Appendix A

Atmospheric Impact Assessment

Invenergy
Environmental Review Report
July 2023 - 22-5016

DILLON
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Atmospheric Impact Assessment

Proposed Upgrade of the St. Clair Energy Centre

Advanced Gas Pathway Upgrade

July 2023 - 22-5016

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Executive Summary

St. Clair Energy Centre (SCEC) is a natural gas (NG) -fired combined-cycle power plant (the Facility) owned and operated by St. Clair Power, L.P. The Facility is proposing to implement an Advanced Gas Path (AGP) upgrade, which will increase the plant capacity through process improvements and equipment upgrades and requires no physical expansion of the Facility.

The Facility is currently approved to operate under the Amended Environmental Compliance Approval (ECA) No. 4774-BG6GZN, issued on October 30, 2019. The major sources of air emissions at the Facility are two NG-fired combustion turbines and steam generators or heat units to support the gas turbine (GT) operation.

The indicator compounds from the Facility include: Criteria Air Contaminants (CACs), Volatile Organic Compounds (VOCs), and Polycyclic Aromatic Hydrocarbons (PAHs). To support the environmental effects assessment, background air quality was characterized through the use of the most recent 3 year monitoring data collected at representative air quality monitoring stations. The ambient concentrations of contaminants were compared against relevant Ontario Ambient Air Quality Criteria (AAQC) and Ontario Regulation (O.Reg.) 419/05 schedule 3 standards. The 90th percentile concentrations of all contaminants with 10-min, 1-hr, 8-hr, and 24-hr averaging periods were below their respective criteria, with the exception of the 24-hr average Benzo(a)pyrene (a surrogate for total PAHs). The annual average concentrations for all contaminants were below their respective criteria, with the exception of Benzo(a)pyrene (BaP) and benzene (a surrogate for total VOCs) criteria.

Emission rates were developed for the significant sources of air emissions at the Facility using industry accepted methodologies.

The environmental effects assessment includes a combination of the background air quality for the region and the predicted contribution of all sources of emissions with the potential to cause residual effects on the atmospheric environment.

In addition to the evaluation of environmental effects, a compliance assessment was performed to determine whether the Facility would be anticipated to operate in compliance with only the sources regulated under O.Reg. 419/05.

Atmospheric dispersion modelling was conducted using the MECP approved AERMOD version 22112, MECP terrain data, and an MECP processed site specific 5-year meteorological dataset. The modelling was completed using worst case facility conditions, which measured emissions data accounting for if the facility ran at full capacity for a 24 hour (hr) period. The facility runs approximately

The results from the air dispersion modelling for the environmental effects assessment show all contaminants are below the criteria, except for Benzene (annual) and BaP (24-hr and annual). The annual facility contribution to benzene concentrations accounts for less than 1% of the criteria, and the exceedance is due to the high background concentration in the region.

The frequency of exceedance of modelled 24 hour average ambient air BaP concentrations over the applicable MECP 24 hour average POI limit is very low at all sensitive receptor locations for the 5 year assessment period. At the worst case receptor location, the exceedance frequency is only 2.2%, indicating that 98% of the time during the 5 year assessment period, there would be no exceedances of the 24 hour average POI limit at this receptor location.

It is important to note that the analysis considers a higher emissions level than the actual operating conditions of the Facility. Historical net capacity factors indicate that the Facility operates at much lower levels, leading to a very low frequency of exceedances based on the worst-case scenario analysis.

When the conservatism inherent to the air quality assessment and air quality modelling is considered in addition to the low exceedance frequency over the MECP 24 hour average POI limit, and the lack of exceedance of the facility-related maximum annual average air BaP concentration over the MECP annual average POI limit, the potential for human health risk in relation to facility-related and cumulative 24 hour average and annual average ambient air BaP concentrations is essentially negligible.

The results from the air dispersion modelling for the compliance assessment show that all contaminants are predicted below the criteria in O.Reg. 419/05 and, therefore, the Facility is demonstrated can operate in compliance with O.Reg. 419/05.

The report also examined the impact of the Facility on climate change through a review of estimated greenhouse gas (GHG) emissions. The Facility's GHG emissions, after the

AGP upgrade, are estimated to be approximately 1.1 megatonnes (Mt) of carbon dioxide equivalent (CO2e) per year, which accounts for about 0.73% of Ontario’s total GHGs (150 Mt) in 2021 and about 1.91% Ontario's stationary combustion emissions profile (57.7 Mt).

1.0 Introduction

1.1 Background

St. Clair Energy Centre (SCEC) is a natural gas (NG) -fired combined-cycle plant (the Facility) owned and operated by St. Clair Power, L.P. To meet Ontario's growing demand for electricity, SCEC is proposing to upgrade and expand the Facility through the implementation of an Advanced Gas Path (AGP) Upgrade, which will increase the plant capacity through process improvements and equipment upgrades and requires no physical expansion of the Facility.

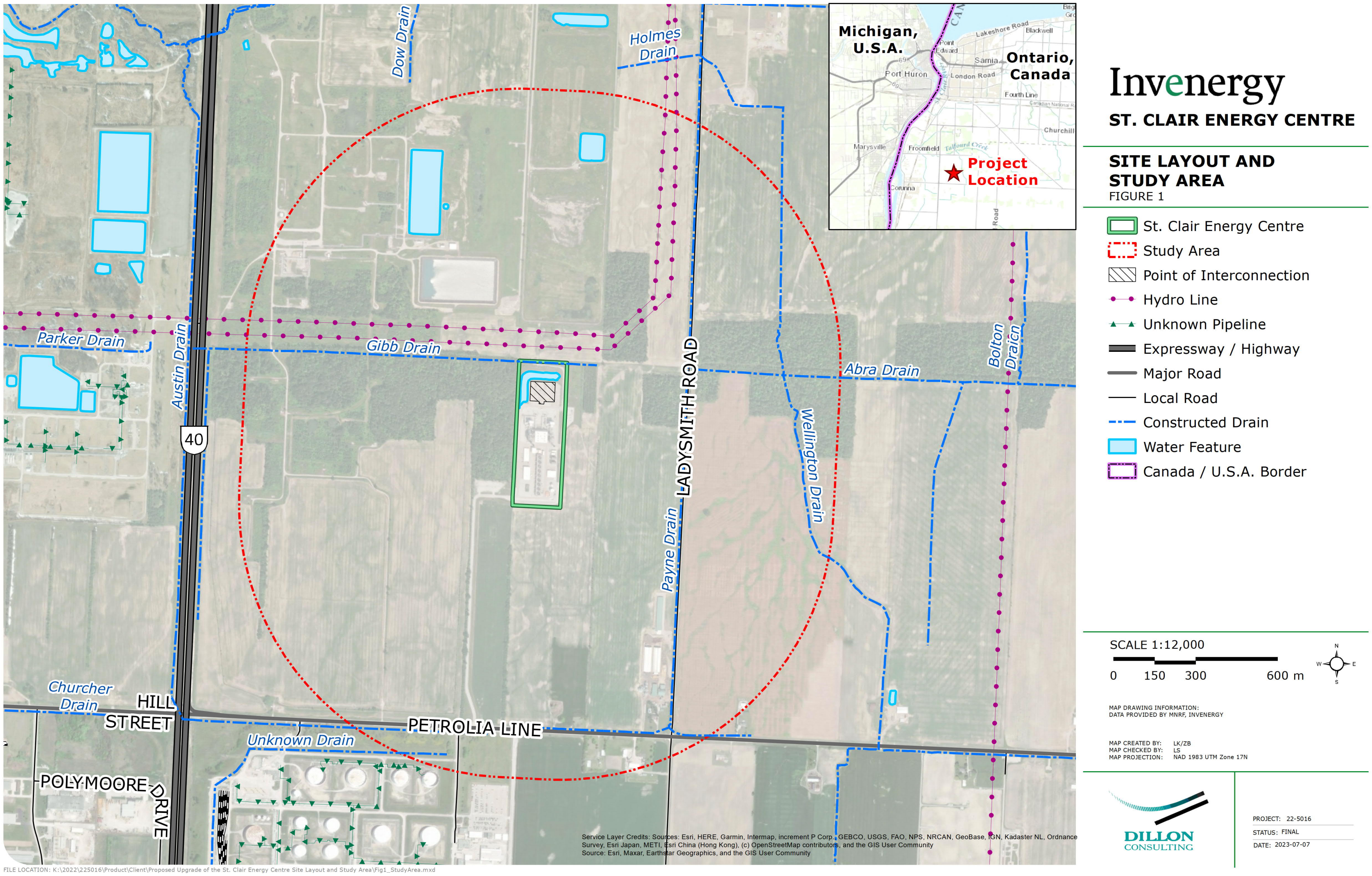
1.2 Facility Description

The Facility is located in a rural area in St. Clair Township, northeast of the intersection of Petrolia Line and Highway 40, as shown in Figure 1. The Facility is currently approved to operate under the Amended Environmental Compliance Approval ECA) No. 4774-BG6GZN, issued on October 30, 2019. The Facility operates 24 hours/day, 7 days/week, and 52 weeks/year.

The major processes at the Facility include power generation, heat recovery, and auxiliary activities such as comfort heating. The Facility is currently approved to operate the following air emission sources under ECA No. 4774-BF6GZN:

- Two NG-fired combustion turbines, each having a nominal rating of 185 megawatts and equipped with dry low-NOx burners, having a total nominal heat input of 4,680 gigajoules per hour;
- Two horizontal heat recovery steam generators (HRSGs), each serving a combustion turbine generator and a steam turbine. Each HRSG is equipped with NG-fired duct burners having a nominal heat input of 369.3 gigajoules per hour;
- Two steam turbine generators;
- Two dew point heaters;
- Cooling towers;
- A fire-fighting water pump; and,
- Storage tanks.

Figure 1: Facility Location and Boundary



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1.3 Role of Atmospheric Discipline in the Environmental Screening

1.3.1 Scope of the Atmospheric Assessment

The scope of the Atmospheric Impact Assessment (AIA) includes a review of background air quality, followed by an examination of potential impacts from the AGP Upgrade, atmospheric modelling, and the cumulative effects of these impacts that may be affected by the proposed Facility upgrades. Atmospheric modelling can provide insight into the atmospheric setting and help us understand the physical, chemical and biochemical processes occurring at the Facility. This complex model includes: the atmospheric conceptual framework, the geometry and structure of the site features, assumptions and limitations, processes, boundary conditions, governing equations, and a solution method.

Atmospheric modelling was performed to determine potential air quality impacts from the proposed Facility upgrades during worst-case operating conditions.

The AIA also included an assessment of the Facility-wide GHG emissions, including carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4). The Facility's GHG emissions are compared against the regional total GHGs and the sector total GHGs.

The purposes of this AIA report are to support the Environmental Screening Review (ESR) under the Electricity Projects Regulation
(O.Reg. 116/01) for the Facility's proposed AGP Upgrade.

1.3.2 Air Quality Guidelines

The air emission assessment followed the guidance documents published by the Ministry of the Environment, Conservation and Parks (MECP), including:

- Guideline A-10: Procedure for Preparing an Emission Summary and Dispersion Modelling Report, dated March 2018 (ESDM Procedure Document); and,
- Guideline A-11: Air Dispersion Modelling Guideline for Ontario, dated February 2017 (ADMGO).

1.4 Overview of Report Contents

The report describes the baseline atmospheric environment and assesses the emission impacts and compliance associated with the upgrade of the Facility. The report consists of the following:

- Section 1 presents an introduction to the study, a description of the Facility site, and applicable air quality regulations;
- Section 2 describes methods of assessment including indicator compounds and assessment criteria;
- Section 3 provides a description of the local climate and existing ambient air quality;
- Section 4 describes the Facility's emission sources and methods of emission estimations;
- Section 5 covers the dispersion modelling method, model results, and mitigative measures;
- Section 6 summarizes the major conclusions; and,
- Appendix A provides emission calculations that support the AIA.

2.0 Methods of Assessment

The potential for impact of the Facility upgrade on the atmospheric environment was evaluated using the Air Impact Study Area and indicator compounds described in the following subsections.

2.1 Air Impact Study Area

The term "Air Impact Study Area" refers to those areas for which data was collected and the impact analysis was carried out. For the purpose of the AIA, the Air Impact Study Area considered encompassed an area 10 km by 10 km, with the Facility at the centre of this grid.

For all indicator compounds, nearest discrete receptors were identified in all directions around the site. For the compliance assessment, a multi-tier grid of receptors were developed in accordance with O.Reg. 419/05.

2.2 Air Quality Indicator Compounds

The following list includes indicator compounds (also referred to as concerned contaminants) that are expected to be emitted based on Facility activities (e.g., stationary fuel combustion):

- Criteria Air Contaminants (CACs);
- Volatile Organic Compounds (VOCs);
- Polycyclic Aromatic Hydrocarbons (PAHs); and,
- Greenhouse Gases (GHGs)

2.2.1 Criteria Air Contaminants

As per typical industry best practice, the CACs associated with fuel combustions include nitrogen oxides (NO_x), particulate matter (PM, including TSP, PM_{10}, and $PM_{2.5}$), sulphur dioxide (SO_2), carbon monoxide (CO), and ozone (O_3). NO_x is typically the limiting contaminant emitted from natural gas combustion while other CACs are also emitted in minor quantities and therefore have been included in this assessment.

2.2.1.1 Nitrogen Oxides

NO_x are present in the atmosphere as the sum of nitrogen dioxide (NO_2) and nitric oxide (NO). Nitrogen oxide readily reacts photochemically in the atmosphere with VOCs to produce ground-level O_3 and $PM_{2.5}$. As with O_3 and $PM_{2.5}$, NO_2 also causes health problems as it can irritate the lungs and promote respiratory effects in those who are susceptible. It is also a contributor to acid rain formation through the transformation of NO to nitric acid. Combustion is the main source of anthropogenic nitrogen oxides. Significant sources of nitrogen oxides include those from the utility, transportation, and manufacturing sectors.

As NO_2 has adverse health effects at much lower concentrations than NO, the Ontario AAQC is based on the health effects of NO_2. For a conservative assessment, it is assumed the predicted concentrations of NO_x from the Facility equals NO_2 (i.e., 100% conversion).

2.2.1.2 Particulate Matter

Particulate matter (PM) is made up of aerosols, smoke, dust, ash and pollen. Anthropogenic sources of particulate emissions include industry, combustion and transportation. Total Suspended Particulate (TSP) matter is a measure of particulate matter, with particle aerodynamic diameters less than 44 µm (micrometres or microns), suspended in the air. PM_{10} is the fraction of TSP with particle aerodynamic diameters less than 10 µm. Both TSP and PM_{10} are no longer measured by the MECP since 2000, as the focus has shifted to fine particulate matter of size less than 2.5 µm due to its negative impact on health. However, AAQC standards for TSP and PM_{10} remain in place.

$PM_{2.5}$ is the fraction of TSP with particle aerodynamic diameters less than 2.5 µm. This is classified as fine particulate matter and is respirable, resulting in adverse health effects for people with asthma, cardiovascular or lung diseases, children and the elderly. Fine particulate matter can also negatively impact the environment through corrosion, soiling and its contribution to creating smog episodes.

As $PM_{2.5}$ is a size fraction subset of PM_{10}, and PM_{10} is a size fraction subset of TSP, the PM_{10} and TSP background concentrations can be estimated based on the $PM_{2.5}$

background concentration. Background concentrations of PM_{10} and TSP were estimated by applying a $PM_{2.5}/PM_{10}$ ratio of 0.54 and a $PM_{2.5}$/TSP ratio of 0.31.

2.2.1.3 Sulphur Dioxide

SO_2 contributes to the formation of acid rain through oxidation to sulphuric acid. It is also a precursor to $PM_{2.5}$ through the transformation to sulphates. The inhalation of SO_2 can also cause respiratory problems in sensitive individuals and can also aggravate cardiovascular disease conditions.

2.2.1.4 Carbon Monoxide

CO is produced primarily through the combustion of fossil fuels. It is a colourless and odourless gas, formed when hydrocarbon-based fuels are not completely combusted.

2.2.1.5 Ozone

Ground-level O_3 results from the atmospheric photochemical reactions between VOCs and NO_x. Ozone can impact the environment and human health. Studies have shown that there is a correlation between ground-level O_3 concentrations and increased hospital admissions and premature deaths.

As O_3 is not a primary contaminant emitted directly from Facility emission sources but a secondary contaminant formed through complex chemical reactions, O_3 emissions are not assessed through modelling. However, the background concentration of O_3 in the Project area is characterized and its precursors, including NO_x and VOCs, have been assessed in the study.

2.2.2 Volatile Organic Compounds

VOCs are organic chemical compounds that may evaporate under normal ambient conditions of temperature and pressure, such as benzene and toluene. VOCs are of interest because many individual VOCs from engine combustions are known to be harmful to human health and can contribute to the formation of ground-level ozone and

[1] Lall, R., Kendall, M., Ito, K., and G. Thurston (2004). Estimation of Historical Annual $PM_{2.5}$ Exposures for Health Effects Assessment. Atmospheric Environment 38 (2004) 5217-5226.

$PM_{2.5}$. Benzene, one of the common VOCs associated with fuel combustion, is selected as a surrogate for assessing VOC emissions.

2.2.3 Polycyclic Aromatic Hydrocarbons

PAHs are a class of complex substances that are produced through the incomplete combustion of fossil fuels. PAHs in the atmosphere are primarily associated with suspended particulates, although they are also present in the vapour phase. PAHs in Canada are mainly contributed by forest fires and aluminum smelters. Among the anthropogenic sources, thermal power plants constitute only a small fraction (0.3 %) of total PAHs releases[2]. Among PAH species, Benzo(a)pyrene (BaP) is generally selected as a surrogate for assessing the total carcinogenicity as per Ontario AAQC.

2.2.4 Air Quality Criteria

The criteria for air quality in Ontario are established in O.Reg. 419/05[3] and in Ontario's Ambient Air Quality Criteria[4] (AAQC). O.Reg. 419/05 provides contaminant concentration standards and guidelines to assess impacts for permitting requirements (i.e., compliance). The AAQCs developed by the MECP are commonly used in environmental assessments, special studies using ambient air monitoring data, assessment of general air quality in a community and annual reporting on air quality across the province.

Table 1 summarizes the applicable Ontario criteria for the indicator compounds.

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[2] Environmental Canada. Canadian Environmental Protection Act, Priority substances list assessment report- Polycyclic Aromatic Hydrocarbons.

[3] Ministry of the Environment, Conservation and Parks (2019). Environmental Protection Act. Ontario Regulation 419/05 (O.Reg.419/05): Air Pollution – Local Air Quality. January 2019.

[4] Ministry of the Environment, Conservation and Parks (2019). Ontario's Ambient Air Quality Criteria. April 2019.

Table 1: Air Quality Criteria for the Concerned Contaminants

Indicator Compound (Contaminants)	Averaging Period	Criterion[1] (µg/m³)	Regulations
TSP	24 hr	120	Ontario AAQC, O.Reg. 419/05
	Annual	60	Ontario AAQC
PM_{10}	24 hr	50	Ontario AAQC
$PM_{2.5}$	24 hr	27	Ontario AAQC
	Annual	8.8	Ontario AAQC
Nitrogen Dioxide (NO_2)	1 hr	400	Ontario AAQC
	24 hr	200	Ontario AAQC
Carbon Monoxide (CO)	0.5 hr	6000	O.Reg. 419/05
	1 hr	36,200	Ontario AAQC
	8 hr	15,700	Ontario AAQC
Sulphur Dioxide (SO_2)	10 min	178	Ontario AAQC
	1 hr	690	O.Reg. 419/05
	1 hr	106	Ontario AAQC
	1 hr	100	O.Reg. 419/05[2]
	24 hr	275	O.Reg. 419/05
	Annual	10.6	Ontario AAQC
	Annual	10.0	O.Reg. 419/05[2]
Benzo(a)pyrene (as a surrogate for PAHs)	24 hr	0.00005	Ontario AAQC
	Annual	0.00001	Ontario AAQC
Benzene (as a surrogate for VOCs)	24 hr	2.3	Ontario AAQC
	Annual	0.45	Ontario AAQC
Ozone (O_3)	1 hr	165	Ontario AAQC

Notes:

1. Criteria have been converted to ug/m³.
2. O.Reg. 419/05 future criterion for Sulphur Dioxide will be effective from July 1, 2023. The most stringent criteria (bolded) for each averaging period is used for the assessment.

2.3 Assessment Criteria

The air quality and climate change criteria, indicators, rationale, and data sources are provided in Table 2.

Table 2: Air Quality and Climate Change Impact Assessment Criteria

Criteria	Indicator	Rationale	Data Source
Potential impacts to air quality from the Facility based on indicator compounds	Comparison of predicted concentrations of air quality indicator compounds with baseline conditions against MECP air quality criteria.	The Facility must meet criteria established by the MECP.	• MECP and Environmental Climate Change Canada (ECCC) background air quality monitoring data; • MECP processed meteorological data; • Existing and proposed facility characteristics including stack location and parameters, operating conditions, etc.; • Manufacturer emissions data • US EPA AP-42 emission factors; • MECP D-4 Land Use on or Near Landfills and Dumps; and, • US EPA LandGEM modelling.
GHG emissions potential.	Quantitative assessment of GHG emissions (US EPA and Canadian National Inventory Report [NIR] emission factors).	The operation of the Facility results in GHG emissions so it is necessary to characterize the emissions to be able to mitigate where possible.	• Manufacturer emissions data; • US EPA AP-42 emission factors; and, • Canada NIR.

3.0 Existing Atmospheric Conditions

3.1 Local Climate

St. Clair Energy Center is located in the St. Clair Township (the Township) in southwestern Ontario, immediately south of Sarnia in Lambton County, along the eastern shores of the St. Clair River. Characterization of the local and regional climate and meteorological conditions including wind speed and direction were determined for the site. These parameters are key in determining the long-term flow regime and transport of air contaminants. Some key meteorological parameters for the site, such as atmospheric stability and wind data characteristics are provided in the below sections.

3.1.1 Climate Normals

Climate normals data including local temperature and precipitation were obtained from Environment Canada's Sarnia Airport Station (Latitude: 42°59' N, Longitude: 82°18' W, Elevation: 180.60 m, Climate ID 6127514). It is the closest climate station located approximately 13 km to the northeast of the Facility and the climatic data reflects the average atmospheric conditions at the site. The most recent 30-year climate normals for the station are presented in Table 3 below, for the period 1981 to 2010.

Table 3: Sarnia Airport Station Climate Normals (1981-2010)

Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Daily Average (°C)	-4.8	-3.7	0.6	6.9	12.7	18.2	21.1	20	16.4	10.1	4.3	-1.8	8.3
Mean Daily Maximum (°C)	-1.2	0.2	4.9	12	18.3	23.8	26.4	25.2	21.7	14.7	8	1.5	13
Mean Daily Minimum (°C)	-8.3	-7.5	-3.6	1.7	7.1	12.6	15.8	14.8	11	5.3	0.6	-5.1	3.7
Mean Rainfall (mm)	22.9	26.4	38	66.8	79.7	83.1	78.5	78.5	104.7	75.6	76.3	39.6	770
Mean Snowfall (cm)	31	24.9	19.1	4.5	0	0	0	0	0	0.5	5.9	26.1	112
Total Precipitation (mm)	51.5	50.9	57.5	71.5	79.7	83.1	78.5	78.5	104.7	76.1	82.4	63.9	878.2
Days with Precipitation (>= 0.2 mm)	15	11.9	12.9	14	12.6	10.9	10.9	10.4	11.4	12.2	13.7	14.2	150

The climate normals near the Township show a humid continental climate with cold winters, and warm, humid summers. Winters are cold with a maximum of −1.2 °C during the day and −8.3 °C during the night in January. As it is not located in the Snowbelt region, snow cover is intermittent throughout the winter. Summers are warm and humid with a July high of 26.4°C and a low of 15.8 °C. The annual mean temperature for the site is 8.3 °C. The annual precipitation is 878.2 millimetres and evenly distributed throughout the year which results in 150 days with measurable precipitation. The wind data is summarized in Section 3.1.3 below using an MECP pre-processed regional meteorological dataset.

3.1.2 Atmospheric Stability

Generally, temperature decreases with increasing height. The rate of change in air temperature with height determines the atmosphere's ability to resist or enhance vertical motion. The degree of vertical motion is a measure of atmospheric stability.

The atmosphere can have three general stabilities which are unstable, neutral and stable. The Pasquill stability scale (Pasquill and Smith, 1983), has been used historically in atmospheric dispersion modelling to classify stability classes ranging from (A) being very unstable, through (D) neutral, to very stable (F). Atmospheric dispersion is very sensitive to atmospheric stability and these broad Pasquill stability classes cannot accurately describe dispersion under all prevailing conditions. To address these sensitivities, AERMOD, the latest state-of-the-art dispersion model, was used. AERMOD provides a more accurate description of the vertical transport of pollutants and dispersion as stability classes are not used, rather actual stability is calculated.

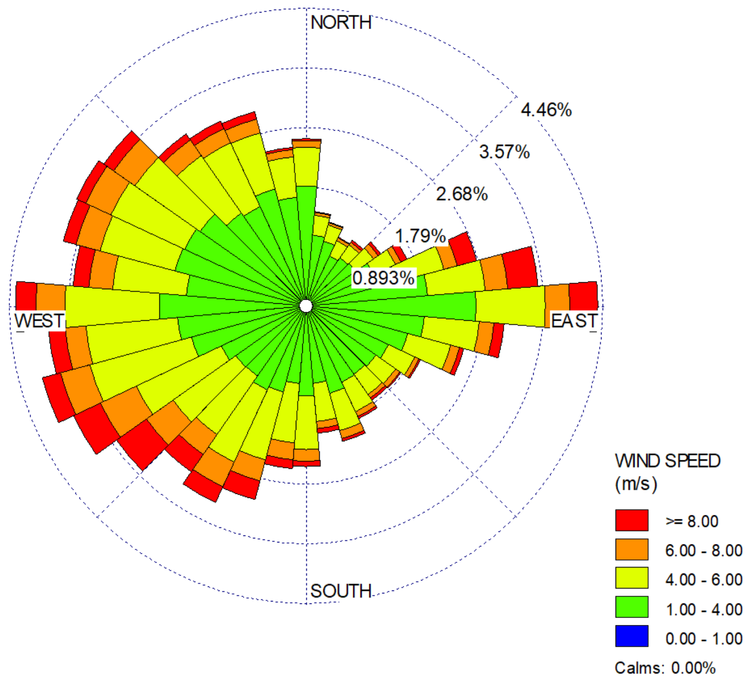
3.1.3 Wind Data

The regional meteorological dataset pre-processed by the MECP for the London Region, Ontario is required for air permit applications for sites located in Sarnia. The London regional meteorological dataset uses meteorological observations from the London surface station (ID 6144475) and White Lake upper air station (ID 726320). The regional meteorological data including wind observations were used for air dispersion modelling.

Wind speed and direction are key parameters in predicting the atmospheric dispersion of contaminants. In general, if the wind does not blow toward a receptor, there will be no impact from that emission source. The wind at a specific location can blow in all directions but with varying frequencies and strengths. Winds from certain directions tend to occur more frequently than others, and these are known as the prevailing wind directions.

The annual wind rose for the Air Impact Study Area provides a method for illustrating these trends in wind speed and direction and is shown in Figure 2. The wind rose indicates that the predominant wind directions for the site are from the west sectors.

Figure 2: Annual Windrose for London Region, Ontario (1996-200)



3.2 Baseline Air Quality

3.2.1 Ambient Monitoring Stations

There are two active NAPS monitoring stations in Sarina, which collect information on ambient concentrations of relevant contaminants: Aamjiwnaang station (NAPS ID 61007) at 1300 Tashmoo Avenue, Sarnia and Sarnia station (NAPS ID 61009) at 700 Christina Street North, Sarnia.

The Aamjiwnaang station which has been operational since 2017 is the closest air quality station to the Facility, located approximately 2.1 km to the northwest, and has therefore been selected as a representative. The Aamjiwnaang station monitors most concerned contaminants except O_3 which is only monitored at the Sarnia station. CO is not monitored at any NAPS stations in Sarnia and therefore the CO monitoring data from the Winsor Downtown Station (ID 60204) where CO levels are relatively high due to traffic were used for conservative estimates of background concentrations for the Air Impact Study Area.

Table 4 summarizes the station information and monitoring data availabilities.

Table 4: Ambient Air Quality Monitoring Station

Station Name	NAPS ID	Distance to the Facility	Latitude	Longitude	Elevation	Monitored Contaminants	Monitoring Data Used	Data period
Aamjiwnaang [(1)]	61007	2.1 km	42.912545	-82.416816	180 m	$PM_{2.5}$, NO_x, NO_2, NO, SO_2, VOC, and PAHs	$PM_{2.5}$, NO_2, SO_2, VOC, and PAHs	2018-2020
Sarnia	61009	10.1 km	42.990263	-82.395341	182 m	$PM_{2.5}$, NO_x, NO_2, NO, SO_2, VOC, and O_3	O_3	
Windsor Downtown	60204	82 km	42.315778	-83.043667	176 m	NO_x, NO_2, NO, SO_2, O_3, and CO	CO	

Note:

(1) The Aamjiwnaang monitoring station is the nearest AQ station which is about 2.1 km northwest of the Project site. Non-continuous PAHs and other monitoring data collected under the Clean Air Sarnia and Area (CASA) program can be obtained from the CASA website. For the consistency of the monitoring data period, the PAH data from 2018 to 2020 were summarized.

3.2.2 Ambient Air Quality

3.2.2.1 Ontario Air Quality and Transboundary Influences

According to the most recent Air Quality in Ontario 2020 Report, published by MECP, air quality in Ontario has improved over time as both ambient concentrations of common air pollutants and emissions to air have decreased. Over the last 10 years, NO_2 concentrations have decreased by 25%, $PM_{2.5}$ concentrations by 17%, maximum ground-level O_3 concentrations by 13%, and SO_2 concentrations by 50% on average across the province.

Ontario's air quality is heavily impacted by long-range transport and the transboundary flow of air pollutants. Transboundary contributions are most notable in areas of southwestern Ontario, near the U.S. border, especially in Sarnia. Typically, during the summer, smog-related air pollutants (i.e., $PM_{2.5}$, O_3, NO_x, and VOCs) are transported from neighbouring U.S. industrial and urbanized states due to prevailing southwesterly airflows.

According to the Air Quality in Ontario 2020 Report, over 70% of the annual $PM_{2.5}$ concentrations in southwestern Ontario are contributed from transboundary sources. Over 95% of the O_3 is attributable to transboundary sources when O_3 levels are elevated.

3.2.2.2 Summary of Ambient Background

Background air quality was quantified by compiling historic monitoring records in the region of the Air Impact Study Area. The MECP and ECCC NAPS stations were reviewed for each indicator compound. The closest monitoring station to the Air Impact Study Area with a three-year dataset was selected (please refer to Table 4).

Background air quality for indicator compounds was compared against the applicable criterion, as shown in Table 5.

For contaminants with 1-hr and 24-hr criteria, the maximum, 90^{th} percentile, and average of monitoring data are summarized. For contaminants with annual criteria, annual average concentrations are summarized using hourly or 24-hr monitoring data.

The maximum concentration exceeded the regulatory criteria for PM_{10} (24-hr), SO_2 (10-min and 1-hr), benzene (24-hr), and O_3 (1-hr). However, both the 90th percentile and average of the datasets are below their respective regulatory criteria. As the 90th percentile and average concentrations for these contaminants are well below their respective criteria, this indicates that the concentrations exceed the criteria on an infrequent basis.

The maximum and 90th percentile of BaP concentrations exceeded the 24-hr criteria. Both the annual average concentrations of BaP and Benzene exceeded their respective annual criteria.

Table 5: Background Air Quality and Applicable Standards

Indicator Compound	CAS#	Averaging Period	Background Concentration (μg/m³)			Percentage of Criterion			Criterion	Regulation/ Standards
			Max	90th Percentile	Average	Max	90th Percentile	Average	(μg/m³)	
TSP[1]	NA_TSP	24 hr	98	43	24	81%	36%	20%	120	Ontario AAQC, O.Reg. 419/05
		Annual	-	-	24	-	-	40%	60	Ontario AAQC
PM_{10}[1]	NA_PM10	24 hr	54	24	13	108%	48%	27%	50	Ontario AAQC
$PM_{2.5}$	NA_PM2.5	24 hr	29	13	7	108%	48%	27%	27	Ontario AAQC
		Annual	-	-	7	-	-	82%	8.8	Ontario AAQC
Nitrogen Dioxide (NO_2)	10102-44-0	1 hr	79	19	10	20%	5%	3%	400	Ontario AAQC
		24 hr	38	17	10	19%	8%	5%	200	Ontario AAQC
Carbon Monoxide (CO)	630-08-0	0.5 hr	3375	478	336	56%	8%	6%	6000	O.Reg. 419/05
		1 hr	2812	398	280	8%	1%	1%	36,200	Ontario AAQC
		8 hr	1602	392	280	10%	2%	2%	15,700	Ontario AAQC
Sulphur Dioxide[2] (SO_2)	7446-09-05	10-min	257	8.8	4.1	144%	5%	2%	178	Ontario AAQC
		1 hr	257	8.8	4.1	37%	1%	1%	690	O.Reg. 419/05
		1 hr	257	8.8	4.1	241%	8%	4%	106	Ontario AAQC
		1 hr	257	8.8	4.1	257%	9%	4%	100	O.Reg. 419/05 future[3]
		24 hr	50	9.4	4.1	18%	3%	1%	275	O.Reg. 419/05
		Annual	-	-	4.1	-	-	39%	11	Ontario AAQC
		Annual	-	-	4.1	-	-	41%	10	O.Reg. 419/05 future[3]
Benzo(a)pyrene	50-32-8	24 hr	0.000132	0.000070	0.000038	264%	141%	77%	0.00005	Ontario AAQC
		Annual	-	-	0.000038	-	-	385%	0.00001	Ontario AAQC
Benzene	71-43-2	24 hr	4.8	2.1	1.1	210%	90%	46%	2.3	Ontario AAQC
		Annual	-	-	1.1	-	-	238%	0.45	Ontario AAQC
Ozone (O_3)	10028-15-6	1-hr	198	86	56	120%	52%	34%	165	Ontario AAQC

Notes:

(1) Estimated from $PM_{2.5}$ monitored data.
(2) The 10-min average concentration is assumed the same as the 1-hr monitoring data
(3) O.Reg. 419/05 future criterion for Sulphur Dioxide will be effective from July 1, 2023.

4.0 Atmospheric Emissions

The operating conditions used in the calculation of the emission estimates, sources, and contaminants identification for the Facility are described in the following sub-sections.

4.1 Source Identification

The major processes and activities at the Facility were reviewed to identify the significant emission sources and associated contaminants, as presented in Table 6. The significant sources and contaminants are assessed through dispersion modelling.

For sources or contaminants identified as insignificant, a corresponding rationale is provided following applicable Ontario air quality guidelines published by the MECP (i.e., ESDM Procedure Document and ADMGO).

To screen out emission sources that emit contaminants in negligible amounts or contaminants that are emitted in negligible amounts, a negligibility assessment was conducted to identify negligible sources or contaminants following the ESDM Procedure Document, as provided in Appendix A.

Table 6: Sources and Contaminations Identification Table

Source Information			Contaminants	Significant	Rationale
Source Identifier	Source Description	General Location		(Yes/No)	
DPH3	Dew Point Heater #3	GT Building	Products of Combustion	Yes	
DPH4	Dew Point Heater #4		Products of Combustion	Yes	
CTG3	Combustion Turbine Generator & HRSG Stack #3 (equipped with a Duct Burner)		Products of Combustion	Yes	
CTG4	Combustion Turbine Generator & HRSG Stack #4 (equipped with a Duct Burner)		Products of Combustion	Yes	
HRSG3	Heat Recovery Steam Generator 3		Products of Combustion	Yes	
HRSG4	Heat Recovery Steam Generator 4		Products of Combustion	Yes	
CCT1	Chiller Cooling Tower 1	Chiller Building	Particulate Matter	Yes	-
CCT2	Chiller Cooling Tower 2		Particulate Matter	Yes	-
CT1	Process Cooling Tower #1	Cooling Tower Building	Particulate Matter	Yes	-
CT2	Process Cooling Tower #2		Particulate Matter	Yes	-
CT3	Process Cooling Tower #3		Particulate Matter	Yes	-
CT4	Process Cooling Tower #4		Particulate Matter	Yes	-
CT5	Process Cooling Tower #5		Particulate Matter	Yes	-
CT6	Process Cooling Tower #6		Particulate Matter	Yes	-
CT7	Process Cooling Tower #7		Particulate Matter	Yes	-
CT8	Process Cooling Tower #8		Particulate Matter	Yes	-
CT9	Process Cooling Tower #9		Particulate Matter	Yes	-
FP_1	Diesel-Fired Water Pump	Water Treatment Building	Products of Combustion	Yes	-

Source Information			Contaminants	Significant	Rationale
Source Identifier	Source Description	General Location		(Yes/No)	
HVACs	Comfort Heating Units (HVACs)	Various Locations	Products of Combustion	Yes/No	Only emissions of nitrogen oxides were considered significant as per Section 7.1.1 of the ESDM Procedure Document.
FPT_1	Fire Water Pump Diesel Tank	Adjacent to the Water Treatment Building	Diesel	No	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
BST_1	Sulphuric Acid Bulk Storage Tank		Sulphuric Acid	No	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
BST_4	Sodium Bisulphite Bulk Storage Tank		Sodium Bisulphate	No	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
LOH3	Lube Oil Heater Tank Vent - Unit 3	Adjacent to the GT building	Polyakylene glycol monobutyl ether	No	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
LOH4	Lube Oil Heater Tank Vent - Unit 4		Polyakylene glycol monobutyl ether	No	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
-	QA/QC Water Test Lab	-	Volatile Organic Compounds	No	QA/QC labs at industrial facilities generally emit contaminants in negligible amounts, as per Table B-3A of the ESDM Procedure Document.
-	Two Bulk Chemical Storage Tanks	-	Volatile Organic Compounds	No	This source is listed in Table B-3A of the ESDM Procedure Document and vented indoors as per the 2020 ESDM Report
-	Air Intakes and Roof Exhaust/Vents	-	None	No	Those don't release process emissions.
-	Fugitive Road Dust	-	Particulate Matter	No	Fugitive particulate from Facility's on-site roadways can be considered as insignificant as per Section 7.4 of the ESDM Procedure Document.

4.2 Emission Estimations

4.2.1 Gas Turbines

The AIA assesses the worst-case emissions resulting from the maximum operating scenario to provide a conservative assessment of the potential air quality impacts. The gas turbines (GTs) are the major emission sources for concerned contaminants. The GT manufacturer (GE Gas Power) provided the turbine performance and emission data under various load conditions after the AGP upgrade. Emissions of contaminants, including NOx, CO, and PM, are the highest under peak load.

To provide a conservative estimate, NOx, CO, and PM emissions from GTs were determined based on the maximum of the following:

- The maximum emission data across all loads, provided by GE Gas Power; or,
- The emission rates estimated using the maximum heat input across all loads, provided by GE Gas Power and US EPA AP-42 emission factors.

Emissions of other compounds (i.e., SO_2, BaP, benzene) which are not provided by GE Gas Power were estimated based on the maximum heat input and US EPA AP-42 emission factors.

Emissions of GHGs (CO_2, N_2O, and CH_4) were estimated using the maximum annual heat input rating and US EPA AP-42 emission factors.

4.2.2 Other Emission Sources

Emissions from other significant sources (e.g., heaters, cooling towers, tanks, etc.) other than the GTs were conservatively estimated based on the maximum approved capacity in the current ECA permit. For each emission source, relevant AP-42 emission factors were used to estimate emissions.

The emission factors and supporting documentation for the calculated emission rates for individual emission sources are presented in Appendix A.

4.3 Source Emission Summary

Table 7: Source Summary Table

Source ID	Source Description	Source Orientation	Emissions Data						
			Contaminant	CAS No.	Max Emission Rate [g/s]	Averaging Period [hours]	Data Quality[1]	Estimation Technique[4]	Percent of Overall Emission
DPH3	Dew Point Heater #3	Capped	Nitrogen Oxides	10102-44-0	2.47E-02	1	Marginal	EF	<1%
			Nitrogen Oxides	10102-44-0	2.47E-02	24	Marginal	EF	<1%
			Carbon Monoxide	630-08-0	2.08E-02	0.5	Marginal	EF	<1%
			Particulate Matter	SPM	1.88E-03	24	Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	1	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	24	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	Annual	Above-Average	EF	<1%
			Benzene	71-43-2	5.19E-07	24	Above-Average	EF	<1%
			Benzene	71-43-2	5.19E-07	Annual	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	2.97E-10	24	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	2.97E-10	Annual	Above-Average	EF	<1%
			Carbon Dioxide	124-38-9	2.97E+01	24	Above-Average	EF	<1%
			Nitrous Oxide	10024-97-2	1.58E-04	24	Marginal	EF	<1%
			Methane	74-82-8	5.69E-04	24	Above-Average	EF	<1%
DPH4	Dew Point Heater #4	Capped	Nitrogen Oxides	10102-44-0	2.47E-02	1	Marginal	EF	<1%
			Nitrogen Oxides	10102-44-0	2.47E-02	24	Marginal	EF	<1%
			Carbon Monoxide	630-08-0	2.08E-02	0.5	Marginal	EF	<1%
			Particulate Matter	SPM	1.88E-03	24	Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	1	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	24	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	Annual	Above-Average	EF	<1%
			Benzene	71-43-2	5.19E-07	24	Above-Average	EF	<1%
			Benzene	71-43-2	5.19E-07	Annual	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	2.97E-10	24	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	2.97E-10	Annual	Above-Average	EF	<1%
			Carbon Dioxide	124-38-9	2.97E+01	24	Above-Average	EF	<1%
			Nitrous Oxide	10024-97-2	1.58E-04	24	Marginal	EF	<1%
			Methane	74-82-8	5.69E-04	24	Above-Average	EF	<1%

Source ID	Source Description	Source Orientation	Emissions Data						
			Contaminant	CAS No.	Max Emission Rate [g/s]	Averaging Period [hours]	Data Quality(1)	Estimation Technique(4)	Percent of Overall Emission
CTG3	Combustion Turbine Generator & HRSG Stack #3 (equipped with a Duct Burner)	Vertical	Nitrogen Oxides	10102-44-0	3.25E+01	1	Highest (2)	EF	49%
			Nitrogen Oxides	10102-44-0	3.25E+01	24	Highest (2)	EF	49%
			Carbon Monoxide	630-08-0	7.67E+00	0.5	Highest (2)	EF	50%
			Particulate Matter	SPM	2.09E+00	24	Highest (2)	EF	46%
			Sulphur Dioxide	7446-09-5	9.33E-01	1	Above-Average	EF	50%
			Sulphur Dioxide	7446-09-5	9.33E-01	24	Above-Average	EF	50%
			Sulphur Dioxide	7446-09-5	4.06E-01	Annual	Above-Average	EF	51%
			Benzene	71-43-2	3.29E-03	24	Above-Average	EF	50%
			Benzene	71-43-2	1.43E-03	Annual	Above-Average	EF	51%
			Benzo[a]pyrene	50-32-8	2.40E-04	24	Average	EF	50%
			Benzo[a]pyrene	50-32-8	1.01E-04	Annual	Average	EF	51%
			Carbon Dioxide	124-38-9	3.66E+04	24	Above-Average	EF	50%
			Nitrous Oxide	10024-97-2	8.28E-01	24	Marginal	EF	50%
			Methane	74-82-8	2.39E+00	24	Average	EF	50%
CTG4	Combustion Turbine Generator & HRSG Stack #4 (equipped with a Duct Burner)	Vertical	Nitrogen Oxides	10102-44-0	3.25E+01	1	Highest (2)	EF	49%
			Nitrogen Oxides	10102-44-0	3.25E+01	24	Highest (2)	EF	49%
			Carbon Monoxide	630-08-0	7.67E+00	0.5	Highest (2)	EF	50%
			Particulate Matter	SPM	2.09E+00	24	Highest (2)	EF	46%
			Sulphur Dioxide	7446-09-5	9.33E-01	1	Above-Average	EF	50%
			Sulphur Dioxide	7446-09-5	9.33E-01	24	Above-Average	EF	50%
			Sulphur Dioxide	7446-09-5	3.95E-01	Annual	Above-Average	EF	49%
			Benzene	71-43-2	3.29E-03	24	Above-Average	EF	50%
			Benzene	71-43-2	1.40E-03	Annual	Above-Average	EF	49%
			Benzo[a]pyrene	50-32-8	2.40E-04	24	Average	EF	50%
			Benzo[a]pyrene	50-32-8	9.79E-05	Annual	Average	EF	49%
			Carbon Dioxide	124-38-9	3.66E+04	24	Above-Average	EF	50%
			Nitrous Oxide	10024-97-2	8.28E-01	24	Marginal	EF	50%
			Methane	74-82-8	2.39E+00	24	Average	EF	50%
HRSG3	Heat Recovery Steam Generator 3	Vertical	Nitrogen Oxides	10102-44-0	5.19E-03	1	Marginal	EF	<1%
			Nitrogen Oxides	10102-44-0	5.19E-03	24	Marginal	EF	<1%
			Carbon Monoxide	630-08-0	4.36E-03	0.5	Marginal	EF	<1%
			Particulate Matter	SPM	3.95E-04	24	Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	1	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	24	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	Annual	Above-Average	EF	<1%
			Benzene	71-43-2	1.09E-07	24	Above-Average	EF	<1%
			Benzene	71-43-2	1.09E-07	Annual	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	6.23E-11	24	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	6.23E-11	Annual	Above-Average	EF	<1%
			Carbon Dioxide	124-38-9	6.23E+00	24	Above-Average	EF	<1%
			Nitrous Oxide	10024-97-2	3.32E-05	24	Marginal	EF	<1%
			Methane	74-82-8	1.19E-04	24	Above-Average	EF	<1%

Source ID	Source Description	Source Orientation	Emissions Data						
			Contaminant	CAS No.	Max Emission Rate [g/s]	Averaging Period [hours]	Data Quality[1]	Estimation Technique[4]	Percent of Overall Emission
HRSG4	Heat Recovery Steam Generator 4	Vertical	Nitrogen Oxides	10102-44-0	5.19E-03	1	Marginal	EF	<1%
			Nitrogen Oxides	10102-44-0	5.19E-03	24	Marginal	EF	<1%
			Carbon Monoxide	630-08-0	4.36E-03	0.5	Marginal	EF	<1%
			Particulate Matter	SPM	3.95E-04	24	Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	1	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	24	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	Annual	Above-Average	EF	<1%
			Benzene	71-43-2	1.09E-07	24	Above-Average	EF	<1%
			Benzene	71-43-2	1.09E-07	Annual	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	6.23E-11	24	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	6.23E-11	Annual	Above-Average	EF	<1%
			Carbon Dioxide	124-38-9	6.23E+00	24	Above-Average	EF	<1%
			Nitrous Oxide	10024-97-2	3.32E-05	24	Marginal	EF	<1%
			Methane	74-82-8	1.19E-04	24	Above-Average	EF	<1%
CCT1	Chiller Cooling Tower 1	Modelled as Volume Sources	Particulate Matter	SPM	3.44E-03	24	Marginal	EF	<1%
CCT1b	Chiller Cooling Tower 1 (Cell 2)		Particulate Matter	SPM	3.44E-03	24	Marginal	EF	<1%
CCT2	Chiller Cooling Tower 2		Particulate Matter	SPM	3.44E-03	24	Marginal	EF	<1%
CCT2b	Chiller Cooling Tower 2 (Cell 2)		Particulate Matter	SPM	3.44E-03	24	Marginal	EF	<1%
CT1	Process Cooling Tower #1	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT2	Process Cooling Tower #2	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT3	Process Cooling Tower #3	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT4	Process Cooling Tower #4	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT5	Process Cooling Tower #5	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT6	Process Cooling Tower #6	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT7	Process Cooling Tower #7	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT8	Process Cooling Tower #8	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT9	Process Cooling Tower #9	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
FP_1	Diesel-Fired Water Pump	Horizontal	Nitrogen Oxides	10102-44-0	1.27E+00	1, 24	Marginal	EF	2%
ADMINHVAC	Admin HVAC	Modelled as Volume Sources	Nitrogen Oxides	10102-44-0	1.26E-02	1, 24	Above-Average	EF	<1%
PHVAC	Phouse HVAC		Nitrogen Oxides	10102-44-0	7.55E-03	1, 24	Above-Average	EF	<1%
STGHVAC	STG HVAC		Nitrogen Oxides	10102-44-0	5.03E-02	1, 24	Above-Average	EF	<1%
WAREHOUSEHVAC	Warehouse HVAC		Nitrogen Oxides	10102-44-0	1.26E-02	1, 24	Above-Average	EF	<1%
WTHVAC	WT HVAC		Nitrogen Oxides	10102-44-0	1.26E-02	1, 24	Above-Average	EF	<1%

Notes
(1). Emission estimation data quality as per Section 9.2 of the Procedure Document.
(2). Emissions of NOx, CO and PM are estimated from either performance or emission data across all loads and therefore have the highest data quality.
(3). Emergency generator is conservatively assessed with other sources for the worst-case NOx emissions.
(4). EF= Emission Factor.

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5.0 Air Dispersion Modelling

This section provides a description of how the dispersion modelling was conducted at the facility to calculate the maximum concentration at a point-of-impingement (POI).

The dispersion modelling was conducted in accordance with MECP Guidelines (the ADMGO)[5]. A general description of the input data used in the dispersion model is provided in the following sections.

5.1 Model Description

The AERMOD modelling system has been identified by the MECP as one of the approved dispersion models under O.Reg. 419/05. AERMOD is a steady-state Gaussian plume dispersion model used to predict contaminant ground-level concentration and includes consideration of meteorology, topography, and building effects. AERMOD version 22112 was used for assessing predicted impacts from the Facility operations in this AIA.

The AERMOD modelling system is made up of the AERMOD dispersion model, the AERMET meteorological pre-processor and the AERMAP terrain pre-processor. The meteorological pre-processor, AERMET, provides AERMOD with the detailed hourly meteorological data needed to characterize the planetary boundary layer (PBL) and estimate PBL and micrometeorological parameters. The terrain pre-processor, AERMAP, defines the terrain and generates gridded and discrete receptors and their heights, with respect to the terrain elevation, for the AERMOD. AERMAP requires terrain data in Digital Elevation Model (DEM) or other compatible formats.

The model estimates the ground-level concentrations and/or deposition rates for defined receptors using a 1-hour time step and calculates short-term averages that can range from 1-hr to 24-hrs as well as longer-term averages, such as the annual period.

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[5] Ministry of the Environment, Conservation and Parks (2017). Air Dispersion Modelling Guideline for Ontario (ADMGO). February 2017.

5.2 Model Setup and Inputs

5.2.1 Model Domain and Emission Sources

A 10 km by 10 km model domain, centred by the Facility site, was used for the modelling assessment. The UTM coordinate system along with the WGS84 Geodetic system were used in the AERMOD. Electronic drawings of the Facility were projected to the 17 UTM zone coordinate system to define stacks, buildings, and the property boundary.

All emission sources were modelled as point sources in the AERMOD, except for the comfort heating units which were modelled as volume sources. Figure 3 shows the layout of emission sources in the AERMOD.

Figure 3: Source Layout in the AERMOD

5.2.2 Meteorological and Terrain

Applicable MECP pre-processed meteorological and terrain files were used for the modelling study. The meteorological dataset for the crops surface conditions was used, which consists of processed surface observations from the London surface station (ID 6144475) and White Lake (ID 726320) upper air station. The MECP-provided Canadian Digital Elevation Model (CDEM) DEM file in .tif format was used in the

AERMAP terrain preprocessor to extract elevations for the emission sources, buildings, and receptors.

5.2.3 Building Downwash

The Building Profile Input Program Plume Rise Model Enhancements (BPIP PRIME) methodology (Schulman et al., 2000) is used to estimate the impact of building wake effects on plume dispersion. To consider building downwash effects, the dimensions of existing and proposed buildings (e.g., steam turbine building) were specified in the AERMOD. Figure 4 presents the buildings and model heights and Figure 5 presents the 3-Dimensional view of the building layout.

Figure 4: Buildings in the AERMOD

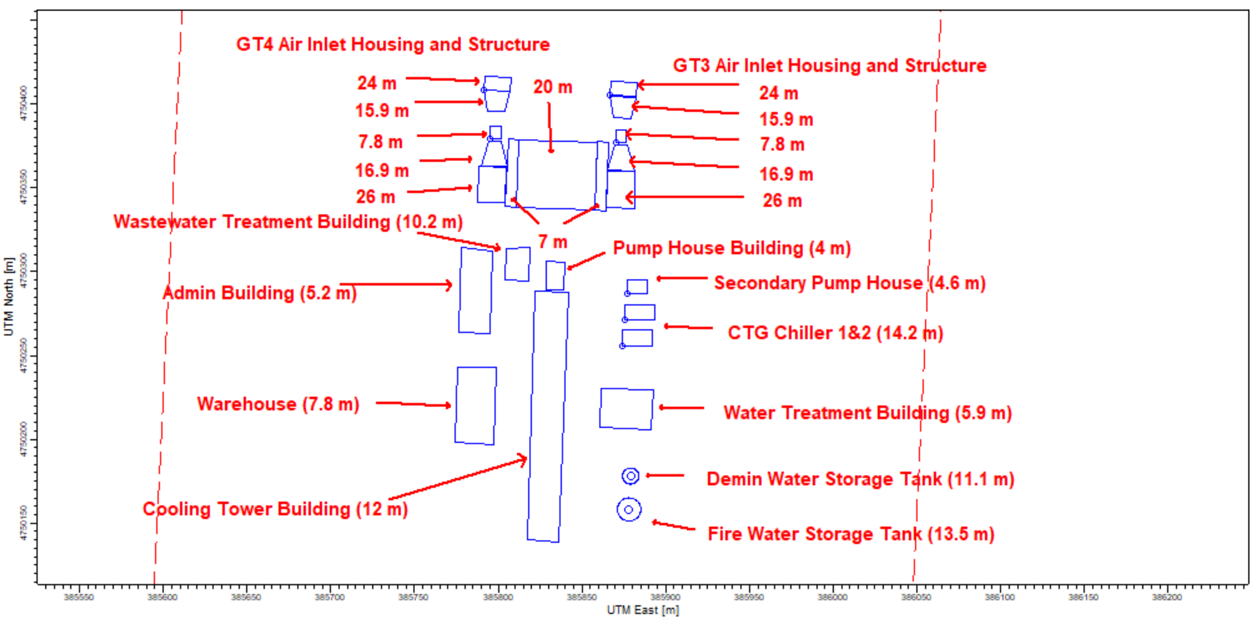
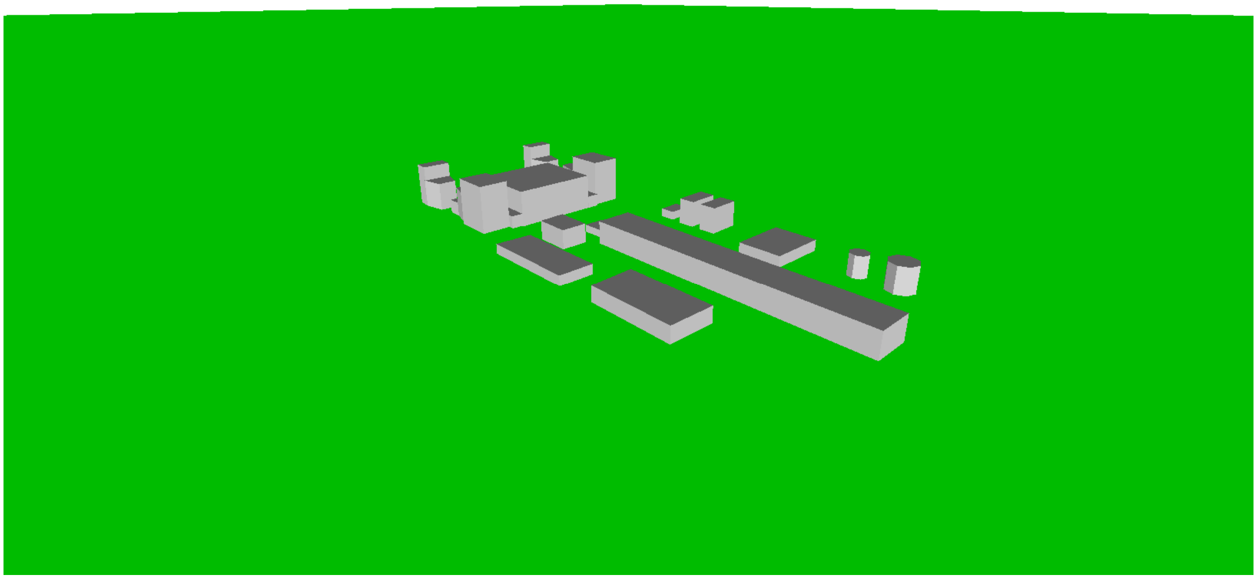


Figure 5: Building 3D view

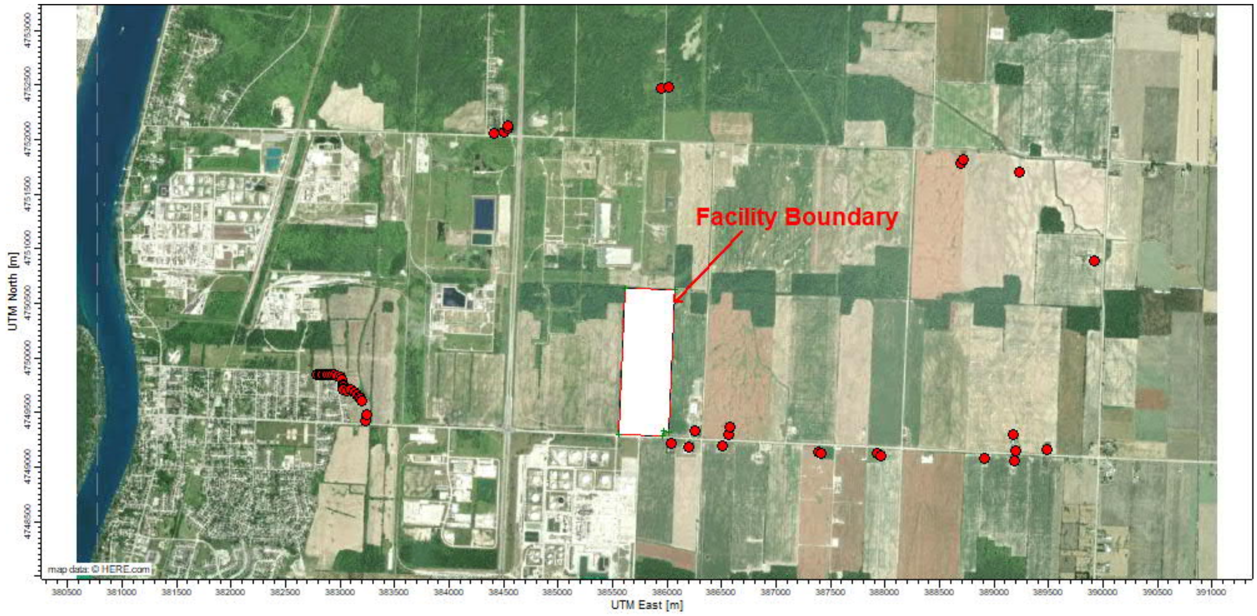


5.2.3.1 Environmental Effects Assessment

Receptors were chosen to determine the impact of environmental effects from a grid of discrete receptors identified using satellite imagery. The discrete receptors for the Air Impact Study Area were residences, businesses, and a medical centre located in the vicinity of the Facility. Figure 6 presents the discrete receptors for the Air Impact Study Area.

The modelled discrete receptors capture the maximum predicted concentrations in all wind directions.

Figure 6: Discrete Receptors Reviewed for the Environmental Effects Assessment



5.2.3.2 Compliance Assessment

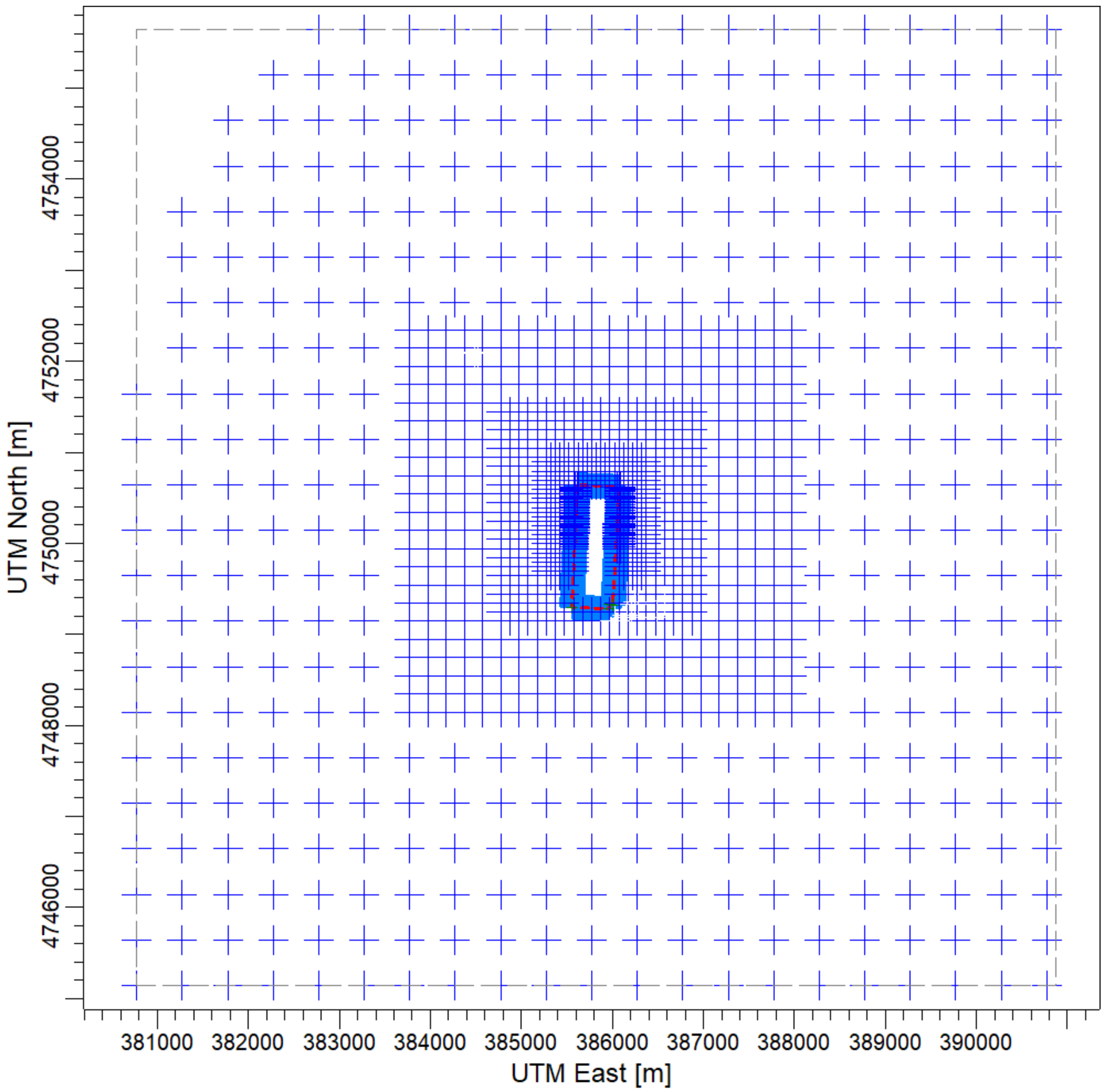
Receptors were chosen based on recommendations provided in Section 7.1 of the ADMGO, which is in accordance with s.14 of O.Reg. 419/05. As the areas of highest impact from site operations are anticipated close to or at the property line, a 5 km multi-tier grid (from the centre of the Facility) was decided to be appropriate for the modelling that was conducted. Specifically, a nested receptor grid, centered around the buildings at the site, were placed as follows:

- 20 m spacing, within an area of 200 m by 200 m;
- 50 m spacing, within an area surrounding the area described in (a) with a boundary at 500 m by 500 m outside of the boundary described in (a);
- 100 m spacing, within an area surrounding the area described in (b) with a boundary at 1,000 m by 1,000 m outside of the boundary described in (a);
- 200 m spacing, within an area surrounding the area described in (c) with a boundary at 2,000 m by 2,000 m outside of the boundary described in (a); and,
- 500 m spacing, within an area surrounding the area described in (d) with a boundary at 5,000 m by 5,000 m outside of the boundary described in (a).

In addition to using the nested receptor grid, receptors were also placed every 10 m along the property line. The highest predicted impacts occur at or near the property line and therefore the 5,000 m coverage provided within the model captures the worst-case impacts. Figure 7. Presents the compliance assessment grid receptors for the Air Impact Study Area.

There is no child care facility, health care facility, senior's residence, or long-term care facility located at the site. Therefore, same-structure contamination was not assessed.

Figure 7: Receptor Grid for the Compliance Assessment



5.2.4 Averaging Time and Conversions

The shortest time scale that AERMOD predicts is a 1-hr average value. Schedule 3 standards of O.Reg. 419/05 apply to this facility; these standards are based on 10-min, 0.5-hr, 1-hr, 8-hr, 24-hr, and annual averaging times.

For contaminants with criteria with 10-min or 0.5-hr averaging times, the 1-hr predicted value has been converted to the appropriate averaging period using Table 7-1 of the ESDM Procedure Document.

5.2.5 Dispersion Modelling Options

The regulatory default options for AERMOD were used for this assessment. Some of the options used are summarized in Table 8 below.

Table 8: Dispersion Modelling Input Summary Table

Modelling Parameter	**Description**	Used in the Assessment?
DFAULT	Specifies the regulatory default options will be used	Yes
CONC	Specifies that concentration values will be calculated	Yes
NODRYDPLT	Specifies that no dry deposition will be calculated	**Dry deposition was not** considered.
NOWETDPLT	Specifies that no wet deposition will be calculated	**Wet deposition was not** considered.
FLAT	Specifies that the non-default option of assuming flat terrain will be used	No – elevated terrain used
NOSTD	Specifies that the non-default option of no-stack tip downwash will be used	No
AVERTIME	Averaging periods used	1-hour, 24-hour, annual
URBANOPT	Specifies that the urban dispersion coefficients will be used	No
URBANROUGHNESS	Specifies the urban roughness (m) if URBANOPT is used	Default
FLAGPOLE	Specifies that receptor heights above local ground level are allowed on the receptors	No

5.3 Predicted Air Quality

Predicted concentrations for each indicator compound were generated based on the emission rates provided in Section 4.2 and the modelling that was conducted.

5.3.1 Environmental Effects Assessment

The predicted POI concentrations from the dispersion model have been added to the background concentrations to determine the cumulative air quality.

The cumulative air quality for each indicator compound was compared against the most stringent applicable air quality criteria. The results from the predicted concentrations are below their respective criteria for each indicator compound, except for Benzene (annual) and BaP (24-hr and annual) as shown in Table 9.

The predicted annual POI concentration of Benzene from the Facility contribution only is less than 1% of the criteria. The predicted annual POI concentration of BaP from the Facility contribution only is 35.1% of the criteria. The exceedances of the cumulative annual concentrations of Benzene and BaP are due to the high background concentration observed at the ambient air monitoring station.

The maximum predicted 24 hour average ambient air concentration of BaP at any of the sensitive receptor locations slightly exceeds (1.6x) the applicable MECP 24 hour average POI limit. The measured (monitored) 90^{th} percentile background 24 hour average BaP concentration in the vicinity of the facility also slightly exceeds this limit (1.4x). The cumulative maximum 24 hour average BaP concentration (90^{th} percentile background concentration + maximum modelled concentration at any of the sensitive receptor locations) exceeds the MECP 24 hour average POI limit by roughly 3-fold.

The maximum modelled annual average ambient air concentration of BaP does not exceed the applicable MECP annual average POI limit at any of the sensitive receptor locations. The measured (monitored) 90^{th} percentile background annual average BaP concentration in the vicinity of the facility exceeds this limit by roughly 4-fold. The cumulative maximum annual average BaP concentration (90^{th} percentile background concentration + maximum modelled concentration at any of the sensitive receptor locations) also exceeds the MECP annual average POI limit by roughly 4-fold.

As only the modelled 24 hour average ambient air BaP concentration exceeds its applicable MECP POI limit, frequency of exceedance over the 24 hour average POI limit was determined at each of the sensitive receptor locations.

As shown in Table 10, the frequency of exceedance of modelled 24 hour average ambient air BaP concentrations over the applicable MECP 24 hour average POI limit is very low at all sensitive receptor locations for the 5 year assessment period. At the worst case receptor location, the exceedance frequency is only 2.2%, indicating that 98% of the time during the 5 year assessment period, there would be no exceedances of the 24 hour average POI limit at this receptor location.

When the conservatism inherent to the air quality assessment and air quality modelling is considered in addition to the low exceedance frequency over the MECP 24 hour average POI limit, and the lack of exceedance of the facility-related maximum annual average air BaP concentration over the MECP annual average POI limit, the potential for human health risk in relation to facility-related and cumulative 24 hour average and annual average ambient air BaP concentrations is essentially negligible.

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Table 9: Environmental Effects Assessment – Emission Summary Table

Contaminant Name	Total Site-Wide Emission Rate [g/s]	Maximum Modelled Concentration at Sensitive Receptors (3)(5) [µg/m^3]	Background Concentration (6) [µg/m^3]	Maximum Cumulative Concentration at Sensitive Receptor [µg/m^3]	Averaging Period [hrs]	MECP POI Criteria [µg/m^3](1)	Benchmark (4)	Facility Maximum Percentage of the Criteria [%]	Maximum Cumulative Percentage of the Criteria [%]
Nitrogen Oxides	6.63E+01	80.7	19	100	1	400	AAQC/B1	20.2%	24.9%
Nitrogen Oxides	6.63E+01	19.5	17	36	24	200	AAQC/B1	9.8%	18.2%
Carbon Monoxide	1.54E+01	21.3	478	499	0.5	6,000	B1	< 1%	8.3%
Carbon Monoxide	1.54E+01	17.7	398	416	1	36,200	AAQC	< 1%	1.1%
Carbon Monoxide	1.54E+01	6.9	392	399	8	15,700	AAQC	< 1%	2.5%
Particulate Matter	4.54E+00	3.0	43	46	24	120	AAQC/B1	2.5%	38.5%
Particulate Matter	4.54E+00	0.18	24	24	Annual	60	AAQC	< 1%	40.5%
PM10	4.54E+00	3.0	24	27	24	50	AAQC	5.9%	53.9%
PM2.5	4.54E+00	3.0	13	16	24	27	AAQC	10.9%	58.9%
PM2.5	4.54E+00	0.18	7	7	Annual	8.8	AAQC	2.1%	84.3%
Sulphur Dioxide	1.87E+00	3.5	8.8	12	10-min	178	AAQC	2.0%	6.9%
Sulphur Dioxide	1.87E+00	2.1	8.8	10.9	1	100 (2)	B1	2.1%	10.9%
Sulphur Dioxide	1.87E+00	0.4	9.4	9.8	24	275	B1	< 1%	3.6%
Sulphur Dioxide	8.02E-01	0.01	4.1	4.2	Annual	10 (2)	B1	< 1%	41.5%
Benzene	6.58E-03	0.0014	2.1	2.1	24	2.3	AAQC	< 1%	90.5%
Benzene	2.83E-03	0.00005	1.1	1.1	Annual	0.45	AAQC/B1	< 1%	237.6%
Benzo[a]pyrene	4.80E-04	0.000081	0.000070	0.000151	24	0.00005	AAQC	161.3%	301.9%
Benzo[a]pyrene	1.98E-04	0.0000035	0.000038	0.000042	Annual	0.00001	AAQC/B1	35.1%	419.8%

Notes:
(1) Criteria listed in the MECP AAQC and Air Contaminants Benchmarks (ACB) List Version 3.0, dated April 2023.
(2) MECP proposed POI criteria, effective on July 1, 2023. The most stringent SO2 MECP criteria for each averaging period are used for the determination of compliance.
(3) The maximum concentrations at sensitive receptors. Meteorological anomalies were only eliminated for the results of Benzo(a)pyrene (24-hr average) following section 6.5 of the MECP's AMMGO.
(4) B1 - Benchmark 1 - Exceedance of a Benchmark 1 concentration triggers specific actions under O.Reg. 419/05.
B2 - Benchmark 2 - Exceedance of a Benchmark 2 concentration triggers a toxicological assessment to determine the likelihood of adverse effects.
(5) For assessing the annual concentration of contaminants, the maximum annual concentration among multiple years is used following the ADMGO.
(6) Background concentrations of contaminants are estimated based on the 90th percentile of monitoring data.

Table 10: Frequency of 24-hr BaP Exceedances at Sensitive Receptors

X	Y	Count of exceedances	Frequency of Exceedances	X	Y	Count of exceedances	Frequency of Exceedances
386574.18	4749361.64	41	2.2%	383170.94	4749644.79	8	0.4%
386567.28	4749294.67	32	1.8%	383186.57	4749624.64	8	0.4%
386250.5	4749330.25	25	1.4%	383197.04	4749605.6	8	0.4%
386503.23	4749195.27	22	1.2%	383240.71	4749483.64	8	0.4%
386039.64	4749212.23	15	0.8%	383032.47	4749710.93	7	0.4%
386201.49	4749184.25	14	0.8%	383058.21	4749698.46	7	0.4%
382923.14	4749841.55	13	0.7%	387394.38	4749131.7	5	0.3%
382948.14	4749840.28	13	0.7%	387409.23	4749122.56	5	0.3%
382972.03	4749838.6	13	0.7%	383227.68	4749421.21	4	0.2%
382968.12	4749829.39	12	0.7%	388689.77	4751777.27	2	0.1%
383001.61	4749828.65	12	0.7%	388722.02	4751809.52	2	0.1%
383013.64	4749804.64	12	0.7%	387925.71	4749119.98	2	0.1%
382903.46	4749841.9	11	0.6%	387965.86	4749096.28	2	0.1%
382784.84	4749848.4	10	0.5%	389232.2	4751699.5	1	0.1%
382806.2	4749845.02	10	0.5%	384413.9	4752055.91	0	0.0%
382821.93	4749846.71	10	0.5%	384500	4752061.87	0	0.0%
382836.55	4749846.71	10	0.5%	384533.09	4752096.57	0	0.0%
382851.16	4749843.34	10	0.5%	384538.21	4752127.56	0	0.0%
382866.34	4749845.02	10	0.5%	385944.06	4752465.37	0	0.0%
382883.45	4749843.62	10	0.5%	386013.97	4752482.75	0	0.0%
383022.28	4749757.72	8	0.4%	388909.69	4749083.14	0	0.0%
383024.59	4749739.39	8	0.4%	389175.59	4749291.94	0	0.0%
383027.82	4749725.51	8	0.4%	389184.6	4749051.97	0	0.0%
383097.56	4749706.52	8	0.4%	389198.35	4749150.24	0	0.0%
383130.81	4749685.92	8	0.4%	389482.47	4749159.86	0	0.0%
383148.69	4749665.33	8	0.4%	389917.73	4750889.04	0	0.0%

5.3.2 Compliance Assessment

The predicted concentrations for each indicator compound of potential sources that are subject to O.Reg. 419/05 for assessment of compliance are provided in Table 11.

The concentrations for each indicator compound were compared against the applicable criteria. The predicted concentrations are below their respective criteria for each indicator compound. This AIA demonstrates that the Facility (with the AGP Upgrade) is predicted to operate in compliance with O.Reg. 419/05.

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Table 11: Compliance Assessment – Emission Summary Table

Contaminant Name	Total Site-Wide Emission Rate [g/s]	Air Dispersion Model Used	Maximum Concentration at Offsite Receptors (3)(5) [µg/m³]	Averaging Periods [hrs]	MECP POI Criteria [µg/m³](1)	Benchmark (4)	Percentage of POI Criteria [%]
Nitrogen Oxides	6.63E+01	AERMOD v. 22112	173.6	1	400	B1	43.4%
Nitrogen Oxides	6.63E+01	AERMOD v. 22112	124.3	24	200	B1	62.1%
Carbon Monoxide	1.54E+01	AERMOD v. 22112	46.3	0.5	6,000	B1	< 1%
Particulate Matter	4.54E+00	AERMOD v. 22112	8.2	24	120	B1	6.8%
Sulphur Dioxide	1.87E+00	AERMOD v. 22112	2.7	1	100 (2)	B1	2.7%
Sulphur Dioxide	1.87E+00	AERMOD v. 22112	0.7	24	275	B1	< 1%
Sulphur Dioxide	8.02E-01	AERMOD v. 22112	0.02	Annual	10 (2)	B1	< 1%
Benzene	6.58E-03	AERMOD v. 22112	0.003	24	100	DAV	< 1%
Benzene	6.58E-03	AERMOD v. 22112	0.00018	Annual	4.5	AAV	< 1%
Benzene	2.83E-03	AERMOD v. 22112	0.00008	Annual	0.45	B1	< 1%
Benzo[a]pyrene	4.80E-04	AERMOD v. 22112	0.00019	24	0.005	DAV	3.8%
Benzo[a]pyrene	4.80E-04	AERMOD v. 22112	0.000013	Annual	0.0001	AAV	13.0%
Benzo[a]pyrene	1.98E-04	AERMOD v. 22112	0.000005	Annual	0.00001	B1	53.7%

Notes:
(1) Criteria listed in the MECP AAQC and Air Contaminants Benchmarks (ACB) List Version 3.0, dated April 2023.
(2) MECP proposed POI criteria, effective on July 1, 2023. The most stringent SO2 MECP criteria for each averaging period are used for the determination of compliance.
(3) The maximum concentrations at MECP grid receptors (i.e., offsite receptors along and beyond the property boundary).
(4) B1 - Benchmark 1 - Exceedance of a Benchmark 1 concentration triggers specific actions under O.Reg. 419/05.
B2 - Benchmark 2 - Exceedance of a Benchmark 2 concentration triggers a toxicological assessment to determine the likelihood of adverse effects.
DAV- Daily Assessment Value which represents the maximum daily exposure possible based on the maximum daily emission rate.
AAV- Annual Assessment Value which represents the maximum yearly POI concentrations based on the maximum daily emission rate maintained over a whole year.
(5) For assessing the annual concentration of contaminants, the maximum annual concentration among multiple years is used following the ADMGO.

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5.4 Climate Change Impact Assessment

The impacts of the Project on climate change were assessed by evaluating the potential GHG emissions resulting from the Facility AGP Upgrade.

5.4.1 Facility GHG Emissions

The estimation of GHGs, specifically CO_2, CH_4, and N_2O from Facility operations (e.g., combustion of natural gas) was completed using emission factors from industry accepted methodologies. The annual GHG emissions in CO_2e (carbon dioxide equivalent units) after the AGP upgrade are summarized in Table 12.

The Facility generates approximately 1,102 kilotonnes of GHG annually which is above the annual GHG reporting threshold of 10 kilotonnes. Therefore, the Facility is required to report annual GHG emissions to Environment and Climate Change Canada (ECCC).

GHG emissions from construction activities were not considered as these emissions are anticipated to be short-term and negligible (i.e., no major construction activities or change to Facility footprint or site layout).

Table 12: GHG emissions

GHGs	Site-wide Annual Emission Rate	Annual Emissions	GWP(1)	CO2 Equivalent
	g/s	t/yr	-	kt/yr
Carbon Dioxide	34,704.98	1,094,456	1	1,094
Nitrous Oxide	0.72	22.61	265	5.992
Methane	2.10	66.10	28	1.851
Facility Annual GHG Emission				1,102

Note:

1. Global Warming Potential (GWP) from the Fifth Assessment Report published by the Intergovernmental Panel on Climate Change (IPCC).

The best available estimate of Ontario's reported GHG emissions is provided in the ECCC National Inventory Report (NIR). A review of the most recent year of available data (year 2021) of GHG emission summaries from the ECCC NIR[6] show that Ontario had an annual total GHG emission of 150 mega-tonnes (Mt) CO_2e. Additionally, the ECCC NIR shows that Ontario's stationary combustion sources account for 57.7 Mt CO_2e.

The Facility's projected emissions for the Project account for 1,102 kt CO_2e/year (or 1.102 Mt CO_2e/year) which would result in a 0.73% contribution to Ontario's total GHG emissions profile. The Facility's project emissions additionally result in a contribution of 1.91% to Ontario's stationary combustion source emissions profile.

5.5 Mitigative Measures

The Facility uses modern GT technology equipped with modern emission monitoring and control/reduction technologies. These technologies include:

- Ultra-Low-NOx (ULN) combustors for the GTs; and,
- A Continuous Emissions Monitoring Systems (CEMS) installed on the GT exhaust stacks to measure continuous emission concentrations of contaminants.

In addition, a natural gas-fired facility with combined cycle technology emits lower emissions, particularly NO_x and SO_2, than the traditional power plants which burn oil or coal.

6.0 Conclusions

The results of the AIA on Facility operations with the installation of the proposed AGP Upgrade can be summarized as follows:

- The predicted concentrations of indicator compounds are anticipated to meet relevant O.Reg. 419/05 regulatory compliance criteria;
- The modelling of environmental effects for all sources yielded indicator compound cumulative concentrations (Facility operations and background concentrations) below their relevant criteria with the exception of BaP (24-hr and annual) and Benzene (annual);

[6] Environment and Climate Change Canada (2022). National Inventory Report 1990-2020: Greenhouse Gas Sources and Sinks in Canada. Part 3. 2022.

- The predicted annual POI concentration of Benzene from the Facility contribution only is less than 1% of the criteria. The predicted annual POI concentration of BaP from the Facility contribution only is 35.1% of the criteria. The exceedances of the cumulative annual concentrations of Benzene and BaP are due to the high background concentration observed at the ambient air monitoring station;
- The frequency of exceedance of modelled 24 hour average ambient air BaP concentrations over the applicable MECP 24 hour average POI limit is very low at all sensitive receptor locations for the 5 year assessment period. At the worst case receptor location, the exceedance frequency is only 2.2%, indicating that 98% of the time during the 5 year assessment period, there would be no exceedances of the 24 hour average POI limit at this receptor location. When the conservatism inherent to the air quality assessment and air quality modelling is considered in addition to the low exceedance frequency over the MECP 24 hour average POI limit, and the lack of exceedance of the facility-related maximum annual average air BaP concentration over the MECP annual average POI limit, the potential for human health risk in relation to facility-related and cumulative 24 hour average and annual average ambient air BaP concentrations is essentially negligible; and,
- The results of the Facility GHG assessment show that the predicted Facility emissions, after the AGP Upgrade, are negligible (0.73%) compared to total provincial emissions.

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Appendix A

Emission Calculations

Table 1
Sources and Contaminations Identification Table
St. Clair Power, LP

Source Information			Contaminants	Significant (Yes/No/Exempt)	Rationale
Source Identifier	Source Description	General Location			
DPH3	Dew Point Heater #3	Gas Turbine Building	Products of Combustion	Y/N	Some contaminants have been deemed negligible as per Section 7.1.1 of the ESDM Procedure Document.
DPH4	Dew Point Heater #4		Products of Combustion	Y/N	Some contaminants have been deemed negligible as per Section 7.1.1 of the ESDM Procedure Document.
CTG3	Combustion Turbine Generator & HRSG Stack #3 (equipped with a Duct Burner)		Products of Combustion	Y/N	Some contaminants have been deemed negligible as per Section 7.1.1 of the ESDM Procedure Document.
CTG4	Combustion Turbine Generator & HRSG Stack #4 (equipped with a Duct Burner)		Products of Combustion	Y/N	Some contaminants have been deemed negligible as per Section 7.1.1 of the ESDM Procedure Document.
HRSG3	Heat Recovery Steam Generator 3		Products of Combustion	Y/N	Some contaminants have been deemed negligible as per Section 7.1.1 of the ESDM Procedure Document.
HRSG4	Heat Recovery Steam Generator 4		Products of Combustion	Y/N	Some contaminants have been deemed negligible as per Section 7.1.1 of the ESDM Procedure Document.
CCT1	Chiller Cooling Tower 1	Chiller Building	Particulate Matter	Y	-
CCT2	Chiller Cooling Tower 2		Particulate Matter	Y	-
CT1	Process Cooling Tower #1	Cooling Tower Building	Particulate Matter	Y	-
CT2	Process Cooling Tower #2		Particulate Matter	Y	-
CT3	Process Cooling Tower #3		Particulate Matter	Y	-
CT4	Process Cooling Tower #4		Particulate Matter	Y	-
CT5	Process Cooling Tower #5		Particulate Matter	Y	-
CT6	Process Cooling Tower #6		Particulate Matter	Y	-
CT7	Process Cooling Tower #7		Particulate Matter	Y	-
CT8	Process Cooling Tower #8		Particulate Matter	Y	-
CT9	Process Cooling Tower #9		Particulate Matter	Y	-
FP_1	Diesel-Fired Water Pump	Water Treatment Building	Products of Combustion	Y	-
HVACs	Comfort Heating Units (HVACs)	Various Locations	Products of Combustion	Y/N	Some contaminants have been deemed negligible as per Section 7.1.1 of the ESDM Procedure Document.
FPT_1	Fire Water Pump Diesel Tank	Adjacent to the Water Treatment Building	Diesel	N	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
BST_1	Sulphuric Acid Bulk Storage Tank		Sulphuric Acid	N	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
BST_4	Sodium Bisulphite Bulk Storage Tank		Sodium Bisulphate	N	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
LOH3	Lube Oil Heater Tank Vent - Unit 3	Adjacent to the GT building	Polyakylene glycol monobutyl ether	N	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
LOH4	Lube Oil Heater Tank Vent - Unit 4		Polyakylene glycol monobutyl ether	N	Insignificant contaminant as per Table B.1 negligibility assessment following Section 7.1 of the ESDM Procedure Document.
-	QA/QC Water Test Lab	-	Volatile Organic Compounds	N	This source is listed on Table B-3A of the ESDM Procedure Document.
-	Two Bulk Chemical Storage Tanks	-	Volatile Organic Compounds	N	This source is listed on Table B-3A of the ESDM Procedure Document and vented indoors as per the 2020 ESDM Report
-	Air Intakes and Roof Exhaust/Vents	-	None	N	Those don't release process emissions and therefore exempt from O. Reg. 419/05
-	Fugitive Road Dust	-	Particulate Matter	N	Fugitive particulate from Facility's on-site roadways can be considered as insignificant as per Section 7.4 of the ESDM Procedure Document.

Table 2
Source Summary Table
St. Clair Power, LP

Source ID	Source Description	Source Orientation	Emissions Data						
			Contaminant	CAS No.	Max Emission Rate [g/s]	Averaging Period [hours]	Data Quality(1)	Estimation Technique(4)	Percent of Overall Emission
DPH3	Dew Point Heater #3	Capped	Nitrogen Oxides	10102-44-0	2.47E-02	1	Marginal	EF	<1%
			Nitrogen Oxides	10102-44-0	2.47E-02	24	Marginal	EF	<1%
			Carbon Monoxide	630-08-0	2.08E-02	0.5	Marginal	EF	<1%
			Particulate Matter	SPM	1.88E-03	24	Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	1	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	24	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	Annual	Above-Average	EF	<1%
			Benzene	71-43-2	5.19E-07	24	Above-Average	EF	<1%
			Benzene	71-43-2	5.19E-07	Annual	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	2.97E-10	24	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	2.97E-10	Annual	Above-Average	EF	<1%
			Carbon Dioxide	124-38-9	2.97E+01	24	Above-Average	EF	<1%
			Nitrous Oxide	10024-97-2	1.58E-04	24	Marginal	EF	<1%
			Methane	74-82-8	5.69E-04	24	Above-Average	EF	<1%
DPH4	Dew Point Heater #4	Capped	Nitrogen Oxides	10102-44-0	2.47E-02	1	Marginal	EF	<1%
			Nitrogen Oxides	10102-44-0	2.47E-02	24	Marginal	EF	<1%
			Carbon Monoxide	630-08-0	2.08E-02	0.5	Marginal	EF	<1%
			Particulate Matter	SPM	1.88E-03	24	Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	1	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	24	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	1.48E-04	Annual	Above-Average	EF	<1%
			Benzene	71-43-2	5.19E-07	24	Above-Average	EF	<1%
			Benzene	71-43-2	5.19E-07	Annual	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	2.97E-10	24	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	2.97E-10	Annual	Above-Average	EF	<1%
			Carbon Dioxide	124-38-9	2.97E+01	24	Above-Average	EF	<1%
			Nitrous Oxide	10024-97-2	1.58E-04	24	Marginal	EF	<1%
			Methane	74-82-8	5.69E-04	24	Above-Average	EF	<1%
CTG3	Combustion Turbine Generator & HRSG Stack #3 (equipped with a Duct Burner)	Vertical	Nitrogen Oxides	10102-44-0	3.25E+01	1	Highest (2)	EF	49%
			Nitrogen Oxides	10102-44-0	3.25E+01	24	Highest (2)	EF	49%
			Carbon Monoxide	630-08-0	7.67E+00	0.5	Highest (2)	EF	50%
			Particulate Matter	SPM	2.09E+00	24	Highest (2)	EF	46%
			Sulphur Dioxide	7446-09-5	9.33E-01	1	Above-Average	EF	50%
			Sulphur Dioxide	7446-09-5	9.33E-01	24	Above-Average	EF	50%
			Sulphur Dioxide	7446-09-5	4.06E-01	Annual	Above-Average	EF	51%
			Benzene	71-43-2	3.29E-03	24	Above-Average	EF	50%
			Benzene	71-43-2	1.43E-03	Annual	Above-Average	EF	51%
			Benzo[a]pyrene	50-32-8	2.40E-04	24	Average	EF	50%
			Benzo[a]pyrene	50-32-8	1.01E-04	Annual	Average	EF	51%
			Carbon Dioxide	124-38-9	3.66E+04	24	Above-Average	EF	50%
			Nitrous Oxide	10024-97-2	8.28E-01	24	Marginal	EF	50%
			Methane	74-82-8	2.39E+00	24	Average	EF	50%

Source ID	Source Description	Source Orientation	Emissions Data						
			Contaminant	CAS No.	Max Emission Rate [g/s]	Averaging Period [hours]	Data Quality[1]	Estimation Technique[4]	Percent of Overall Emission
CTG4	Combustion Turbine Generator & HRSG Stack #4 (equipped with a Duct Burner)	Vertical	Nitrogen Oxides	10102-44-0	3.25E+01	1	Highest [2]	EF	49%
			Nitrogen Oxides	10102-44-0	3.25E+01	24	Highest [2]	EF	49%
			Carbon Monoxide	630-08-0	7.67E+00	0.5	Highest [2]	EF	50%
			Particulate Matter	SPM	2.09E+00	24	Highest [2]	EF	46%
			Sulphur Dioxide	7446-09-5	9.33E-01	1	Above-Average	EF	50%
			Sulphur Dioxide	7446-09-5	9.33E-01	24	Above-Average	EF	50%
			Sulphur Dioxide	7446-09-5	3.95E-01	Annual	Above-Average	EF	49%
			Benzene	71-43-2	3.29E-03	24	Above-Average	EF	50%
			Benzene	71-43-2	1.40E-03	Annual	Above-Average	EF	49%
			Benzo[a]pyrene	50-32-8	2.40E-04	24	Average	EF	50%
			Benzo[a]pyrene	50-32-8	9.79E-05	Annual	Average	EF	49%
			Carbon Dioxide	124-38-9	3.66E+04	24	Above-Average	EF	50%
			Nitrous Oxide	10024-97-2	8.28E-01	24	Marginal	EF	50%
			Methane	74-82-8	2.39E+00	24	Average	EF	50%
HRSG3	Heat Recovery Steam Generator 3	Vertical	Nitrogen Oxides	10102-44-0	5.19E-03	1	Marginal	EF	<1%
			Nitrogen Oxides	10102-44-0	5.19E-03	24	Marginal	EF	<1%
			Carbon Monoxide	630-08-0	4.36E-03	0.5	Marginal	EF	<1%
			Particulate Matter	SPM	3.95E-04	24	Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	1	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	24	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	Annual	Above-Average	EF	<1%
			Benzene	71-43-2	1.09E-07	24	Above-Average	EF	<1%
			Benzene	71-43-2	1.09E-07	Annual	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	6.23E-11	24	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	6.23E-11	Annual	Above-Average	EF	<1%
			Carbon Dioxide	124-38-9	6.23E+00	24	Above-Average	EF	<1%
			Nitrous Oxide	10024-97-2	3.32E-05	24	Marginal	EF	<1%
			Methane	74-82-8	1.19E-04	24	Above-Average	EF	<1%

Source ID	Source Description	Source Orientation	Emissions Data						
			Contaminant	CAS No.	Max Emission Rate [g/s]	Averaging Period [hours]	Data Quality[1]	Estimation Technique[4]	Percent of Overall Emission
HRSG4	Heat Recovery Steam Generator 4	Vertical	Nitrogen Oxides	10102-44-0	5.19E-03	1	Marginal	EF	<1%
			Nitrogen Oxides	10102-44-0	5.19E-03	24	Marginal	EF	<1%
			Carbon Monoxide	630-08-0	4.36E-03	0.5	Marginal	EF	<1%
			Particulate Matter	SPM	3.95E-04	24	Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	1	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	24	Above-Average	EF	<1%
			Sulphur Dioxide	7446-09-5	3.11E-05	Annual	Above-Average	EF	<1%
			Benzene	71-43-2	1.09E-07	24	Above-Average	EF	<1%
			Benzene	71-43-2	1.09E-07	Annual	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	6.23E-11	24	Above-Average	EF	<1%
			Benzo[a]pyrene	50-32-8	6.23E-11	Annual	Above-Average	EF	<1%
			Carbon Dioxide	124-38-9	6.23E+00	24	Above-Average	EF	<1%
			Nitrous Oxide	10024-97-2	3.32E-05	24	Marginal	EF	<1%
			Methane	74-82-8	1.19E-04	24	Above-Average	EF	<1%
CCT1	Chiller Cooling Tower 1	led as Volume S	Particulate Matter	SPM	3.44E-03	24	Marginal	EF	<1%
CCT1b	Chiller Cooling Tower 1 (Cell 2)		Particulate Matter	SPM	3.44E-03	24	Marginal	EF	<1%
CCT2	Chiller Cooling Tower 2		Particulate Matter	SPM	3.44E-03	24	Marginal	EF	<1%
CCT2b	Chiller Cooling Tower 2 (Cell 2)		Particulate Matter	SPM	3.44E-03	24	Marginal	EF	<1%
CT1	Process Cooling Tower #1	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT2	Process Cooling Tower #2	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT3	Process Cooling Tower #3	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT4	Process Cooling Tower #4	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT5	Process Cooling Tower #5	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT6	Process Cooling Tower #6	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT7	Process Cooling Tower #7	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT8	Process Cooling Tower #8	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
CT9	Process Cooling Tower #9	Vertical	Particulate Matter	SPM	3.84E-02	24	Marginal	EF	<1%
FP_1	Diesel-Fired Water Pump	Horizontal	Nitrogen Oxides	10102-44-0	1.27E+00	1, 24	Marginal	EF	2%
ADMINHVAC	Admin HVAC	Modelled as Volume Sources	Nitrogen Oxides	10102-44-0	1.26E-02	1, 24	Above-Average	EF	<1%
PHVAC	Phouse HVAC		Nitrogen Oxides	10102-44-0	7.55E-03	1, 24	Above-Average	EF	<1%
STGHVAC	STG HVAC		Nitrogen Oxides	10102-44-0	5.03E-02	1, 24	Above-Average	EF	<1%
WAREHOUSEHVAC	Warehouse HVAC		Nitrogen Oxides	10102-44-0	1.26E-02	1, 24	Above-Average	EF	<1%
WTHVAC	WT HVAC		Nitrogen Oxides	10102-44-0	1.26E-02	1, 24	Above-Average	EF	<1%
FPT_1	Fire Water Pump Diesel Tank	-	Diesel	68334-30-5	3.50E-05	24	Above-Average	MB	100%
BST_1	Sulphuric Acid Bulk Storage Tank	Vertical	Sulphuric Acid	7664-93-9	1.20E-08	24	Above-Average	MB	100%
BST_4	Sodium Bisulphite Bulk Storage Tank	Capped	Sodium Bisulfite	7631-90-5	4.03E-04	24	Above-Average	MB	100%
LOH3	Lube Oil Heater Tank Vent - Unit 3	Capped	Polyakylene glycol monobutyl ether	9038-95-3	2.62E-05	24	Above-Average	MB	50%
LOH4	Lube Oil Heater Tank Vent - Unit 4	Capped	Polyakylene glycol monobutyl ether	9038-95-3	2.62E-05	24	Above-Average	MB	50%

Notes
(1). Emission estimation data quality as per Section 9.2 of the Procedure Document.
(2). Emissions of NOx, CO and PM are conservatively estimated based on the performance and emission data provided by the GT manufacturer across various operating conditions and therefore have the highest data quality.
(3). Emergency generator is conservatively assessed with other sources for the worst-case NOx emissions.
(4). EF = Emission Factor

Table 3
Dispersion Modelling Input Summary Table
St. Clair Power, LP

Relevant Section of the Regulation O.Reg. 419/05	Section Title	Description of How the Approved Dispersion Model was Used
Section 8	Negligible sources of contaminant	Negligible sources and contaminants have been identified in Table 1.
Section 9	Same structure contamination	The Facility is the only occupant in the building, and there are no sensitive receptor (i.e. daycare) on-site. Furthermore, the property line is more than 5 meters away from the buidling. Therefore same structure contamination does not apply.
Section 10	Operating conditions	All equipment was assumed to be operating at their maximum production rates at the same time.
Section 11	Source of contaminant emission rates	The emission rate for each significant contaminant emitted from a significant source was estimated, the methodology for the calculation is documented in Table 2. See Appendix A of the ESDM Report for more information.
Section 12	Combined effect of assumptions for operating conditions and emission rates	The operation conditions were estimated in accordance with s.10(11)1 and s.11(11)1 of O.Reg. 419/05 and are therefore considered to result in the highest concentration at a POI that the Facility is capable of for that contaminant emitted.
Section 13	Meteorological data	AERMOD-ready meteorological data set based on “Crop” surface characteristics for London, Ontario was downloaded from the MECP website and used in the AERMOD dispersion model.
Section 14	Area of modelling coverage	The area of modelling coverage extends to a distance of 5,000 m from the Facility.
Section 15	Stack height for certain new sources of contaminants	Documented in accordance with MECP Guidance as provided in Table 2.
Section 16	Terrain data	Terrain data provided by the MECP located within the facility geographic region was used in the AERMOD dispersion model.
Section 17	Averaging periods	The averaging periods as summarized in Table 2 were used.

Table 4
Emission Summary Table - Grid Receptors
St. Clair Power, LP

Contaminant Name	CAS No.	Total Site-Wide Emission Rate [g/s]	Air Dispersion Model Used	Maximum Concentration at Offsite Receptors (3) [µg/m³]	Averaging Periods [hrs]	MECP POI Limit [µg/m³](1)	Limiting Effect	Benchmark (4)	Percentage of POI Limit [%]
Nitrogen Oxides	10102-44-0	6.63E+01	AERMOD v. 22112	173.6	1	400	Health	B1	43.4%
Nitrogen Oxides	10102-44-0	6.63E+01	AERMOD v. 22112	124.3	24	200	Health	B1	62.1%
Carbon Monoxide	630-08-0	1.54E+01	AERMOD v. 22112	46.3	0.5	6,000	Health	B1	< 1%
Particulate Matter	SPM	4.54E+00	AERMOD v. 22112	8.2	24	120	Visibility	B1	6.8%
Sulphur Dioxide	7446-09-5	1.87E+00	AERMOD v. 22112	2.7	1	100 (2)	Health & Vegetation	B1	2.7%
Sulphur Dioxide	7446-09-5	1.87E+00	AERMOD v. 22112	0.7	24	275	Health & Vegetation	B1	< 1%
Sulphur Dioxide	7446-09-5	8.02E-01	AERMOD v. 22112	0.02	Annual	10 (2)	Health & Vegetation	B1	< 1%
Benzene	71-43-2	6.58E-03	AERMOD v. 22112	0.003	24	100	Health	DAV	< 1%
Benzene	71-43-2	6.58E-03	AERMOD v. 22112	0.00018	Annual	4.5	Health	AAV	< 1%
Benzene	71-43-2	2.83E-03	AERMOD v. 22112	0.00008	Annual	0.45	Health	B1	< 1%
Benzo[a]pyrene	50-32-8	4.80E-04	AERMOD v. 22112	0.00019	24	0.005	Health	DAV	3.8%
Benzo[a]pyrene	50-32-8	4.80E-04	AERMOD v. 22112	0.000013	Annual	0.0001	Health	AAV	13.0%
Benzo[a]pyrene	50-32-8	1.98E-04	AERMOD v. 22112	0.000005	Annual	0.00001	Health	B1	53.7%

Notes

(1) Criteria listed in the MECP AAQC and Air Contaminants Benchmarks (ACB) List Version 3.0, dated April 2023.

(2) MECP proposed POI limit, effective on July 1, 2023. The most stringent SO_2 MECP limits for each averaging period are used for determination of compliance.

(3) The maximum concentrations at MECP grid receptors (i.e., offsite receptors along and beyond the property boundary).
(4) B1 - Benchmark 1 - Exceedence of a Benchmark 1 concentration triggers specific actions under O.Reg. 419/05.
B2 - Benchmark 2 - Exceedance of a Benchmark 2 concentration triggers a toxicological assessment to determine the likelihood of adverse effect.
DAV- Daily Assessment Value which represents the maximum daily exposure possible based on the maximum daily emission rate.
AAV- Annual Assessment Value which represents the maximum yearly POI concentrations based on the maximum daily emission rate maintained over a whole year.

Table 5

Emission Summary Table - Sensitive Receptors

St. Clair Power, LP

Contaminant Name	CAS No.	Total Site-Wide Emission Rate [g/s]	Air Dispersion Model Used	Maximum Concentration at Sensitive Receptors (3) [µg/m^3]	Background Concentration (5) [µg/m^3]	Maximum Cumulative Concentration at Sensitive Receptor [µg/m^3]	Averaging Periods [hrs]	MECP POI Limit [µg/m^3](1)	Limiting Effect	Benchmark (4)	Facility-contributed Percentage of the Limit [%]	Percentage of the Limit [%]
Nitrogen Oxides	10102-44-0	6.63E+01	AERMOD v. 22112	80.7	19	100	1	400	Health	AAQC/B1	20.2%	24.9%
Nitrogen Oxides	10102-44-0	6.63E+01		19.5	17	36	24	200	Health	AAQC/B1	9.8%	18.2%
Carbon Monoxide	630-08-0	1.54E+01		21.3	478	499	0.5	6,000	Health	B1	< 1%	8.3%
Carbon Monoxide	630-08-0	1.54E+01		17.7	398	416	1	36,200	Health	AAQC	< 1%	1.1%
Carbon Monoxide	630-08-0	1.54E+01		6.9	392	399	8	15,700	Health	AAQC	< 1%	2.5%
Particulate Matter	SPM	4.54E+00		3.0	43	46	24	120	Visibility	AAQC/B1	2.5%	38.5%
Particulate Matter	SPM	4.54E+00		0.18	24	24	Annual	60	Visibility	AAQC	< 1%	40.5%
PM10	PM10	4.54E+00		3.0	24	27	24	50	Health	AAQC	5.9%	53.9%
PM2.5	PM2.5	4.54E+00		3.0	13	16	24	27	Health	AAQC	10.9%	58.9%
PM2.5	PM2.5	4.54E+00		0.18	7	7	Annual	8.8	Health	AAQC	2.1%	84.3%
Sulphur Dioxide	7446-09-5	1.87E+00		3.5	8.8	12	10-min	178	Health	AAQC	2.0%	6.9%
Sulphur Dioxide	7446-09-5	1.87E+00		2.1	8.8	10.9	1	100 (2)	Health & Vegetation	B1	2.1%	10.9%
Sulphur Dioxide	7446-09-5	1.87E+00		0.4	9.4	9.8	24	275	Health & Vegetation	B1	< 1%	3.6%
Sulphur Dioxide	7446-09-5	8.02E-01		0.01	4.1	4.1	Annual	10 (2)	Health & Vegetation	B1	< 1%	41.5%
Benzene	71-43-2	6.58E-03		0.0014	2.1	2.1	24	2.3	Health	AAQC	< 1%	90.5%
Benzene	71-43-2	2.83E-03		0.00005	1.1	1.1	Annual	0.45	Health	AAQC/B1	< 1%	237.6%
Benzo[a]pyrene	50-32-8	4.80E-04		0.000081	0.000070	0.000151	24	0.00005	Health	AAQC	161.3%	301.9%
Benzo[a]pyrene	50-32-8	1.98E-04		0.0000035	0.000038	0.000042	Annual	0.00001	Health	AAQC/B1	35.1%	419.8%

Notes

(1) Criteria listed in the MECP AAQC and Air Contaminants Benchmarks (ACB) List Version 3.0, dated April 2023.

(2) MECP proposed POI limit, effective on July 1, 2023. The most stringent SO_2 MECP limits for each averaging period are used for determination of compliance.

(3) The maximum concentrations at senstive receptors. Meterological anomolies were only eliminated for the results of Benzo(a)pyrene (24-hr average) following section 6.5 of the MECP's AMMGO.

(4) B1 - Benchmark 1 - Exceedence of a Benchmark 1 concentration triggers specific actions under O.Reg. 419/05.

B2 - Benchmark 2 - Exceedance of a Benchmark 2 concentration triggers a toxicological assessment to determine the likelihood of adverse effect.

(5) Background concentrations of contaminants are estimated based on the 90th percentile of monitoring data.

Table 6

Emission Summary Table - Greenhouse Gas Emissions

St. Clair Power, LP

GHGs	Site-wide Annual Emission Rate	Annual Emissions	GWP(1)	CO2 Equivalent
	g/s	t/yr	-	kt/yr
Carbon Dioxide	34,704.98	1,094,456	1	1,094
Nitrous Oxide	0.72	22.61	265	5.992
Methane	2.10	66.10	28	1.851
Facility Annual GHG Emission (CO2-eq)				1,102

1. Global Warming Potential (GWP) from the Fifth Assessment Report published by the Intergovernmental Panel on Climate Change (IPCC).

Table A.1
Gas Turbine Maximum Operating Capacity after AGP Upgrade
St. Clair Power, LP

GT (post-upgrade)[1]

Case	Load Condition	Ambient Temp (oF)	Output (kW)	Heat Cons (MMBTU/hr)	Emission Rate (lb/hr)							
					NOx as NO2	**CO**	**UHC (dry)**	**VOC (dry)**	**SO2**	PM (US Filt)	PM (total)	CO2
Case 1	44.0%	0	93,154	1197.9	51.9	19.1	8.5	1.7	--	2.4	4.9	141,508
Case 2	75%	0	158,785	1657.1	71.8	26.1	11.6	2.3	--	3.3	6.6	195,730
Case 3	BASE	0	**211,714**	**2089.8**	**90.6**	**7.2**	**14.3**	**2.9**	**--**	**4.1**	**8.2**	**246,810**
Case 4	43.4%	20	91,963	1182.8	51.2	19.1	8.5	1.7	--	2.5	5.0	139,735
Case 5	75%	20	158,922	1634.9	70.8	25.7	11.4	2.3	--	3.3	6.7	193,107
Case 6	BASE	20	**211,895**	**2092.1**	**90.7**	**7.0**	**14.0**	**2.8**	**--**	**4.1**	**8.2**	**247,036**
Case 7	45.2%	50	90,043	1160.6	50.3	19.2	8.5	1.7	--	2.6	5.2	137,141
Case 8	75%	50	149,574	1562.2	67.7	24.7	11.0	2.2	--	3.4	6.7	184,534
Case 9	BASE	50	199,432	1980.1	85.8	6.7	13.4	2.7	--	4.1	8.2	233,826
Case 10	46.4%	59	89,992	1158.6	50.2	19.2	8.6	1.7	--	2.7	5.3	136,907
Case 11	75%	59	145,461	1531.9	66.4	24.2	10.8	2.2	--	3.4	6.7	180,946
Case 12	BASE	59	193,949	1936.5	83.9	6.5	13.1	2.6	--	4.1	8.2	228,678
Case 13	48.0%	70	89,500	1153.3	50.0	19.2	8.6	1.7	--	2.74	5.5	136,286
Case 14	75%	70	139,844	1491.0	64.6	23.4	10.4	2.1	--	3.4	6.7	176,114
Case 15	BASE	70	186,459	1878.3	81.4	6.4	12.7	2.5	--	4.1	8.2	221,814
Case 16	54.5%	95	90,513	1164.7	50.5	19.4	8.7	1.7	--	3.1	6.1	137,634
Case 17	75%	95	124,559	1378.1	59.7	21.5	9.6	1.9	--	3.4	6.8	162,767
Case 18	BASE	95	166,079	1719.0	74.5	5.7	11.5	2.3	--	4.1	8.2	202,982
Case 19	57.0%	102	90,504	1167.1	50.6	19.4	8.7	1.7	--	3.2	6.4	137,918
Case 20	75%	102	119,084	1338.0	58.0	20.8	9.3	1.9	--	3.4	6.9	158,038
Case 21	BASE	102	158,779	1663.5	72.1	5.5	11.0	2.2	--	4.1	8.2	196,418
Case 22	BASE Chiller	50	199,432	1980.1	85.8	6.7	13.4	2.7	--	4.1	8.2	233,826
Case 23	BASE Chiller	59	199,577	1982.2	85.9	6.6	13.3	2.7	--	4.1	8.2	234,073
Case 24	BASE Chiller	70	199,810	1985.7	86.1	6.6	13.3	2.7	--	4.1	8.2	234,470
Case 25	BASE Chiller	95	199,778	1985.4	86.1	6.6	13.3	2.7	--	4.1	8.2	234,449
Case 26	BASE Chiller	102	199,764	1985.3	86.1	6.6	13.3	2.7	--	4.1	8.2	234,440
Case 27	Robust Peak	50	**214,000**	**2109.3**	**129.5**	**32.0**	**14.3**	**2.9**	**--**	**4.1**	**8.2**	**249,089**
Case 28	Robust Peak	59	**214,000**	**2114.3**	**129.8**	**31.5**	**14.0**	**2.8**	**--**	**4.1**	**8.2**	**249,649**
Case 29	Robust Peak	70	206,005	2042.3	125.4	29.9	13.3	2.7	--	4.1	8.2	241,123
Case 30	Robust Peak	95	200,671	1998.1	122.7	29.4	13.1	2.6	--	4.1	8.2	235,907
Case 31	Robust Peak	102	192,999	1938.0	119.0	28.5	12.7	2.5	--	4.1	8.2	228,809
Case 32	Peak Chiller	50	206,005	2042.3	125.4	6.7	13.3	2.7	--	4.1	8.2	241,123
Case 33	Peak Chiller	59	206,090	2043.9	125.5	6.6	13.3	2.7	--	4.1	8.2	241,307
Case 34	Peak Chiller	70	206,225	2046.5	125.7	6.6	13.3	2.7	--	4.1	8.2	241,603
Case 35	Peak Chiller	95	206,197	2046.3	125.7	6.6	13.3	2.7	--	4.1	8.2	241,585
Case 36	Peak Chiller	102	206,185	2046.2	125.7	6.6	13.3	2.7	--	4.1	8.2	241,577

Maximum Summary

				Emission Rate (lbs/hr)							
Load Condition	Ambient Temp (oF)	Output (kW)	Heat Cons (MMBTU/hr)	**NOx as NO2**	**CO**	**UHC (dry)**	**VOC (dry)**	**SO2**	PM (US Filt)	PM (total)	CO2
~50%	0	93,154	1,198	51.9	19.4	8.7	1.7	0.0	3.2	6.4	141,508
75%	20	158,922	1,657	71.8	26.1	11.6	2.3	0.0	3.4	6.9	195,730
BASE	20	211,895	2,092	90.7	7.2	14.3	2.9	0.0	4.1	8.2	247,036
BASE Chiller	70	199,810	1,986	86.1	6.7	13.4	2.7	0.0	4.1	8.2	234,470
Robust Peak	50/59	214,000	2,114	129.8	32.0	14.3	2.9	0.0	4.1	8.2	249,649
Peak Chiller	70	206,225	2,047	125.7	6.7	13.3	2.7	0.0	4.1	8.2	241,603

				Emission Rate (g/s)							
Load Condition	Ambient Temp (oF)	Output (kW)	Heat Cons (MMBTU/hr)	**NOx as NO2**	**CO**	**UHC (dry)**	**VOC (dry)**	**SO2**	PM (US Filt)	PM (total)	CO2
~50%	0	93,154	1,198	6.5	2.4	1.1	0.2	0.0	0.4	0.8	17,829.7
75%	20	158,922	1,657	9.0	3.3	1.5	0.3	0.0	0.4	0.9	24,661.6
BASE	20	211,895	2,092	11.4	0.9	1.8	0.4	0.0	0.5	1.0	31,125.9
BASE Chiller	70	199,810	1,986	10.8	0.8	1.7	0.3	0.0	0.5	1.0	29,542.7
Robust Peak	50/59	214,000	2,114	16.4	4.0	1.8	0.4	0.0	0.5	1.0	31,455.2
Peak Chiller	70	206,225	2,047	15.8	0.8	1.7	0.3	0.0	0.5	1.0	30,441.5

Notes:
(1) Performance and emissions data for the Advanced Gas Path upgrades to the turbines are provided by GE Gas Power.

Table A.2

Gas Turbine CEMS Data

St. Clair Power, LP

	CTG3 MMBTU/year[1]	CTG4 MMBTU/year[1]
2017	1,020,795.6	789,472.8
2018	3,034,404.7	2,457,217.9
2019	3,110,985.5	3,398,273.6
2020	2,903,271.4	2,630,978.3
2021	4,726,490.3	5,038,002.6
2022	6,720,579.4	5,992,037.6

	CTG3 MMBTU/hr	CTG4 MMBTU/hr
Existing Facility Maximum[2]	1,830	1,678
AGP Upgrade Maximum[3]	2,114	2,114
Increase (%)	15.50%	25.98%

	CTG3 MMBTU/year	CTG4 MMBTU/year
Annual Maximum (2017-2022)	6,720,579	5,992,038
Projected Annual Maximum with AGP Upgrade	7,762,282	7,548,968

Notes:

(1) Taken from the totals of the daily natural gas consumption taken from St. Clair 2017-2022 CEMS data.

(2) Taken from the maximum hourly natural gas consumption taken from St. Clair 2017 CEMS data during either startup, normal, or shutdown operations.

(3) Taken from performance and emissions data for the Advanced Gas Path upgrades to the turbines provided by GE Gas Power.

Table A.3

Stationary Natural Gas Turbines Emission Estimates

St. Clair Power, LP

Source ID	Maximum Approved Capacity (MW)	Maximum Heat Input (MMBTU/hr)(1)	AGP Upgrade Capacity (MW)	AGP Upgrade Maximum Hourly Heat Input (MMBTU/hr)(2)	AGP Upgrade Maximum Hourly [Annual Average] Heat Input (MMBTU/hr)(3)	Contaminant	CAS#	Emission Factor (lb/MMBTU)(4)(5)(6)	Rating	AGP Upgrade 1-hr Emission Rate (g/s)(2)(7)	AGP Upgrade 1-hr Emission Rate (g/s)(7)	AGP Upgrade 1-hr Emission Rate (g/s)	AGP Upgrade Annual Emission Rate (g/s)
CTG3	185	1830	214	2,114	886	Nitrogen Oxides	10102-44-0	9.90E-02	D	1.64E+01	2.64E+01	2.64E+01	1.11E+01
						Carbon Monoxide	630-08-0	1.50E-02	D	4.03E+00	4.00E+00	4.03E+00	1.68E+00
						Particulate Matter	SPM	6.60E-03	C	1.03E+00	1.76E+00	1.76E+00	7.38E-01
						Sulphur Dioxide	7446-09-05	3.40E-03	B	--	9.07E-01	9.07E-01	3.80E-01
						Benzene	71-43-2	1.20E-05	A	--	3.20E-03	3.20E-03	1.34E-03
						Benzo[a]pyrene	50-32-8	9.00E-07	C	--	2.40E-04	2.40E-04	1.01E-04
						Carbon Dioxide	124-38-9	1.10E+02	A	3.15E+04	2.93E+04	3.15E+04	1.23E+04
						Nitrous Oxide	10024-97-2	3.00E-03	E	--	8.00E-01	8.00E-01	3.35E-01
						Methane	74-82-8	8.60E-03	C	--	2.29E+00	2.29E+00	9.61E-01
CTG3 (Duct Burner)	369.3 GJ/hr	350.0	369.3 GJ/hr	350	--	Nitrogen Oxides	10102-44-0	1.37E-01	D	--	6.06E+00	6.06E+00	--
						Carbon Monoxide	630-08-0	8.24E-02	D	--	3.64E+00	3.64E+00	--
						Particulate Matter	SPM	7.45E-03	C	--	3.29E-01	3.29E-01	--
						Sulphur Dioxide	7446-09-05	5.88E-04	B	--	2.60E-02	2.60E-02	--
						Benzene	71-43-2	2.06E-06	B	--	9.09E-05	9.09E-05	--
						Benzo[a]pyrene	50-32-8	1.18E-09	B	--	5.19E-08	5.19E-08	--
						Carbon Dioxide	124-38-9	1.18E+02	A	--	5.19E+03	5.19E+03	--
						Nitrous Oxide	10024-97-2	6.27E-04	E	--	2.77E-02	2.77E-02	--
						Methane	74-82-8	2.25E-03	B	--	9.95E-02	9.95E-02	--
CTG4	185	1678	214	2,114	862	Nitrogen Oxides	10102-44-0	9.90E-02	D	1.64E+01	2.64E+01	2.64E+01	1.08E+01
						Carbon Monoxide	630-08-0	1.50E-02	D	4.03E+00	4.00E+00	4.03E+00	1.63E+00
						Particulate Matter	SPM	6.60E-03	C	1.03E+00	1.76E+00	1.76E+00	7.17E-01
						Sulphur Dioxide	7446-09-05	3.40E-03	B	--	9.07E-01	9.07E-01	3.70E-01
						Benzene	71-43-2	1.20E-05	A	--	3.20E-03	3.20E-03	1.30E-03
						Benzo[a]pyrene	50-32-8	9.00E-07	C	--	2.40E-04	2.40E-04	9.78E-05
						Carbon Dioxide	124-38-9	1.10E+02	A	3.15E+04	2.93E+04	3.15E+04	1.20E+04
						Nitrous Oxide	10024-97-2	3.00E-03	E	--	8.00E-01	8.00E-01	3.26E-01
						Methane	74-82-8	8.60E-03	C	--	2.29E+00	2.29E+00	9.35E-01
CTG4 (Duct Burner)	369.3 GJ/hr	350.0	369.3 GJ/hr	350	--	Nitrogen Oxides	10102-44-0	1.37E-01	D	--	6.06E+00	6.06E+00	--
						Carbon Monoxide	630-08-0	8.24E-02	D	--	3.64E+00	3.64E+00	--
						Particulate Matter	SPM	7.45E-03	C	--	3.29E-01	3.29E-01	--
						Sulphur Dioxide	7446-09-05	5.88E-04	B	--	2.60E-02	2.60E-02	--
						Benzene	71-43-2	2.06E-06	B	--	9.09E-05	9.09E-05	--
						Benzo[a]pyrene	50-32-8	1.18E-09	B	--	5.19E-08	5.19E-08	--
						Carbon Dioxide	124-38-9	1.18E+02	A	--	5.19E+03	5.19E+03	--
						Nitrous Oxide	10024-97-2	6.27E-04	E	--	2.77E-02	2.77E-02	--
						Methane	74-82-8	2.25E-03	B	--	9.95E-02	9.95E-02	--

Notes:

(1) Taken as the maximum approved capacity of the duct burners and from the maximum hourly natural gas consumption at the turbines taken from St. Clair 2017 CEMS data during either startup, normal, or shutdown operations.

(2) Taken from performance and emissions data for the Advanced Gas Path upgrades to the turbines provided by GE Gas Power.

(3) Taken from the totals of the daily natural gas consumption at St. Clair from 2017-2022 (CEMS data) and including an incremental increase (%) in natural gas consumption from the maximum hourly heat input with the AGP upgrade.

(4) Combustion turbine emission factor taken from US EPA AP-42 Chapter 3.1 Stationary Internal Combustion Sources for lean-premix Natural Gas-Fired Turbines.

(5) Duct burner emission factor taken from US EPA AP-42 Chapter 1.4 Natural Gas Combustion for controlled -low Nox burners of Large Wall-Fired Boilers (>100 MMBTU).

(6) The BaP emission factor from the combustion turbines was taken as the emission factor for total PAHs with the emission factor for naphthalene removed. This was used as a surrogate emission factor for estimating BaP emissions.

(7) The maximum of either the estimated emissions using heat input rating and U.S. EPA Emission Factors or the performance data provided by GE Gas Power was used to represent a conservative analysis for the turbine emissions.

Table A.4

Natural Gas-Fired Heaters Emission Estimates

St. Clair Power, LP

Source ID	Maximum Approved Capacity (MMBTU/hr)	Contaminant	CAS#	Emission Factor (lb/MMBTU)(1)	Rating	Emission Rate (g/s)
DPH3	2.0	Nitrogen Oxides	10102-44-0	9.80E-02	D	2.47E-02
		Carbon Monoxide	630-08-0	8.24E-02	D	2.08E-02
		Particulate Matter	SPM	7.45E-03	C	1.88E-03
		Sulphur Dioxide	7446-09-05	5.88E-04	B	1.48E-04
		Benzene	71-43-2	2.06E-06	B	5.19E-07
		Benzo[a]pyrene	50-32-8	1.18E-09	B	2.97E-10
		Carbon Dioxide	124-38-9	1.18E+02	A	2.97E+01
		Nitrous Oxide	10024-97-2	6.27E-04	E	1.58E-04
		Methane	74-82-8	2.25E-03	B	5.69E-04
DPH4	2.0	Nitrogen Oxides	10102-44-0	9.80E-02	D	2.47E-02
		Carbon Monoxide	630-08-0	8.24E-02	D	2.08E-02
		Particulate Matter	SPM	7.45E-03	C	1.88E-03
		Sulphur Dioxide	7446-09-05	5.88E-04	B	1.48E-04
		Benzene	71-43-2	2.06E-06	B	5.19E-07
		Benzo[a]pyrene	50-32-8	1.18E-09	B	2.97E-10
		Carbon Dioxide	124-38-9	1.18E+02	A	2.97E+01
		Nitrous Oxide	10024-97-2	6.27E-04	E	1.58E-04
		Methane	74-82-8	2.25E-03	B	5.69E-04
HRSG3 Heater	0.4	Nitrogen Oxides	10102-44-0	9.80E-02	D	5.19E-03
		Carbon Monoxide	630-08-0	8.24E-02	D	4.36E-03
		Particulate Matter	SPM	7.45E-03	C	3.95E-04
		Sulphur Dioxide	7446-09-05	5.88E-04	B	3.11E-05
		Benzene	71-43-2	2.06E-06	B	1.09E-07
		Benzo[a]pyrene	50-32-8	1.18E-09	B	6.23E-11
		Carbon Dioxide	124-38-9	1.18E+02	A	6.23E+00
		Nitrous Oxide	10024-97-2	6.27E-04	E	3.32E-05
		Methane	74-82-8	2.25E-03	B	1.19E-04
HRSG4 Heater	0.4	Nitrogen Oxides	10102-44-0	9.80E-02	D	5.19E-03
		Carbon Monoxide	630-08-0	8.24E-02	D	4.36E-03
		Particulate Matter	SPM	7.45E-03	C	3.95E-04
		Sulphur Dioxide	7446-09-05	5.88E-04	B	3.11E-05
		Benzene	71-43-2	2.06E-06	B	1.09E-07
		Benzo[a]pyrene	50-32-8	1.18E-09	B	6.23E-11
		Carbon Dioxide	124-38-9	1.18E+02	A	6.23E+00
		Nitrous Oxide	10024-97-2	6.27E-04	E	3.32E-05
		Methane	74-82-8	2.25E-03	B	1.19E-04

Notes:

(1) Taken from US EPA AP-42 Chapter 1.4 Natural Gas Combustion for uncontrolled Small Boilers (<100 MMBTU/hr)

Table A.5

Cooling Tower Emission Estimates

St. Clair Power, LP

Source ID	Source Description	Circulation Rate (kg/s)[1]	Total Liquid Drift Factor (%)[2]	Total Dissolved Solids (ppm)[3]	PM Emission Rate (g/s)
CCT1	Cooling Tower 1	93	0.001%	3700	3.44E-03
CCT1b	Cooling Tower 1 (Cell 2)	93	0.001%	3700	3.44E-03
CCT2	Cooling Tower 2	93	0.001%	3700	3.44E-03
CCT2b	Cooling Tower 2 (Cell 2)	93	0.001%	3700	3.44E-03
CT1	Process Cooling Tower #1	1037	0.001%	3700	3.84E-02
CT2	Process Cooling Tower #2	1037	0.001%	3700	3.84E-02
CT3	Process Cooling Tower #3	1037	0.001%	3700	3.84E-02
CT4	Process Cooling Tower #4	1037	0.001%	3700	3.84E-02
CT5	Process Cooling Tower #5	1037	0.001%	3700	3.84E-02
CT6	Process Cooling Tower #6	1037	0.001%	3700	3.84E-02
CT7	Process Cooling Tower #7	1037	0.001%	3700	3.84E-02
CT8	Process Cooling Tower #8	1037	0.001%	3700	3.84E-02
CT9	Process Cooling Tower #9	1037	0.001%	3700	3.84E-02

Notes:

(1) Provided by St. Clair Power

(2) Manufacturer specification

(3) Lowest range of TDS values for counter flow induced draft cooling towers from US EPA AP-42 Chapter 13.4 "Wet Cooling Towers" was used for consistency with supporting documentation in the approved ECA No. 4774-BG6GZN.

Table A.5
Storage Tank Emission Estimates
St. Clair Power, LP

Source ID	Source Description	Flow Rate (US Gal/min)	Flow Rate (L/s)	Operating Period (hr/day)	Temperature (^{o}C)	Contaminant	Partial Pressure (mmHg)	Wt. Percent in Liquid (%)	Molecular Weight (g/mol)	1-hr Emission Rate (g/s)	24-hr Emission Rate (g/s)
BST_1	Sulphuric Acid Bulk Storage Tank	167	10.5	0.5	20	Sulphuric Acid	0.0000102	93	98.08	2.88E-07	1.20E-08
BST_4	Sodium Bisulphite Bulk Storage Tank	72	4.5	0.1	20	Sodium bisulphite	4.5	40	104.061	9.67E-03	4.03E-04
FPT_1	Fire Water Pump Diesel Tank	3	0.2	0.1	20	Diesel	7.5	100	130	8.41E-04	3.50E-05
LOH3	Lube Oil Heater Tank Vent - Unit 3	2.1	0.1	24	48.9	Polyakylene glycol monobutyl ether	0.001	100	3930	2.62E-05	2.62E-05
LOH4	Lube Oil Heater Tank Vent - Unit 4	2.1	0.1	24	48.9	Polyakylene glycol monobutyl ether	0.001	100	3930	2.62E-05	2.62E-05

Notes:
Emission Rate (g/s) = Partial Pressure (mmHg) * Pumping Rate (L/s) * Molecular Weight (g/mol) /(Gas Constant- R (mmHG-L/gmol-K)* (Product Temperature (^{o}C) + 273.15))
Universal Gas Constant- R = 62.36 (mmHG-L / gmol-K)

Table A.7

Natural Gas-Fired Comfort Heating Equipment Emission Estimates

St. Clair Power, LP

Source ID	Unit Name	Make	Model #	Heat Input Rating (BTU/hr)	Emission Factor (kg/$10^6 m^3$)(1)	Emission Rate (g/s)
Admin HVAC	various	various	various	1,000,000	1600	1.26E-02
Phouse HVAC	various	various	various	600,000		7.55E-03
STG HVAC	various	various	various	4,000,000		5.03E-02
Warehouse HVAC	various	various	various	1,000,000		1.26E-02
WT HVAC	various	various	various	1,000,000		1.26E-02
			TOTAL	7,600,000	TOTAL	9.56E-02

Notes:

(1) Emission factor taken from US EPA Chapter 1.4 Natural Gas Combustion for boilers less than 100 MMBtu/hr with a data rating of B.

Table A.8
Negligibility Assessment
St. Clair Power, LP

Contaminant	Cas No.	Facility Emission Rate (g/s)	MECP POI Limit (µg/m³)	Averaging Period (hrs)	Emission Threshold (g/s)	Significant (Y/N)
Nitrogen Oxides	10102-44-0	6.63E+01	400	1	5.71E-02	Y
Nitrogen Oxides	10102-44-0	6.63E+01	200	24	7.14E-02	Y
Carbon Monoxide	630-08-0	1.54E+01	6000	0.5	7.14E-01	Y
Particulate Matter	SPM	4.54E+00	120	24	4.29E-02	Y
Sulphur Dioxide	7446-09-5	1.87E+00	100	1	1.43E-02	Y
Sulphur Dioxide	7446-09-5	1.87E+00	275	24	9.82E-02	Y
Sulphur Dioxide	7446-09-5	8.02E-01	10	Annual	1.79E-02	Y
Benzene	71-43-2	2.83E-03	0.45	Annual	8.04E-04	Y
Benzo[a]pyrene	50-32-8	1.98E-04	0.00001	Annual	1.79E-08	Y
Sulphuric Acid	7664-93-9	1.20E-08	5	24	1.79E-03	N
Sodium Bisulfite	7631-90-5	4.03E-04	120	24	4.29E-02	N
Diesel	68334-30-5	3.50E-05	350	24	1.25E-01	N
Polyakylene glycol monobutyl ether	9038-95-3	5.23E-05	50	24	1.79E-02	N

Rural Dispersion Factor [1](µg/m³ per g/s)

0.5 hr	1 hr	8 hr	24 hr	Annual
4200	3500	2346	1400	280

(1) All sources are measured at least 160m away from the facility fenceline and the major emission sources- gas turbines are 180m from the fenceline.
The 1-hr rural dispersion factor for a distance up to 150m is conservatively used for a screening assessment following Section 3.1.1 of the ADMGO.
The 1-hr dispersion factor is converted into other averaging periods per section 4.4 of the ADMGO.

Table A.6

Emergency Fire Pump Emission Estimates

St. Clair Power, LP

Power Rating 325 hp

Contaminant	CAS	Emission Factor[1] (lb/hp-hr)	Maximum Allowable Emission Rate (g/s)
Nitrogen oxides	10102-44-0	0.031	1.27E+00

Notes:

Emission factor taken from US EPA AP-42 Chapter 3.1 Stationary Internal Combustion Sources for Diesel Industrial Engines with a data rating of D.