The ambient air monitoring locations were finalized in consultation with WEGH2, in consideration of the location of project components, sensitive receptors, best practice siting requirements for ambient monitoring and of secure locations for ambient air monitor installation. The samplers for particulate matter components were installed and scheduled to run for three periods of 24 hours during each season to allow for sufficient time to measure baseline ambient air quality levels during favourable meteorological conditions (i.e., no rain and low winds). The passive air samplers were deployed for a period of two weeks during each seasonal monitoring event. This report presents the findings of the 2023 ambient air monitoring program.

Stantec

Sensitive Receptor Location

Local Assessment Area/ Regional Assessment Area

Proposed Project Features

Wind Turbine

Hydrogen / Ammonia Plant Location

Project Area

Other Features

Trans-Canada Highway

Road

Watercourse

Waterbody

Wetland

Forested Area

N

0 12 Kilometres

(At original document size of 8.5x11)
1:600,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec

Project Location
Stephenville
NL

Prepared by MER on 2023-07-20
QR by AW on 2023-07-20

Client/Project
World Energy GH2
Project Nujio'qonik

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Figure No.
1-1

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Proposed Project Features and Location

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2.0 SCOPE AND OBJECTIVES

2.1 AMBIENT AIR QUALITY MONITORING OBJECTIVES

The objectives of the 2023 ambient air quality monitoring program were to:

- Gather project specific baseline ambient air quality data at Project locations at the Stephenville Airport and in West Bay (representative of the Port au Port area) to support the ongoing environmental assessment of the Project.
- Conduct ambient air monitoring to cover the seasonal variations – Spring (June), Summer (August), and Fall/Winter (November).
- Collect ambient monitoring data for air contaminants most likely to be emitted from the Project in notable quantities during construction or operation.

The ambient air quality monitoring program described and reported on herein was developed in consideration of the above noted objectives.

2.2 APPLICABLE REGULATIONS AND GUIDELINES

The Newfoundland and Labrador Air Pollution Control Regulations (NL APCR), published under the *Environmental Protection Act*, are used to regulate air quality in the province. The NL APCR were amended in 2022 and contain Ambient Air Quality Standards (AAQS) for acceptable concentrations of various air contaminants over periods of time (1-hour, 3-hour, 8-hour, 24-hour, and annual standards) in Schedule A of the Regulations. The AAQS published in the NL APCR are used to maintain air quality in the province by controlling/regulating the release of air contaminants from various sources to the atmosphere. This is done to ensure that any activities releasing air contaminants to the atmosphere do not cause the ambient concentrations to exceed the ambient standards, which are considered to be protective of the environment (NL ECC 2023).

Federal guidance for managing air quality is primarily through the Air Quality Management System (AQMS), developed by the Canadian Council of Ministers of the Environment (CCME) (CCME 2019). The AQMS outlines the Air Zone Management Framework (AZMF) which offers guidance on actions to be taken at the air zone level to achieve the federal Canadian Ambient Air Quality Standards (CAAQS). The CAAQS were developed by the CCME in 2013 and contain criteria for air contaminants (CCME 2022). The Standards for both the province (NL APCR) and the federal government (CAAQS) are presented in Table 2-1. The CAAQS do not contain 24-hour time averaging standards for any air contaminants beyond $PM_{2.5}$. The CAAQS for NO_2 and SO_2 are based on 1-hour or annual averaging times.

Table 2-1 Applicable Regulatory Criteria for Ambient Air Monitoring

Air Contaminant	Units	Regulatory Criteria for the 24-hour Time Averaging Period	
		Newfoundland Ambient Air Quality Standards (NL AAQS)	Canadian Ambient Air Quality Standards (CAAQS)
Particulate Matter with Aerodynamic Particle Diameter less than or equal to 2.5 microns ($PM_{2.5}$)	µg/ m³	25	27 (2020 standard) [A]
Particulate Matter with Aerodynamic Particle Diameter less than or equal to 10 microns (PM_{10})	µg/ m³	50	-
Nitrogen Dioxide (NO_2)	ppb	106	-
Sulphur Dioxide (SO_2)	ppb	115	-
Ammonia (NH_3)	ppb	144	-

Notes:
[A] Based on a 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.
µg/ m³ micrograms per cubic meter
ppb parts per billion
"-" Indicates no applicable provincial or federal criteria
Source: (GNL 2022; CCME 2022)

2.3 KEY COMPONENTS ASSESSED

Three key sets of measurements are reported:

- Meteorological data such as temperature, wind direction and windspeed, from the Stephenville Airport weather station
- Ambient concentrations of air contaminants measured during the 2023 field monitoring program at the Stephenville Airport and in West Bay
- Ambient air quality data from the provincially monitored ambient air quality station in Grand Falls-Windsor

2.3.1 Meteorology

Meteorological data to support the ambient air monitoring project have been acquired from the Meteorological Services of Canada (MSC) weather station located at the Stephenville Airport (Figure 3-1). The Stephenville Airport meteorological station is located on-site for one of the monitoring locations and West Bay is approximately 30 kilometers (km) northwest of the Stephenville Airport. The Stephenville Airport weather station only reports meteorological data, and no ambient air quality data is available from this station. Data from this location are sufficiently representative of the meteorological conditions surrounding the Project site to provide general meteorology data for the days of air quality sampling. These data are relevant to the air quality sampling events as they provide additional context in regards to the environmental conditions likely present at the ambient monitoring sites during the sampling.
For example, higher winds may explain an increased particulate matter concentration in that winds can contribute to increased fugitive dust in areas with exposed soils or other dusty materials.

The variables that are measured at the Stephenville Airport weather station are shown in Table 2-2.

Table 2-2 Variables Measured at the Stephenville Airport Weather Station

Parameter/Variable	Units
Temperature	°C
Dew Point Temperature	°C
Relative Humidity	%
Wind Direction (10's)	Degrees
Wind Speed	km/hr
Station Pressure	kPa

2.3.2 Air Contaminants of Interest

The ambient air monitoring project included monitoring of the following air contaminants at the Stephenville Airport and in West Bay by Stantec, as well as a comparison to data from the provincially run air monitoring station in Grand Falls-Windsor:

- Stephenville Airport and West Bay Field Program Monitoring
  - Particulate matter with aerodynamic particle diameter less than or equal to 10 microns (PM_{10})
    - Particulate matter of this size is a health risk as it can accumulate in the respiratory system after being inhaled (GNL 2010).
  - Particulate matter with aerodynamic particle diameter less than or equal to 2.5 microns ($PM_{2.5}$)
    - This size of particulate matter poses a greater health risk than PM_{10}, as it is small enough to lodge deeply into the lungs, and also because the smaller particles are suspended in the air for relatively long periods of time (GNL 2010).
  - Nitrogen Dioxide (NO_2)
    - A reddish-brown gas that originates from high temperature combustion of fuels in processes such as power generation, transportation, and heating (WHO 2023).
  - Sulphur Dioxide (SO_2)
    - A colourless gas that is formed when fossil fuels such as coal and oil are burned for use in heating, power generation, or in industrial uses (WHO 2023).
  - Ammonia (NH_3) – Only at Stephenville Airport
    - A colourless gas that is poisonous when inhaled in sufficient quantities. At concentrations above 50 ppm, it is accompanied by a strong odour. NH_3 combines in the atmosphere with sulphates and nitrates to form $PM_{2.5}$ (ECCC 2013).

These air contaminants were selected as they are expected to be emitted in measurable quantities during either project construction or operation and have relevant air quality criteria.

2.4 EXISTING CONDITIONS

Ambient air quality in Newfoundland and Labrador is monitored at six air monitoring stations throughout the province, through a joint effort between the NL ECC and the ECCC's National Air Pollution Surveillance (NAPS) network. The parameters monitored at each air monitoring station vary (NL ECC 2023). Major industrial operators such as NL Hydro, Iron Ore Company of Canada, and Corner Brook Pulp and Paper are also required to monitor air quality near their operations, which are then audited on a routine basis by the NL ECC. The NL ECC summarizes the air quality data collected over the year for each air monitoring station, releasing an annual air quality report. The most recently released report includes data for the years of 2021 and 2022.

The provincial air quality monitoring station that is considered most representative to baseline conditions in the vicinity of the Project Area is located in Grand Falls-Windsor, approximately 220 km from the Project Area. There is a NAPS air monitoring station located in Corner Brook, which is closer to the Project; however, this station is adjacent to the Corner Brook Pulp and Paper Mill which would be expected to contribute to the air contaminant levels that would not be representative to the background concentration of the Project Area. The Grand Falls-Windsor air monitoring station monitors the ambient levels of the following air contaminants on a continuous basis:

- Sulphur Dioxide (SO_2)
- Nitrogen Oxides (NO_X), Nitrogen Dioxide (NO_2), Nitric Oxide (NO)
- Carbon Monoxide (CO)
- Ground-level Ozone (O_3)
- Particulate matter less than 2.5 microns ($PM_{2.5}$)
- Particulate matter less than 10 microns (PM_{10})

There was one exceedance of the NL APCR standards at the Grand Falls-Windsor air monitoring station for $PM_{2.5}$ in July of 2022, where the 24-hour maximum was recorded at 34.4 µg/m³ (NL ECC 2023). The standards for PM_{10} were also exceeded one day in June of 2022, where the 24-hour maximum concentration was 55.8 µg/m³ (NL ECC 2023). There was a forest fire in central Newfoundland in July of 2022, south of the air monitoring station that affected air quality in the region, potentially contributing to the $PM_{2.5}$ exceedance (NL ECC 2023). There were also 21 exceedances in 2021, and six exceedances in 2022 of the 8-hour averaging period O_3 standard at the Grand Falls-Windsor air monitoring station (NL ECC 2023). There were no exceedances of any other measured air contaminants at Grand Falls-Windsor during 2021 or 2022. Monthly averages and 24-hour maximums for the air contaminants measured in the baseline monitoring program from the Grand Falls-Windsor NAPS air monitoring station are summarized in Tables 2-3 to 2-5 below.

Table 2-3 NO_x and NO_2 Concentrations - Grand Falls-Windsor Air Monitoring Station - 2021 and 2022

Year	Month	Measured Hours	Average Concentration (ppb)		24-Hour Maximum (ppb)	
			NO_X	NO_2	NO_X	NO_2
2021	January	-	-	-	-	-
	February	-	-	-	-	-
	March	724	1.7	1.0	5.2	2.4
	April	718	1.4	1.1	3.1	2.2
	May	743	1.5	1.0	3.3	1.9
	June	718	1.8	1.0	4.8	2.5
	July	744	1.6	0.9	2.2	1.1
	August	739	1.4	0.7	2.8	1.4
	September	717	1.5	0.8	2.4	1.4
	October	742	2.4	1.4	4.2	2.4
	November	720	2.3	1.4	3.7	2.2
	December	743	1.6	0.9	3.4	2.5
	Annual	7308	1.7	1.0	5.2	2.5
2022	January	741	3.2	2.2	7.0	4.6
	February	672	3.2	2.0	6.3	3.9
	March	740	3.0	2.0	5.1	3.7
	April	710	3.9	2.6	6.2	4.3
	May	743	2.7	1.8	4.8	3.5
	June	719	2.2	1.4	3.8	2.0
	July	379	2.0	1.2	3.1	1.5
	August	731	1.8	1.2	2.4	1.8
	September	720	1.8	1.2	2.6	1.6
	October	659	2.5	1.6	3.9	2.3
	November	0	-	-	-	-
	December	562	3.1	1.8	4.1	3.2
	Annual	7376	2.7	1.8	7.0	4.6
Regulatory Criteria for the 24-hour Time Averaging Period		**NL AAQS**	N/A	N/A	N/A	106

Legend:
NL AAQS Newfoundland Ambient Air Quality Standards
N/A No applicable regulatory criteria
"-" Indicates months where data was not available
Ppb Parts per billion
Source: 2022 Ambient Air Monitoring Report (NL ECC 2023)

Table 2-4 SO_2 Concentrations - Grand Falls-Windsor Air Monitoring Station - 2021 and 2022

Year	Month	Measured Hours	Average Concentration (ppb)	24-Hour Maximum (ppb)
			SO_2	SO_2
2021	January	651	0.6	1.0
	February	671	0.6	1.0
	March	740	0.8	1.4
	April	716	0.7	1.4
	May	506	0.4	0.8
	June	715	0.5	0.9
	July	744	0.6	1.3
	August	739	0.6	1.1
	September	718	0.5	0.9
	October	737	0.7	1.3
	November	716	0.8	1.5
	December	744	0.9	1.7
	Annual	8397	0.7	1.7
2022	January	740	0.6	1.5
	February	15	0.2	0.0
	March	700	0.6	1.5
	April	714	0.8	1.5
	May	372	0.9	1.4
	June	719	1.4	1.7
	July	378	1.2	2.2
	August	652	0.4	0.7
	September	705	0.7	1.1
	October	722	0.6	1.2
	November	69	0.8	1.1
	December	0	-	-
	Annual	5786	0.8	2.2
Regulatory Criteria for the 24-hour Time Averaging Period		**NL AAQS**	N/A	115

Legend:
NL AAQS Newfoundland Ambient Air Quality Standards
N/A No applicable regulatory criteria
"-" Indicates months where data was not available
Ppb Parts per billion
Source: 2022 Ambient Air Monitoring Report (NL ECC 2023)

Table 2-5 $PM_{2.5}$ and PM_{10} Concentrations - Grand Falls-Windsor Air Monitoring Station - 2021 and 2022

Year	Month	Average Concentration (µg/ m³)		24-Hour Maximum (µg/ m³)	
		$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}
2021	January	5.5	11.6	15.1	23.3
	February	5.1	11.5	12.9	29.2
	March	5.6	13.1	9.4	30.7
	April	5.0	12.6	11.4	25.1
	May	4.0	10.5	11.7	23.4
	June	3.9	12.0	10.4	30.3
	July	4.5	11.4	20.5	32.2
	August	5.7	13.2	10.6	23.8
	September	3.2	8.9	5.5	16.0
	October	4.4	10.2	10.1	18.3
	November	3.5	8.0	7.5	16.3
	December	3.5	8.4	6.6	22.9
	Annual	4.5	11.0	20.5	32.2
2022	January	5.1	11.0	15.0	24.2
	February	4.0	9.2	6.7	22.4
	March	4.1	10.1	7.0	21.8
	April	4.2	10.0	7.9	20.7
	May	3.5	10.7	5.3	20.0
	June	4.2	14.1	7.9	**55.8**
	July	5.7	12.7	**34.3**	49.8
	August	5.0	11.4	9.8	20.4
	September	3.3	9.4	6.4	20.3
	October	4.7	12.7	12.1	28.7
	November	5.0	9.8	19.3	28.9
	December	6.1	13.0	13.1	26.2
	Annual	4.6	11.2	**34.3**	**55.8**
Regulatory Criteria for the 24-hour Time Averaging Period	**NL AAQS**	N/A	N/A	25	50
	CAAQS	N/A	N/A	27	N/A

Legend:
Bold values are an exceedance of the applicable regulatory criteria
NL AAQS Newfoundland Ambient Air Quality Standards
CAAQS Canadian Ambient Air Quality Standards
N/A No applicable regulatory criteria
µg/m³ Micrograms per cubic meter
Source: 2022 Ambient Air Monitoring Report (NL ECC 2023)

The NL Annual Ambient Air Monitoring Reports also include the results from the monitoring conducted by industrial facilities in the province. One Industrial facility that is part of the Industrial Monitoring Network, CEMEX Materials Newfoundland Inc. (CEMEX)'s Lower Cove Quarry, formerly owned by Atlantic Minerals Limited (AML), is located on the Port-au-Port Peninsula, adjacent (< 1 km away) to the Project area where the Port-au-Port Windfarm would be developed. The CEMEX Quarry has continuous ambient monitors installed on the west side of the mining operation for $PM_{2.5}$ and Total Particulate Matter (TPM), that have been monitoring air contaminants released from the mining operations since 2017 (NL ECC 2023). There was one $PM_{2.5}$ exceedance in March of 2021, and an exceedance of TPM in May of 2021. In 2022, there were no $PM_{2.5}$ exceedances of the NL AAQS or the CAAQS. The NL AAQS 24-hour maximums for TPM were exceeded five times over a six-month period, in May (1), June (1), August (2), and October (1), during 2022. The exceedances were expected to be associated with stockpiling and port activities at the CEMEX Quarry (NL ECC 2023). Monthly averages and 24-hour maximum concentrations of TPM and $PM_{2.5}$ are presented for 2021 and 2022 from the CEMEX continuous monitor in Table 2-6 below.

Table 2-6 $PM_{2.5}$ and TPM Concentrations - CEMEX Air Monitoring Station - 2021 and 2022

Year	Month	Average Concentration (µg/ m³)		24-Hour Maximum (µg/ m³)	
		$PM_{2.5}$	**TPM**	**$PM_{2.5}$**	**TPM**
2021	January	3.6	4.7	7.0	16.0
	February	4.2	5.6	9.8	14.3
	March	7.0	7.2	**43.6**	21.7
	April	3.4	6.4	4.6	81.3
	May	-	10.4	-	**152.2**
	June	3.6	11.4	13.7	64.1
	July	3.0	7.6	9.9	33.2
	August	4.4	10.5	8.8	51.8
	September	3.4	9.2	5.3	73.4
	October	2.8	7.7	6.0	54.7
	November	4.4	6.7	16.2	17.9
	December	4.6	5.8	7.8	28.5
	Annual	4.2	7.6	**43.6**	**152.2**

Table 2-6 $PM_{2.5}$ and TPM Concentrations - CEMEX Air Monitoring Station - 2021 and 2022

Year	Month	Average Concentration (µg/ m³)		24-Hour Maximum (µg/ m³)	
		$PM_{2.5}$	TPM	$PM_{2.5}$	TPM
2022	January	5.3	7.0	10.8	18.1
	February	4.4	7.2	11.4	21.0
	March	3.3	5.4	6.0	9.5
	April	3.9	6.0	6.3	16.7
	May	4.2	10.0	8.0	**135.8**
	June	5.1	14.1	9.9	**130.5**
	July	5.7	17.7	12.1	56.0
	August	6.1	14.9	10.9	**183.4**
	September	3.9	8.6	5.8	26.0
	October	4.8	13.0	10.4	**160.2**
	November	3.5	9.2	8.5	58.0
	December	3.5	7.0	7.3	96.9
	Annual	4.5	9.1	12.1	**183.4**
Regulatory Criteria for the 24-hour Time Averaging Period	NL AAQS	N/A	N/A	25	120
	CAAQS	N/A	N/A	27	N/A

Legend:
Bold values are an exceedance of the applicable regulatory criteria
NL AAQS Newfoundland Ambient Air Quality Standards
CAAQS Canadian Ambient Air Quality Standards
N/A No applicable regulatory criteria
"-" Indicates months where data was not available
µg/ m³ Micrograms per cubic meter
Source: 2022 Ambient Air Monitoring Report (NL ECC 2023)

There are no large industrial sources of emissions in the Project Area. Based on a review of the ECCC National Pollutant Release Inventory (NPRI) reporting data for the Island of Newfoundland, the nearest sources of emissions to the Project Area include the CEMEX Lower Cove Quarry, the Corner Brook Pulp and Paper Mill, and the Newfoundland and Labrador Hydro Ramea Diesel Generating Station. Based on recent NPRI reporting data, air contaminants that are released in substantive quantities from these facilities include combustion gases (NO_x) and particulate matter (PM_{10} and $PM_{2.5}$) (ECCC 2023). NPRI defines "substantive quantities" as the masses of air contaminants released to the atmosphere that may impact air quality within a 5 km radius of the source. The air contaminants that were measured in the baseline monitoring are those that may have substantive quantities for which there are ambient air quality criteria (i.e., objectives, guidelines, or standards) adopted by provincial (NL and Ontario) and/or national regulatory agencies.

3.0 METHODOLOGY

The methodology for the 2023 ambient air quality monitoring program includes the following, i) pre-monitoring planning, ii) ambient air monitoring locations, iii) study team, and iv) sampling methods.

3.1 PRE-MONITORING PLANNING

The objective of this baseline study on air quality is to characterize the baseline conditions regarding ambient (i.e., outdoor) air quality (i.e., current, existing conditions) near the Project Area. The existing conditions for air quality were characterized prior to field monitoring using a combination of publicly available data and literature. The most recently available ambient air quality data from the ECCC's NAPS Program (2019–2021), the provincial air quality annual report (2021-2022), and air contaminant release information from the NPRI were obtained and used in the assessment to determine which air contaminants to monitor.

As per the provincial EIS Guidelines (NL ECC 2022), the baseline study includes a review of the ambient air quality data that was collected, including particulate matter.

The ambient air quality monitoring program considered the following air contaminants:

- Nitrogen dioxide (NO_2)
- Sulphur dioxide (SO_2)
- Ammonia (NH_3)
- Particulate matter (PM_{10}) with particles having an aerodynamic diameter less than 10 µm
- Particulate matter ($PM_{2.5}$) with particles having an aerodynamic diameter less than 2.5 µm

Baseline ambient air quality monitoring was conducted for these contaminants as they are considered most relevant to characterize the baseline conditions before the construction of the wind farms and ammonia/hydrogen plant. Sampling was conducted at the Stephenville Airport and in West Bay in order to quantity the seasonal variation (spring, summer, fall/winter) of the air contaminants (PM_{10}, $PM_{2.5}$, NO_2, SO_2, and NH_3). NH_3 was only sampled at the Stephenville Airport due to its close proximity to the proposed hydrogen / ammonia plant were there would be potential for release of NH_3 during operation.

The PM_{10} High Volume (Hi-Vol) monitor and $PM_{2.5}$ PQ200 monitors were installed and scheduled to run for three periods of 24 hours over 1 week during each monitoring event to allow for sufficient time to confirm baseline ambient air quality levels during favourable meteorological conditions (i.e., no rain and low winds). The passive air samplers for NO_2, SO_2, and NH_3 were deployed for a period of two weeks during each monitoring event.

3.1.1 Site Selection

The planned Project development includes the construction of two winds farms, one on the Port au Port Peninsula, and one in the Anguille Mountains, called Codroy, a hydrogen/ammonia plant in Stephenville, transmission lines to connect the windfarms to the hydrogen / ammonia plant, as well as upgrades to the existing port in Stephenville. The proposed hydrogen/ammonia plant and export facilities at the Port of Stephenville are located approximately 5 km west of the Town of Stephenville. The Port au Port Wind Farm (comprised of portions of the Port au Port Peninsula extending eastward to Port au Port East) is located west and north of Stephenville. The Codroy Wind Farm is located 75 km south of Stephenville.

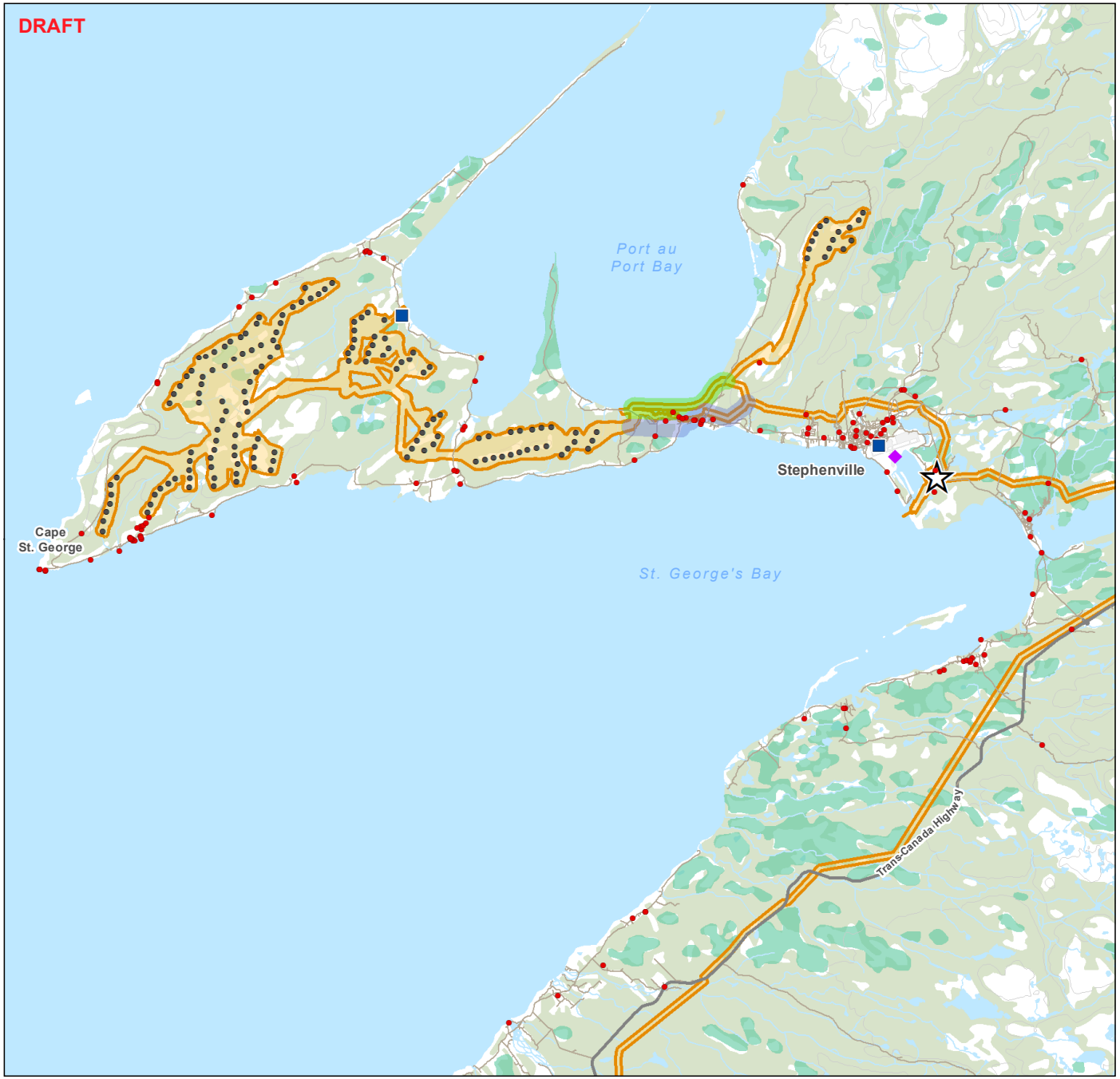
The Port au Port Peninsula is connected to the mainland of Newfoundland by a narrow isthmus, with the peninsula bounded by the Gulf of St. Lawrence to the west, St. George's Bay to the south and Port au Port Bay to the northwest. As of 2021, there were approximately 4,734 people living on the Port au Port Peninsula with 227 living in the community of West Bay, where sampling was completed (Statistics Canada 2023). Apart from the CEMEX Lower Cove Quarry, there are little other sources of industrial air contaminants on the Peninsula. Current air quality would therefore be characteristic of a rural area, with the primary source of air contaminants coming from personal vehicles, home heating and other residential activities. The planned substation for the Port au Port Wind Farm will be constructed close to West Bay, along with many planned turbine locations; therefore, receptors in West Bay could experience elevated air quality contaminants from construction.

According to the 2021 census, the Town of Stephenville had a population of 7,344, a 1% increase from 2016, and has 3,685 private residences (Statistics Canada 2023). There are more industrial sources of air contaminants in Stephenville, including the Stephenville port, the airport, a smolt hatchery, and a metal recycling plant.

The Stephenville Airport monitoring location was chosen due to its close proximity to the proposed Hydrogen/Ammonia Production and Storage Facility, while the West Bay location was chosen due to its proximity to the Port au Port Wind Farm. The exact locations were determined based on site access and security, power availability and siting criteria. Sites were selected in consideration of the CCME NAPS Guideline requirements.

3.2 AMBIENT AIR MONITORING LOCATIONS

The sampling locations for the 2023 ambient air quality monitoring field program included one location at the Stephenville airport and one location in West Bay (Figure 3-1). At the Stephenville airport, the monitors were set up on a patch of grass outside the airport terminal adjacent to the tarmac. There is very little flight traffic or ground vehicle traffic in or out of the Stephenville Airport; however, periods of higher-than-normal air traffic could influence the monitoring results. Photos of the monitoring setup at the Stephenville airport are provided in Appendix D. In the community of West Bay, the monitors were set up in an open backyard of a residential property on Route 463 along the coast, with ample space to install the samplers away from trees and other obstructions.



Stantec

Other Features
- Trans-Canada Highway
- Road
- Contour (100 m)
- Watercourse
- Waterbody
- Wetland
- Forested Area

- Air Quality Monitoring Location
- Sensitive Receptor
- Stephenville Airport Weather Station

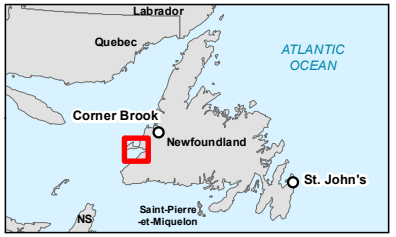
Proposed Project Features
- Turbine Location
- Hydrogen / Ammonia Plant Location
- Project Area

Port au Port Interconnection
- Proposed Route
- Alternate Route

N

0 4 8 Kilometres
(At original document size of 8.5x11)
1:375,000

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: Stantec, World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec



Project Location
Stephenville
NL

Prepared by MB/AC on 1/22/2024

Client/Project
World Energy GH2
Project Nujio'qonik

121418050_CH06

Figure No.
3-1

2023 WEGH2 Air Quality Monitoring Locations

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3.3 EQUIPMENT SUMMARY AND SAMPLING METHODS

Table 3-1 provides a summary of the instrumentation and filter media used for monitoring at each of the sampling locations.

Table 3-1 Summary of Instrumentation and Filter Media used during Monitoring Program

Air Contaminant	Sampler	Filter Media
PM_{10}	Tisch Environmental TE-6070 mass-flow PM_{10} High Volume Sampler	Pre-weighted 8″ x 10″ quartz filter paper
$PM_{2.5}$	BGI/Mesa Labs PQ 200 Ambient Air Particulate Sampler	Pre-weighted 37 mm glass fiber filter
NO_2	Passive Air Sampler Device	Cartridge
SO_2		
NH_3		

Prior to the initiation of sampling events, each sampling device was inspected, cleaned, and calibrated as per the manufacturers and sampling method specifications. Calibration dates for each monitoring event are provide in Table 3-2. Calibration records are provided in Appendix B.

Table 3-2 Sampler Calibrations

Sampler ID	Monitoring Event	Location	Calibration Date
PM_{10}-977	Spring	Stephenville Airport	June 26, 2023
PM_{10}-976	Spring	West Bay	June 26, 2023
PQ200-1392	Spring	Stephenville Airport	June 26, 2023
PQ200-1747	Spring	West Bay	June 26, 2023
PM_{10}-977	Summer	West Bay	August 14, 2023
PM_{10}-976	Summer	Stephenville Airport	August 14, 2023
PQ200-1392	Summer	West Bay	August 14, 2023
PQ200-1747	Summer	Stephenville Airport	August 14, 2023
PM_{10}-977	Fall / Winter	Stephenville Airport	November 6, 2023
PM_{10}-976	Fall / Winter	West Bay	November 6, 2023
PQ200-1392	Fall / Winter	West Bay	November 6, 2023
PQ200-1747	Fall / Winter	Stephenville Airport	November 6, 2023

3.3.1 PM_{10}

A Tisch Environmental TE-6070 mass-flow PM_{10} high-volume sampler was used to collect the samples over a 24-hour period using the US EPA National Primary and Secondary Ambient Air Quality Standards, Appendix M – Reference Method for the Determination of Particulate Matter as PM_{10} in the Atmosphere (US EPA 1997). A pre-weighted 8″ x 10″ quartz filter paper was used to sample the air contaminant. Prior to setting up each of the PM_{10} samples, the flow rate was set to the manufacturers and sampling method specifications. After each of the sampling events, the flow rates were used to determine the volumes and validity of the samples for each monitoring event. The sampler was set up and ran for three 24-hours periods during each monitoring event, with filters collected and stored in envelopes after each 24-hour sampling period.

3.3.2 $PM_{2.5}$

A BGI/Mesa Labs PQ 200 Ambient Air Particulate Sampler was used to collect the $PM_{2.5}$ samples over a 24-hour period. The $PM_{2.5}$ samples were collected following the US EPA Reference Method Designation: EPA RFPS-0498-116 FRM for $PM_{2.5}$ (US EPA 1998). A pre-weighted 37 mm glass fiber filter was used to sample the air contaminant. The $PM_{2.5}$ samplers were setup according to the sampling method specifications. After each sampling event the average temperature, flow, and pressure was used to determine the volume and validity of the samples for each monitoring event. The samplers were set up and ran for three 24-hour periods during each monitoring event, with filters collected and changed each day.

The filters for PM_{10} and $PM_{2.5}$ samples were collected and sent for analysis to AGAT laboratories, located in Dartmouth, Nova Scotia. The full laboratory analysis report is provided in Appendix A.

3.3.3 Gaseous Compounds

A passive air sampler device was setup approximately 1.5 meters (m) off the ground to collect the sample. The NO_2, SO_2, and NH_3 samples that were collected were deployed for a period of two-weeks. The NO_2, SO_2, and NH_3 samples were sent to Bureau Veritas (BV) laboratory in Edmonton, Alberta for analysis. The full laboratory report is provided in Appendix A.

4.0 AMBIENT AIR QUALITY MONITORING RESULTS

The measured data presented for the monitoring events include:

- meteorological data acquired from the MSC weather station at the Stephenville Airport.
- the ambient air quality data collected at the Stephenville Airport and in West Bay for the 2023 ambient air quality field program. The laboratory analysis reports are included in Appendix A.
- $PM_{2.5}$, PM_{10}, and NO_2 average concentrations from the NAPS air monitoring station in Grand Falls-Windsor during the same timeframe as the monitoring conducted by Stantec. This raw monitoring data was provided by Barrie Lawrence of the NL ECC. SO_2 and NH_3 were not measured at the Grand Falls-Windsor air monitoring station during this time. NO_2 concentrations from the Grand Falls-Windsor air monitoring station are not available for the November monitoring period.

4.1 METEOROLOGICAL DATA

A summary of the meteorological conditions from the Stephenville Airport ECCC weather station during each sampling event in 2023 are presented in Table 4-1 and Table 4-2, for sampling conducted at the Stephenville Airport and in West Bay, respectively.

In the event of an exceedance of an ambient air quality criterion, the meteorological data would be reviewed in more detail, as needed, to see if there is any correlation between wind direction and the higher concentrations.

Table 4-1 Meteorological Conditions - Stephenville Airport Sampling 2023

Sampling Date	June 26, 2023	June 27, 2023	June 28, 2023	August 15, 2023	August 16, 2023	August 17, 2023	November 6, 2023	November 7, 2023	November 8, 2023
Sample Start	**06/26 13:30**	**06/27 14:00**	**06/28 14:45**	**08/15 16:59**	**08/16 17:15**	**08/17 17:20**	**11/06 13:55**	**11/07 14:10**	**11/08 14:37**
Sample Stop	**06/27 13:30**	**06/28 14:00**	**06/29 14:45**	**08/16 16:59**	**08/17 17:15**	**08/18 17:20**	**11/07 13:55**	**11/08 14:10**	**11/09 14:37**
Wind Direction (blowing from)	**Frequency (%)**								
North	4	0	8	17	17	4	0	0	8
North-northeast	4	4	0	0	13	13	4	0	21
Northeast	4	13	0	0	17	13	8	0	21
East-northeast	4	21	0	0	0	8	8	13	38
East	38	29	0	0	0	13	13	58	13
East-southeast	13	4	4	0	0	0	0	13	0
Southeast	0	0	0	4	0	0	0	13	0
South-southeast	0	4	21	4	0	25	4	4	0
South	4	17	21	4	0	4	0	0	0
South-southwest	4	0	8	4	4	4	0	0	0
Southwest	8	0	8	0	4	0	0	0	0
West-southwest	8	4	4	0	29	4	0	0	0
West	8	0	17	0	4	8	33	0	0
West-northwest	0	0	4	8	4	0	25	0	0
Northwest	0	0	0	17	0	0	4	0	0
North-northwest	0	0	4	33	8	4	0	0	0
Meteorological Variable	**Value**								
Average Wind Speed m/s (km/hr)	5.1 (18.2)	4.2 (15.0)	2.6 (9.3)	3.4 (12.4)	2.9 (10.3)	3.5 (12.8)	5.2 (18.9)	6.4 (23.1)	6.1 (21.9)
Average Temperature (ºC)	13.4	17.5	20.8	16.2	15.7	17.2	1.9	6.6	5.3
Minimum Temperature (ºC)	9.3	14.4	18.1	13.8	9.8	11.9	-1.6	4.2	2.6
Maximum Temperature (ºC)	18.8	22.8	23.6	19.8	22.8	23.1	5.0	9.9	8.6
Relative Humidity (%)	93.0	81.3	82.6	86.0	83.2	80.7	62.0	80.4	85.2

Notes:
m/s Meters per second km/hr Kilometers per hour
Source: (ECCC 2023b)

The average wind speed during the monitoring period in the Spring was 4.0 m/s, 3.3 m/s in the summer, and 5.9 m/s in the fall/winter. The predominant wind direction varied greatly during the monitoring periods.

Table 4-2 Meteorological Conditions – West Bay Sampling 2023

Sampling Date	June 26, 2023	June 27, 2023	June 28, 2023	August 15, 2023	August 16, 2023	August 17, 2023	November 6, 2023	November 7, 2023	November 8, 2023
Sample Start	**06/26 18:00**	**06/27 18:10**	**06/28 18:20**	**08/15 18:11**	**08/16 18:18**	**08/17 18:25**	**11/06 17:15**	**11/07 18:05**	**11/08 18:35**
Sample Stop	**06/27 18:00**	**06/28 18:10**	**06/29 18:20**	**08/16 18:11**	**08/17 18:18**	**08/18 18:25**	**11/07 17:15**	**11/08 18:05**	**11/09 18:35**
Wind Direction (blowing from)	**Frequency (%)**								
North	4	0	8	17	17	4	0	0	25
North-northeast	4	0	0	0	13	13	4	0	21
Northeast	4	4	0	0	17	13	8	4	17
East-northeast	4	8	0	0	0	8	8	17	29
East	38	67	0	0	0	13	13	67	4
East-southeast	13	17	4	0	0	4	0	13	0
Southeast	0	0	0	4	0	0	8	0	0
South-southeast	0	0	25	4	0	25	8	0	0
South	4	0	25	4	0	4	0	0	0
South-southwest	4	0	4	4	4	4	0	0	0
Southwest	8	0	8	0	4	0	0	0	0
West-southwest	8	0	4	0	33	0	0	0	0
West	8	0	21	0	4	8	33	0	0
West-northwest	0	0	0	8	4	0	13	0	0
Northwest	0	0	0	17	0	0	4	0	0
North-northwest	0	0	0	33	4	4	0	0	4

Table 4-2 Meteorological Conditions – West Bay Sampling 2023

Sampling Date	June 26, 2023	June 27, 2023	June 28, 2023	August 15, 2023	August 16, 2023	August 17, 2023	November 6, 2023	November 7, 2023	November 8, 2023
Sample Start	**06/26 18:00**	**06/27 18:10**	**06/28 18:20**	**08/15 18:11**	**08/16 18:18**	**08/17 18:25**	**11/06 17:15**	**11/07 18:05**	**11/08 18:35**
Sample Stop	**06/27 18:00**	**06/28 18:10**	**06/29 18:20**	**08/16 18:11**	**08/17 18:18**	**08/18 18:25**	**11/07 17:15**	**11/08 18:05**	**11/09 18:35**
Wind Direction (blowing from)	**Frequency (%)**								
Meteorological Variable	**Value**								
Average Wind Speed m/s (km/hr)	5.4 (19.3)	3.2 (11.6)	3.1 (11.2)	3.3 (12.0)	2.8 (10.2)	3.5 (12.7)	5.0 (18.0)	6.4 (22.9)	5.8 (21.0)
Average Temperature (ºC)	13.3	18.6	20.8	16.3	15.7	17.3	2.0	7.1	4.4
Minimum Temperature (ºC)	9.3	14.4	18.1	13.8	9.8	11.9	-1.6	9.9	6.9
Maximum Temperature (ºC)	18.4	22.8	23.6	19.8	22.8	23.1	5.0	9.9	6.9
Relative Humidity (%)	78.8	82.7	81.6	85.5	83.6	80.3	63.4	85.2	82.0

Notes:
m/s Meters per second km/hr Kilometers per hour
Source: (ECCC 2023b)

The average wind speed during the monitoring period in the Spring was 3.9 m/s, 3.2 m/s in the summer, and 5.8 m/s in the fall/winter. The predominant wind direction varied greatly during the monitoring periods.

Wind roses, showing the direction and speed of wind at the Stephenville Meteorological Station for each sampling day in 2023 are presented in Appendix C.

4.2 SAMPLING RESULTS

Ambient Air Monitoring was completed throughout 2023 in four separate field monitoring events. PM_{10} and $PM_{2.5}$ were monitored in West Bay and at the Stephenville Airport for three consecutive 24-hour periods during June, August, and November. NO_2 and SO_2 were monitored using passive air samplers in West Bay and at the Stephenville Airport for a period of two weeks during each season (June, September, and November). NH_3 was measured using passive air samplers at the Stephenville Airport for a period of two weeks during June, August, and November.

The results of the ambient air monitoring for PM_{10}, $PM_{2.5}$, NO_2, SO_2, and NH_3 are displayed in Tables 4-3 to 4-8 and evaluated against the criteria for each contaminant in the NL AAQS and CAAQS. Ambient air monitoring data was also obtained from the most representative NAPS ambient air quality monitoring station in Grand Falls-Windsor which is approximately 220 km east-northeast from the proposed Project. The Grand Falls-Windsor air monitoring station measures the following air contaminants: SO_2, nitric oxide (NO), NO_2, NO_X, CO, $PM_{2.5}$, PM_{10}, and O_3. Data was obtained from the NAPS Grand Falls-Windsor air monitoring station during the timeframe of Stantec's ambient air monitoring and is compared to the results in the Tables below.

4.2.1 Particulate Matter smaller than 10 microns (PM_{10})

Particulate matter with particles less than 10 microns in diameter (PM_{10}) was sampled following the methodology outlined in the US EPA National Primary and Secondary Ambient Air Quality Standards, Appendix M – Reference Method for the Determination of Particulate Matter as PM_{10} in the Atmosphere (US EPA 1997).

A summary of the ambient air monitoring results for PM_{10} for 2023 is presented in Tables 4-3 and 4-4 for Stephenville Airport and West Bay, respectively, along with corresponding regulatory criteria. Monitoring results from the NAPS air monitoring station in Grand Falls-Windsor during the timeframe of Stantec's ambient air monitoring are also presented for comparison.

Table 4-3 Ambient Air Monitoring Results for PM_{10} – Stephenville Airport 2023

Air Contaminant	Units	Regulatory Criteria for the 24-hour Time Averaging Period		Sampling Date									Average
		Newfoundland Ambient Air Quality Standards (NL AAQS)	Canadian Ambient Air Quality Standards (CAAQS)	26-June- 2023	27-June- 2023	28-June- 2023	15-August- 2023	16-August- 2023	17-August- 2023	6- November- 2023	7- November- 2023	8- November- 2023	
Sampling Period	Start			06/26 13:30	06/27 14:00	06/28 14:45	08/15 16:59	08/16 17:15	08/17 17:20	11/06 13:55	11/07 14:10	11/08 14:37	
	End			06/27 13:30	06/28 14:00	06/29 14:45	08/16 16:59	08/17 17:15	08/18 17:20	11/07 13:55	11/08 14:10	11/09 14:37	
Volume of Air Sampled	m^3	-	-	1700	1650	1677	1766	1646	1643	1744	1626	1661	**1679**
Stephenville Airport Particulate Matter less than 10 Microns (PM_{10})	$\mu g/m^3$	50	-	<3[A]	6	9	4[C]	5	8	27	18	7	**<10**
Grand Falls-Windsor Particulate Matter less than 10 Microns (PM_{10})[B]	$\mu g/m^3$	50	-	10	12	13	5	6	9	11	22	7	**11**

Notes:
Averages are reported as "less than" where some of the tests were below the minimum detection limit of the laboratory
"-" No applicable regulatory criteria or not applicable
A Below the laboratory's reported detection limit of 3 $\mu g/m^3$
B Raw data from the Grand Falls-Windsor air monitoring station during the conducted monitoring were provided by Barrie Lawrence of the NL ECC.
C $PM_{2.5}$ measured on August 15 at this location was slightly higher than the PM_{10} sample, indicating that some particulate could have been lost from the PM_{10} sample during sample collection, shipping, or lab handling on the PM_{10} sample.
$\mu g/m^3$ Micrograms per cubic meter
m^3 Cubic meters

Table 4-4 Ambient Air Monitoring Results for PM_{10} – West Bay 2023

Air Contaminant	Units	Regulatory Criteria for the 24-hour Time Averaging Period		Sampling Date									Average
		Newfoundland Ambient Air Quality Standards (NL AAQS)	Canadian Ambient Air Quality Standards (CAAQS)	26-June- 2023	27-June- 2023	28-June- 2023	15-August- 2023	16-August- 2023	17-August- 2023	6- November- 2023	7- November- 2023	8- November- 2023	
Sampling Period	Start			06/26 18:00	06/27 18:10	06/28 18:20	08/15 18:11	08/16 18:18	08/17 18:25	11/06 17:15	11/07 18:05	11/08 18:35	
	End			06/27 18:00	06/28 18:10	06/29 18:20	08/16 18:11	08/17 18:18	08/18 18:25	11/07 17:15	11/08 18:05	11/09 18:35	
Volume of Air Sampled	m³	-	-	1693	1644	1627	1659	1667	1803	1745	1645	1697	**1687**
West Bay Particulate Matter less than 10 Microns (PM_{10})	µg/m³	50	-	9	18	36	14	<3[A]	<3[A]	16	6	28	**<15**
Grand Falls-Windsor Particulate Matter less than 10 Microns (PM_{10})[B]	µg/m³	50	-	12	11	13	5	6	9	11	22	5	**10**

Notes:
Averages are reported as "less than" where some of the tests were below the minimum detection limit of the laboratory
"-" No applicable regulatory criteria or not applicable
A Below the laboratory's reported detection limit of 3 µg/m³
B Raw data from the Grand Falls-Windsor air monitoring station during the conducted monitoring were provided by Barrie Lawrence of the NL ECC.
µg/m³ Micrograms per cubic meter
m³ Cubic meters

A total of eighteen samples (nine at each location) of PM_{10} were collected to represent the seasonal variation of PM_{10} from June to November 2023 at the Stephenville Airport and in West Bay. Three samples were collected at each monitoring location for each season, June (spring), August (summer), November (fall/winter) over a period of 24-hours.

The results of the 2023 PM_{10} ambient air monitoring at the Stephenville airport ranged from <3 µg/m³ (non-detect) to 27 µg/m³. The measured concentrations ranged from <3 µg/m³ (non-detect) to 9 µg/m³ for the spring, 4 µg/m³ to 8 µg/m³ for the summer, and 7 µg/m³ to 27 µg/m³ for the fall/winter. The average measured concentration of PM_{10} at the Stephenville Airport was <10 µg/m³. The results of the ambient air monitoring for PM_{10} were all below the threshold limits in the NL AAQS of 50 µg/m³ and typically were relatively consistent with NAPS monitoring 24-hour averages at Grand Falls-Windsor.

The results of the 2023 PM_{10} ambient air monitoring at West Bay ranged from <3 µg/m³ (non-detect) to 36 µg/m³. The measured concentrations ranged from 9 µg/m³ to 36 µg/m³ for the spring, <3 µg/m³ (non-detect) to 14 µg/m³ for the summer, and 6 µg/m³ to 28 µg/m³ for the fall/winter. The average measured concentration of PM_{10} in West Bay was <15 µg/m³. The results of the ambient air monitoring for PM_{10} were below the threshold limits in the NL AAQS of 50 µg/m³ and trended relatively consistent on average with the NAPS monitoring 24-hour averages at Grand Falls-Windsor.

4.2.2 Particulate Matter smaller than 2.5 microns ($PM_{2.5}$)

The results for particulate matter with particles less than 2.5 microns in diameter ($PM_{2.5}$) were collected following the US EPA Reference Method Designation: EPA RFPS-0498-116 FRM for $PM_{2.5}$ (US EPA 1998).

A summary of the ambient air monitoring results for $PM_{2.5}$ for 2023 is presented in Tables 4-5 and 4-6 for Stephenville Airport and West Bay, respectively, along with corresponding regulatory criteria. Monitoring results from the NAPS air monitoring station in Grand Falls-Windsor during the timeframe of Stantec's ambient air monitoring are also presented for comparison.

Table 4-5 Ambient Air Monitoring Results for $PM_{2.5}$ – Stephenville Airport 2023

Air Contaminant	Units	Regulatory Criteria for the 24-hour Time Averaging Period		Sampling Date									Average
		Newfoundland Ambient Air Quality Standards (NL AAQS)	Canadian Ambient Air Quality Standards (CAAQS)	26-June- 2023	27-June- 2023	28-June- 2023	15-August- 2023	16-August- 2023	17-August- 2023	6- November- 2023	7- November- 2023	8-November-2023	
Sampling Period	Start			06/26 13:30	06/27 14:00	06/28 14:45	08/15 16:59	08/16 17:15	08/17 17:20	11/06 13:55	11/07 14:10	11/08 14:37	
	End			06/27 13:30	06/28 14:00	06/29 14:45	08/16 16:59	08/17 17:15	08/18 17:20	11/07 13:55	11/08 14:10	11/09 14:37	
Volume of Air Sampled	m^3	-	-	24	24	23	26	24	24	28	24	24	**25**
Stephenville Airport Particulate Matter less than 2.5 Microns ($PM_{2.5}$)	$\mu g/m^3$	25	27	2.9	1.7	5.2	4.7	2.6	1.3	4.0	2.1	0.8	**2.8**
Grand Falls-Windsor Particulate Matter less than 2.5 Microns ($PM_{2.5}$)[A]	$\mu g/m^3$	25	27	2.8	2.9	3.5	2.3	1.9	2.9	3.1	5.8	3.3	**3.2**

Notes:
"-" No applicable regulatory criteria or not applicable
A Raw data from the Grand Falls-Windsor air monitoring station during the conducted monitoring were provided by Barrie Lawrence of the NL ECC.
$\mu g/m^3$ Micrograms per cubic meter
m^3 Cubic meters

Table 4-6 Ambient Air Monitoring Results for $PM_{2.5}$ – West Bay 2023

Air Contaminant	Units	Regulatory Criteria for the 24-hour Time Averaging Period		Sampling Date									Average
		Newfoundland Ambient Air Quality Standards (NL AAQS)	Canadian Ambient Air Quality Standards (CAAQS)	26-June- 2023	27-June- 2023	28-June- 2023	15-August- 2023	16-August- 2023	17-August- 2023	6- November- 2023	7- November- 2023	8- November- 2023	
Sampling Period	Start			06/26 18:00	06/27 18:10	06/28 18:20	08/15 18:11	08/16 18:18	08/17 18:25	11/06 17:15	11/07 18:05	11/08 18:35	
	End			06/27 18:00	06/28 18:10	06/29 18:20	08/16 18:11	08/17 18:18	08/18 18:25	11/07 17:15	11/08 18:05	11/09 18:35	
Volume of Air Sampled	m^3	-	-	24	23	24	23	24	24	25	24	24	**24**
West Bay Particulate Matter less than 2.5 Microns ($PM_{2.5}$)	$\mu g/m^3$	25	27	1.7	1.7	5.5	1.7	2.5	2.9	4.8	5.4	16.1	**4.7**
Grand Falls-Windsor Particulate Matter less than 2.5 Microns ($PM_{2.5}$)[A]	$\mu g/m^3$	25	27	3.1	2.6	3.9	2.2	2.0	2.9	3.2	6.0	2.7	**3.2**

Notes:
"-" No applicable regulatory criteria or not applicable
A Raw data from the Grand Falls-Windsor air monitoring station during the conducted monitoring were provided by Barrie Lawrence of the NL ECC.
$\mu g/m^3$ Micrograms per cubic meter
m^3 Cubic meters

A total of eighteen samples of $PM_{2.5}$ were collected to represent the seasonal variation of $PM_{2.5}$ from June to November 2023 at the Stephenville Airport and in West Bay. Three samples were collected at each monitoring location for each season, June (spring), August (summer), November (fall/winter) over a period of 24-hours. The results of the ambient air monitoring for $PM_{2.5}$ were compared to the NL AAQS and the monitoring data from the Grand Falls-Windsor NAPS air monitoring station.

The results of the 2023 ambient air monitoring of $PM_{2.5}$ at the Stephenville airport ranged from 0.8 µg/m³ to 5.2 µg/m³. The measured concentrations ranged from 1.7 µg/m³ to 5.2 µg/m³ for the spring, 1.3 µg/m³ to 4.7 µg/m³ for the summer, and 0.8 µg/m³ to 4.0 µg/m³ for the fall/winter. The average measured concentration of $PM_{2.5}$ at the Stephenville Airport was 2.8 µg/m³. The results of the ambient air monitoring for $PM_{2.5}$ were below the threshold limits in the NL AAQS of 25 µg/m³3 and trended close to the NAPS monitoring 24-hour averages from Grand Falls-Windsor. The average measured concentration of 2.8 µg/m³ also trends below the 2021 and 2022 annual averages of 4.2 and 4.5 µg/m³ measured nearby at the CEMEX air monitoring station on the Port au Port peninsula, summarized in Section 2.4 of this report.

The results of the 2023 ambient air monitoring of $PM_{2.5}$ at West Bay ranged from 1.7 µg/m³ to 16.1 µg/m³. The measured concentrations ranged from 1.7 µg/m³ to 5.5 µg/m³ for the spring, 1.7 µg/m³ to 2.9 µg/m³ for the summer, and 4.8 µg/m³ to 16.1 µg/m³ for the fall/winter. The average measured concentration of $PM_{2.5}$ in West Bay was 4.7 µg/m³. The results of the ambient air monitoring for $PM_{2.5}$ were below the threshold limits in the NL AAQS of 25 µg/m³ and trended close to the NAPS monitoring 24-hour averages from Grand Falls-Windsor. The average measured concentration of 4.7 µg/m³ also trends closely to the 2021 and 2022 annual averages of 4.2 and 4.5 µg/m³ measured nearby at the CEMEX air monitoring station on the Port au Port peninsula, summarized in Section 2.4 of this report.

4.2.3 Nitrogen Dioxide, Sulphur Dioxide, and Ammonia

A summary of the ambient air monitoring results for NO_2, SO_2, and NH_3 for 2023 is presented in Tables 4-7 and 4-8 for Stephenville Airport and West Bay, respectively, along with corresponding regulatory criteria. Monitoring results from the NAPS air monitoring station in Grand Falls-Windsor during the timeframe of Stantec's ambient air monitoring are also presented for comparison. During this period, SO_2 and NH_3 were not monitored at the Grand-Falls Windsor air monitoring station. Results for NO_2 from the Grands Falls-Windsor period are not available for the November sampling.

Table 4-7 Ambient Air Monitoring Results for NO_2, SO_2, and NH_3 – Stephenville Airport 2023

Air Contaminant	Units	Regulatory Criteria for the 24-hour Time Averaging Period		Sampling Date				Average
		Newfoundland Ambient Air Quality Standards (NL AAQS)	Canadian Ambient Air Quality Standards (CAAQS)	June 2023	August 2023	September 2023	November 2023	
Sampling Period	Start			June 26, 2023 13:30	August 14, 2023 13:30	September 19, 2023 12:12	November 6, 2023 13:30	
	End			July 10, 2023 13:15	August 28, 2023 15:00	October 3, 2023 14:30	November 21, 2023 11:20	
Stephenville Nitrogen Dioxide (NO_2)	ppb	106	-	<0.2[A]	N/A	0.7	1.3[D]	**<0.7**
Grand Falls-Windsor NO_2[E]	ppb	106	-	0.7	N/A	1.5	N/A	**1.1[C]**
Stephenville Sulphur Dioxide (SO_2)	ppb	115	-	0.3	N/A	0.1	0.1	**0.2**
Stephenville Ammonia (NH_3)	ppb	144	-	<0.2[A]	<0.2[A]	N/A	<0.1[B]	**<0.2**

Notes:
Averages are reported as "less than" where some of the tests were below the minimum detection limit of the laboratory
"-" No applicable regulatory criteria.
N/A Contaminant not sampled or NAPS data not available
A Measured concentration was below the laboratory's reportable detection limit of 0.2
B Measured concentration was below the laboratory's reportable detection limit of 0.1
C NO_2 data unavailable for November sampling, average is calculated with June and September sampling.
D November blank NO_2 sample was compromised by the lab, value presented was not blank adjusted.
E Raw data from the Grand Falls-Windsor air monitoring station during the conducted monitoring were provided by Barrie Lawrence of the NL ECC.
Ppb Parts per billion

Table 4-8 Ambient Air Monitoring Results for NO_2, and SO_2 – West Bay 2023

Air Contaminant	Units	Regulatory Criteria for the 24-hour Time Averaging Period		Sampling Date			Average
		Newfoundland Ambient Air Quality Standards (NL AAQS)	Canadian Ambient Air Quality Standards (CAAQS)	June 2023	September 2023	November 2023	
Sampling Period	Start			June 26, 2023 17:30	September 19, 2023 13:40	November 6, 2023 16:16	
	End			July 10, 2023 15:00	October 3, 2023 16:00	November 21, 2023 12:51	
West Bay Nitrogen Dioxide (NO_2)	ppb	106	-	<0.2[A]	<0.1[B]	NR	<0.2
Grand Falls-Windsor NO_2[D]				0.7	1.6	N/A	1.2[C]
West Bay Sulphur Dioxide (SO_2)	ppb	115	-	0.3	0.2	<0.1[B]	<0.2

Notes:
Averages are reported as "less than" where some of the tests were below the minimum detection limit of the laboratory
"-" No applicable regulatory criteria.
NR NO_2 sample was compromised in the lab during sample preparation and is not reportable.
N/A NAPS data not available
A Measured concentration was below the laboratory's reportable detection limit of 0.2
B Measured concentration was below the laboratory's reportable detection limit of 0.1
C NO_2 data unavailable for November sampling, average is calculated with June and September sampling.
D Raw data from the Grand Falls-Windsor air monitoring station during the conducted monitoring were provided by Barrie Lawrence of the NL ECC.
Ppb Parts per billion

A total of 15 passive air samplers were deployed to represent the seasonal variation of NO_2, SO_2, and NH_3 from June to November 2023 at the Stephenville Airport and in West Bay.

NO_2, SO_2, and NH_3 were collected at the Stephenville Airport monitoring location for each season, June (spring), August/September/October (summer), November (fall/winter) over a period of 2-weeks.

NO_2 and SO_2 was collected at the West Bay monitoring location for each season, June (spring), September/October(summer), November (fall/winter) over a period of 2-weeks. The NO_2 sample collected in West Bay during November was compromised in the BV laboratory during sample preparation and therefore was unable to be analyzed, leaving two valid NO_2 samples for West Bay. The November NO_2 blank sample was also compromised in the BV laboratory during sample preparation and a blank correction was not performed on the NO_2 November Stephenville Airport sample. The NO_2 November Airport results (uncorrected) were still conservatively presented; however, the result could be lower than 1.3 ppb had it been blank adjusted. Resampling during winter conditions will occur in February, 2024 for the Stephenville Airport NO_2 sample, the West Bay NO_2 sample, and associated NO_2 blank, to have proper blank-adjusted data for each site. A revised report will be issued once these results are available and analyzed.

The results of the ambient air monitoring for NO_2, SO_2, and NH_3 were compared to the regulatory criteria in the NL AAQS and the NO_2 results were compared to Grand Falls-Windsor NAPS air monitoring station results for the same time period. SO_2 and NH_3 were not monitored at the Grand Falls-Windsor NAPS air monitoring station during this time period. NO_2 results from the Grand Falls-Windsor air monitoring station are also unavailable for November.

The results of the 2023 ambient air monitoring at the Stephenville airport ranged from <0.2 ppb (non-detect) to 1.3 ppb for NO_2, 0.1 ppb to 0.3 ppb for SO_2, and were all non-detects for NH_3. The average measured concentrations at the Stephenville Airport were <0.7 pbb for NO_2, 0.2 ppb for SO_2, and <0.2 for NH_3. The measured concentrations for NO_2 were <0.2 ppb (non-detect) for the spring, 0.7 ppb for the summer, and 1.3 ppb for the fall/winter. As previously noted, the values for the November NO_2 sample were not blank-adjusted. The measured concentrations for SO_2 were 0.3 ppb for the spring, 0.1 ppb for the summer, and 0.1 ppb for the fall/winter. The measured concentrations for NH_3 were non-detects in all three seasons. The seasonal high was measured in the fall/winter for NO_2 and in the spring for SO_2.

NO_2, SO_2, and NH_3 were measured over a period of 2-weeks however the regulatory criteria is based on a 24-hour period. As the 2-week average samples are well below the 24-hour regulatory criteria, it is not likely that the 24-hour criteria would have been exceeded during the sampling periods. The results of the ambient air monitoring for NO_2, SO_2, and NH_3 were therefore considered to be below the threshold limits in the NL AAQS of 106 ppb for NO_2, 115 ppb for SO_2, and 144 ppb for NH_3. The average measured concentrations of NO_2 at the Grand Falls-Windsor NAPS air monitoring station were 0.7 ppb in June and 1.5 ppb in September, both trending above the concentrations measured by Stantec. The average measured concentration of SO_2 of 0.2 ppb is below the average annual concentrations measured at the Grand Falls-Windsor air monitoring station in 2021 and 2022 of 0.7 and 0.8 ppb respectively.

The results of the 2023 ambient air monitoring in West Bay were all non-detects for NO_2 and ranged from <0.1 ppb (non-detect) to 0.3 ppb for SO_2. The average measured concentrations in West Bay were <0.2 ppb for NO_2, and <0.2 ppb for SO_2. The measured concentrations for NO_2 were non-detects for the spring and summer, while the fall/winter sample was compromised at the laboratory. The measured concentrations for SO_2 were 0.3 ppb for the spring, 0.2 ppb for the summer, and <0.1 ppb (non-detect) for the fall/winter. The seasonal high was measured in the spring for SO_2, similar to the Stephenville Airport.

NO_2 and SO_2 were measured over a period of two weeks; however, the regulatory criteria is based on a 24-hour period. As the two week average samples are well below the 24-hour regulatory criteria it is not likely that the 24-hour criteria would have been exceeded during the sampling periods. The results of the ambient air monitoring for NO_2 and SO_2 were therefore considered to be below the threshold limits in the NL AAQS of 106 ppb for NO_2 and 115 ppb for SO_2. The average measured concentrations of NO_2 at Grand Falls-Windsor NAPS air monitoring station were 0.7 in June and 1.6 ppb in September, both trending above the concentrations measured by Stantec. The average measured concentration of SO_2 of <0.2 ppb is below the average annual concentrations measured at the Grand Falls-Windsor air monitoring station in 2021 and 2022 of 0.7 and 0.8 ppb respectively.

5.0 SUMMARY AND DISCUSSION OF RESULTS

Sampling was conducted at the Stephenville Airport and in West Bay in order to measure the seasonal variation (spring, summer, fall/winter) of the air contaminants (PM_{10}, $PM_{2.5}$, NO_2, SO_2, and NH_3. NH_3 was only sampled at the Stephenville Airport)).

A total of eighteen samples of PM_{10} were collected at the Stephenville Airport and in West Bay. Three samples were collected at each monitoring location for each season, June (spring), August (summer), November (fall/winter) over a period of 24-hours.

- The results of the 2023 ambient air monitoring for PM_{10} at the Stephenville airport ranged from <3 µg/m³ (non-detect) to 27 µg/m³ and the average was <10 µg/m³.
- The results of the 2023 ambient air monitoring for PM_{10} in West Bay ranged from <3 µg/m³ (non-detect) to 36 µg/m³ and the average was <15 µg/m³.
- The results of the 2023 ambient air monitoring at the provincially run Grand Falls-Windsor NAPS air monitoring station ranged from 5 µg/m³ to 22 µg/m³ and the average was 11 µg/m³.

All PM_{10} samples were therefore below the threshold limits in the NL AAQS of 50 µg/m³.

A total of eighteen samples of $PM_{2.5}$ were collected at the Stephenville Airport and in West Bay. Three samples were collected at each monitoring location for each season, June (spring), August (summer), November (fall/winter) over a period of 24-hours.

- The results of the 2023 ambient air monitoring at the Stephenville airport ranged from 0.8 µg/m³ to 5.2 µg/m³ and the average was 2.8 µg/m³.
- The results of the 2023 ambient air monitoring at West Bay ranged from 1.7 µg/m³ to 16.1 µg/m³ and the average was 4.7 µg/m³.
- The results of the 2023 ambient air monitoring at the provincially run Grand Falls-Windsor NAPS air monitoring station ranged from 1.9 µg/m³ to 6.0 µg/m³ and the average was 3.2 µg/m³.

All $PM_{2.5}$ samples were therefore below the threshold limits in the NL AAQS of 25 µg/m³.

A total of 15 badges were deployed from June to November 2023 at the Stephenville Airport and in West Bay.

- The results of the 2023 ambient air monitoring at the Stephenville airport ranged from <0.2 ppb (non-detect) to 1.3 ppb for NO_2, 0.1 ppb to 0.3 ppb for SO_2, and were all non-detects for NH_3.
- The results of the 2023 ambient air monitoring in West Bay were all non-detects for NO_2 and ranged from <0.1 ppb (non-detect) to 0.3 ppb for SO_2.

NO_2, SO_2, and NH_3 are measured over a period of two weeks and the regulatory criteria is based on a 24-hour period. As the two week sample is well below the 24-hour regulatory criteria, it is not likely that the 24-hour criteria would have been exceeded during the sampling periods. The results of the ambient air monitoring for NO_2, SO_2, and NH_3 were therefore considered to be below the threshold limits in the NL AAQS of 106 ppb for NO_2, 115 ppb for SO_2, and 144 for NH_3.

The data collected during the 2023 monitoring field program are relatively consistent with the background concentration values used in the EA to predict ground level concentrations during the operation phase of the Project. Both the concentration data collected during the field program and the background concentration values used in the EA were well below respective regulatory criteria, with the average concentration values collected at each of the stations for each species being lower than the background concentration values used in the EA. This indicates that the background concentrations used in the EA are sufficiently representative of the background air quality in the area.

6.0 REFERENCES

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APPENDIX A

Laboratory Analysis Reports

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: STANTEC CONSULTING LTD
P.O. BOX 38212
DARTMOUTH, NS B3B1X2
(902) 468-7777
ATTENTION TO: Emma MacNeil
PROJECT: 121417575
AGAT WORK ORDER: 23X043584
OCCUPATIONAL HYGIENE REVIEWED BY: Ashleigh Dussault, Inorganics Laboratory Supervisor
DATE REPORTED: Jul 25, 2023
PAGES (INCLUDING COVER): 6
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23X043584

PROJECT: 121417575

CLIENT NAME: STANTEC CONSULTING LTD

ATTENTION TO: Emma MacNeil

SAMPLING SITE:

SAMPLED BY:

Stantec - Particulate - PM10

DATE RECEIVED: 2023-07-05

DATE REPORTED: 2023-07-25

Parameter	Unit	G / S	RDL	PM10-976-2023-06-26 Air 2023-06-26 5119421	PM10-977-2023-06-26 Air 2023-06-26 5119429	PM10-976-2023-06-27 Air 2023-06-27 5119432	PM10-977-2023-06-27 Air 2023-06-27 5119433	PM10-976-2023-06-28 Air 2023-06-28 5119436	PM10-977-2023-06-28 Air 2023-06-28 5119437
Particulate - PM10	µg/m3		3	9	<3	18	6	36	9
Volume of air sampled - PM10	m3			1693.437	1699.485	1644.292	1649.683	1627.039	1676.982

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5119421-5119437 Volume of air sampled is provided by the client. AGAT is not responsible for any effect on the data related to information supplied by the client.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By: Ashleigh Dussault

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 23X043584

PROJECT: 121417575

CLIENT NAME: STANTEC CONSULTING LTD

ATTENTION TO: Emma MacNeil

SAMPLING SITE:

SAMPLED BY:

Stantec - Particulate - PM2.5

DATE RECEIVED: 2023-07-05

DATE REPORTED: 2023-07-25

Parameter	Unit	G / S	RDL	PQ200-1392-2023-06-26 Air 2023-06-26 5119430	PQ200-1747-2023-06-26 Air 2023-06-26 5119431	PQ200-1392-2023-06-27 Air 2023-06-27 5119434	PQ200-1747-2023-06-27 Air 2023-06-27 5119435	PQ200-1392-2023-06-28 Air 2023-06-28 5119438	PQ200-1747-2023-06-28 Air 2023-06-28 5119439
Particulate PM 2.5	ug/m3		0.5	2.9	1.7	1.7	1.7	5.2	5.5
Volume of air sampled - PM2.5	m3			23.99382	24.18408	23.58807	23.41581	23.26817	23.58807

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5119430-5119439 Volume of air sampled is provided by the client. AGAT is not responsible for any effect on the data related to information supplied by the client.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By: Ashleigh Dussault

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

Method Summary

CLIENT NAME: STANTEC CONSULTING LTD

AGAT WORK ORDER: 23X043584

PROJECT: 121417575

ATTENTION TO: Emma MacNeil

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Occupational Hygiene Analysis			
Particulate - PM10	INOR-121-6041	EPA Method 5	GRAVIMETRIC
Volume of air sampled - PM10			
Particulate PM 2.5	AQM-43-16002	NIOSH-0500	N/A
Volume of air sampled - PM2.5			

Your Project #: 121417575
Site#: 2023/06/26 - 2023/07/10
Site Location: World Energy Passive Monotoring Project
Coding # NSD016400

Attention: VICKI CORNING

STANTEC CONSULTING LTD
845 Prospect Street
Fredericton, NB
CANADA E3B 2T7

Report Date: 2023/07/28
Report #: R3373022
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C355776
Received: 2023/07/20, 13:30

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NH3 by Passive Sampler	1	2023/07/26	N/A	PTC SOP-00157	ASTM D6919
NO2 Passive Analysis	2	2023/07/26	2023/07/28	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2023/07/24	2023/07/28	PTC SOP-00149	Passive SO2 in ATM

Remarks:

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Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of the samples provided by the Client using the testing methodology referenced in this report.

Measurement Uncertainty has not been accounted for when stating conformity to any referenced standard. Interpretation and use of the test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. When sampling is not conducted by Bureau Veritas, results apply only to the sample(s) as received. Bureau Veritas is not responsible for the accuracy or any data impacts that result from the information provided by the customer or on the clients behalf by their agent.
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Results relate only to the items tested.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Delma Elefante
Customer Service Associate
31 Jul 2023 08:12:49

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Customer Service Passives,
Email: PassiveAir@bureauveritas.com
Phone# (780) 378-8500

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Bureau Veritas Job #: C355776
Report Date: 2023/07/28

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Sampler Initials: MA

RESULTS OF CHEMICAL ANALYSES OF AIR

Bureau Veritas ID		BVE733	BVE740		
Sampling Date		2023/06/26 13:30	2023/06/26 13:30		
	UNITS	BAD-AIRPORT-2023-06-26	BAD-WB-2023-06-26	RDL	QC Batch
Passive Monitoring					
Ammonia by Passive Sampler	ppb	<0.2	N/A	0.2	B047952
Calculated NO2	ppb	<0.2	<0.2	0.2	B047884
Calculated SO2	ppb	0.3	0.3	0.2	B042896

RDL = Reportable Detection Limit
N/A = Not Applicable

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GENERAL COMMENTS

Results relate only to the items tested.

Bureau Veritas Edmonton: 6744 - 50th Street T6B 3M9 Telephone (780) 378-8500 Fax (780) 378-8699

Bureau Veritas Job #: C355776
Report Date: 2023/07/28

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Sampler Initials: MA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B042896	OZ	Spiked Blank	Calculated SO2			99	%	90 - 110
B042896	OZ	Method Blank	Calculated SO2		<0.1		ppb	
B047884	SDK	Spiked Blank	Calculated NO2			102	%	90 - 110
B047884	SDK	Method Blank	Calculated NO2		<0.1		ppb	
B047952	SDK	Spiked Blank	Ammonia by Passive Sampler			99	%	90 - 110
B047952	SDK	Method Blank	Ammonia by Passive Sampler		<0.1		ppb	
B047952	SDK	RPD [BVE733-01]	Ammonia by Passive Sampler		NC		%	N/A

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

Bureau Veritas Edmonton: 6744 - 50th Street T6B 3M9 Telephone (780) 378-8500 Fax (780) 378-8699

Bureau Veritas Job #: C355776
Report Date: 2023/07/28

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Sampler Initials: MA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Yang Liu

Yang Liu, Laboratory Supervisor

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CLIENT NAME: STANTEC CONSULTING LTD
P.O. BOX 38212
DARTMOUTH, NS B3B1X2
(902) 468-7777
ATTENTION TO: Emma MacNeil
PROJECT: 121417575
AGAT WORK ORDER: 23X062204
OCCUPATIONAL HYGIENE REVIEWED BY: Ashleigh Dussault, Inorganics Laboratory Supervisor
DATE REPORTED: Sep 12, 2023
PAGES (INCLUDING COVER): 6
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.
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- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.
- For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories

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Dartmouth, Nova Scotia
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TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23X062204

PROJECT: 121417575

CLIENT NAME: STANTEC CONSULTING LTD

ATTENTION TO: Emma MacNeil

SAMPLING SITE:

SAMPLED BY:

Stantec - Particulate - PM10

DATE RECEIVED: 2023-08-28

DATE REPORTED: 2023-09-12

Parameter	Unit	G / S	RDL	PM10-976-2023-08-15 5242745	PM10-977-2023-08-15 5242747	PM10-976-2023-08-16 5242748	PM10-977-2023-08-16 5242749	PM10-976-2023-08-17 5242750	PM10-977-2023-08-17 5242751
SAMPLE DESCRIPTION:				08-15	08-15	08-16	08-16	08-17	08-17
SAMPLE TYPE:				Air	Air	Air	Air	Air	Air
DATE SAMPLED:				2023-08-15	2023-08-15	2023-08-16	2023-08-16	2023-08-17	2023-08-17
Particulate - PM10	µg/m3		3	4	14	5	<3	8	<3
Volume of air sampled - PM10	m3			1765.900	1658.718	1645.986	1666.535	1643.256	1803.454

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5242745-5242751 Volume of air sampled is provided by the client. AGAT is not responsible for any effect on the data related to information supplied by the client.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By: Ashleigh Dussault

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23X062204

PROJECT: 121417575

CLIENT NAME: STANTEC CONSULTING LTD

ATTENTION TO: Emma MacNeil

SAMPLING SITE:

SAMPLED BY:

Stantec - Particulate - PM2.5

DATE RECEIVED: 2023-08-28

DATE REPORTED: 2023-09-12

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: PQ200-1392-2023-08-14 SAMPLE TYPE: Air DATE SAMPLED: 2023-08-14 5242753	SAMPLE DESCRIPTION: PQ200-1747-2023-08-14 SAMPLE TYPE: Air DATE SAMPLED: 2023-08-14 5242754	SAMPLE DESCRIPTION: PQ200-1392-2023-08-15 SAMPLE TYPE: Air DATE SAMPLED: 2023-08-15 5242755	SAMPLE DESCRIPTION: PQ200-1747-2023-08-15 SAMPLE TYPE: Air DATE SAMPLED: 2023-08-15 5242756	SAMPLE DESCRIPTION: PQ200-1392-2023-08-16 SAMPLE TYPE: Air DATE SAMPLED: 2023-08-16 5242757	SAMPLE DESCRIPTION: PQ200-1747-2023-08-16 SAMPLE TYPE: Air DATE SAMPLED: 2023-08-16 5242758
Particulate PM 2.5	ug/m3		0.5	1.7	4.7	2.5	2.6	2.9	1.3
Volume of air sampled - PM2.5	m3			23.31218	25.54307	23.60614	23.45312	23.86071	23.61576

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5242753-5242758 Volume of air sampled is provided by the client. AGAT is not responsible for any effect on the data related to information supplied by the client.
Filters ID 5242756 and 5242758 have been received with a tear.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By: Ashleigh Dussault

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
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Method Summary

CLIENT NAME: STANTEC CONSULTING LTD

AGAT WORK ORDER: 23X062204

PROJECT: 121417575

ATTENTION TO: Emma MacNeil

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Occupational Hygiene Analysis			
Particulate - PM10	INOR-121-6041	EPA Method 5	GRAVIMETRIC
Volume of air sampled - PM10			
Particulate PM 2.5	AQM-43-16002	NIOSH-0500	N/A
Volume of air sampled - PM2.5			

Your Project #: 121417575
Site#: 2023/08/14 - 2023/08/28
Site Location: World Energy Passive Monotoring Project

Attention: EMMA MACNEIL

STANTEC CONSULTING LTD
845 Prospect Street
Fredericton, NB
CANADA E3B 2T7

Report Date: 2023/09/22
Report #: R3399503
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C371646
Received: 2023/09/12, 10:52

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NH3 by Passive Sampler	1	2023/09/18	N/A	PTC SOP-00157	ASTM D6919

Remarks:

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Results relate only to the items tested.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

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Email: PassiveAir@bureauveritas.com
Phone# (780) 378-8500

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Bureau Veritas Job #: C371646
Report Date: 2023/09/22

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Sampler Initials: MA

RESULTS OF CHEMICAL ANALYSES OF AIR

Bureau Veritas ID		BYT641		
Sampling Date		2023/08/14 00:00		
	UNITS	**NH3-2023-08-14-SA**	**RDL**	**QC Batch**
Passive Monitoring				
Ammonia by Passive Sampler	ppb	<0.2	0.2	B111910
RDL = Reportable Detection Limit				

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GENERAL COMMENTS

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Bureau Veritas Job #: C371646
Report Date: 2023/09/22

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Sampler Initials: MA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B111910	SDK	Spiked Blank	Ammonia by Passive Sampler			97	%	90 - 110
B111910	SDK	Method Blank	Ammonia by Passive Sampler		<0.1		ppb	

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Bureau Veritas Job #: C371646
Report Date: 2023/09/22

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Sampler Initials: MA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Steven Gloux, Senior Analyst

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Your Project #: 121417575
Site#: 2023/09/19 - 2023/10/03
Site Location: World Energy Passive Monotoring Project

Attention: VICKI CORNING

STANTEC CONSULTING LTD
845 Prospect Street
Fredericton, NB
CANADA E3B 2T7

Report Date: 2023/11/23
Report #: R3430935
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C392901
Received: 2023/11/14, 08:43

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2023/11/17	2023/11/22	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2023/11/21	2023/11/22	PTC SOP-00149	Passive SO2 in ATM

Remarks:

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* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Bureau Veritas Job #: C392901
Report Date: 2023/11/23

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Sampler Initials: MA

RESULTS OF CHEMICAL ANALYSES OF AIR

Bureau Veritas ID		CEL106	CEL116		
Sampling Date		2023/09/19 12:12	2023/09/19 13:40		
	UNITS	SV AIRPORT	93 MAIN WEST BAY	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	0.7	<0.1	0.1	B206731
Calculated SO2	ppb	0.1	0.2	0.1	B206581
RDL = Reportable Detection Limit					

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GENERAL COMMENTS

Results relate only to the items tested.

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Bureau Veritas Job #: C392901
Report Date: 2023/11/23

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Sampler Initials: MA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B206581	OZ	Spiked Blank	Calculated SO2	2023/11/22		100	%	90 - 110
B206581	OZ	Method Blank	Calculated SO2	2023/11/22	<0.1		ppb	
B206731	S1T	Spiked Blank	Calculated NO2			98	%	90 - 110
B206731	S1T	Method Blank	Calculated NO2		<0.1		ppb	

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Bureau Veritas Job #: C392901
Report Date: 2023/11/23

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Sampler Initials: MA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Steven Gloux, Senior Analyst

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Bureau Veritas Edmonton: 6744 - 50th Street T6B 3M9 Telephone (780) 378-8500 Fax (780) 378-8699

AGAT Laboratories

11 Morris Drive, Unit 122
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TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: STANTEC CONSULTING LTD
P.O. BOX 38212
DARTMOUTH, NS B3B1X2
(902) 468-7777
ATTENTION TO: Emma MacNeil
PROJECT: 121417575
AGAT WORK ORDER: 23X093448
OCCUPATIONAL HYGIENE REVIEWED BY: Ashleigh Dussault, Inorganics Laboratory Supervisor
DATE REPORTED: Dec 01, 2023
PAGES (INCLUDING COVER): 6
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*Notes

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- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.
- For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.

AGAT Laboratories

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CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
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Certificate of Analysis

AGAT WORK ORDER: 23X093448

PROJECT: 121417575

CLIENT NAME: STANTEC CONSULTING LTD

ATTENTION TO: Emma MacNeil

SAMPLING SITE:

SAMPLED BY:

Stantec - Particulate - PM10

DATE RECEIVED: 2023-11-15

DATE REPORTED: 2023-12-01

Parameter	Unit	G / S	RDL	PM10-001-2023-11-06	PM10-001-2023-11-07	PM10-001-2023-11-08	PM10-002-2023-11-06	PM10-002-2023-11-07	PM10-002-2023-11-08
SAMPLE DESCRIPTION:				11-06	11-07	11-08	11-06	11-07	11-08
SAMPLE TYPE:				Air	Air	Air	Air	Air	Air
DATE SAMPLED:				2023-11-06	2023-11-07	2023-11-08	2023-11-06	2023-11-07	2023-11-08
				5461638	5461646	5461647	5461648	5461649	5461650
Particulate - PM10	µg/m3		3	27	18	7	16	6	28
Volume of air sampled - PM10	m3			1744.069	1626.104	1660.951	1744.818	1644.729	1697.410

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5461638-5461650 Volume of air sampled is provided by the client. AGAT is not responsible for any effect on the data related to information supplied by the client.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By: Ashleigh Dussault

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23X093448

PROJECT: 121417575

CLIENT NAME: STANTEC CONSULTING LTD

ATTENTION TO: Emma MacNeil

SAMPLING SITE:

SAMPLED BY:

Stantec - Particulate - PM2.5

DATE RECEIVED: 2023-11-15

DATE REPORTED: 2023-12-01

Parameter	Unit	G / S	RDL	PQ200-1392-2023-11-06 Air 2023-11-06 5461651	PQ200-1392-2023-11-07 Air 2023-11-07 5461674	PQ200-1392-2023-11-08 Air 2023-11-08 5461675	PQ200-1747-2023-11-06 Air 2023-11-06 5461676	PQ200-1747-2023-11-07 Air 2023-11-07 5461677	PQ200-1747-2023-11-08 Air 2023-11-08 5461678
SAMPLE DESCRIPTION:									
SAMPLE TYPE:									
DATE SAMPLED:									
Particulate PM 2.5	ug/m3		0.5	4.8	5.4	16.1	4.0	2.1	0.8
Volume of air sampled - PM2.5	m3			24.91363	24.15173	24.18169	27.82331	24.05589	23.98167

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5461651-5461678 Volume of air sampled is provided by the client. AGAT is not responsible for any effect on the data related to information supplied by the client.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By: Ashleigh Dussault

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

Method Summary

CLIENT NAME: STANTEC CONSULTING LTD

AGAT WORK ORDER: 23X093448

PROJECT: 121417575

ATTENTION TO: Emma MacNeil

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Occupational Hygiene Analysis			
Particulate - PM10	INOR-121-6041	EPA Method 5	GRAVIMETRIC
Volume of air sampled - PM10			
Particulate PM 2.5	AQM-43-16002	NIOSH-0500	N/A
Volume of air sampled - PM2.5			

Your P.O. #: 500.300.304
Your Project #: 121417575
Site#: 2023/11/06 - 2023/11/21
Site Location: World Energy Passive Monotoring Project

Attention: VICKI CORNING

STANTEC CONSULTING LTD
845 Prospect Street
Fredericton, NB
CANADA E3B 2T7

Report Date: 2024/01/24
Report #: R3455001
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3A0081
Received: 2023/12/06, 10:30

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NH3 by Passive Sampler	1	2023/12/08	2023/12/08	PTC SOP-00157	ASTM D6919
NO2 Passive Analysis	2	2023/12/11	2023/12/15	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2023/12/08	2023/12/15	PTC SOP-00149	Passive SO2 in ATM

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025:2017 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as ASTM, CGSB, EN, GPA and/or SM. If not provided with the results, identification of the reference method or Bureau Veritas SOP is available upon request.

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Measurement Uncertainty has not been accounted for when stating conformity to any referenced standard. Interpretation and use of the test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. When sampling is not conducted by Bureau Veritas, results apply only to the sample(s) as received. Bureau Veritas is not responsible for the accuracy or any data impacts that result from the information provided by the customer or on the clients behalf by their agent.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
This report shall not be reproduced except in full, without the written approval of the laboratory.
Results relate only to the items tested.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Customer Service Passives,
Email: PassiveAir@bureauveritas.com
Phone# (780) 378-8500

==========

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Bureau Veritas Job #: C3A0081
Report Date: 2024/01/24

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Your P.O. #: 500.300.304
Sampler Initials: MA

RESULTS OF CHEMICAL ANALYSES OF AIR

Bureau Veritas ID		CGE921	CGE923		
Sampling Date		2023/11/06 13:30	2023/11/06 16:16		
	UNITS	SV AIRPORT	93 MAIN WEST BAY	RDL	QC Batch
Passive Monitoring					
Ammonia by Passive Sampler	ppb	<0.1	N/A	0.1	B227965
Calculated NO2	ppb	1.3	NA	0.1	B231938
Calculated SO2	ppb	0.1	<0.1	0.1	B227786

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Edmonton: 6744 - 50th Street T6B 3M9 Telephone (780) 378-8500 Fax (780) 378-8699

Bureau Veritas Job #: C3A0081
Report Date: 2024/01/24

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Your P.O. #: 500.300.304
Sampler Initials: MA

GENERAL COMMENTS

Sample CGE921 [SV AIRPORT] : CGE923 NO2 Travel Blank compromised during sample preparation.
CGE921 NO2 result is not blank subtracted. 2024/01/24 SDK

Sample CGE923 [93 MAIN WEST BAY] : NO2 CGE923 Sample compromised in the lab during sample preparation. Sample not reportable. No Charge. S1T (13/12/2023)

Results relate only to the items tested.

Bureau Veritas Edmonton: 6744 - 50th Street T6B 3M9 Telephone (780) 378-8500 Fax (780) 378-8699

Bureau Veritas Job #: C3A0081
Report Date: 2024/01/24

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Your P.O. #: 500.300.304
Sampler Initials: MA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B227786	OZ	Spiked Blank	Calculated SO2			99	%	90 - 110
B227786	OZ	Method Blank	Calculated SO2		<0.1		ppb	
B227965	SDK	Spiked Blank	Ammonia by Passive Sampler			96	%	90 - 110
B227965	SDK	Method Blank	Ammonia by Passive Sampler		<0.1		ppb	
B231938	S1T	Spiked Blank	Calculated NO2			99	%	90 - 110
B231938	S1T	Method Blank	Calculated NO2		<0.1		ppb	

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

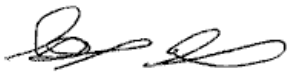
Bureau Veritas Edmonton: 6744 - 50th Street T6B 3M9 Telephone (780) 378-8500 Fax (780) 378-8699

Bureau Veritas Job #: C3A0081
Report Date: 2024/01/24

STANTEC CONSULTING LTD
Client Project #: 121417575
Site Location: World Energy Passive Monotoring Project
Your P.O. #: 500.300.304
Sampler Initials: MA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Steven Gloux, Senior Analyst

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Bureau Veritas Edmonton: 6744 - 50th Street T6B 3M9 Telephone (780) 378-8500 Fax (780) 378-8699

APPENDIX B

Calibration Documents

TE-6070 Calibration Worksheet

Site Information

Location:	Stephenville, NL	**Site ID:**	Stephenville Airport	**Date:**	26-Jun-23
Sampler:	TE-6070 PM10	**Serial No:**	PM10-977	**Tech:**	EM

Site Conditions

Barometric Pressure (in Hg):	30.15	**Corrected Pressure (mm Hg):**	766
Temperature (deg F):	59.0	**Temperature (deg K):**	288
Average Press. (in Hg):	29.86	**Corrected Average (mm Hg):**	758
Average Temp. (deg F):	60	**Average Temp. (deg K):**	289

Calibration Orifice

Make:	Tisch	**Slope:**	1.01960
Model:	TE-5028	**Intercept:**	-0.02626
Serial#:	3309	**Calibration Due Date:**	28-Jun-23

Calibration Data

Plate or Test #	In H2O	Qa * (m3/min)	I (chart)	IC (corrected)
1	9.60	1.889	62.0	38.02
2	3.80	1.198	40.0	24.53
3	3.40	1.135	38.0	23.30
4	3.30	1.118	36.0	22.08
5	2.60	0.996	32.0	19.62

*three Qstd readings must be within 36 to 44 cfm (1.02 to 1.24 m3/min)

Linear Regression

Slope	20.2932
Intercept	-0.2055
Corr. Coeff	0.9983
SFR	1.116
SSP	37
# of Observations:	5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(Sqrt(Ta/Pa))

Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation of sampler flow: 1/m((I)(Sqrt(Tav/Pav))-b)

SFR = 1.13(Ps/Pa)(Ta/Ts)
SSP = (m*SFR+b)(Sqrt(Pa/Ta))

SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I(chart):	37.0
Average Flow over Sample (m3/min	1.135262662
Enter Total Time (Hrs):	24.0
Total flow over sample (m3/min)	1634.778234
Total flow over sample (CFM)	57724.01944

NOTE: Ensure calibration orifice has been certified within 12 months of use

PM10-977 Cal.

Hi-Vol Field Sheet - PM_{10} (TE-6070)

Stantec

Location: Stephenville, NL
Date: 26-Jun-23
Time: 12:35
Personnel: Emmanuel
Project number: 121417575

Sample ID: PM10 calibration
Filter ID:
Hi-Vol Serial #: PM10-977
Install Date:
Last Calibration Date:

Sample date and times:

Date:
Start:
Stop:

Temperature: 59°F
Pressure: 30.15 Hg
(for the day the sample was collected)

Hi-Vol Flow Calibrations

Point	Flow Recorder CFM	Manometer Reading in H2O	
1	62	4.9+4.7	Orifice open
2	40	~~2.3+2.2~~ 1.8+1.5	
3	~~38~~ 36	~~1.5+1.3~~	
4	38	~~2.0+1.8~~ 1.8+1.6	
5	~~38~~ 32	~~1.0+0.8~~ 1.1+0.9	Orifice closed

*three Qstd readings must be within 36 to 44 cfm (1.02 to 1.24 m3/min) - see calibration spreadsheet

Calibrator Qstd *

Slope: 1.01960
Intercept: -0.02626
Date of Last Factory Cal: June 28, 2022

Caculated SSP: 37

Elapsed Time Indicator

Start time:
Stop time:
Elapsed time :

Avg Flow Chart Reading: _____ cfm

*Flow chart recorder should read calculated SSP value with filter in place (see calibration sheet for SSP and user manual pg 40 for calc procedure) then adjust voltage set point screw so flow on chart corresponds to SSP value

Notes: Set flow to 37 ~~36~~ for 1.13 m³/min

* Qstd slope and intercept obtained from TE-5028 orifice calibration sheet (provided with calibrator)

PQ200-1392 Calibration.

Field Sheet - $PM_{2.5}$ (PQ-200)

Stantec

Location: Stephenville Airport
Date: June 26, 2023
Time: 11:45 am
Personnel: MA / EM
Project number: 121417575

Sample ID: /
Filter ID: /
Instrument [PQ200 - 1392
Install Date: June 26/2023
Last Calibration Date: June 26/2023

Sample date and times:

Date: /
Start: /
Stop: /

Calibration

Date: June 26/2023
Time: 11:45 AM →

Temperature: 16°C 59°F
Pressure: 7 30.15 Hg

Leck Checks (pass or fail)

External ✓
Internal ✓

Initial SP= 192cm Final SP=190cm

*Internal leak check only required if external fails

if leak checks fail, inspect filter cassett and internal o-rings and in down tube

Flow varification

point	Flow setting (lpm)	Delta Cal reading (lpm) *	Temperature ('C) **		Pressure (mm Hg) **	
			PQ200	Delta Cal	PQ200	Delta Cal
1	15	15.1	16.4	19.8	767	767
2	18.4	18.4	18.6	19.9	767	767
3	16.7	16.72	18.2	19.9	767	767

* if flow varies from delta cal adjust using arrow buttons
** temp shouldn't vary more than ± 2'C and pressure more than ± 10 mm Hg, if either vary more then calibration is required

Notes:

Temp / Pressure are within 2°C and 10mHg
Calibrated / verified all flow rates / temps / pressure

TE-6070 Calibration Worksheet

Site Information

Location:	West Bay, NL	**Site ID:**	93 R463 West Bay, NL	**Date:**	26-Jun-23
Sampler:	TE-6070 PM10	**Serial No:**	PM10-976	**Tech:**	EM

Site Conditions

Barometric Pressure (in Hg):	30.15	**Corrected Pressure (mm Hg):**	766
Temperature (deg F):	59.0	**Temperature (deg K):**	288
Average Press. (in Hg):	29.86	**Corrected Average (mm Hg):**	758
Average Temp. (deg F):	60	**Average Temp. (deg K):**	289

Calibration Orifice

Make:	Tisch	**Slope:**	1.01960
Model:	TE-5028	**Intercept:**	-0.02626
Serial#:	3309	**Calibration Due Date:**	28-Jun-23

Calibration Data

Plate or Test #	In H2O	Qa * (m3/min)	I (chart)	IC (corrected)
1	8.60	1.790	59.0	36.18
2	4.00	1.229	44.0	26.98
3	3.60	1.167	40.0	24.53
4	3.00	1.068	36.0	22.08
5	1.60	0.787	25.0	15.33

*three Qstd readings must be within 36 to 44 cfm
(1.02 to 1.24 m3/min)

Linear Regression

Slope	20.5482
Intercept	0.2013
Corr. Coeff	0.9909
SFR	1.116
SSP	38
# of Observations:	5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(Sqrt(Ta/Pa))

Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation
of sampler flow: 1/m((I)(Sqrt(Tav/Pav))-b)

SFR = 1.13(Ps/Pa)(Ta/Ts)
SSP = (m*SFR+b)(Sqrt(Pa/Ta))

SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

NOTE: Ensure calibration orifice has been certified within 12 months of use

Average I(chart):	38.0
Average Flow over Sample (m3/min	1.131408659
Enter Total Time (Hrs):	24.0
Total flow over sample (m3/min)	1629.228469
Total flow over sample (CFM)	57528.05725

PM10 - 976 Calibration

Hi-Vol Field Sheet - PM_{10} (TE-6070)

Stantec

Location:	West Bay, NL
Date:	June 26, 2023
Time:	4:30 PM
Personnel:	MA/EM
Project number:	121417575
Sample ID:	/
Filter ID:	/
Hi-Vol Serial #:	PM10-976
Install Date:	/
Last Calibration Date:	/

Sample date and times:

Date: _____
Start: _____
Stop: _____

Temperature: 59°F
Pressure: 30.15 Hg
(for the day the sample was collected)

Hi-Vol Flow Calibrations

Point	Flow Recorder CFM	Manometer Reading in H2O	
1	51	4.4	Orifice open
2	44	2.7	
3	40	1.6	
4	36	1.5	
5	25	0.6	Orifice closed

*three Qstd readings must be within 36 to 44 cfm (1.02 to 1.24 m3/min) - see calibration spreadsheet

Calibrator Qstd *

Slope: 1.01960
Intercept: -0.02626
Date of Last Factory Cal: June 28, 2022

Caculated SSP: 38

Elapsed Time Indicator

Start time: _____
Stop time: _____
Elapsed time : _____

Avg Flow Chart

Reading: _____ cfm

*Flow chart recorder should read calculated SSP value with filter in place (see calibration sheet for SSP and user manual pg 40 for calc procedure) then adjust voltage set point screw so flow on chart corresponds to SSP value

Notes:

Set to 38 cfm
R = 0.9905

* Qstd slope and intercept obtained from TE-5028 orifice calibration sheet (provided with calibrator)

PQ200 - 1747 Calibration

Field Sheet - $PM_{2.5}$ (PQ-200)

Stantec

Location: 93 Mapnld-West Bay
Date: June 26, 2023
Time: 9:30 pm
Personnel: MA/EA
Project number: 121417575

Sample date and times:

Sample ID: /
Filter ID: /
Instrument [PQ200 - 1747
Install Date: June 26
Last Calibration Date: June 26

Date: /
Start: /
Stop: /

Calibration

Date: June 26, 2023
Time: 4:30 pm

Temperature: 59°F
Pressure: 30.15 Hg

Leck Checks (pass or fail)

External ✓
Internal

Intial: 10.5cm Final: 10.9cm

*Internal leak check only required if external fails

if leak checks fail, inspect filter cassett and internal o-rings and in down tube

Flow varification

point	Flow setting (lpm)	Delta Cal reading (lpm) *	Temperature ('C) **		Pressure (mm Hg) **	
			PQ200	Delta Cal	PQ200	Delta Cal
1	15	14.92	14.9	15.3	~~767~~	~~766~~
2	18.4	18.47	16.9	15.5	~~764~~	~~767~~
3	16.7	16.73	14.6	14.8	768	767

* if flow varies from delta cal adjust using arrow buttons

** temp shouldn't vary more than ± 2'C and pressure more than ± 10 mm Hg, if either vary more then calibration is required

Notes: Used Tetracal for Calibrations

Temperature / Pressure / Flow rates were all good

T/P within ±2°C and ±10mmHg

TE-6070 Calibration Worksheet

Site Information

Location:	Stephenville,	**Site ID:**	Stephenville Airport	**Date:**	14-Aug-23
Sampler:	TE-6070 PM10	**Serial No:**	PM10-976	**Tech:**	EM

Site Conditions

Barometric Pressure (in Hg):	29.85	**Corrected Pressure (mm Hg):**	758
Temperature (deg F):	64.4	**Temperature (deg K):**	291
Average Press. (in Hg):	29.86	**Corrected Average (mm Hg):**	758
Average Temp. (deg F):	60	**Average Temp. (deg K):**	289

Calibration Orifice

Make:	Tisch	**Slope:**	1.01723
Model:	TE-5028	**Intercept:**	-0.02616
Serial#:	3309	**Calibration Due Date:**	21-Jul-24

Calibration Data

Plate or Test #	In H2O	Qa * (m3/min)	I (chart)	IC (corrected)
1	5.60	1.467	40.0	24.78
2	4.20	1.274	39.0	24.16
3	4.00	1.244	38.0	23.54
4	3.90	1.228	37.0	22.92
5	3.60	1.181	36.0	22.30

*three Qstd readings must be within 36 to 44 cfm (1.02 to 1.24 m3/min)

Linear Regression

Slope	7.8464
Intercept	13.5074
Corr. Coeff	0.8838
SFR	1.139
SSP	36
# of Observations:	5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(Sqrt(Ta/Pa))

Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation of sampler flow: 1/m((I)(Sqrt(Tav/Pav))-b)

SFR = 1.13(Ps/Pa)(Ta/Ts)
SSP = (m*SFR+b)(Sqrt(Pa/Ta))

SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

NOTE: Ensure calibration orifice has been certified within 12 months of use

Average I(chart):	36.0
Average Flow over Sample (m3/min)	1.109823966
Enter Total Time (Hrs):	24.0
Total flow over sample (m3/min)	1598.146511
Total flow over sample (CFM)	56430.55329

CALIBRATION

Hi-Vol Field Sheet - PM_{10} (TE-6070)

Stantec

Location: Stephenville Airport
Date: August 14th, 2023
Time: 10:19 AM
Personnel: EM. PO
Project number: 121417575

Sample ID:
Filter ID:
Hi-Vol Serial #: PM10 - 976
Install Date: August 14, 2023
Last Calibration Date: August 14, 2023

Sample date and times:

Date:
Start:
Stop:

Temperature: 64.4°F
Pressure: 29.85 Hg
(for the day the sample was collected)

Hi-Vol Flow Calibrations

Point	Flow Recorder CFM	Manometer Reading in H2O	
1	40	5.6	Orifice open
2	39	4.2	
3	38	4.0	
4	37	3.9	
5	36	3.6	Orifice closed

*three Qstd readings must be within 36 to 44 cfm (1.02 to 1.24 m3/min) - see calibration spreadsheet

Calibrator Qstd *

Slope: 1.01723
Intercept: -0.02616
Date of Last Factory Cal: July 21, 2023

Caculated SSP: 36

Elapsed Time Indicator

Start time:
Stop time:
Elapsed time :

Avg Flow Chart Reading: _____ cfm

*Flow chart recorder should read calculated SSP value with filter in place (see calibration sheet for SSP and user manual pg 40 for calc procedure) then adjust voltage set point screw so flow on chart corresponds to SSP value.

Notes:

* Qstd slope and intercept obtained from TE-5028 orifice calibration sheet (provided with calibrator)

CALIBRATION

Field Sheet - $PM_{2.5}$ (PQ-200)

Stantec

Location: Stephenville Airport
Date: August 14, 2023
Time: 10:20 AM
Personnel: EM & DO
Project number: 1214 17575

Sample date and times:

Sample ID:
Filter ID:
Instrument [PQ200-1747
Install Date: August 14, 2023
Last Calibration Date: August 14, 2023

Date:
Start:
Stop:

Calibration

Date: August 14, 2027
Time: 10:20 AM

Temperature: 64.4°F
Pressure: 29.85 Hg

Leck Checks (pass or fail)

External ✓
Internal ✓

*Internal leak check only required if external fails
if leak checks fail, inspect filter cassett and internal o-rings and in down tube

Flow varification

point	Flow setting (lpm)	Delta Cal reading (lpm) *	Temperature ('C) **		Pressure (mm Hg) **	
			PQ200	Delta Cal	PQ200	Delta Cal
1	15	15.05	17.9	17.7	758.5	758
2	18.4	18.43	17.9	17.7	758.5	758
3	16.7	16.73	17.9	17.7	758.5	758

* If flow varies from delta cal adjust using arrow buttons
** temp shouldn't vary more than ± 2'C and pressure more than ± 10 mm Hg, if either vary more then calibration is required

Notes:

- used BGI tetra cal
- swap delta cal + PQ200 readings

TE-6070 Calibration

Site Information

Location:	West Bay, NL	**Site ID:**	West Bay	**Date:**	14-Aug-23
Sampler:	TE-6070 PM10	**Serial No:**	PM10-977	**Tech:**	EM

Site Conditions

Barometric Pressure (in Hg):	29.85	**Corrected Pressure (mm Hg):**	758
Temperature (deg F):	64.4	**Temperature (deg K):**	291
Average Press. (in Hg):	29.86	**Corrected Average (mm Hg):**	758
Average Temp. (deg F):	60	**Average Temp. (deg K):**	289

Calibration Orifice

Make:	Tisch	**Slope:**	1.01723
Model:	TE-5028	**Intercept:**	-0.02616
Serial#:	3309	**Calibration Due Date:**	21-Jul-24

Calibration Data

Plate or Test #	In H2O	Qa * (m3/min)	I (chart)	IC (corrected)
1	4.40	1.303	40.0	24.78
2	4.20	1.274	39.0	24.16
3	4.00	1.244	38.0	23.54
4	3.90	1.228	37.0	22.92
5	3.60	1.181	36.0	22.30

*three Qstd readings must be within 36 to 44 cfm (1.02 to 1.24 m3/min)

Linear Regression	
Slope	20.9544
Intercept	-2.5697
Corr. Coeff	0.9892
SFR	1.139
SSP	34
# of Observations:	5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(Sqrt(Ta/Pa))

Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation of sampler flow: 1/m((I)(Sqrt(Tav/Pav))-b)

SFR = 1.13(Ps/Pa)(Ta/Ts)
SSP = (m*SFR+b)(Sqrt(Pa/Ta))

SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I(chart):	34.0
Average Flow over Sample (m3/min	1.123921367
Enter Total Time (Hrs):	24.0
Total flow over sample (m3/min)	1618.446768
Total flow over sample (CFM)	57147.35538

NOTE: Ensure calibration orifice has been certified within 12 months of use

CALIBRATION

Hi-Vol Field Sheet - PM_{10} (TE-6070)

Stantec

Location: West Bay, NL
Date: August 14th 2023
Time: 5:00 PM
Personnel: EM & PO
Project number: 121417575

Sample ID:
Filter ID:
Hi-Vol Serial #: PM10-977 CAL
Install Date: August 14, 2023
Last Calibration Date: August 14, 2023

Sample date and times:

Date:
Start:
Stop:

Temperature: 64.4°F
Pressure: 29.85 Hg
(for the day the sample was collected)

Hi-Vol Flow Calibrations

Point	Flow Recorder CFM	Manometer Reading in H2O	
1	40	2.2 + 2.2	Orifice open
2	39	2.1 + 2.1	
3	38	2.0 + 2.0	
4	37	1.9 + 2.0	
5	36	1.9 + 1.7	Orifice closec

*three Qstd readings must be within 38 to 44 cfm (1.02 to 1.24 m3/min) - see calibration spreadsheet

Calibrator Qstd *

Slope: 1.01723
Intercept: -0.02616
Date of Last Factory Cal: July 21, 2023

Caculated SSP: 34.5

Elapsed Time Indicator

Start time:
Stop time:
Elapsed time :

Avg Flow Chart

Reading: _____ cfm

*Flow chart recorder should read calculated SSP value with filter in place (see calibration sheet for SSP and user manual pg 40 for calc procedure) then adjust voltage set point screw so flow on chart corresponds to SSP value

Notes:

* Qstd slope and Intercept obtained from TE-5028 orifice calibration sheet (provided with calibrator)

CALIBRATION

Field Sheet - $PM_{2.5}$ (PQ-200)

Stantec

Location: West Bay, NL
Date: August 14, 2023
Time: 5:00PM
Personnel: EM & PD
Project number: 121417575

Sample ID: /
Filter ID: /
Instrument [PQ200 SN 1392
Install Date: August 14, 2023
Last Calibration Date: August 14, 2023

Sample date and times:

Date:
Start:
Stop:

Calibration

Date: August 14th, 2023
Time: 5:00 PM

Temperature: 64.4°F
Pressure: 29.85 Hg

Leck Checks (pass or fail)

External ✓
Internal ✓

*Internal leak check only required if external fails
if leak checks fail, inspect filter cassett and internal o-rings and in down tube

Flow varification

point	Flow setting (lpm)	Delta Cal reading (lpm) *	Temperature ('C) **		Pressure (mm Hg) **	
			PQ200	Delta Cal	PQ200	Delta Cal
1	15	15.00	19.5°	20.2	755	757
2	18.4	18.41	19.5	20.5	755	757
3	16.7	16.72	19.6	20.5	755	757

* if flow varies from delta cal adjust using arrow buttons
** temp shouldn't vary more than ± 2'C and pressure more than ± 10 mm Hg, if either vary more then calibration is required

Notes:

TE-6070 Calibration Worksheet

Site Information

Location:	STEPHENVILLE AIRPORT	**Site ID:**	1	**Date:**	6-Nov-23
Sampler:	TE-6070 PM10	**Serial No:**	977	**Tech:**	MA/MF

Site Conditions

Barometric Pressure (in Hg):	29.94	**Corrected Pressure (mm Hg):**	760
Temperature (deg F):	72	**Temperature (deg K):**	295
Average Press. (in Hg):	29.58	**Corrected Average (mm Hg):**	751
Average Temp. (deg F):	66	**Average Temp. (deg K):**	292

Calibration Orifice

Make:	Tisch Environmental, Inc.	**Slope:**	1.01723
Model:	TE-5028A	**Intercept:**	-0.02616
Serial#:	3309	**Calibration Due Date:**	21-Jul-24

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)
1	3.00	1.087	36.0	22.43
2	3.60	1.188	38.0	23.68
3	3.80	1.220	39.0	24.30
4	4.10	1.266	40.0	24.92
5	5.20	1.422	43.0	26.79

Linear Regression

Slope	13.0823
Intercept	8.2475
Corr. Coeff	0.9962
SFR	1.129
SSP	36.95
# of Observations:	5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(Sqrt(Ta/Pa))

Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation
of sampler flow: 1/m((I)(Sqrt(Tav/Pav))-b)

SFR = 1.13(Ps/Pa)(Ta/Ts)
SSP = (m*SFR+b)(Sqrt(Pa/Ta))

SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

NOTE: Ensure calibration orifice has been certified within 12 months of use

Average I(chart):	36.0
Average Flow over Sample (m3/min)	1.084753773
Enter Total Time (Hrs):	24.0
Total flow over sample (m3/min)	1562.045434
Total flow over sample (CFM)	55155.82426

PM10-001 Calibration

Hi-Vol Field Sheet - PM_{10} (TE-6070)

Stantec

Location: Stephenville Airport
Date: Nov 6 /23
Time: 12:00pm
Personnel: MA/MF
Project number: 121417571

Sample ID: ~
Filter ID: ~
Hi-Vol Serial #: PM10-977
Install Date: Nov 6
Last Calibration Date: Nov 6

Sample date and times:

Date: ~
Start: ~
Stop: ~

Temperature: 72°F
Pressure: 29.94 in-Hg
(for the day the sample was collected)

I had to calibrate inside due to high winds

Hi-Vol Flow Calibrations

Point	Flow Recorder CFM	Manometer Reading in H2O	
1	36	3.00	Orifice open
2	38	3.60	
3	34	3.80	
4	40	4.1	
5	43	5.2	Orifice closed

*three Qstd readings must be within 36 to 44 cfm (1 02 to 1 24 m3/min) see calibration spreadsheet

Calibrator Qstd *

Slope: 1.01723
Intercept: -0.02616
Date of Last Factory Cal: July 21/2023

Caculated SSP: 36.95

Elapsed Time Indicator

Start time: ~
Stop time: ~
Elapsed time : ~

Avg Flow Chart

Reading: _____ cfm

*Flow chart recorder should read calculated SSP value with filter in place (see calibration sheet for SSP and user manual pg 40 for calc procedure) then adjust voltage set point screw so flow on chart corresponds to SSP value

Notes: $R^2 = 0.9962$

Set to 37 cfm for mid-point.

* Qstd slope and intercept obtained from TE-5028 orifice calibration sheet (provided with calibrator)

Calibration PQ200-1747

Field Sheet - $PM_{2.5}$ (PQ-200)

Stantec

Location: Stephenville Airport
Date: Nov 6/2023
Time: 12:00 PM
Personnel: MA/MF
Project number: 121417575

Sample date and times:

Sample ID: /
Filter ID: /
Instrument [PQ200 - 1747
Install Date: Nov 6/2023
Last Calibration Date: Nov 6/2023

Date: /
Start: /
Stop: /

Calibration

Date: 12:00 PM
Time: Nov 6/2023

Temperature: 50°F
Pressure: 29.8 in. Hg
} from weather app

Leck Checks (pass or fail)

External ✓
Internal ✓

*Internal leak check only required if external fails
if leak checks fail, inspect filter cassett and internal o-rings and in down tube

Flow varification

point	Flow setting (lpm)	Delta Cal reading (lpm) *	Temperature ('C) **		Pressure (mm Hg) **	
			PQ200	Delta Cal	PQ200	Delta Cal
1	15	15.03	4.3	4.4	763	760
2	18.4	18.41	4.3	4.4	760	761
3	16.7	16.69	4.7	4.6	763	762

* if flow varies from delta cal adjust using arrow buttons
** temp shouldn't vary more than ± 2'C and pressure more than ± 10 mm Hg, if either vary more then calibration is required

Notes: Leak test: 106cm (initial = 107cm) - Passed (internal/external)

Temperature is within ±2°C (no need to adjust)
Pressure is within ±10 mmHg (no need to adjust)

TE-6070 Calibration Worksheet

Site Information

Location: West Bay	**Site ID:** 2	**Date:** 6-Nov-23
Sampler: TE-6070 PM10	**Serial No:** 976	**Tech:** MA/MF

Site Conditions

Barometric Pressure (in Hg):	29.94	**Corrected Pressure (mm Hg):**	760
Temperature (deg F):	45	**Temperature (deg K):**	280
Average Press. (in Hg):	29.58	**Corrected Average (mm Hg):**	751
Average Temp. (deg F):	66	**Average Temp. (deg K):**	292

Calibration Orifice

Make:	Tisch Environmental, Inc.	**Slope:**	1.01723
Model:	TE-5028	**Intercept:**	-0.02616
Serial#:	3309	**Calibration Due Date:**	21-Jul-24

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)
1	3.40	1.126	36.0	21.85
2	3.70	1.174	36.5	22.16
3	4.10	1.234	39.0	23.67
4	4.90	1.347	43.0	26.10
5	5.60	1.438	46.0	27.92

Linear Regression

Slope	20.3963
Intercept	-1.4319
Corr. Coeff	0.9915
SFR	1.072
SSP	33.65

# of Observations: 5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(Sqrt(Ta/Pa))

Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation of sampler flow: 1/m((I)(Sqrt(Tav/Pav))-b)

SFR = 1.13(Ps/Pa)(Ta/Ts)
SSP = (m*SFR+b)(Sqrt(Pa/Ta))

SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I(chart): 34.0
Average Flow over Sample (m3/min)
1.109213576
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1597.267549
Total flow over sample (CFM)
56399.51715

NOTE: Ensure calibration orifice has been certified within 12 months of use

PM10-002 Calibration

Hi-Vol Field Sheet - PM_{10} (TE-6070)

Stantec

Location: West Bay
Date: Nov 6/2023
Time: 17:00
Personnel: MA/MF
Project number: 121417575

Sample ID: -
Filter ID: -
Hi-Vol Serial #: PM10-976
Install Date: Nov 6, 23
Last Calibration Date: Nov 6, 23

Sample date and times:

Date: -
Start: -
Stop: -

Temperature: 45°F
Pressure: 29.94 in. Hg
(for the day the sample was collected)

Hi-Vol Flow Calibrations

Point	Flow Recorder CFM	Manometer Reading in H2O	
1	36	3.4	Orifice open
2	36.5	3.7	
3	39	4.1	
4	43	4.7	
5	46	5.6	Orifice closed

*three Qstd readings must be within 36 to 44 cfm
(1 02 to 1 24 m3/min) - see calibration spreadsheet

Calibrator Qstd *

Slope: 1.01723
Intercept: -0.02616
Date of Last Factory Cal: July 21, 203

Caculated SSP: 34

Elapsed Time Indicator

Start time: -
Stop time: -
Elapsed time : -

Avg Flow Chart Reading: - cfm

*Flow chart recorder should read calculated SSP value with filter in place (see calibration sheet for SSP and user manual pg 40 for calc procedure) then adjust voltage set point screw so flow on chart corresponds to SSP value

Notes: $R^2 = 0.9915$

Set to 34 cfm for mid-point

* Qstd slope and intercept obtained from TE-5028 orifice calibration sheet (provided with calibrator)

Calibration PQ200-1392

Field Sheet - $PM_{2.5}$ (PQ-200)

Stantec

Location: West Bay
Date: Nov 6/2023
Time: 16:00
Personnel: MA/MF
Project number: 121417575

Sample date and times:

Sample ID: —
Filter ID: —
Instrument [PQ200-1392
Install Date: Nov 6/2023
Last Calibration Date: Nov 6/2023

Date: —
Start: —
Stop: —

Calibration

Date: Nov 6/2023
Time: 16:00

Temperature: 45°F } From Weather App
Pressure: 29.9 in. Hg

Leck Checks (pass or fail)

External ✓
Internal ✓

*Internal leak check only required if external fails
if leak checks fail, inspect filter cassett and internal o-rings and in down tube

Flow varification

point	Flow setting (lpm)	Delta Cal reading (lpm) *	Temperature ('C) **		Pressure (mm Hg) **	
			PQ200	Delta Cal	PQ200	Delta Cal
1	15	15.01	2.3	3.0	763	763
2	18.4	18.41	2.9	3.0	763	763
3	16.7	16.68	2.9	3.0	763	763

* if flow varies from delta cal adjust using arrow buttons
** temp shouldn't vary more than ± 2'C and pressure more than ± 10 mm Hg, if either vary more then calibration is required

Notes:
(Leak test: 106cm (initial: 107cm) - Passed (internal/external)
Temperature is within ±2C (no need to adjust)
Pressure is within ±10 mmHg (no need to adjust)

APPENDIX C

Wind Rose Plots

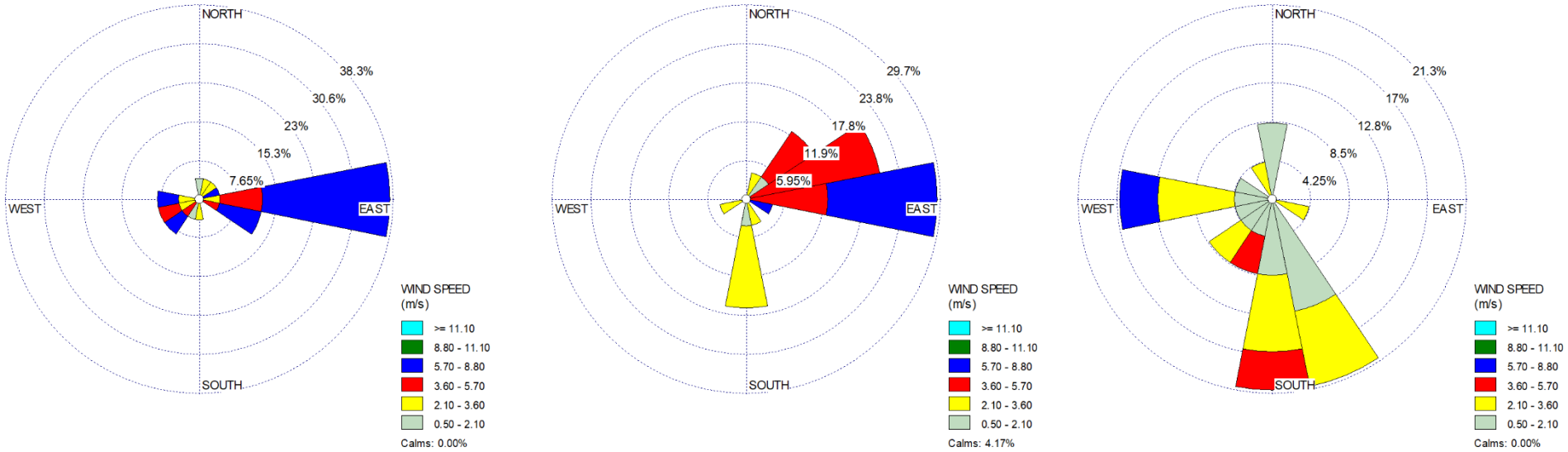

Figure C 1 Wind Roses for June Monitoring Events – Stephenville Airport

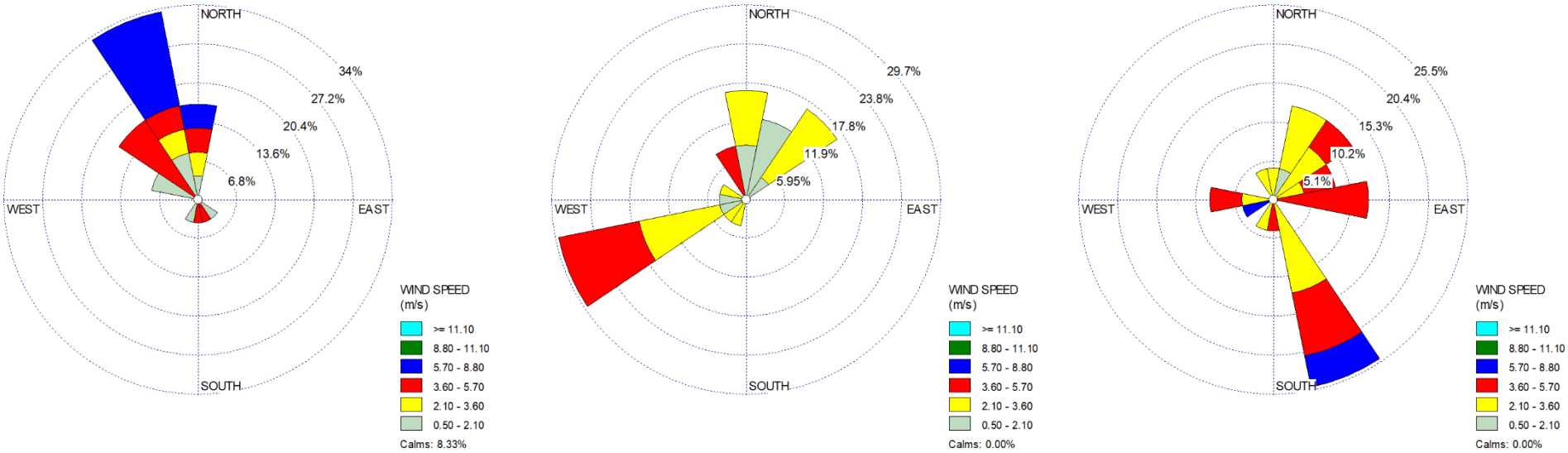

Figure C 2 Wind Roses for August Monitoring Events – Stephenville Airport

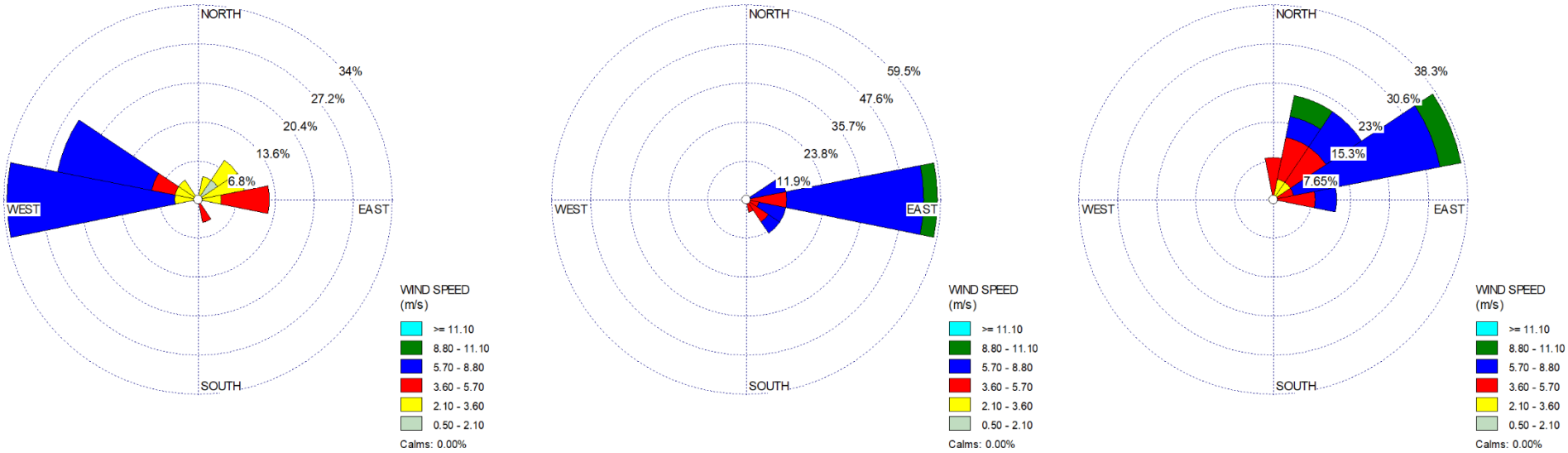

Figure C 3 Wind Roses for November Monitoring Events – Stephenville Airport

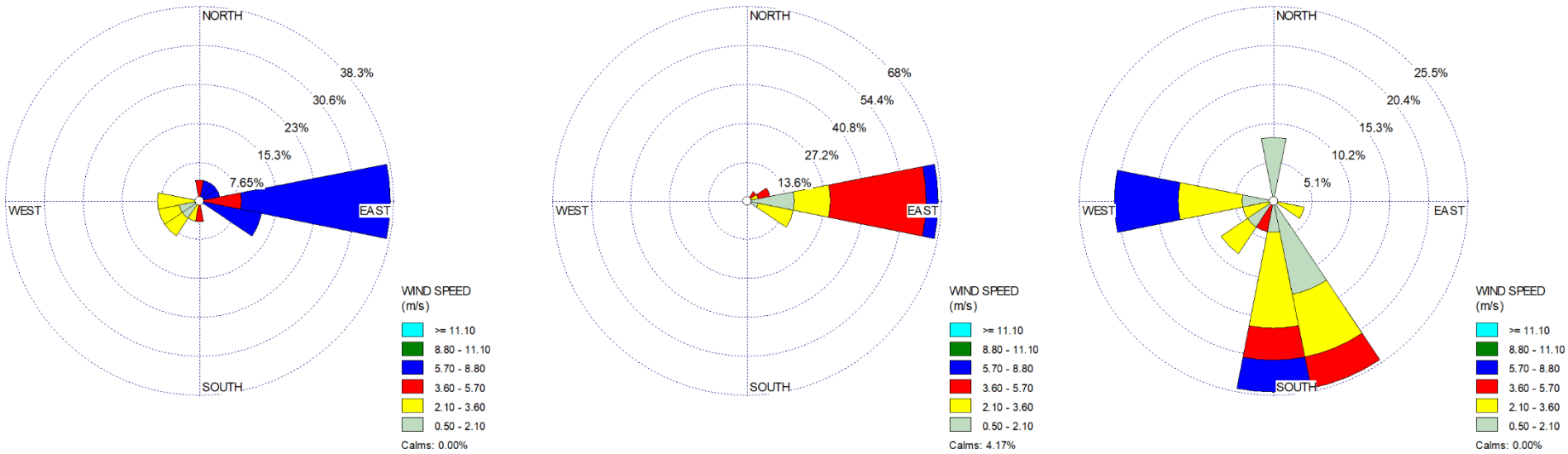

Figure C 4 Wind Roses for June Monitoring Events – West Bay

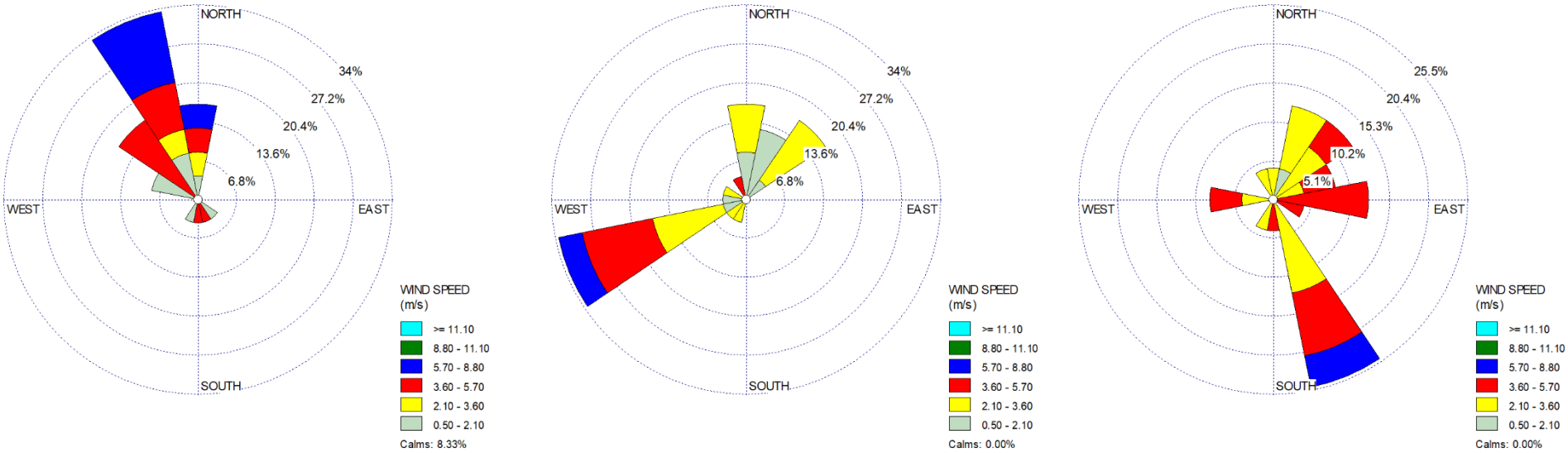

Figure C 5 Wind Roses for August Monitoring Events – West Bay

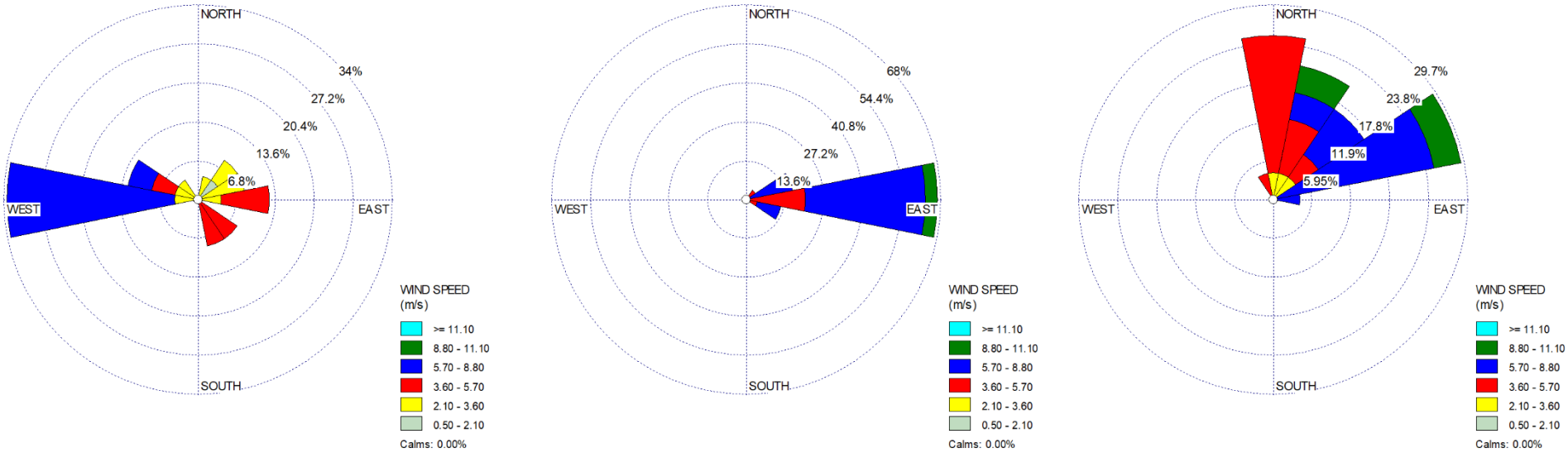

Figure C 6 Wind Roses for November Monitoring Events – West Bay

APPENDIX D

Site Location Photos

Photo 1 August Monitoring Setup at the Stephenville Airport

Photo 2 November Monitoring Setup at the Stephenville Airport

Appendix 2-F

Species at Risk Impacts Mitigation and Monitoring Plan TOC

Draft Annotated Table of Contents for Species at Risk Impacts Mitigation and Monitoring Plan (SAR IMMP)

1 Project Title

Title: Project Nujio'qonik - Species at Risk Impacts Management and Monitoring Plan (SAR IMPP)

The purpose of this SAR IMMP is to meet requirements for the issuance of a Section 19 permit under the *Newfoundland and Labrador Endangered Species Act*.

Note that separate SAR IMMPs and associated permit applications may be filed for specific phases and geographic locations of Project activities (e.g., construction and operation, Port au Port, Codroy, and Stephenville). However, the final SAR IMMP's geographic and temporal scope will be determined in close consultation with the NL Department of Fisheries, Forestry and Agriculture (NLDFFA-Wildlife Division).

2 Project Description and Study Area

A description of the Project is provided, including the components of the Project that could have adverse effects on the identified species at risk (SAR), both directly and indirectly. The Project description will include a schedule of activities, construction and operation methods, and proposed phasing or other timelines for Project activities that may affect the identified SAR. This will be drafted using information in the EIS, which will be updated with the ongoing engineering / design work that has been completed since submission of the EIS.

This section will define the geographic and temporal scope for the SAR IMMP (i.e., Port au Port, Codroy, and / or Stephenville; construction, operation, and decommissioning phases).

2.1 Project Schedule

A detailed, up to date schedule for Project activities / phases for each geographic location included in the scope of this SAR IMMP.

2.2 Site Preparation and Construction Activities

A detailed, up to date description of site preparation and construction activities for each geographic location included in the scope of this SAR IMMP. Information will be provided as available. For example, Port au Port plans are far more advanced than Codroy.

2.3 Operation Activities

A detailed, up to date description of operation activities for each geographic location included in the scope of this SAR IMMP. This will be drafted using information in the EIS and will be updated with the ongoing engineering / design work that has been completed since submission of the EIS and new information gathered during the construction phase monitoring.

Note that if NLDFFA-Wildlife Division agrees to a site preparation / construction only SAR IMMP, this section may not be required at this time.

2.4 Decommissioning and Rehabilitation Activities

A description of decommissioning and rehabilitation activities for each geographic location included in the scope of this SAR IMMP. Subject to confirmation by NLDFFA-Wildlife Division, this may be drafted using information in the EIS, with commitments to follow-up / update closer to the time of decommissioning (e.g., rehabilitation of temporary roads, construction or laydown areas) and informed by monitoring results.

Note that if NLDFFA-Wildlife Division agrees to a site preparation / construction only SAR IMMP, this section may be restricted to rehabilitation of temporary construction or laydown areas.

2.5 Study Area and Mapping

This section will identify and delineate (in map form and digital GIS shapefile formats) the study area within which direct and indirect impacts or potential impacts to the identified SAR have been assessed.

Based on past SAR IMMPs, the following mapping may be required:

- Detailed maps showing planned and potential turbine locations, planned and potential road and trail locations, and transmission and substation infrastructure locations. Maps should include a legend, scale bar, and indicate specific road and trail width and intended vehicle capacity (i.e., size of vehicles and traffic levels). Detailed maps should be consistent with road and work activity (e.g., locations, alignments, design, and capacity) that are detailed in engineering drawings. Drawings, graphics, maps, figures, and tables should be dated to the month of submission.
- Linear length (km) and area(km²) of roads, access trails, and transmission lines.
- Total area of turbines and associated clearing.
- Estimated area calculations for Project-associated zones of influence.
- Anticipated construction / operation periods for each of the major Project components.
- Detailed maps showing the proposed location of Project infrastructure and the proposed location of associated access / servicing roads or other servicing / construction activities.

3 Species Group 1

The following subsections will be populated for each species group included in the SAR IMMP (e.g., rare plants, bats, caribou, marten, fish). The species groups included will be determined in consultation with NLDFFA-Wildlife Division.

There may be further need to use sub-sections if the three geographic areas of the Project (i.e., Port au Port, Codroy, and Stephenville) are required to be included in this SAR IMMP.

3.1 Habitat Uses and Preferences

This section will describe the SAR addressed in the SAR IMMP including their general habitat preferences, mapping of known occurrences, and discussion of potential distribution based on the land cover classification (LCC), which is complete for the Port aux Port Wind Farm and included in the EIS Amendment.

3.2 Cumulative Effects

A description of how the components of the Project impacting or potentially impacting the identified SAR were assessed for their combined potential contributions to incremental and / or cumulative landscape change and / or disturbance in conjunction with other existing and potential (future) land use activities (e.g., forest operating plans, mineral leases).

3.3 Consideration of Avoidance and Reasonable Activity Alternatives

Identification of what measures have been taken to avoid adverse impacts on SAR. Identify which Project alternative(s) were considered. Highlight the advantages and disadvantages of the preferred alternative(s) in relation to its effects or potential effects on the identified SAR, as well as the necessity and effectiveness of meeting the main purpose of the activity.

3.3.1 CONSIDERATION OF AVOIDANCE

Description of Project layout refinements as well as the micro-siting process that will be followed during final siting of turbines and other Project components.

3.3.2 REASONABLE ALTERNATIVES

Description of reasonable alternatives related to specific Project components, such as other energy supplies, turbine types and sizes, locations land area requirements, access routes, and water sources, and why the preferred option was chosen. This will be based on information in the EIS and will be updated where appropriate with information from subsequent detailed engineering design.

3.4 Mitigation and Monitoring Strategies

Where adverse impacts cannot be avoided, this section will identify specific and detailed monitoring actions and measures proposed to document residual adverse effects of Project activities on the identified SAR, as well as the effectiveness of proposed mitigations in reducing these effects. This includes the proposed mitigation, methods and schedule for implementation (including appropriate mapping and description of surveys that may be required prior to implementation), monitoring of mitigation, defining success criteria (i.e., thresholds), adaptive management approaches (i.e., additional mitigation measures pending monitoring results), reporting schedule, and structure.

3.4.1 MITIGATION AND MONITORING TIER 1

Standard mitigation measures with associated monitoring approaches with thresholds to direct future responses and actions through the application of adaptive management approaches.

3.4.2 MITIGATION AND MONITORING TIER 2

Non-standard mitigation measures with associated monitoring approaches with thresholds to direct future responses and actions through the application of adaptive management approaches.

4 Species Group 2

This section will include the same sub-sections as in Section 3.

5 Species Group 3

This section will include the same sub-sections as in Section 3.

6 Avian Species at Risk

A concise and high-level summary of the Avifauna Impacts Mitigation and Monitoring Program will be provided.

7 References

Bibliography of references used throughout the text.

Appendix 2-G
Groundwater Monitoring Plan TOC

Draft Annotated Table of Contents for Groundwater Monitoring Plan (GWMP)

1 Introduction

A broad overview of the project, introducing readers to the Project and giving pertinent background information relevant to the GWMP.

1.1 Project Overview

Description of project activities, areas, and schedule.

1.2 Goals and Objectives

1.2.1 PURPOSE

The purpose of the GWMP is to:

- Identify the regulatory requirements and standards relevant to groundwater
- Identify and describe the existing conditions for groundwater
- Describe the management and mitigation measures that will be used to reduce the potential effects on groundwater from Project construction and operation
- Describe the groundwater monitoring that will be conducted during Project construction and operation to meet regulatory requirements

1.2.2 OBJECTIVES

State the primary objective of the monitoring plan, such as "…to provide a framework for monitoring potential changes in groundwater quantity and quality in relation to the Project."

1.3 Regulatory Setting

Identify the regulatory requirements and standards relevant to groundwater. This may include references to discussions and communications held with regulators.

1.3.1 FEDERAL REGULATORY REQUIREMENTS

Identify applicable federal regulatory requirements and guidelines, such as the Guidelines for Canadian Drinking Water Quality.

1.3.2 PROVINCIAL REGULATORY REQUIREMENTS

Identify provincial regulations and legislation, such as the *NL Environmental Protection Act* and *Water Resources Act*.

2 Baseline Information

Summary of the existing conditions section of the EIS.

3 Proposed Mitigation and Management Measures

Key measures to mitigate the potential effects of the Project on groundwater resources identified during the EA process.

4 Monitoring Program

4.1 Measurable Parameters and Thresholds

4.1.1 GROUNDWATER QUANTITY

Identification of parameters relevant to groundwater quantity. This will include water levels and/or flow rates that may have residual environmental effects or may be identified as locations of interest by the regulators.

4.1.2 GROUNDWATER QUALITY

Identification of parameters relevant to groundwater quality. This will focus on parameters that may have residual environmental effects or may be identified as particular parameters of interest by the regulators.

4.1.3 THRESHOLDS

Identification of critical thresholds relevant to groundwater quantity and quality. This will quantify benchmarks for measurable values of groundwater quantity and quality that will trigger adaptive management.

4.2 Monitoring Locations

Maps and descriptions of monitoring well locations. Tables listing monitoring well types, locations, parameters, schedules, etc. May include sections for any existing monitoring wells (e.g., plant site or Stephenville wellfield), recommendations for installation of additional monitoring wells, and a section that summarizes the combined monitoring network (i.e., existing + proposed).

4.3 Methods

4.3.1 FREQUENCY

A proposal of initial water quality sampling/water level monitoring frequency for each monitoring location.

4.3.2 DRILLING METHODS

Recommended drilling methods and discussion of paired/nested monitoring wells, if required and field conditions to be recorded.

4.3.3 MONITORING WELL CONSTRUCTION

Includes monitoring well construction requirements, including screen specifications, sand pack, annular seal, grout, etc.

4.3.4 WELL DEVELOPMENT, TESTING, AND MONITORING EQUIPMENT DEPLOYMENT

Includes standard methodology for properly preparing a monitoring well for sampling/data recording.

4.3.5 MONITORING WELL SAMPLING

Includes groundwater sampling methodology, including water level measurements, purging requirements, materials requirements (e.g., dedicated tubing, pumps, etc.), shipping requirements for samples, etc.

5 Reporting

Description of the scope and schedule of reporting, such as the preparation of an Annual Report submitted to the Government of Newfoundland and Labrador Department of Environment and Climate Change (NLDECC) or groundwater exceedances, if applicable, reported to NLDECC upon occurrence. This section will include conditions that define the termination of monitoring (e.g., trend analysis, stable concentrations/water levels for a specified period).

6 Related Documents

Other related monitoring plans occurring concurrently with this one and how they relate (i.e., environmental protection plan or surface water monitoring plan.

7 References

Bibliography of references used throughout the text.

Appendix 2-H

Surface Water Monitoring Plan TOC

Draft Annotated Table of Contents for Surface Water Monitoring Plan (SWMP)

1 Introduction

A broad overview of the project, introducing readers to the Project and giving pertinent background information relevant to the Surface Water Monitoring Plan (SWMP).

1.1 Project Overview

Description of project activities, areas, and schedule.

1.2 Goals and Objectives

1.2.1 PURPOSE

The purpose of the SWMP is to:

- Provide monitoring-based traceability to confirm predictions made in the Environmental Impact Statement (Stantec 2023)
- Confirm compliance with regulatory requirements
- Demonstrate execution of monitoring-based commitments
- Identify the regulatory requirements and standards relevant to surface water
- Provide reference stations to link the existing conditions for surface water
- Describe the management and mitigation measures that will be used to reduce the potential effects on surface water from Project construction and operation
- Describe the surface water monitoring that will be conducted during Project construction and operation to meet regulatory requirements

1.2.2 OBJECTIVES

The objectives of the SWMP include: supporting predictions of potential effects of the Project on surface water, confirmation of compliance with regulatory requirements, identification of changes in drainage patterns, surface water flow and quality, and determination of additional mitigation or response measures, if required.

1.3 Regulatory Setting

Identify the regulatory requirements standards, and EIS and permitting conditions relevant to surface water. This may include references to discussions and communications held with regulators.

1.3.1 FEDERAL REGULATORY REQUIREMENTS

Identify relevant federal regulatory requirements and guidelines.

1.3.2 PROVINCIAL REGULATORY REQUIREMENTS

Identifying provincial regulations and legislation such as the *NL Environmental Protection Act*, *Water Resources Act* and effluent / water quality guidelines (e.g., Canadian Council of Ministers of the Environment, (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life), etc.

2 Baseline Information

2.1 Hydrology

Description of the network of watersheds and bodies of water, and the hydrologic regime in the Project areas. Also, a description of the physiography that influences the hydrologic processes and dictates geomorphological processes. Description and hydrologic interpretation of surface water quantity data from the hydrologic regional analysis conducted for the EIS.

2.2 Surface Water Quality

Description of surface water quality presented in the EIS including information gathered from public sources and collected by the proponent.

3 Proposed Mitigation and Management Measures

Key measures to mitigate the potential effects of the Project on surface water resources identified during the EIS review process.

4 Monitoring Program

Introduction of the SWMP. The program will have three phases: pre-construction, construction and operations. Each phase will incorporate an adaptive management strategy used to inform the next phase of the program.

4.1 Measurable Parameters and Thresholds

Identification of critical thresholds relevant to surface water quality and quantity. This will focus on thresholds for parameters that may have residual environmental effects or may be identified as particular parameters of interest by the regulators.

4.1.1 SURFACE WATER QUALITY

Surface water quality parameters and their respective thresholds for relevant guidelines and potential effluent criteria. Each parameter will have a pre-defined threshold or thresholds where a parameter may have an effluent criteria limit and CCME CEQG for the Protection of Aquatic Life guideline (Marine or Freshwater) used to define the edge of an effluent mixing zone.

4.1.2 SURFACE WATER QUANTITY

Monitoring flows at select watercourses for comparison against predicted reductions (indirect loss) of fish habitat in watercourses in the EIS. This will involve hydrometric and geomorphic monitoring for the watersheds with the highest infrastructure density.

Thresholds of 30% and 50% of the mean annual flow (MAF), as determined by the hydrologic regional regression analysis conducted for the EIS, will be used for reference; however, threshold determination can vary depending on the regulator.

4.2 Monitoring Locations

Maps and descriptions of monitoring locations. Tables listing station types, locations, parameters, schedules, etc.

4.3 Pre-Construction Monitoring

Description of continued baseline monitoring prior to the start of construction to enhance understanding of local conditions for watercourses and receiving water bodies. Installation of hydrometric monitoring.

4.3.1 METHODS

4.3.1.1 Surface Water Quality

A description of the in-situ collection of water quality samples, including reference to frequency and parameter packages, as well as processes for Quality Assurance / Quality Control (QA / QC) and laboratory procedures.

4.3.1.2 Surface Water Quantity

A description of flow monitoring techniques and methods, and monitoring frequency and relevant QA / QC. This section will reference appropriate hydrometric monitoring standards such as those used by the Water Survey of Canada.

4.4 Construction Monitoring

Description of surface water monitoring during the construction phase and expected Project interactions.

4.4.1 ADAPTIVE MANAGEMENT

Implement construction surface water adaptive management to verify that:

- Monitoring results track as expected / predicted and are relevant to construction phasing
- SWMP is capable of detecting and identifying unforeseen effects
- SWMP has a process established to investigate the source of the effect and, if necessary, implement additional mitigative measures to respond to the identified effect

4.5 Operation Monitoring

A description of proposed changes to operation monitoring locations and frequency from construction with the stabilization of areas around wind turbines. As part of operations, discharge effluent volumes from the hydrogen / ammonia plant will be recorded daily. Installation of flow monitoring equipment at the outlet of the hydrogen/ ammonia plant to monitor effluent flows from the plant. The discharge effluent monitoring location and sampling frequency from the hydrogen / ammonia plant will be described.

4.5.1 ADAPTIVE MANAGEMENT

Implement construction surface water adaptive management to verify that:

- Monitoring results track as expected / predicted and are relevant to construction phasing
- SWMP is capable of confirming compliance with regulatory requirements
- SWMP is capable of detecting and identifying unforeseen effects
- SWMP has a process established to investigate the source of the effect and, if necessary, implement additional mitigative measures to respond to the identified effect

5 Reporting

Description of the magnitude and schedule of reporting, such as Annual Surface Water Quality and Quantity Report submitted to the Newfoundland and Labrador Department of Environment and Climate Change (NLDECC) or Water Quality Exceedances reported to NLDECC upon occurrence. This will include a summary table of all proposed reporting efforts.

5.1 Monitoring Program Changes

Document adaptive management based on findings during each reporting phase.

6 Related Documents

Other related monitoring plans occurring concurrently with this plan and how they relate, i.e. environmental protection plan or groundwater monitoring plan.

7 References

Bibliography of references used throughout the text.

Appendix 2-I

Avifauna Impacts Mitigation and Monitoring Plan TOC

Draft Annotated Table of Contents for Avifauna Impacts Mitigation and Monitoring Plan (AIMMP)

Project Title: Project Nujio'qonik – Avifauna Impacts Mitigation and Monitoring Plan (AIMMP)

1 Introduction

General background on the Project and requirements for the AIMMP and introduction to the key issues

Overview of consultation process with the provincial Department of Fisheries, Forestry and Agriculture (FFA) and Environment and Climate Change Canada's Canadian Wildlife Service (ECCC-CWS).

2 Objectives

Objectives of the AIMMP including verification of predictions made in the Environmental Impact Statement (EIS) as well as determining the efficacy of mitigation measures designed to minimize project effects on avifauna.

3 Overview of Avifauna

Overview of avifauna in the Regional Assessment Area include summary of SAR. This section will include map(s) depicting key bird areas relative to Project Area, LAA, RSA. There may be further need to use sub-sections if the three geographic areas of the Project (i.e., Port au Port, Codroy, and Stephenville) are required to be included in this AIMMP.

4 Project Description and Study Area

A description of the Project, including the components of the Project that could have negative effects on avifauna, both directly and indirectly. The Project description will include a schedule of activities, overview construction and operation activities, and proposed phasing or other timelines for Project activities that may affect avifauna. This will be prepared using information in the EIS, which will be updated with the ongoing engineering / design work that has been completed since submission of the EIS.

This section will define the geographic and temporal scope for the AIMMP.

4.1 Project Schedule

A schedule for Project activities / phases for each Project Area included in the scope of this AIMMP.

4.2 Construction Activities

An overview of site preparation and construction activities for each Project Area included in the scope of this AIMMP.

4.3 Operation Activities

An overview of operation activities for each Project Area included in the scope of this AIMMP.

4.4 Decommissioning and Rehabilitation Activities

A description of decommissioning and rehabilitation activities for each Project Area included in the scope of this AIMMP. This will be prepared using information in the EIS, with commitments to follow-up / update closer to the time of decommissioning (rehabilitation of temporary roads, construction or laydown areas will need to be included) and based upon monitoring results.

4.5 Study Area and Mapping

Identification and delineation (via mapping) of the study area within which direct and indirect impacts for avifauna have been assessed in the EIS.

The following mapping may be required:

- *Detailed maps showing planned and potential turbine locations, planned and potential road and trail locations, and transmission and substation infrastructure locations.*
- *Linear length in km² of roads, access trails, and transmission lines.*
- *Total area of turbines and associated clearing.*
- *Estimated area calculations for project-associated zones of influence.*
- *Anticipated construction / operation periods for each of the major Project components.*

5 Monitoring Design and Methodology

Overview of general monitoring design and methodology for the AIMMP including how ECCC-CWS' "Wind Turbines and Birds: A Guidance Document for Environmental Assessment" (EC 2007a), "Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds"(EC 2007b), and "Environment and Climate Change Canada's Canadian Wildlife Service (Atlantic Region) - Wind Energy & Birds Environmental Assessment Guidance Update" (Environment Canada, April 2022) were incorporated into the AIMMP.

Will include description of how consultations with FFA and ECCC-CWS were incorporated into the AIMMP.

5.1 Frequency, Duration and Geographic Extent of Monitoring

Summary (tabular format) of the frequency, duration, and geographic extent of avifauna monitoring.

6 Waterbirds

The following subsections will be populated for each of the seven avifauna groups assessed in the EIS. This approach is subject to change based on consultation with FFA and ECCC-CWS. There may be further need to use sub-sections if the three geographic areas of the Project (i.e., Port au Port, Codroy, and Stephenville) are required to be included in this AIMMP.

6.1 Habitat Uses and Key Areas

This section will include description of avifauna group general habitat preferences, mapping of known occurrences with emphasis on key areas, and discussion of potential distribution based on habitat classification.

6.2 Cumulative Effects

A description of how the components of the Project affecting or potentially affecting avifauna group were assessed for their combined potential contributions to incremental and or cumulative landscape change and / or disturbance in conjunction with other existing and potential (future) land use activities (e.g., forest operating plans, mineral leases).

6.3 Consideration of Avoidance and Reasonable Activity Alternatives

Identification of what measures have been taken to avoid adverse impacts on avifauna group. Identify which project alternative(s) were considered. Highlight the advantages and disadvantages of the preferred alternative(s) in relation to its effects or potential effects on avifauna group, as well as the necessity and effectiveness of meeting the main purpose of the activity.

6.3.1 CONSIDERATION OF AVOIDANCE

Description of Project layout refinements as well as the micro-siting process that will be followed during final siting of turbines and other Project components.

6.3.2 REASONABLE ALTERNATIVES

Description of reasonable alternatives related to specific Project components, such turbine types and sizes, locations land area requirements, access routes, and water sources, and why the preferred option was chosen. This will be based on information in the EIS and will be updated where appropriate with information from subsequent detailed engineering design.

6.4 Mitigation and Monitoring Strategies

Where negative effects cannot be avoided, this section will identify specific and detailed monitoring actions and measures proposed to document residual adverse effects of Project activities on avifauna group, as well as the effectiveness of proposed mitigations in reducing these effects. This includes the proposed mitigation, methods and schedule for implementation (including appropriate mapping and description of surveys that may be required prior to implementation), monitoring of mitigation, defining success criteria (i.e., thresholds), adaptive management approaches (i.e., additional mitigation measures pending monitoring results), reporting schedule, and structure.

6.4.1 MITIGATION AND MONITORING TIER 1

Standard mitigation measures with associated monitoring approaches with thresholds to direct future responses and actions through the application of adaptive management approaches.

6.4.2 MITIGATION AND MONITORING TIER 2

Non-standard mitigation measures with associated monitoring approaches with thresholds to direct future responses and actions through the application of adaptive management approaches.

7 Shorebirds

This section will include the same sub-sections and general content as in Section 6.

8 Waterfowl

This section will include the same sub-sections and general content as in Section 6.

9 Raptors

This section will include the same sub-sections and general content as in Section 6.

10 Landbirds

This section will include the same sub-sections and general content as in Section 6.

11 Upland Gamebirds

This section will include the same sub-sections and general content as in Section 6.

12 Species at Risk

This section will include the same sub-sections and general content as in Section 6. It will be linked to the SARIMMP.

13 Reporting

Description of reporting procedures as required by regulators.

14 Communication Plan

Description of communications plan to describe the results of AIMMP to interested parties as per EIS Guidelines.

15 References

Bibliography of references used throughout the text.

Appendix 2-J

Outfitters Effects Monitoring Plan TOC

Draft Annotated Table of Contents for Outfitter Environmental Effects Monitoring Plan (OEEMP)

Project Title: Project Nujio'qonik – Outfitter Environmental Effects Monitoring Plan (OEEMP)

1 Introduction

General background on the Project and requirements for the OEEMP and introduction to the key issues

Overview of engagement process with the Newfoundland and Labrador Outfitters Association (NLOA) including development of OEEMP in collaboration with NLOA.

2 Objectives

Objectives of the OEEMP including (but not limited to) establishing a program to monitor the efficacy of measures to mitigate potential negative effects of the Project on outfitters' land and resource use and associated economic conditions.

Key Performance Indicators will be used to monitor whether mitigation objectives are being met.

3 Definitions

Provision of clear definitions used in the EIS and relevant to the OEEMP including but not limited to Local Assessment Area, Regional Assessment Area.

4 Project Description and Study Area

A description of the Project, including the components of the Project that could have negative effects on outfitters, both directly and indirectly. The Project description will include a schedule of activities, overview construction and operation activities, and proposed phasing or other timelines for Project activities that may affect outfitters. This will be prepared using information in the EIS, which will be updated with the ongoing engineering / design work that has been completed since submission of the EIS.

This section will define the geographic and temporal scope for the OEMMP.

4.1 Project Schedule

A schedule for Project activities / phases for each Project Area included in the scope of this OEMMP.

4.2 Construction Activities

An overview of site preparation and construction activities for each Project Area included in the scope of this OEMMP.

4.3 Operation Activities

An overview of operation activities for each Project Area included in the scope of this OEMMP.

4.4 Decommissioning and Rehabilitation Activities

A description of decommissioning and rehabilitation activities for each Project Area included in the scope of this OEMMP. This will be prepared using information in the EIS, with commitments to follow-up / update closer to the time of decommissioning (rehabilitation of temporary roads, construction or laydown areas will need to be included) and based upon monitoring results.

5 Outfitting Operations

Overview of outfitters and outfitter companies in NL, RSA, LAA, and Project Area derived from the EIS and follow-up engagement with the NLOA.

6 Potential Residual Project Effects – Outfitters

Overview of EIS determinations for effects of Project activities on outfitters and outfitting activities including determination of significance.

Overview of outfitters concerns.

7 Environmental Effects Management and Monitoring Measures

Overview of WEGH2's overall Environmental Management System.

7.1 Construction Phase – Effects Mitigation

Mitigation strategies in response to potential construction effects on outfitters.

7.2 Operations Phase—Effects Mitigation

Mitigation strategies in response to potential operations effects on outfitters.

7.3 Decommissioning and Rehabilitation—Effects Mitigation

Mitigation strategies in response to potential decommissioning and rehabilitation effects on outfitters.

8 Outfitters Environmental Effects Monitoring Plan

Description of specific effects monitoring components for outfitters to be developed in collaboration with NLOA. Anticipated to include Key Performance Indicators and Response Mechanisms.

9 Engagement

Description of process for ongoing engagement between WEGH2 and NLOA with dissemination of information to NLOA members.

10 Review of OEEMP and Reporting

Description of the review process of the OEEMP which will involve WEGH2 and NLOA and procedures for modifying the OEEMP acknowledging that it is considered a "living" document.

Description of reporting procedures to communicate findings of OEMMP to NLOA and regulatory agencies as appropriate.

11 Compensation

Overview of compensation provisions of the OEMMP.

12 References

Bibliography of references used throughout the text.

Appendix 2-K

Updated Transportation Impact Study and Traffic Management Plan

Project Nujio'qonik: Updated Transportation Impact Study and Traffic Management Plan

Final Report

January 29, 2024

Prepared for:

World Energy GH2 LP

Prepared by:

Stantec Consulting Ltd.

File: 121417575

PROJECT NUJIO'QONIK: UPDATED TRANSPORTATION IMPACT STUDY AND TRAFFIC MANAGEMENT PLAN

This document entitled Project Nujio'qonik: Updated Transportation Impact Study and Traffic Management Plan was prepared by Stantec Consulting Ltd. ("Stantec") for the account of World Energy GH2 LP (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by _____
(signature)

Ray Lei, M.Sc., EIT.

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Arash Mirhoseini, M.Sc., P.Eng., PMP.

Approved by Flower, Peter Digitally signed by Flower, Peter Date: 2024.01.29 15:48:11 -04'00' _____
(signature)

Peter Flower, P.Eng.

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1.0 INTRODUCTION

World Energy GH2 (WEGH2) is proposing Project Nujio'qonik (the Project). The Project involves the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of one of the first Canadian, commercial-scale, "green hydrogen" and ammonia production plants powered by renewable wind energy. Located on the western coast of the island of Newfoundland, Newfoundland and Labrador (NL), the Project will have a maximum production of up to approximately 206,000 tonnes of green hydrogen (equivalent to approximately 1.17 megatonnes (Mt) of ammonia) per year. The hydrogen produced by the Project will be converted into ammonia and exported to international markets by ship. The hydrogen / ammonia plant and associated storage and export facilities will be located at the Port of Stephenville (in the Town of Stephenville, NL) on a privately-owned brownfield site and at an adjacent existing marine terminal, both of which are zoned for industrial purposes.

Renewable energy from two approximately 1,000 megawatt (MW) / 1 gigawatt (GW) onshore wind farms on the western coast of Newfoundland will be used to power the hydrogen and ammonia production processes. These wind farms (referred to herein as the "Port au Port area wind farm" and the "Codroy area wind farm") will include up to 298 turbines and collectively produce approximately 2,000 MW / 2 GW of renewable electricity. The Port au Port wind farm will include up to 155 wind turbines, with up to 171 sites that are being studied for the EIS, on the Port au Port Peninsula, NL and adjacently on the Newfoundland "mainland" (i.e., northeast of the isthmus at Port au Port). The Codroy wind farm will also consist of up to 143 wind turbines located on Crown land in the Anguille Mountains of the Codroy Valley, NL. The modelling and assessment work is based on preliminary layouts for both wind farm sites (i.e., 171 potential turbine locations at the Port au Port wind farm and 143 potential turbine locations at Codroy wind farm). Final wind farm layouts will be dependent on results of the wind campaign and more detailed field investigations. Once the layout and number of turbines are finalized, the results of models will be reviewed and updated as required.

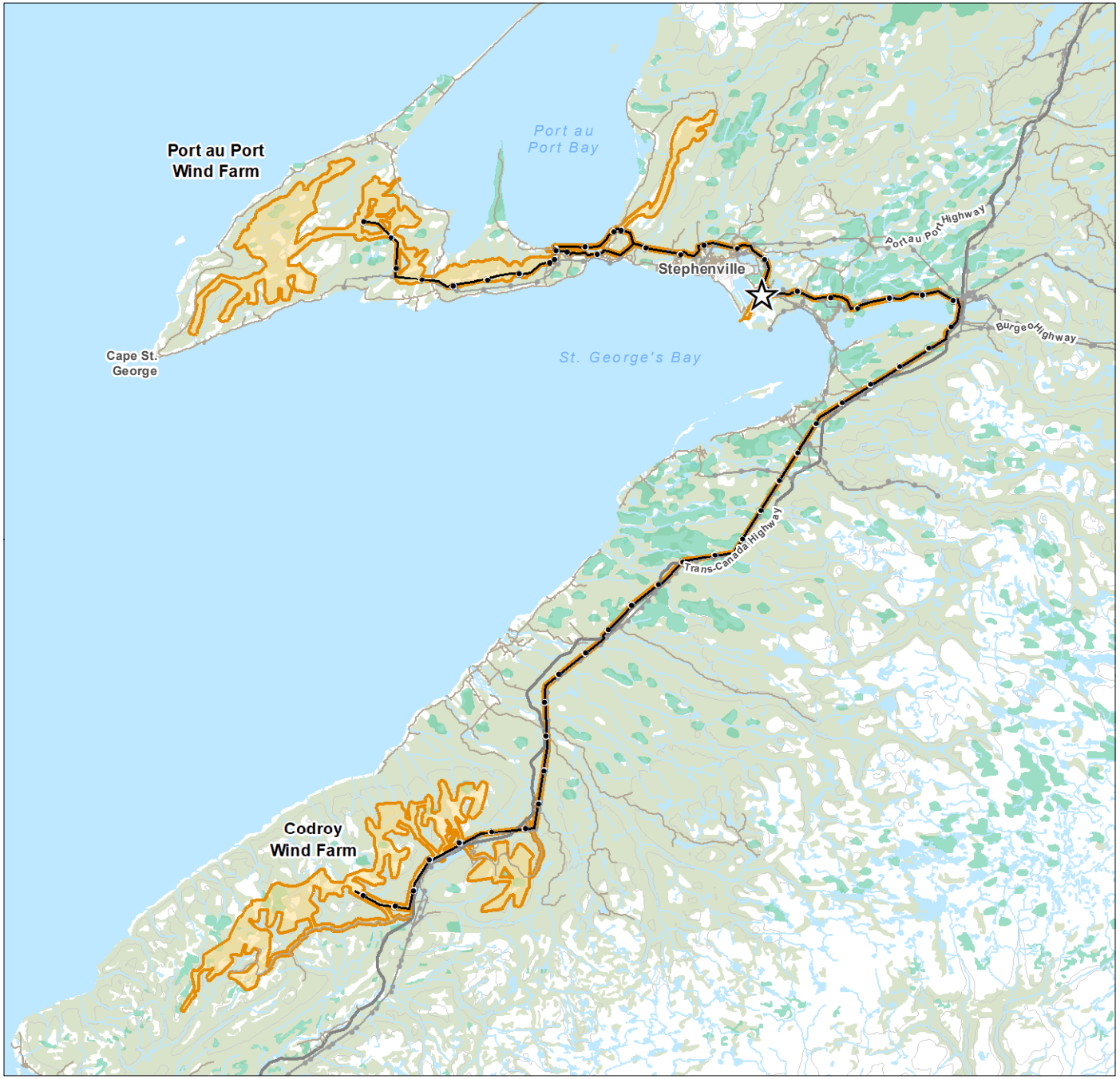
The Project is subject to provincial environmental assessment (EA) requirements under the NL *Environmental Protection Act* and associated *Environmental Assessment Regulations* (EA Regulations). This document is the Transportation Impact Study and Traffic Management Plan, prepared in support of an Environmental Impact Statement (EIS) and required under section 7.2.4 of the EIS Guidelines.

1.1 PROJECT TRANSPORTATION OVERVIEW AND LOCATION

The locations of the Project sites are shown in Figure 1.1 and the locations of turbines are illustrated in Figure 1.2 and Figure 1.3.

Materials, equipment, and components for construction and commissioning of the Project, will be delivered by ship to the Port of Stephenville and be stored at laydown areas before being distributed to the appropriate construction site. A landing site has also been defined / planned for the Port au Port peninsula to accommodate direct landing of large equipment. This may include specialized heavy equipment, transmission line materials, large wind turbine components, and components for the hydrogen/ammonia plant and ship-loading system. Distribution of components during construction will include:

- Use of existing or upgraded roads at the Port to transport components / materials to the hydrogen/ammonia plant site.
- Use of barges to transport wind farm and transmission line / transformer materials and equipment to the wind farm on the Port au Port Peninsula using the proposed marine landing site.
- Use of the local and private road network to transport wind farm and transmission line / transformer materials and equipment to the portion of the Port au Port Wind Farm located on the east side of Port au Port Bay.
- Use of the local road network and the TransCanada Highway (Route 1) to transport wind farm and transmission line / transformer materials and equipment to the Codroy Wind Farm site.



Stantec

Proposed Project Features

- Hydrogen / Ammonia Plant Location
- Transmission Line 230 kV
- Project Area

Other Features

- Transmission Line, Existing
- Trans-Canada Highway
- Road
- Contour (100 m)
- Watercourse
- Waterbody
- Wetland
- Forested Area

N

0 10 Kilometres
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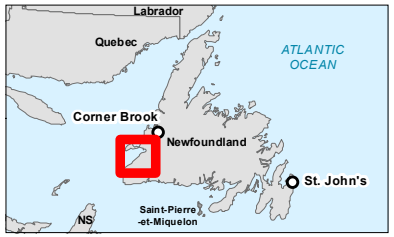
Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec



Project Location
Stephenville
NL

Prepared by XX on 6/23/2023
QR by XX on 20XX-XX-XX

Client/Project
World Energy GH2
Project Nujio'qonik

121417233_000a

Figure No.
1.1

Proposed Project Features (All Areas)

Stantec

Proposed Project Features

- Turbine Location
- Substation
- Hydrogen / Ammonia Plant Location
- Transmission Line 230 kV
- Collector Line
- Access Road
- Project Area

Other Features

- Substation, Existing
- Electrical Generation, Existing
- Transmission Line, Existing
- Trans-Canada Highway
- Road
- Contour (100 m)
- Watercourse
- Waterbody
- Wetland
- Forested Area

N

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Notes

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2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
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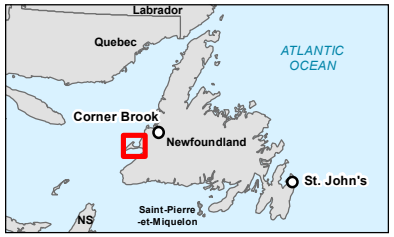

Project Location
Stephenville
NL

Prepared by MB on 2024-01-22
QR by AW on 2024-01-22

Client/Project
World Energy GH2
Project Nujio'qonik

121418050_020

Figure No.
1.2

Proposed Project Features (Port au Port Wind Farm)

V:\1214\active\121417233\03_data\gis_cad\gis_data\mapping\mxd\general\EIS_Amendment\Ch02_Refinements\121418050_020_Fig2.1_Project_Area_PAP.mxd Revised: 2024-01-23 By: mblackwood

Stantec

Proposed Project Features

- Turbine Location
- Substation
- Transmission Line 230 kV
- Collector Line
- Access Road
- Project Area

Other Features

- Transmission Line, Existing
- Trans-Canada Highway
- Road
- Resource Road / Trail
- Contour (100 m)
- Watercourse
- Waterbody
- Wetland
- Forested Area

N

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Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
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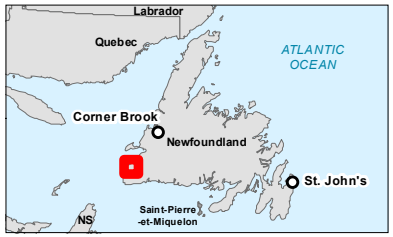
3. Background: NRCan CanVec



Project Location
Stephenville
NL

Prepared by XX on 6/23/2023
QR by XX on 20XX-XX-XX

Client/Project
World Energy GH2
Project Nujio'qonik

121417233_000a

Figure No.
1.3

Proposed Project Features (Codroy Wind Farm)

1.2 SCOPE OF THE STUDY

A Transportation Impact Study (TIS) has been developed in consideration of the Section 7.2.4 of the EIS Guidelines. This study focuses on the potential effects of transporting oversized and overweight Project materials and equipment over existing roadways during construction, operation, maintenance, modification, and decommissioning, and rehabilitation phases of the Project. The marine transportation of Project materials is not considered in this study.

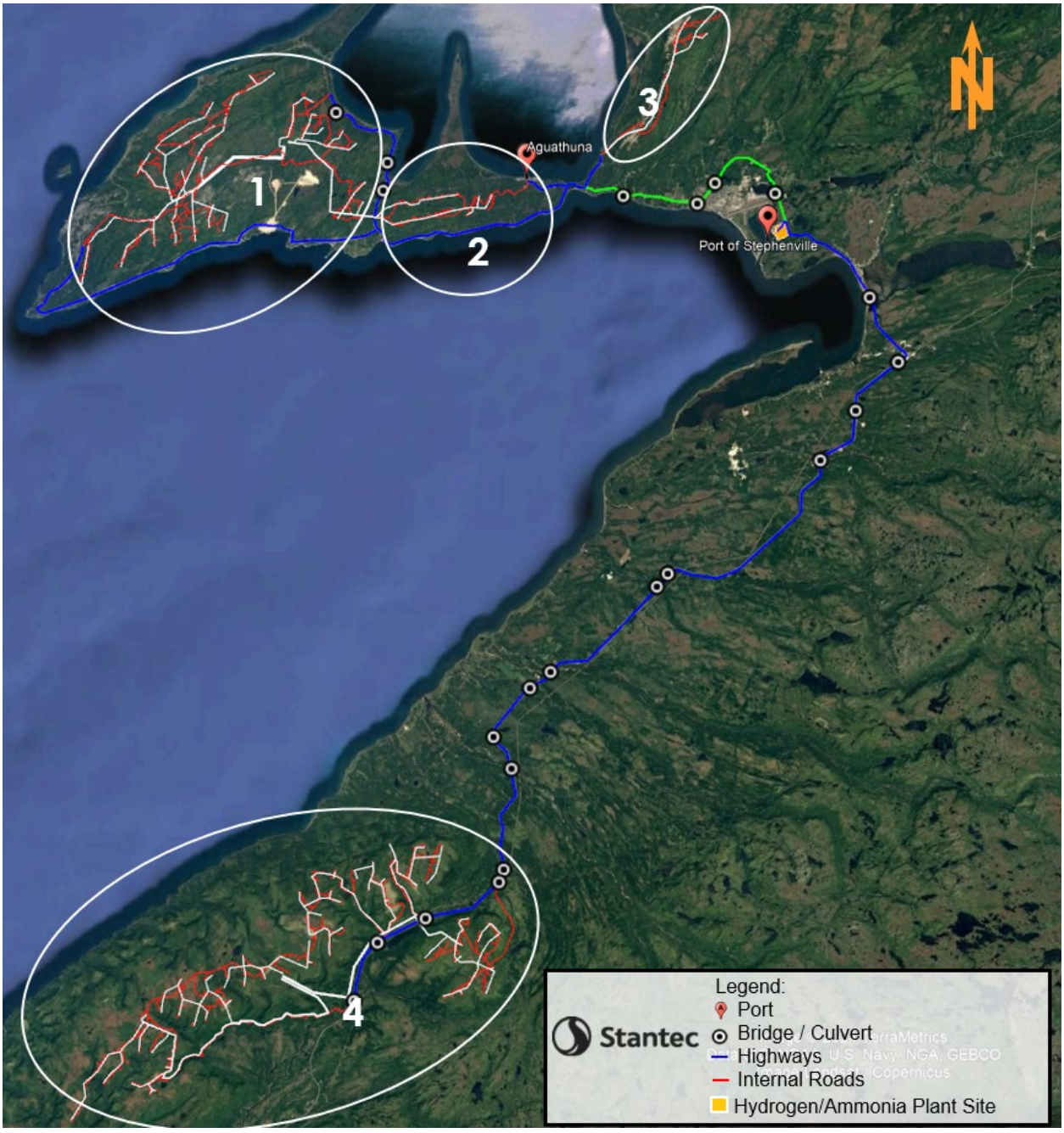
Among all phases of the Project, it is identified that the construction phase represents the worst-case scenario since oversized and overweight Project materials and equipment will be transported to the site during the construction period. It is also important to note that components for the construction of hydrogen/ammonia plant will be transported from the laydown areas at the Port of Stephenville to the adjacent construction site using the road network at the port and Harbour Drive, which is also used for delivery of oversized and overweight Project materials and equipment. Therefore, this study focuses on the impact of transporting oversized and overweight Project materials and equipment during the construction phase of the wind farms. In addition, a Traffic Management Plan and Swipe Path Analysis was conducted to confirm the site accessibility during the transporting of oversized and overweight Project materials and equipment or components. The TIS is focused on the following components:

- Existing infrastructure (i.e., roads) will be used to transport oversized and overweight Project materials and equipment during the construction phase of the wind farms.
- Traffic volume analysis for the proposed routes to be used for Project-related transportation.
- Mitigation measures including planned infrastructure to support barging component from the port or laydown areas to one of two landing sites.

As detailed below, the approach to this study has been developed based on both data provided by the client and NL government, and publicly available information.

2.0 ROAD INFRASTRUCTURE

This section of the report discusses the existing road infrastructure that will be used during all phases of the Project. For the convenience of traffic analysis, the wind farms are generally divided into four areas. Area 1 is located on the west side of the Port au Port peninsula, west of Route 463. Area 2 is located on the east side of the Port au Port peninsula, east of Route 463. Area 3 is located on the north of Stephenville, nearby the Route 462. Area 4 is located near the Codroy Pond and on both sides of the Trans-Canada Highway (Route 1). The existing road infrastructures that will be used during construction, operation, maintenance, modification, decommissioning and rehabilitation phases of the Project are shown in Figure 2.1.



Source: Google Earth

Figure 2.1 Road Infrastructure

2.1 PORT / BARGING STATIONS

As previously noted, materials, equipment, and components, including oversized and overweight components, will be brought to the Port of Stephenville by ship, stored at the port itself or at additional laydown area secured/available at the Stephenville airport and distributed to the appropriate construction site. To reduce disruptions to local traffic flow on the Port au Port peninsula when necessary, and to manage the effort of transporting oversized and overweight project materials and equipment, Project materials and equipment may also be barged from the Port of Stephenville to Aguathuna on the peninsula.

Aguathuna will provide landing location for barges with turbine components and supporting materials and infrastructure for Area 1, Area 2, and Area 3 (Port au Port East turbine sites).For Areas 4 (Codroy Wind Farm), components, materials, and components will be delivered to the construction sites by road from the Port of Stephenville.

2.2 HIGHWAYS

Construction materials, equipment, and components for the wind farms and supporting infrastructure will be transported to Areas 1 to 4 using the local road network (Table 2.1). These routes will also be used to transport Project personnel to the construction sites.

Table 2.1 Highway Information

Road	Classification	Speed limit (km/h)	Number of Lanes	Area*
Route 1	Provincial Highway	100	2 / 3 / 4	4
Route 460	Regional Road	60	2	1 2 3 4
Route 462	Regional Road	50	2	3
Route 463	Regional Road	60	2	1
Route 490	Regional Road	80	2	1 2 3 4
Main Street/Aguathuna Road	Local Road	50	2	1 2 3
Harbour Drive	Local Road	50	2	1 2 3 4
*see Figure 2.1 for Areas defined for the purpose of the TIS				

As shown in Figure 2.1, the delivery routes of oversized and overweight components for each Area of the Project are highlighted in blue as further described as follows:

- For Area 1, shipments from Aguathuna will cross Aguathuna Road to access internal roads in Area 2 and then cross Route 463 to access Area 1 sites for wind turbine installation. Alternatively, Route 460 and Route 463 are available to transport the turbine components from Aguathuna to the southwest and northeast portions of Area 1.
- For Area 2, shipments from Aguathuna will cross Aguathuna Road to access the internal roads.

- For Area 3, trucks departing from Aguathuna will leave the landing area through Main Street/Aguathuna Road to access Route 460, then turn left to Route 462 to reach the Port au Port East site.
- For Area 4, trucks will start from Port of Stephenville, leave the port through Harbour Drive, turn right to Route 490, and finally turn right onto Route 1 to access the Codroy Wind Farm.

The delivery routes of other construction materials for each Area of the Project are highlighted in blue or green depend on whether the route overlaps with the delivery routes of turbine components or not:

- For Area 1, trucks departing from Port of Stephenville will leave the port through Harbour Drive and turn left to Route 490, then turn left to Route 460. Trucks will turn right to Route 463 to access the rest of the Area 1. Alternatively, some trucks will continue drive on Route 460 until reach the southwest portion of the Area 1 site.
- For Area 2, trucks departing from Port of Stephenville will leave the port through Harbour Drive and turn left to Route 490, then turn left to Route 460, finally access the Area 2 site through Aguathuna Road.
- For Area 3, trucks departing from Port of Stephenville will leave the port through Harbour Drive and turn left to Route 490, then turn left to Route 460, and finally turn right to Route 462 to access the Port au Port East site.
- For Area 4, the route is the same as the delivery routes of oversized and overweight components.

A truck swept path analysis has been completed as part of this assessment and is discussed in a later section of this report.

2.3 BRIDGES AND CULVERTS

Bridges and large diameter culverts that exist on the transportation routes are listed in Table 2.2. The location of bridges and culverts can be found on Figure 2.1. There are no existing bridges or large diameter culverts along the routes from Aguathuna to Area 2 and Area 3.

Table 2.2 Bridges and Culverts Information

ID	Road	Structure Name	Structure Type	Year Built	Design Load Code
Aguathuna to Area 1					
1	Route 463	Harry's River Multi-Plate	Culvert (Steel)	1974	N/A
2	Route 463	Piccadilly Slant Multi-Plate	Culvert (Steel)	1975	N/A
3	Route 463	Piccadilly Multi-Plate	Culvert (Steel)	1974	N/A
Port of Stephenville to Area 1, 2, and 3					
4	Route 490	Noel's Pond Multi-Plate	Culvert (Steel)	1983	N/A
5	Route 460	Blanche Brook Bridge	Bridge (Conc.)	1980	MS200
6	Route 460	Gadons Brook Bridge	Bridge (Conc.)	1995	CS-600
7	Route 460	Romaines River Bridge	Bridge (Conc.)	1955	Unknown

Table 2.2 Bridges and Culverts Information

ID	Road	Structure Name	Structure Type	Year Built	Design Load Code
Port of Stephenville to Area 4					
8	Route 490	Main Gut Bridge[1]	Bridge (Conc.)	1973	HS 20-44
9	Route 1	Little Barachois Brook Bridge	Bridge (Conc.)	2021	CL-625
10	Route 1	First Dribble Pond Culvert	Culvert (Steel)	1964	N/A
11	Route 1	Flat Bay Brook Bridge	Bridge (Conc.)	2009	CL-625
12	Route 1	Fischell's Brook Bridge	Bridge (Conc.)	2010	CL-625
13	Route 1	Little Fischell's River Multi-Plate	Culvert (Steel)	1982	N/A
14	Route 1	Robinson's River Bridge	Bridge (Conc.)	2012	CL-625
15	Route 1	Middle Barachois River Bridge	Bridge (Conc.)	2011	N/A
16	Route 1	Little Crabbes River	Culvert (Steel)	1968	N/A
17	Route 1	Crabbe's River Bridge	Bridge (Conc.)	1994	CS-600
18	Route 1	Highlands River Bridge (River BK.)	Bridge (Conc.)	2006	CL-625
19	Route 1	Bald Mountain Brook Bridge	Bridge (Conc.)	1961	HS 20-44
20	Route 1	Codroy Pond CNR Overpass	Arch Culvert (Steel)	2006	N/A
21	Route 1	Morris Brook Bridge	Bridge (Conc.)	1955	HS 20-44
22	Route 1	North Branch CNR Overpass	Culvert (Steel)	1997	N/A

2.4 INTERNAL ROADS

In addition to the existing road infrastructures, a series of internal/project roads will be constructed to be used throughout the life of the Project including transport the materials, equipment, and components to and around the wind farm sites and to support on-going maintenance. As shown in Figure 2.1, the internal roads highlighted in red will be used to connect the barge landing sites or public roads to the turbine locations. The internal roads will be designed and constructed to accommodate the weight, size and turning movements of the trucks and equipment.

3.0 TRAFFIC ANALYSIS

This section discusses the potential traffic impact of transporting oversized and overweight Project materials, equipment, and components over existing roadways. The peak daily trips generated by the Project will be estimated based on the site trips planned during the construction phase, when the majority of oversized / overweight cargo will occur.

[1] In 2024, a structural assessment of the Main Gut Bridge was conducted, confirming its capability to bear the load of overweight components.

3.1 ANNUAL AVERAGE DAILY TRAFFIC VOLUME

The locations and annual average daily traffic (AADT) volumes of selected intersections provided by the NL Department of Transportation and Infrastructure are listed in Table 3.1. The location of the data collection points and AADT of each segment are illustrated in Figure 3.1. No growth rate was applied to the AADTs. The detailed AADTs are included in Appendix A.

Table 3.1 Intersections with AADT Data

Intersection	Legs	2013 AADT	Heavy Vehicle (HV)%
Route 1 and Route 490	North (Corner Brook)	1,537	28.32%
	West (Stephenville)	1,079	12.82%
	South (Channel - P.A.B)	2,166	29.51%
Route 1 and Route 403	North (Corner Brook)	2,039	26.46%
	West (Flat Bay)	333	3.61%
	South (Channel - P.A.B)	1,737	27.86%
Route 1 and Route 404	North (Corner Brook)	1,619	37.39%
	West (Robinsons)	338	4.92%
	South (Channel - P.A.B)	1,144	28.64%
Route 1 and Route 404	North (Corner Brook)	1,244	29.13%
	West (Jeffrey's)	194	4.49%
	South (Channel - P.A.B)	1,295	25.55%
Route 1 and Route 405	North (Corner Brook)	1,173	10.62%
	West (St. Davids)	218	4.15%
	South (Channel - P.A.B)	908	23.38%
Route 460 - Boswarlos - Stephenville	West (Boswarlos)	8,169	27.19%
	South (Route 460)	2,566	8.08%
	East (Stephenville)	1,683	39.76%
Route 490 and Seal Cove Road	North (Stephenville Crossing)	1,154	13.80%
	West (Stephenville)	3,858	7.24%
	East (Route 1)	2,789	12.69%
Romaines River Bridge	-	1,200	Not Available
Main Gut Bridge	-	3,858	Not Available
Crabbe's River Bridge	-	2,081	Not Available
Morris Brook Bridge	-	2,871	Not Available

Source: Google Earth

Figure 3.1 AADT Locations

The maximum AADT recorded in the road network is 8,169. This was recorded on the west side of the Port au Port isthmus. The capacity of a two-lane highway is 1,700 vehicles per hour (veh/h) for each direction of travel (Transportation Research Board, 2000). To determine the peak hour volume at each travelling direction, it is assumed that the peak hour volume is 10% of the AADT and traffics are evenly distributed in two directions. The result peak hour volume at each travelling direction is about 410 veh/h, which is well below the default capacity of 1,700 veh/h for a two-lane highway road. Several peak hour counts were collected at various locations on Route 460, Route 463, and Route 490 in 2023. All peak hour volumes collected in 2023 are lower than 200 veh/h. Therefore, it confirms that the peak hour volumes in the study area is considerably below the road capacity.

3.2 TRIP ESTIMATION

It is expected that the turbine installation will generate the highest traffic volumes which mainly include turbine component delivery trips, construction material delivery trips, and trips generated by construction staff and other personnel. It is expected that the site trips will be limited to a few weekly maintenance and site visit trips after sites become fully operational.

3.2.1 Turbine Delivery Trips

It is assumed that up to 3 turbines will be shipped to construction sites per week during the construction phase. The construction of each wind farm will not be conducted simultaneously. Construction crews will finish one area then move on to the next. It is estimated that each turbine comprised 12 to14 components/shipments to transport to a wind farm site. The number of turbine component delivery trips per day results from the above assumptions is up to 6 deliveries per day. The number of round trips per day and days of delivery are provided in Table 3.2.

Table 3.2 Estimated Turbine Delivery Round Trips

Areas	Number of turbines	Number of Components	Daily Delivery Round Trips	Days of Turbine Delivery
Area 1	117	1,638	6	273
Area 2	23	322	6	54
Area 3	15	210	6	35
Area 4	143	2,002	6	334
Total	298	4,172	N/A[2]	696

3.2.2 Construction Material Delivery Trips

In addition to turbine delivery trips, other construction materials such as transmission line and transformer station components and materials will be shipped from Stephenville to each site. It was estimated that up to 30 construction material delivery round trips will be made per day.

[2] The delivery to the different areas will happen sequentially.

3.2.3 Personnels Trips

During the construction phase of the Project, it is estimated that approximately 400 workers will be residing in accommodations camps. Staff will be based in Stephenville and Codroy during construction of Port au Port site and Codroy site respectively, and shuttles will be provided for their commute. It is estimated that 10 shuttles are required to transport the staff back and forth between accommodations camps and project sites. In addition, it is assumed that 5 personal trips from Stephenville and 5 personal trips from the nearest ferry (i.e., Port aux Basques) to the Project sites will be made by contractors, inspectors, surveyors, and supervisors.

3.2.4 Overall Estimated Future Trips

The overall estimated peak daily round trips during the turbine installation phase are shown in Table 3.3.

Table 3.3 Estimated Peak Future Round Trips per Day during Turbine Installation

From\To	Area 1	Area 2	Area 3	Area 4
Port of Stephenville	45	45	45	41
Aguathuna	6	6	6	0
Codroy	0	0	0	10
Port aux Basques	5	5	5	5
Total	56	56	56	56

3.3 TRAFFIC IMPACT FOR AREA 1

As shown in Figure 3.2, the Area 1 site is located on the west side of Route 463. Oversized and overweight components can be barged to the Aguathuna site and transported by land to the construction site. Shipments from Aguathuna will cross Aguathuna Road to access internal roads in Area 2 and then cross Route 463 to access Area 1 sites for wind turbine installation. Route 460 and Route 463 are available to transport the turbine components from Aguathuna to the southwest and northeast portions of Area 1 as an alternative. It is estimated that up to 6 round trips will take place between barging stations and wind farm site in one day during the construction season.

When trucks are making turns at the intersections or crossing a major highway, traffic will need to be stopped for up to 5 minutes to allow a truck to pass. Two traffic controller persons will be needed for each crossing location during this process. This issue will be further discussed in Section 4.1. Considering the traffic volume on Route 463 is fairly low, it is not expected that this process to be a cause for congestion at the crossing point.

For the delivery of other construction materials and transportation of workers, up to 50 daily round trips will be added to the road network which will not bring noticeable impact to the road network and is within the design capacity of the road network.

Source: Google Earth

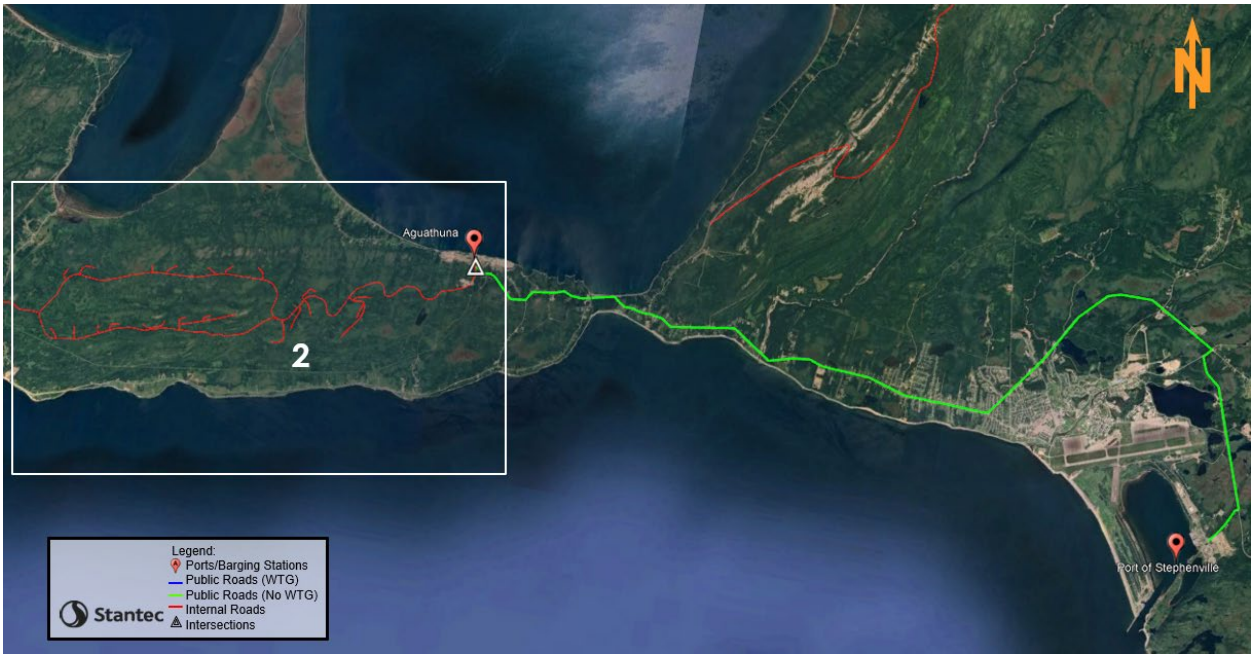
Figure 3.2 Wind Farm Area 1

3.4 TRAFFIC IMPACT FOR AREA 2

As shown in Figure 3.3, Area 2 is located on the east side of Route 463. The turbine components can be barged to the Aguathuna landing site and then will be transported to the internal roads of the wind farm. Trucks need to cross Aguathuna Road when bringing material and equipment from landing site to the wind farm site.

For the delivery of oversized and overweight components, it is estimated that 6 round trips will be made between the landing site and wind farm in one day during the construction season. When trucks are crossing Aguathuna Road, traffic will need to be stopped for up to 5 minutes to allow a truck to pass. Two traffic controller persons will be needed for each intersection. This issue will be further discussed and monitored as part of the Traffic Management Plan (Stantec 2023). Considering the traffic volume on Aguathuna road are low, it is not expected to cause congestion at the crossing point.

For the delivery of other construction materials and transportation of workers, up to 50 daily round trips will be added to the road network which will not bring noticeable impact to the road network.



Source: Google Earth

Figure 3.3 Wind Farm Area 2

3.5 TRAFFIC IMPACT FOR AREA 3

As shown in Figure 3.4, Area 3 includes turbines on the east side of Port au Port Bay and is located to the north of Stephenville. Oversized and overweight components can be barged to the Aguathuna site and transported by land to the construction site. The delivery route is highlighted in blue. Trucks will use Main Street/Aguathuna Road, Route 460, and Route 462. This route is selected to avoid passing through the residential areas of Stephenville and Kippens.

For the delivery of oversized and overweight components, it is estimated that 6 round trips per day will be made between the Aguathuna site and Port au Port East site during the construction season. When trucks are making turns at the intersections, traffic will need to be stopped for up to 5 minutes to allow a truck to pass. An approved traffic management plan with appropriate traffic control will be needed for each intersection.

For the delivery of other construction materials and transportation of workers, up to 50 daily round trips will be added to the road network which will not bring noticeable impact to the road network and is within the design capacity of the road network.

Source: Google Earth

Figure 3.4 Wind Farm Area 3

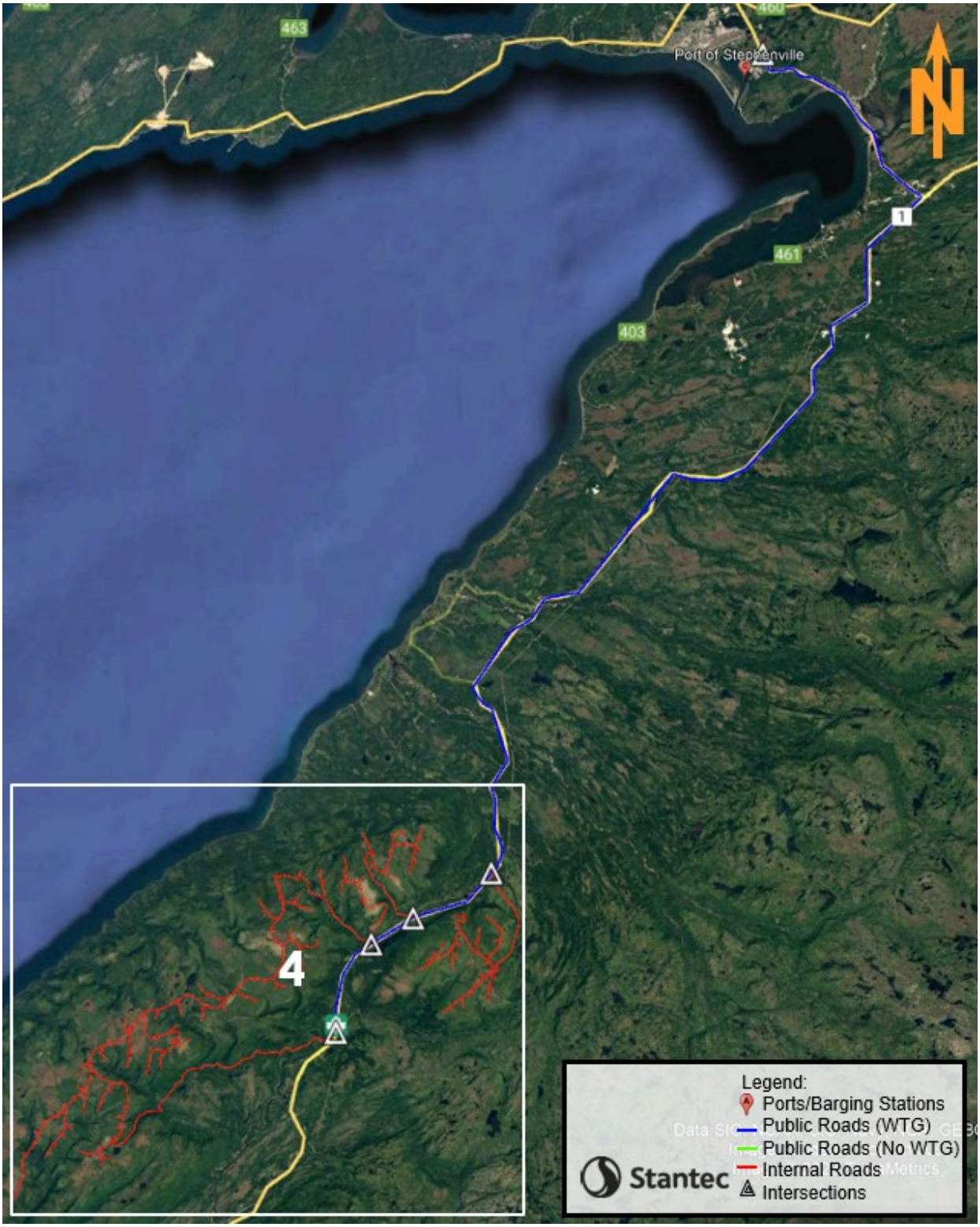
3.6 TRAFFIC IMPACT FOR AREA 4

As shown in Figure 3.5, the Codroy Wind Farm is within Area 4 which is south of Stephenville. Materials, equipment, and components will be delivered by road to Area 4 from the Port of Stephenville. Trucks will start from Port of Stephenville, leave the port through Harbour Drive, turn right to Route 490, and finally turn right onto Route 1 to access the Codroy Wind Farm.

For the delivery of oversized and overweight components, It is estimated that 6 round trips will be made between the Port of Stephenville and Area 4 in one day during the construction season. When trucks are making turns at the intersections, traffic will need to be stopped for up to 5 minutes to allow a truck to pass. Two traffic controller persons will be needed for each intersection.

Although the route between Port of Stephenville and Area 4 is considerably longer than the other routes, and the travelling speed of the transport vehicle is lower than the posted speed on Route 1, the majority of sections of Route 1 have more than one lane in each direction which may reduce the impact of the transport vehicle to the general traffic. It is recommended to have escort vehicles to warn the traveling public or other motorists and schedule the delivery to avoid the ferry traffics between Stephenville and Port aux Basques. Figure 3.6 illustrates time windows of ferry traffics between Stephenville and Port aux Basques according to the Port aux Basques ferry summer schedule (Marine Atlantic 2023).

For the delivery of other construction materials and transportation of workers, up to 45 daily round trips will be added to the road network which will not bring noticeable impact to the road network.



Source: Google Earth

Figure 3.5 Wind Farm Area 4

Traffic Direction	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	1:00	2:00	3:00
Traffics from Stephenville to Port aux Basques	Wed. Only																							
Traffics from Port aux Basques and Stephenville																					Wed. Only			

* Red blocks represent the ferry traffics hours between Stephenville and Port aux Basques

Figure 3.6 Time Windows of Ferry Traffic between Stephenville and Port aux Basques

4.0 TRANSPORT METHODS

For Areas 1 and 2, it has been assumed that oversized and overweight equipment and materials will arrive via barging and landing at Aguathuna. From there they will be transported to the development site. Local roads can be used as alternative routes. For Area 3, it has been assumed that oversized and overweight equipment and materials will arrive via barging and landing at Aguathuna as well. Area 3 is approximately 8 km in length using the existing road network from Aguathuna. For Areas 4, it has been assumed that oversized and overweight equipment and materials will arrive at the Port of Stephenville. Area 4 is approximately 120 km in length from the Port of Stephenville. The alignment assessments were conducted along these routes, between the Port of Stephenville and the wind turbines.

There are several horizontal and vertical alignment elements that were assessed to confirm if the transporter vehicle has the appropriate clearances for height and width. 90-degree turns were reviewed to determine if the maneuver can be made and if not, what modifications would be required, such as clearing, additional extra roadway and shoulder width, property encroachment, relocation of infrastructure, lengthening of culverts, and other potential temporary upgrades. The vertical clearances were assessed at the underpass structures and overhead utility locations that the transporter vehicle will pass under.

For the assessment of the horizontal clearances, Stantec used AutoCAD and Civil3D software with the specialized add-on software AutoTURN, that mimics the travel path of the design vehicle to verify wheel paths and overhang boundaries for specified movements. Without the aid of detailed profile information for the roads and ramps identified, there were limitations in being able to accurately determine if there are any significant limitations along the travel route, however, based on Google Street View and NLDTI's Bridge Inventory List, vertical clearance assessments were made, and recommendations provided that are beneficial to the overall route assessment. The assessment included a summary of challenges or problem areas along the route and provided recommendations for mitigation. More refined assessments should be conducted once the equipment and transporter vehicle loads and dimensions are finalized.

4.1 TRANSPORTER VEHICLE DESCRIPTION

Swept path assessments (using AutoTURN) for each of the key intersections and potential pinch points along the route were undertaken. An 82.0-metre-long wind farm transporter vehicle was used for the route assessment, starting at the Port / Barging Stations and ending at the corresponding wind turbine areas. Figure 4.1 illustrates the vehicle template for the 82-metre-long wind farm truck and trailer assembly. For this assessment, the return route was not assessed. It is anticipated that the overall trailer length is reduced on the return trip to that of a standard tractor trailer, thus being able to navigate the geometry at roadway and interchange locations, with no challenges or pinch points.

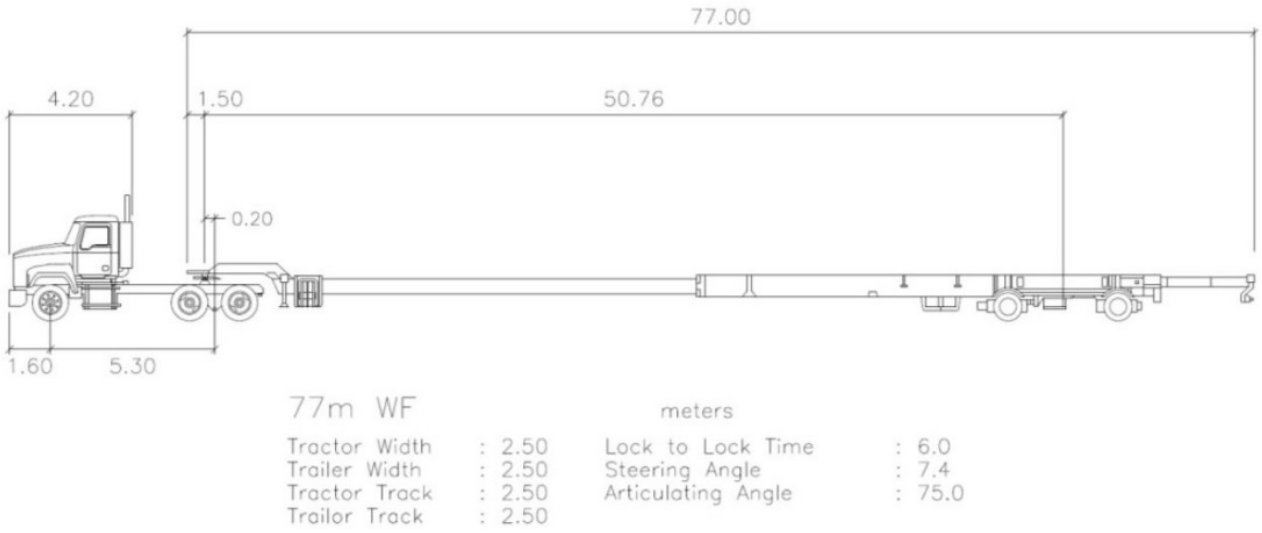


Figure 4.1 82 m Wind Farm Transporter Vehicle (77 m Blade)

It is also anticipated that other transporter vehicles will be used to facilitate transporting the other wind farm components, including generators, transformers, and turbines. It is anticipated that the vehicles used for this equipment will be via a 53-foot-long tractor trailer assembly and larger, similar to the float trailer illustrated in Figure 4.2, with the float trailer and truck having additional axles to distribute the heavy loads. Since these vehicles are of standard length, an assessment of the horizontal clearances was not conducted, as it does not exceed the footprint of the longer transport vehicle for the wind farm blades. As the vehicle loads and dimensions of the equipment and components have not been fully defined, the vertical clearances and structural load capacities of the bridges, overpasses and culverts will need to be assessed once they are known.

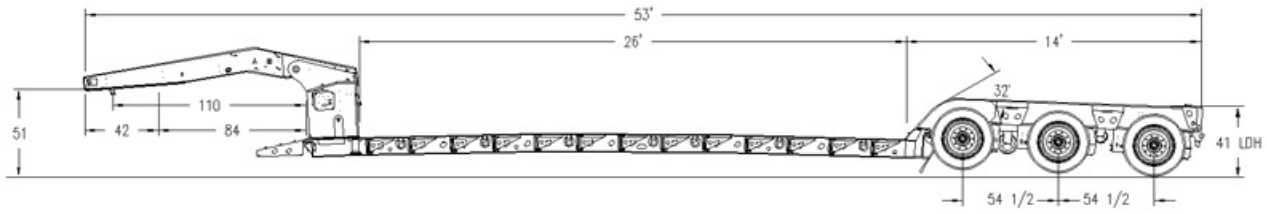


Figure 4.2 53 Foot Gooseneck Float Trailer (Imperial Measurements)

Figure 4.3 illustrates a typical style of transport unit for the various configurations of components for heavy and oversized loads. It is anticipated that 2 or 3 different trailer configurations for heavy loads (towers, blades, and transformers) will be equipped with a steerable rear unit. Table 4.1 provides a summary of the preliminary components per turbine.

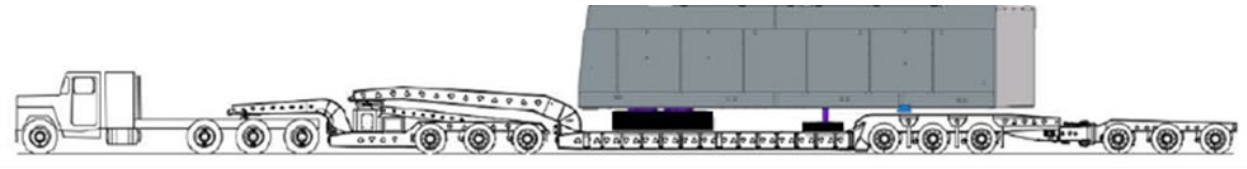


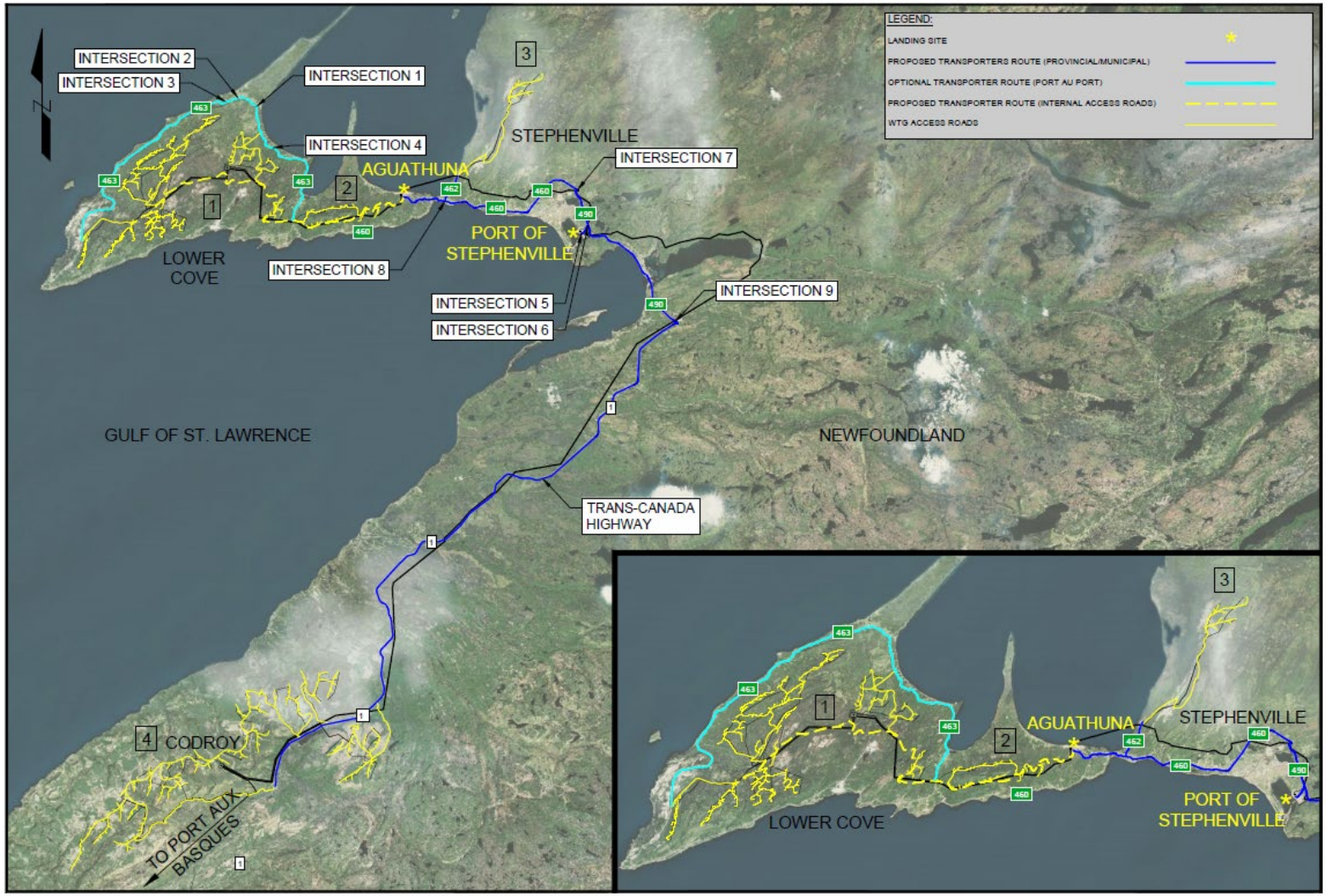
Figure 4.3 Typical Transporter Vehicle Unit

Table 4.1 Preliminary Breakdown of Transport Unit Components Per Wind Turbine

Component	Weight	Dimensions	Assumptions
1x Nacelle	60 to 85 tonnes	15 m x 4.5 m x 4.5 m	Assuming shipped in 'empty' configuration
1x Drivetrain	80 to 100 tonnes	7.5 m x 3 m x 3 m	
1x Hub	50 to 60 tonnes	5 m x 4.5 m 4.3 m	
3x Blades	20 to 30 tonnes	L = 70 m to 90 m Dia. 4.5 m x 3.0 m	
4 to 5x Tower Sections	50 to 90 tonnes	L = 20 to 30 m Dia. 4 m to 5 m	
3x loads of smaller components	< 20 tonnes	varies	

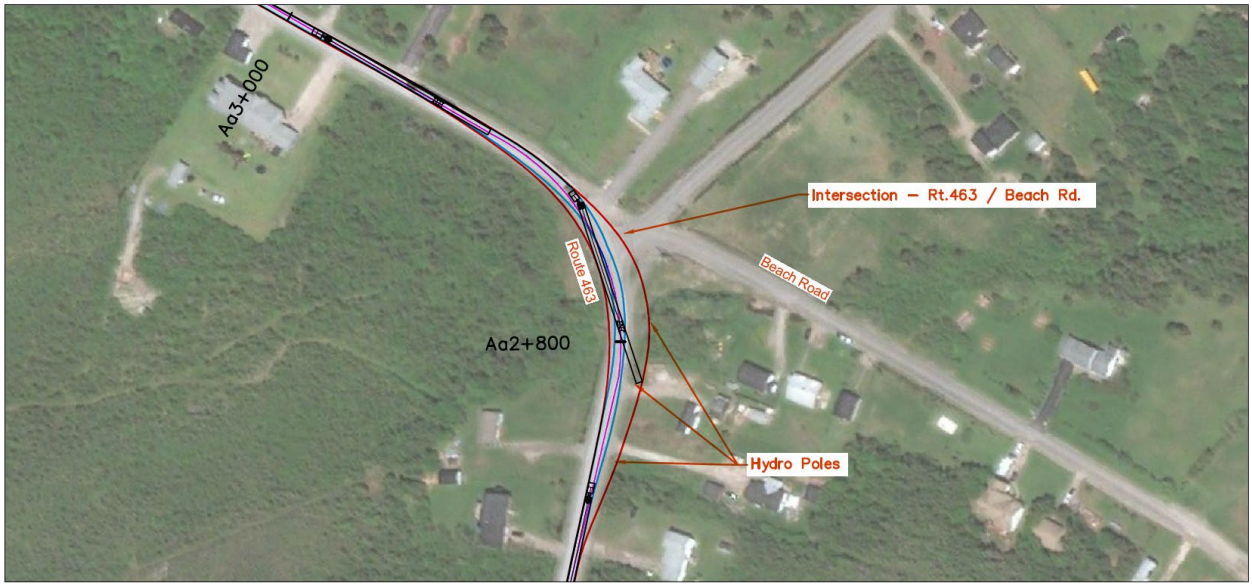
Based on the methods and transporter vehicle specifications identified in the sections above, a horizontal clearance assessment through a swept path analysis was performed. The analysis used the methods and transporter vehicle specifications identified in Section 4 and as described in Figure 4.1. Based on the analysis, nine (9) intersections were identified that pose potential turn movement conflicts along the described routing. The figures below illustrate the required path and the table in this section summarizes the locations with proposed mitigation measures for the required movements.

The results of the swept path analysis for the route are provided below, including an overall map of the routes and the specific locations with zoomed in images (Figure 4.4 to 4.13) and provides a summary of the assessment in Table 4-1. It is anticipated that, with the exception of the Trans-Canada Highway, a number of the routes will require lane closures in order for the transporter vehicle to maneuver along the provincially designated and local roadways.



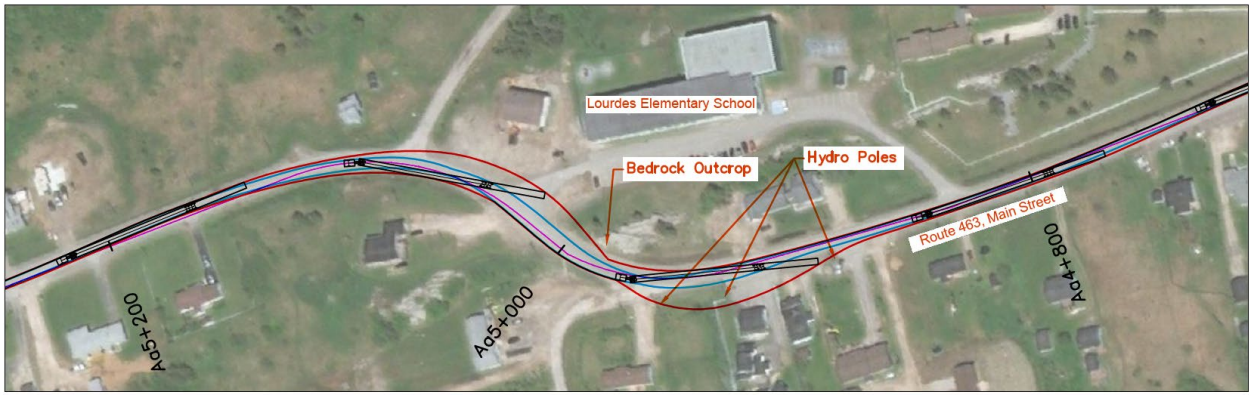
Source: Google Maps

Figure 4.4 Overall Route Plan Illustrating Conflict Locations



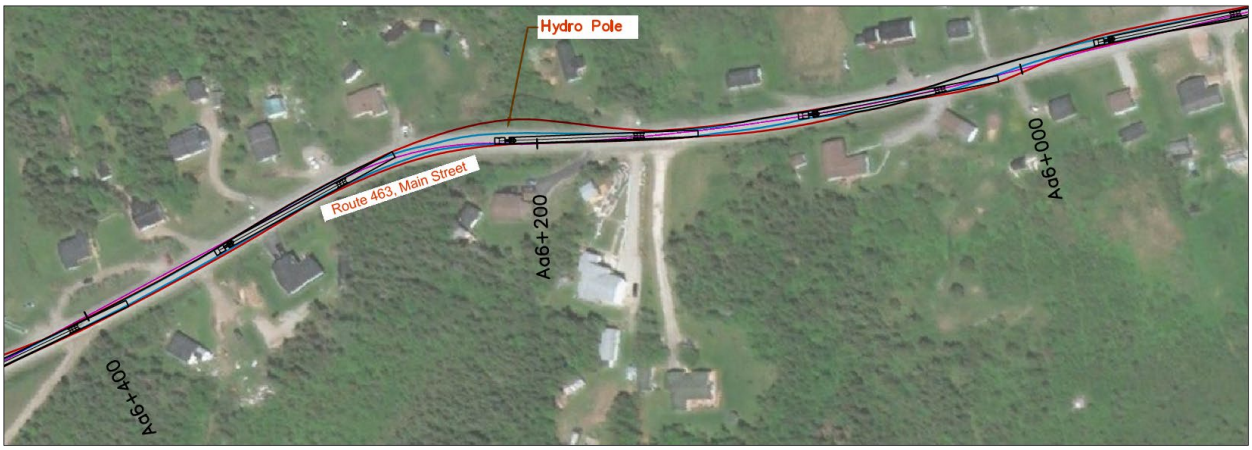
Source: Google Maps

Figure 4.5 Intersection 1



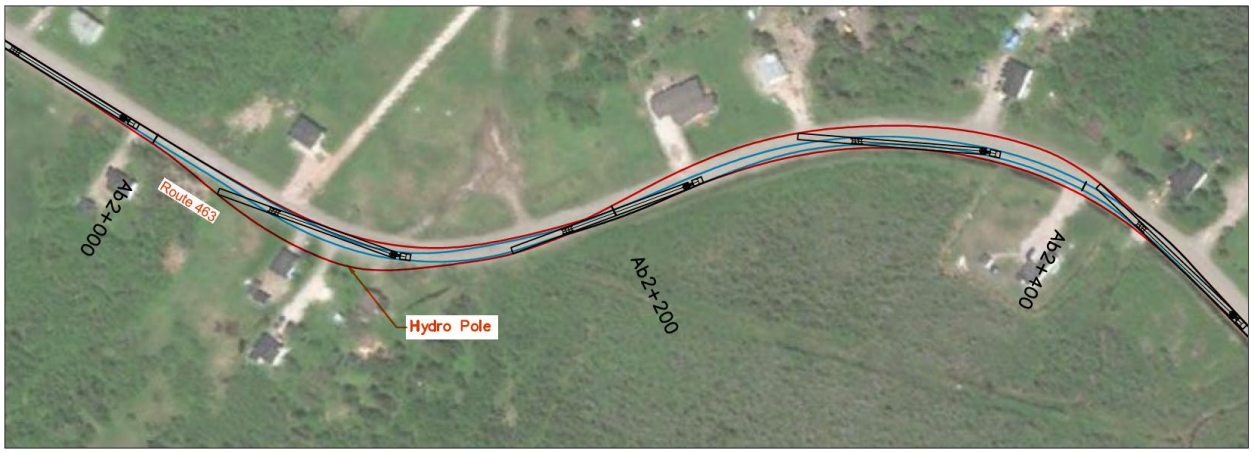
Source: Google Maps

Figure 4.6 Intersection 2



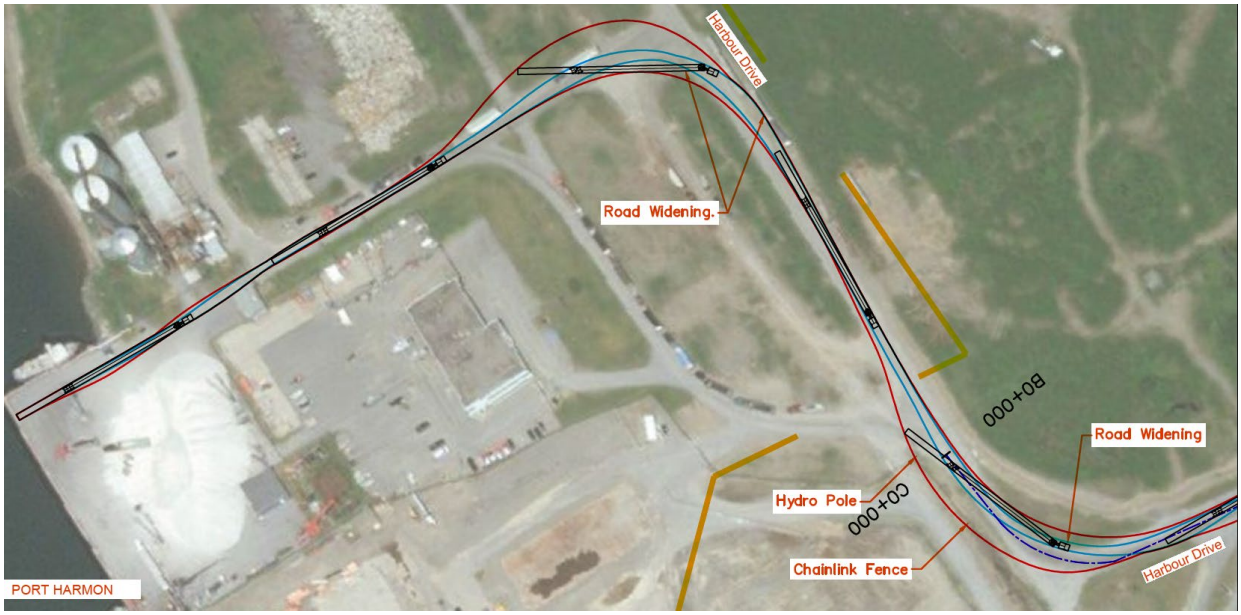
Source: Google Maps

Figure 4.7 Intersection 3



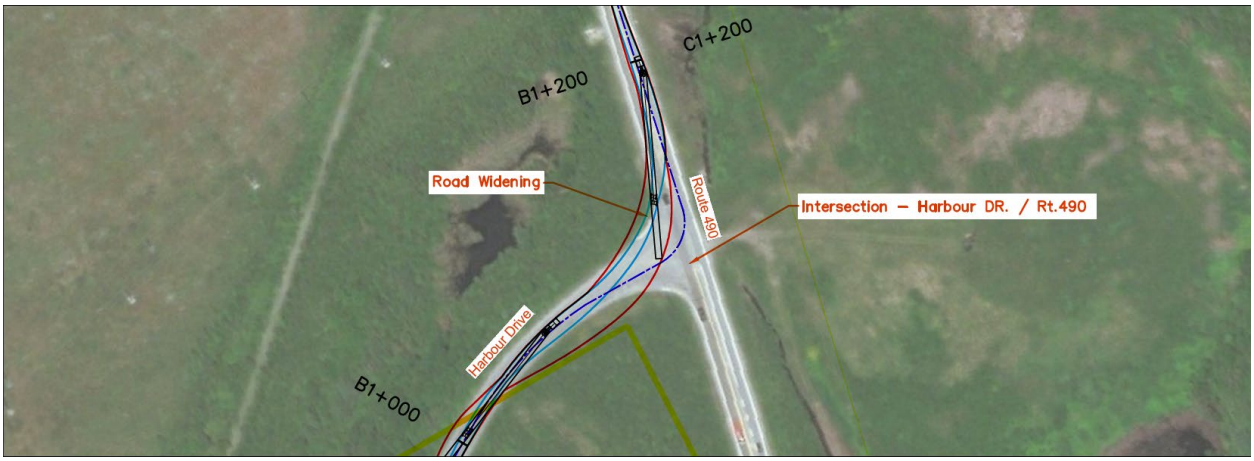
Source: Google Maps

Figure 4.8 Intersection 4



Source: Google Maps

Figure 4.9 Intersection 5

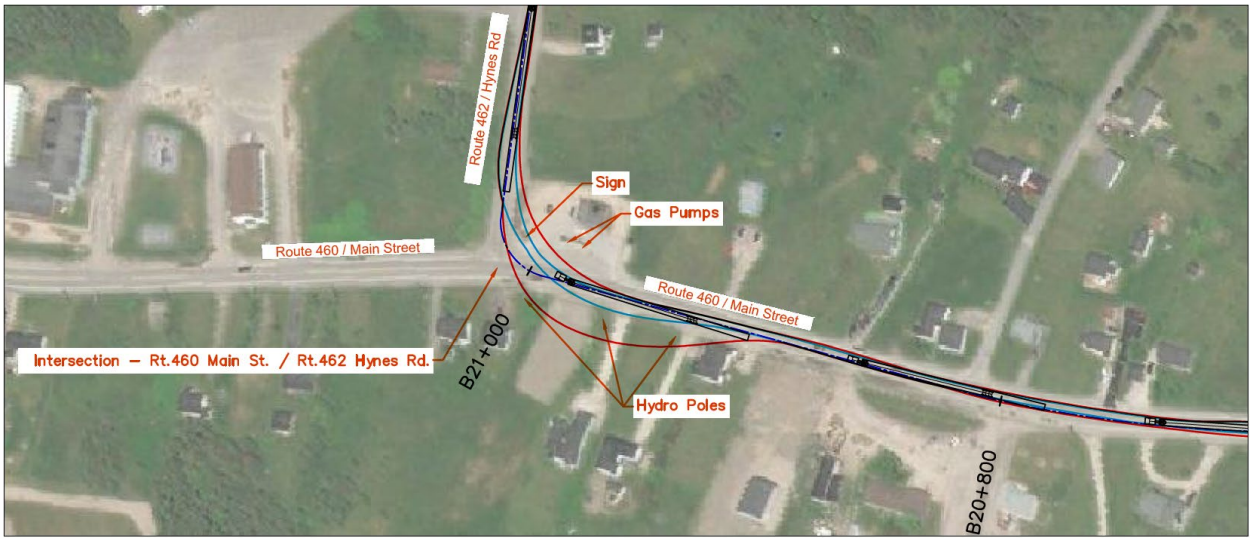


Source: Google Maps

Figure 4.10 Intersection 6

Source: Google Maps

Figure 4.11 intersection 7



Source: Google Maps

Figure 4.12 Intersection 8

Source: Google Maps

Figure 4.13 Intersection 9

Table 4.2 Summary of Swept Path Assessment

Figure No.	Wind Farm Site	Location	Comment
4-2	Area 1 (optional)	Route 463 (Main St.) at Beach Road, Port au Port	Hydro poles located on west side of RTE 463. *This route would be optional should the transport vehicle use the existing public roadway vs. utilizing internal access roads at Area 1.
4-3	Area 1 (optional)	Route 463 (Main St.), Port au Port	Hydro poles located on south side of RTE 463 and large bedrock outcrop. * This route would be optional should the transport vehicle use the existing public roadway vs. utilizing internal access roads at Area 1.
4-4	Area 1 (optional)	Route 463 (Main St.), Port au Port	Hydro pole located on north side of RTE 463. *This route would be optional should the transport vehicle use the existing public roadway vs. utilizing internal access roads at Area 1.
4-5	Area 1 / 2 (optional)	Route 463, Port au Port	Hydro pole located on south side of RTE 463. *This route would be optional should the transport vehicle use the existing public roadway vs. utilizing internal access roads at Areas 1 and 2.
4-6	Port Exit, Area 4	Offloading to Harbour Drive	Roadway widening work within the port access roads, hydro poles and overhead lines crossing. It should be noted that a finalized swept path analysis should be completed as part of the overall logistics of offloading at the Port to the laydown area to minimize impact to the existing infrastructure and need for roadway widening where feasible.
4-7	Port Exit, Area 4	Harbour Drive and Route 490	Minor clearing and widening work at intersection.
4-8	Port Exit Area 4	Route 490 / Minnesota Drive / Route 460 westbound and eastbound	Clearing and widening work at intersection approaches. Temporary removal of signage (regulatory, warning and wayfinding). Hydro pole impacts and overhead lines crossing.
4-9	Area 3	Intersection Route 460 (Main St) and Route 462 (Hynes Rd)	Widening work at intersection through encroachment onto residential and commercial properties (Western Petroleum), including temporary removal of commercial signage. Hydro pole impacts and overhead lines crossing.
4-10	Area 4	Route 460 / Trans-Canada Highway Interchange (RTE 1)	Clearing and widening work at TCH on ramp SB. Temporary removal of regulatory, warning and wayfinding signage. Movement is provided for the return transport vehicle at the RTE 460 off ramp WB. It should be noted that the return unloaded transporter vehicle could return to Port the RTE 490 / TCH interchange provided weight requirements are met for Main Gut Bridge. However, it's anticipated that the overall trailer length can be reduced on the return trip to that of a standard tractor trailer, thus being able to navigate the roadway geometry and at interchange and intersection locations, with no challenges or pinch points.
*Transporter vehicle movements will need to be accompanied by pilot vehicles and include an appropriate traffic management plan acceptable to NLTI Provincial requirements (Traffic Control Manual, latest edition).			

4.2 SITE ACCESS ROADWAY UPGRADES

The swept path analysis indicates that site-specific intersection upgrades are required to accommodate the identified transporter vehicle. Tree clearing, temporary widening, signage and hydro poles will require modification or removal at the identified intersections in order to accommodate the transporter vehicle. The site-specific upgrades would be assessed in further detail through a comprehensive route analysis and agreed to with NLDTI and WEGH2 through the permitting process, prior to commencing work.

Each of the vehicle access and egress points to the site(s) and the internal access road network should be designed to accommodate the swept path requirements of the largest transporter vehicle.

Along the routes, there are several smaller diameter culverts with varying depths of cover. Of less concern are the culverts under Route 1, however, under the other roadways, many of the small diameter culverts have minimal cover and may require further assessment on a case-by-case basis, depending on the loads, dimensions and axel configurations of the final transporter vehicle and float trailers.

Speed reductions along the routing will be required during the construction phase to provide a safer environment for all roadway users, particularly along the Trans-Canada Highway (Route 1), where the reduction should be from 100 km/h to 70 km/h. This would need to be discussed and agreed to by NLDTI.

4.3 VERTICAL CLEARANCE ASSESSMENT

Based on the transporter vehicle described in in Figure 4.1, there are no apparent clearance limitations at any of the underpass structures along the routes. There are also multiple locations along the route where there are overhead utilities (e.g., power, communication). Without any survey information available, it is assumed that the heights of the overhead utilities exceed the minimum roadway clearance requirements for arterial and collector roadways of 5.03 metres.

Based on the transporter vehicles defined in Figures 4.1 to 4.3, the ground clearance at structure locations will need to be assessed to ensure the trailer does not bottom out. Based on the condition and standard of the Trans-Canada Highway (Route 1), and it being subjected to oversize and overweight vehicles and loads in the past, it is not anticipated that ground clearance will be cause for concern, however, an assessment is recommended once more information is known on the dimensions of the transporter vehicles.

4.4 HYDRO CONFLICTS

Utility poles and transmission lines along the roadside will potentially be impacted, during the transporting of oversized and overweight equipment or components. Scenarios such as those shown in Figures 4.14 and 4.15 should be inspected and evaluated to determine the appropriate mitigation method(s) required during transportation and construction. The specific occurrences of scenarios shown in Figures 4.14 and 4.15 will be further reviewed during detailed design of the Project.

Figure 4.14 Example of Crossing at an Existing Public Road to WTG Site (Ex. Crossing between Route 463 and Internal Road from the Area 2 Wind Farm Site to the Area 1 Wind Farm Site)

Figure 4.15 Example of Trucks Driving under Overhead Wires (Route 490 near Newfoundland T'Railway)

4.5 LOAD RATING REQUIREMENTS

The legally allowable gross vehicle mass and dimensions are given in the Vehicle Regulations, under the *Highway Traffic Act*. which can be accessed on the Government of Newfoundland Labrador website on the *Overweight and Over Dimensional Special Permits* page (Overweight and Over Dimensional Special Permits - Digital Government and Service NL). This page also provides a link to apply for a special permit to operate vehicles not in conformance with the weights and dimensions set out in the regulation.

Oversize Permits are required for a vehicle that exceeds either an overall width of 4.27 metres, an overall height of 4.5 metres or a length with overhangs of front overhang of 3.1 metres and rear overhang of 5.5 metres and an overall length of 30 metres.

Over-mass/Oversize Permits are issued for vehicles that exceed the axle group or gross masses prescribed under the Act. Maximum mass of 64,000 kg while the axle weight, axle spacing, tire sizes and number of tires are also reviewed and may result in an excessive overweight permit being required. The maximum mass permitted corresponds closely to the design vehicle used in the province and prescribed in the *Canadian Highway Bridge Design Code* (CSA S6:19). This is the CL-625-ONT truck with axle loads as illustrated in Figure 4.7. It has an overall gross weight of 625 kilonewtons (63,710 kg) and interaxle spacings and axle groupings less than what is legally allowed, for conservatism and safety.

NLDTI's Design Branch review Over-mass/Oversize Permit applications and determine if current infrastructure can accommodate the vehicles. The Branch evaluates the truck loads against available load ratings (or structural evaluation) or against the design vehicle at the time of construction. To help evaluate the likelihood of Over-mass permits being allowed along the proposed route, a list of bridge structures (bridges, retaining walls and culverts over 3 m in diameter) has been assembled by Stantec and is presented in Table 2.2. The provided information is available in the bridge database system of the province. The location of the structures, along with the conflicting movement intersections, is shown on a map of the proposed route in Figure 2.1.

As noted in the bridge list in Table 2.2**,** the year of construction of the major structures range between 1955 and 2021 with most dating from the 1970's. Of the 29 structures along the route, five have been evaluated to the CL-625-ONT vehicle in accordance with section 14 of the *Canadian Highway Bridge Design Code*. Once the final routing is accepted and with the owner's approval, it is recommended that structural evaluations for the project transport loads be completed.

Figure 4-16 shows the CL-625 design load and the Newfoundland Special Heavy Truck live load.

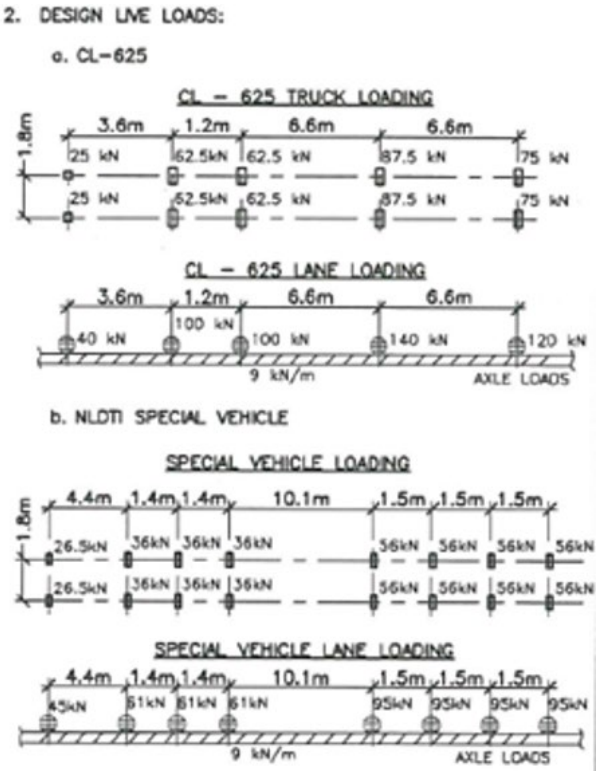


Figure 4.16 CL-625 design load and the Newfoundland Special Heavy Truck live load

In stakeholder discussions with the NLDTI Design Branch, they have stated that vehicle configurations can be submitted to the Permits office for pre-approval. They have also stated that for overlength vehicles, a comprehensive Traffic Management Plan including vehicle configuration approval or completed load evaluation calculations, if deemed necessary, shall also be submitted to NLDTI.

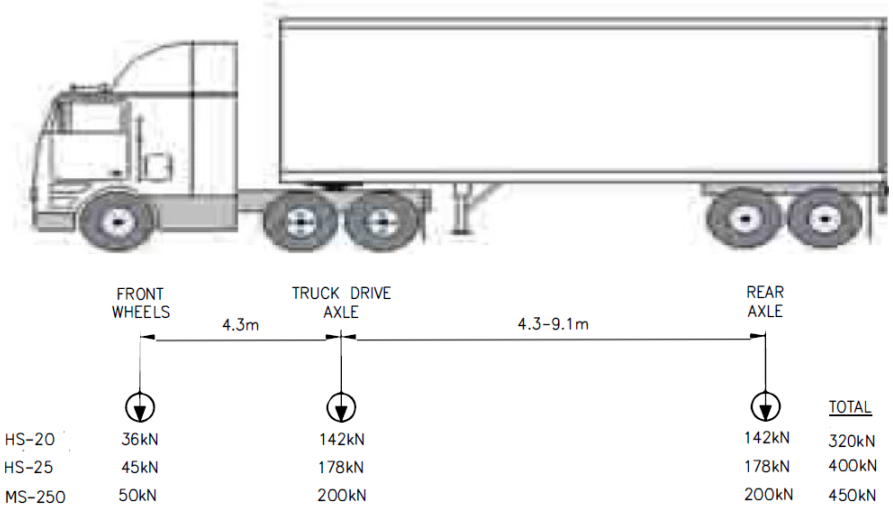


Figure 4.17 HS-20, HS-25 and MS-250 Truck Loadings

5.0 CONCLUSIONS AND RECOMMENDATIONS

Once the equipment and transporter vehicles have been finalized for all delivery components, WEGH2 will proceed with the following next steps.

1. A comprehensive Traffic Management Plan to provide detailed information on the proposed routes, schedule, component & equipment dimensions and weights, traffic controls & private escorts, structures, overhead obstructions, significant turns including communication protocols, emergency vehicles plans, breakdown plans and environmental constraints.
2. Detailed load rating assessments and calculations to be conducted on the structures and large diameter culverts identified in this report.
3. Permit applications to be completed and submitted to proper authorities.
4. Detailed route analysis (horizontal and vertical) to be completed:
    a. Horizontal clearance: provide recommendations to upgrade the road to permit the transporter vehicle to pass. Include clearing, roadway and shoulder widening, traffic control (temporary lane closures, flaggers, etc.).
    b. Vertical clearances: provide recommendations on any potential challenges including overpass/underpass clearances and utility line clearances.
5. Early confirmation of equipment and transporter vehicle dimensions and loadings to allow adequate time to conduct structural load ratings and permit applications.
6. Early coordination with Newfoundland Power and NL Hydroon the requirements of temporary relocation of hydro poles and overhead wires.
7. Any shallow buried small diameter culverts that would not be included as part of the bridge inventory (< 3 m dia.) should be assessed prior transport of WTG components and equipment.
8. Among all phases of the Project, it is identified that the construction phase represents the worst-case scenario since oversized and overweight Project materials and equipment will be transported to the site during the construction period.
9. Components for the construction of hydrogen/ammonia plant will be transported from the laydown areas at the Port of Stephenville to the adjacent construction site using the road network and Harbour Drive, which is also used for delivery of oversized and overweight Project materials and equipment.
10. On average, 6 daily round trips will be made to deliver overweight and oversized equipment from barging stations / ports to wind farm sites and 30 round trips will be made to deliver other construction materials from Port of Stephenville to wind farms per day.
11. When shipping the turbine components, the transport vehicles will need to cross the public road and/or make turns when travelling between barging stations and wind farm sites. Up to 5 minutes are needed to allow vehicles to cross. Two traffic controller persons are needed for each intersection.
12. When shipping the turbine components to Area 4, the travelling speed of the transport vehicle is much lower than the posted speed. It is recommended to have escort vehicles to warn the traveling public and to schedule the delivery to avoid the ferry traffics between Stephenville and Port aux Basques.

13. In 2024, a structural assessment of the Main Gut Bridge was conducted, confirming its capability to bear the load of overweight components.
14. In terms of construction-related vehicles during the construction season, the impact to current traffic operation is low.

6.0 REFERENCES

Marine Atlantic. 2024. Passenger Ferry Schedule. Available online at: Nova Scotia & Newfoundland Ferry Schedule | Marine Atlantic

Transportation Research Board. 2000. Highway Capacity Manual 2000. Prepared for the National Research Board. Available online at: https://sjnavarro.files.wordpress.com/2008/08/highway_capacital_manual.pdf

APPENDIX A

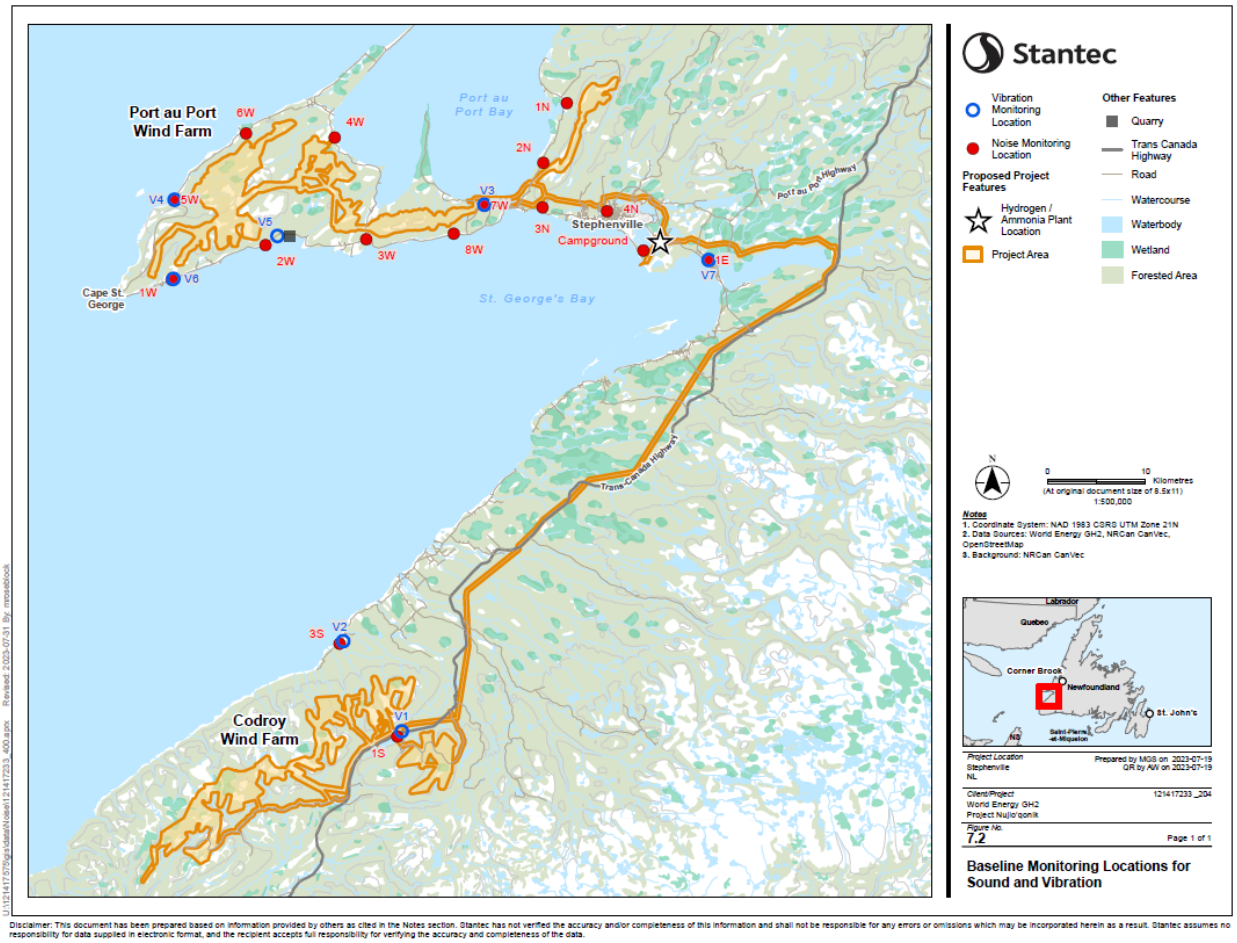
Traffic Data

MANUAL COUNT # LOCATION	LEG DESCRIPTION	2013 LEG AADT	2013 CARS AADT	2013 P/V AADT	2013 ST AADT	2013 TT AADT	% COMMERCIAL VEHICLES
TCH-DIST.4			(Passenger Cars)	(Pickups & Vans)	(Single Unit Trucks)	(Tractor Trailers & Buses)	
1-420	A. CORNER BROOK	5416	2495	1506	598	818	26.14
TCH.AT RTE.430	B. DEER LAKE	4100	1543	1402	847	309	28.18
DEER LAKE TO	C. GRAND FALLS	3519	2815	145	131	429	15.91
ST.ANTHONY	D. ST.ANTHONY	3837	2048	1473	235	81	8.24
1-422	A. CORNER BROOK	3803	2488	621	188	505	18.24
TCH.AT NICHOLSVILLE	B. DEER LAKE	7621	4369	2234	724	294	13.36
OVERPASS AND	C. GRAND FALLS	5093	3926	507	199	461	12.95
DEER LAKE	D. NICHOLSVILLE	6136	3265	2087	615	168	12.76
	A. CORNER BROOK	4529	2206	1453	340	530	19.22
TCH.AT ST. JUDES EAST	B. DEER LAKE	1276	1196	40	18	22	3.07
INTERCHANGE WITH ACCESS	C. GRAND FALLS	3986	1869	1462	263	393	16.45
TO DEER LAKE	D. ST JUDES	664	435	74	74	80	23.30
TCH.AT ST. JUDES WEST	A. GRAND FALLS	4483	2733	816	250	685	20.85
INTERCHANGE ACCESS	B. ST JUDES	120	70	41	9	0	7.81
	C. CORNER BROOK	4680	2578	1374	225	503	15.57
	A. DEER LAKE	5149	3537	924	252	437	13.37
TCH.AT PASADENA EAST	B. SERVICE RD & ROD & GUN CLUB	209	192	10	5	3	3.54
INTERCHANGE	C. CORNER BRK.	8070	6129	831	410	700	13.75
	D. PASADENA	1114	762	297	40	16	4.98
1-430	A. DEER LAKE	8544	6489	880	434	741	13.75
TCH.AT SOUTH BRK.	B. SOUTH BRK. (BOOM SIDING)	92	89	3	0	0	0.00
`	C. CORNER BRK.	12770	10544	1195	456	575	8.07
	D. PASADENA	3010	2798	160	38	15	1.76
	A. DEER LAKE	12770	10544	1195	456	575	8.07
TCH.AT RAPID POND	B. BOOM SIDING	565	552	5	7	2	1.50
INTERCHANGE	C. CORNER BRK.	12621	9627	1893	483	617	8.72
	D. LITTLE RAPIDS	115	104	3	5	3	6.56
	A. DEER LAKE	12960	9886	1944	496	634	8.72
TCH.AT LITTLE RAPIDS							
INTERCHANGE	C. CORNER BRK.	13356	10243	1500	555	1058	12.08
	D. LITTLE RAPIDS	135	59	50	22	5	19.59
	A. DEER LAKE	13007	9975	1461	540	1031	12.08
TCH.AT HUMBER VILLAGE							
INTERCHANGE	C. CORNER BRK.	13771	10630	1011	606	1525	15.47
	D. LITTLE RAPIDS	285	272	6	5	3	2.64
1-435	A. DEER LAKE	12963	9670	1301	650	1341	15.36
TCH.AT STEADY BRK.	B. STEADY BRK.	1235	1114	73	26	21	3.82
BRIDGE	C. CORNER BRK.	14345	11079	1054	710	1501	15.41
	D. MARBLE MTN.	4320	2020	590	342	590	21.58
1-440	A. DEER LAKE	13972	10791	1027	691	1462	15.41
TCH.AT R440 HUMBER RD/	B. RIVERSIDE DRIVE	2595	2116	132	73	274	13.38
RIVERSIDE DRIVE	C. PORT AUX BASQUE	11196	9250	818	382	746	10.07
	A. DEER LAKE	11616	9598	848	397	774	10.07
TCH.AT RTE.	B. LEWIN PARKWAY	6978	4274	1910	434	360	11.38
LEWIN PARKWAY	C. PORT AUX BASQUE	5921	4557	600	280	485	12.91
1-445	A. DEER LAKE	6927	5332	701	327	567	12.91
TCH.AT MASSEY DRIVE	B. CORNER BROOK	6268	5623	540	73	32	1.68
IN CORNER BROOK	C. PORT AUX BASQUE	3871	2992	420	223	235	11.85
	D. MASSEY DRIVE	4734	2415	1506	616	197	17.18
	A. DEER LAKE	3216	1749	679	315	472	24.50

MANUAL COUNT # LOCATION	LEG DESCRIPTION	2013 LEG AADT	2013 CARS AADT	2013 P/V AADT	2013 ST AADT	2013 TT AADT	% COMMERCIAL VEHICLES
TCH-DIST.4			(Passenger Cars)	(Pickups & Vans)	(Single Unit Trucks)	(Tractor Trailers & Buses)	
TCH.AT RTE.	B.ROUTE 450	3056	1535	608	362	551	29.89
WATSONS POND INTERCH.	C. PORT AUX BASQUE	3202	2451	368	162	222	11.98
1-455	A. CORNER BRK.	2772	1778	524	174	297	16.98
TCH.AT RTE.402	B. GALLANTS	141	74	47	17	3	14.20
TO GALLANTS	C. CHANNEL-P.A.B.	2869	2155	361	126	227	12.29
1-457	A. CORNER BRK.	2640	1501	500	184	455	24.21
TCH.AT RTE.460	B. STEPHENVILLE	1273	1190	50	27	6	2.62
TO STEPHENVILLE	C. CHANNEL-P.A.B.	1298	554	260	166	318	37.29
1-460	A. CHANNEL-P.A.B.	1279	788	220	100	171	21.19
TCH.AT RTE.480	B. BURGEO	294	208	62	12	12	8.21
TO BURGEO	C. CORNER BRK.	1282	522	376	143	241	29.92
1-462	A. CORNER BRK.	1537	817	285	178	257	28.32
TCH.AT RTE.490	B. STEPHENVILLE	1079	803	138	62	76	12.82
TO STEPHENVILLE	C. CHANNEL-P.A.B.	2166	848	679	266	373	29.51
1-463	A. CORNER BRK.	4764	2555	353	541	1315	38.97
TCH.AT RTE.461	B. ST.GEORGE'S	939	474	162	108	196	32.35
TO ST.GEORGE'S	C. CHANNEL-P.A.B.	5231	2234	471	470	2055	48.27
1-465	A. CORNER BRK.	2039	803	697	176	364	26.46
TCH.AT RTE.403	B. FLAT BAY	333	293	28	8	4	3.61
TO FLAT BAY	C. CHANNEL-P.A.B.	1737	807	446	152	332	27.86
1-469	A. CORNER BRK.	1619	679	335	186	420	37.39
TCH.AT RTE.404	B. ROBINSONS	338	263	59	11	6	4.92
TO ROBINSONS	C. CHANNEL-P.A.B.	1144	633	184	90	238	28.64
1-470	A. CORNER BRK.	1244	676	206	124	238	29.13
TCH.AT RTE.404	B. JEFFREY'S	194	177	9	8	1	4.49
TO JEFFREY'S	C. CHANNEL-P.A.B.	1295	785	179	120	211	25.55
	A. CORNER BRK.	1173	945	103	48	77	10.62
TCH.AT RTE.405	B. ST. DAVIDS	218	202	7	5	4	4.15
TO ST. DAVIDS	C. CHANNEL-P.A.B.	908	537	159	70	142	23.38
1-480A	A. CORNER BRK.	1530	1172	140	82	136	14.26
TCH.AT SOUTH BRANCH	B. SOUTH BRANCH	191	72	70	36	13	25.96
ROAD	C. CHANNEL-P.A.B.	1341	581	355	150	255	30.22
1-480B	A. CORNER BRK.	1084	720	167	94	103	18.17
TCH.AT SOUTH BRANCH	B. SOUTH BRANCH	328	265	36	16	11	8.23
ROAD (WEST ENTRANCE)	C. CHANNEL-P.A.B.	1235	775	217	96	147	19.64

MANUAL COUNT # LOCATION	LEG DESCRIPTION	2013 LEG AADT	2013 CARS AADT (Passenger Cars)	2013 P/V AADT (Pickups & Vans)	2013 ST AADT (Single Unit Trucks)	2013 TT AADT (Tractor Trailers & Buses)	% COMMERCIAL VEHICLES
TCH-DIST.4							
1-484	A. CORNER BRK.	1443	977	207	91	167	17.93
TCH.AT GRAND CODROY	B. GRAND CODROY	394	166	116	43	69	28.45
ROAD	C. CHANNEL-P.A.B.	1781	1085	357	132	206	18.99
	D. BENOIT SIDING	394	166	116	43	69	28.45
1-485	A. CORNER BRK.	1691	1310	143	102	137	14.11
TCH.AT RTE.406	B. UPPER FERRY	1074	982	43	27	21	4.48
TO UPPER FERRY &	C. CHANNEL-P.A.B.	2395	1229	664	253	249	20.96
DOYLES	D. DOYLES	186	117	42	20	6	14.23
1-486	A. CORNER BRK.	2106	1655	181	104	166	12.80
TCH.AT RTE.407	B. ST.ANDREW'S	779	695	40	24	20	5.65
TO ST.ANDREW'S	C. CHANNEL-P.A.B.	2063	1291	416	143	213	17.24
1-490	A. CORNER BRK.	2224	1795	200	94	134	10.28
TCH.AT RTE.408	B. RTE.408 EAST	698	384	122	51	141	27.47
EAST ENTRANCE	C. CHANNEL-P.A.B.	2399	1750	328	123	198	13.39
1-491	A. CORNER BRK.	2799	2194	285	117	203	11.43
TCH.AT RTE.408	B. RTE.408 WEST	60	54	4	1	1	3.49
WEST ENTRANCE	C. CHANNEL-P.A.B.	2930	2030	541	169	190	12.26
1-495	A. CORNER BRK.	2107	1668	173	110	156	12.63
TCH.AT GRAND BAY	C. GRAND BAY EAST(error ?)	5175	4328	492	174	181	6.86
EAST ROAD	D. CHANNEL-P.A.B.	1809	1142	299	137	231	20.33
1-496	A. CORNER BRK.	2888	2221	307	150	209	12.43
TCH.AT GRAND BAY	B. GRAND BAY WEST	1576	1190	184	96	106	12.83
WEST ROAD	C. CHANNEL-P.A.B.	3270	2820	193	89	168	7.87
1-497	A. FERRY	1356	954	164	87	151	17.58
TCH.AT RTE.470	B. ROSE BLANCHE	814	787	21	6	0	0.75
TO ROSE BLANCHE	C. TCH East to Corner Brook	1487	925	247	119	198	21.27
	D. CHANNEL-P.A.B.	688	557	48	46	37	11.96
	A. TCH EAST	1400	1105	190	53	52	7.47
TCH.AT MAIN STREET PAB	B. MAIN STREET PAB	6811	3667	479	532	2133	39.12
TO PORT AUX BASQUES	C. TCH WEST	1689	1622	44	158	7	9.80
RTE.430							
430-92	A. ST.ANTHONY	973	850	58	29	37	6.70
INTERSECTION OLD RD.	B. PORT AU CHOIX	1110	916	134	29	31	5.44
TO PORT AU CHOIX	C. DEER LAKE	1422	1260	92	35	35	4.92
430-120	A. ST.ANTHONY	995	809	94	42	49	9.21
INTERSECTION	B. ST.BARBE	995	809	94	42	49	9.21
ST.BARBE ROAD	C. DEER LAKE	995	809	94	42	49	9.21
	A. ST.ANTHONY	1979	1675	197	55	51	5.38
INTERSECTION	B. ROCKY HR.	1230	1168	41	20	0	1.61
RTE.430-14- ROCKY HR. NORT	C. DEER LAKE	2446	1533	683	123	106	9.36
	A. ST.ANTHONY	1074	896	45	29	103	12.31
INTERSECTION	B. RODDICKTON	318	271	23	17	8	7.67
RTE.432- RODDICKTON	C. DEER LAKE	1609	933	101	150	425	35.74
RTE.461							
	A. STEPHENVILLE	2615	2415	111	36	53	3.42
INTERSECTION	B. Route 461	1584	1517	40	19	8	1.75
RTE.461- Stephenville.	C. TCH	1708	1369	85	58	196	14.89

MANUAL COUNT # LOCATION	LEG DESCRIPTION	2013 LEG AADT	2013 CARS AADT	2013 P/V AADT	2013 ST AADT	2013 TT AADT	% COMMERCIAL VEHICLES
TCH-DIST.4			(Passenger Cars)	(Pickups & Vans)	(Single Unit Trucks)	(Tractor Trailers & Buses)	
RTE.460- Stephenville - Barswalos							
	A. Boswarlos	**8169**	**4630**	**1317**	**826**	**1395**	27.19
INTERSECTION	B. Route 460	**2566**	**2170**	**188**	**81**	**126**	8.08
RTE.460- Stephenville - Barswal	C. Stephenville	**1683**	**906**	**108**	**150**	**519**	39.76
RTE.490- Intersection to Stephenville Crossing near Seal Cove							
INTERSECTION	A. Stephenville Crossing	**1154**	**426**	**568**	**134**	**25**	13.80
RTE.490- Stephenville	B. TCH	**3858**	**3197**	**382**	**148**	**131**	7.24
Seal Cove	C. Stephenville	**2789**	**1940**	**495**	**204**	**150**	12.69



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<u>Location E1 - 25/05/2023 2:00 – 3:00 pm</u>
Direction SOUTH: Cars:49 – LT:0 – HT:1
Direction NORTH: Cars:45 – LT:1: HT:1
Total: 97

<u>Between locations 2W and 3W near the quarry– 19/05/2023 10:30-11:30am</u>
Direction NORTH: Cars: 30; LT: 0; HT: 0
Direction SOUTH: Cars: 14; LT: 1; HT: 1
Total Count: 46

<u>Location 6W - 05/16/2023 12-1pm</u>
Direction SOUTH: Heavy Trucks:0; Light Trucks:0; Cars: 12
Direction NORTH: Heavy Trucks:0; Light Trucks:1; Cars:16
Total Count: 29

<u>Location 4W - 22/05/2023 – Unknown time (my guess is 3-4pm)</u>
Direction SOUTH: Cars:85 - LT:1 - HT:3
Direction NORTH: Cars:71 – LT:0 – HT:9
Total: 169