EXECUTIVE SUMMARY

Alliance Technical Group (ATG), formerly ORTECH Consulting Inc., completed a voluntary compliance emission testing program at the Durham York Energy Centre (DYEC) located in Courtice, Ontario between December 2 to December 5, 2024. The voluntary emission testing program was performed at the request of the Regions of Durham and York. The current test program is the ninth voluntary test program conducted at the facility.

Ontario Ministry of the Environment, Conservation and Parks (MECP) Amended Environmental Compliance Approval (ECA) No. 7306-8FDKNX Section 7(1) states that "the owner shall perform annual source testing, in accordance with the procedures and schedule outlined in the attached Schedule E, to determine the rates of emissions of the test contaminants from the stack. The program shall be conducted not later than six months after the commencement date of operation of the facility/equipment and subsequent source testing programs shall be conducted once every calendar year thereafter". A list of the test programs conducted to date is provided below:

Test Program	Test Date	Report No.
2015 Compliance	September/October 2015	21546
2016 Voluntary	May 2016	21656
2016 Compliance	October/November 2016	21698
2017 Voluntary	May 2017	21754
2017 Compliance	October 2017	21800
2018 Voluntary	May/June 2018	21840
2018 Compliance	September 2018	21880
2019 Voluntary	June 2019	21936
2019 Compliance	September 2019	21960
2020 Voluntary	June 2020	22001
2020 Compliance	November 2020	22050
2021 Voluntary	June 2021	22081
2021 Compliance	November/December 2021	22085
2022 Voluntary	May 2022	22158
2022 Compliance	November/December 2022	22160
2023 Voluntary	April 2023	22230
2023 Compliance	September/October 2023	22235
2024 Compliance	March 2024	22327
2024 Voluntary	December 2024	AST-2024-4547

Source testing was performed on the Baghouse (BH) Outlet of Boiler No. 1 and BH Outlet of Boiler No. 2 for the test contaminants listed in Schedule D of the ECA.

Emission tests were completed for particulate matter, metals, semi-volatile organic compounds, acid gases, volatile organic compounds, aldehydes and combustion gases at the BH Outlet of each Boiler. Emission tests were also completed for total hydrocarbons at the Quench Inlet of each Boiler. The contaminant groups included in the emission test program and the reference test methods used are summarized below:

Test Groups	Reference Method
Particulate and Metals	US EPA Method 29
$PM_{2.5}$/PM_{10} and Condensable Particulate	US EPA Methods 201A and 202
Semi-Volatile Organic Compounds	Environment Canada Method EPS 1/RM/2
Volatile Organic Compounds	US EPA SW-846 Method 0030 (SLO VOST modification)
Aldehydes	NCASI Method ISS/FP-A105.01
Halides and Ammonia	US EPA Method 26A
Combustion Gases:	
Oxygen and Carbon Dioxide	Facility CEM
Carbon Monoxide	Facility CEM
Sulphur Dioxide	Facility CEM
Nitrogen Oxides	Facility CEM
Total Hydrocarbons	ATG per US EPA Method 25A

Sampling, analysis and reporting were conducted following the procedures detailed in the Pre-Test Plan with the following exception. During the Voluntary Source Test conducted from December 2 to December 5, 2024, the facility encountered unforeseen operational challenges with Boiler No. 2 which impacted the testing process. While two test runs were completed for Semi-Volatile Organic Compounds (SVOC) on Boiler No. 2, an operational issue arose during the third test. The third test was rescheduled for the second week of December, but the issue remained unresolved, forcing the facility to take a feed stop on Boiler No. 2 on December 10 to carry out necessary repairs. Despite the facility's efforts to resolve the issue quickly, the malfunction made it impossible to proceed with the third SVOC test on Boiler No. 2. The SVOC results for Boiler No. 1 are from the triplicate tests conducted as per the Pre-Test Plan.

Schedule C of ECA No. 7306-8FDKNX lists in-stack limits for the emissions of various compounds. In-stack emissions limits are given for particulate matter, mercury, cadmium, lead, dioxins and furans and organic matter for comparison with the results from compliance source testing. In-stack emission limits are also given for hydrochloric acid, sulphur dioxide, nitrogen oxides and carbon monoxide calculated as the rolling arithmetic average of data measured by a continuous emission monitoring system (CEMS).

Since relative accuracy and system bias testing was conducted in August 2024, the data recorded by the DYEC CEMS was used to assess against the in-stack emissions limits detailed in Schedule C of the ECA for hydrochloric acid, sulphur dioxide, nitrogen oxides and carbon monoxide. Note the DYEC CEMS data for the days when isokinetic testing was performed at each unit (December 2 to December 5, 2024) was used to determine the minimum, average and maximum concentrations of the combustion gases listed in the ECA. Concentration data measured by ATG on December 3 and December 4, 2024, was used to assess the total hydrocarbons (organic matter) in-stack emissions limit detailed in Schedule C of the ECA.

Consistent with the approach commonly required by the MECP for compliance emission testing programs, the following results are conservative in the sense that when the analytical result is reported to be below the detection limit, the full detection limit is used to calculate emission data and is shown by a "<" symbol. Also, when one or both Boiler results are reported to be below the detection limit, the detection limit was used to conservatively estimate the total emission rate for the Main Stack.

The MECP "Summary of Standards and Guidelines to Support Ontario Regulation 419/05 – Air Pollution – Local Air Quality", dated April 2012, provides an updated framework for calculating dioxin and furan toxicity equivalent concentrations which includes emission data for 12 dioxin-like PCBs. This document was replaced by "Air Contaminants Benchmarks List: standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", with the most recent version published on November 5, 2023, however the dioxin and furan toxicity equivalent calculation methodology remains the same. The dioxins, furans and dioxin-like PCBs toxicity equivalent emission data was also calculated using half the detection limit for those compounds not detected. The half detection limit data was used to assess against the dispersion modelling Point of Impingement limit. The toxicity equivalent concentrations calculated using the full detection limit, for those compounds less than the reportable detection limit, were used to assess against the in-stack limit detailed in Schedule C of the ECA.

The average results for the tests conducted at Boiler No. 1, along with the respective in-stack emission limits, are summarized in the following table:

Parameter	Test No. 1	Test No. 2	Test No. 3	Average	In-Stack Limit
Total Power Output (MWh/day)*	-	-	-	374	-
Average Combustion Zone Temp. (°C)*	-	-	-	1295	-
Steam (tonnes/day)*	-	-	-	795	-
MSW Combusted (tonnes/day)*	-	-	-	202	-
NO_X Reagent Injection Rate (liters/day)*	-	-	-	571	-
Carbon Injection (kg/day)*	-	-	-	125	-
Lime Injection (kg/day)*	-	-	-	3320	-
Filterable Particulate (mg/Rm^3) (1)	<0.34	<0.45	<0.32	<0.37	9
PM_{10} with Condensable (mg/Rm^3) (1)	<6.60	<5.31	<5.02	<5.65	-
$PM_{2.5}$ with Condensable (mg/Rm^3) (1)	<6.32	<5.04	<4.74	<5.37	-
Hydrogen Fluoride (mg/Rm^3) (1)	<0.11	<0.10	<0.10	<0.10	-
Ammonia (mg/Rm^3) (1)	0.62	0.59	0.58	0.60	-
Cadmium (µg/Rm^3) (1)	0.051	3.17	<0.022	<1.08	7
Lead (µg/Rm^3) (1)	0.26	0.49	0.11	0.29	50
Mercury (µg/Rm^3) (1)	<0.13	<0.14	<0.13	<0.13	15
Antimony (µg/Rm^3) (1)	<0.045	<0.045	<0.045	<0.045	-
Arsenic (µg/Rm^3) (1)	<0.11	<0.11	<0.11	<0.11	-
Barium (µg/Rm^3) (1)	11.0	11.3	11.1	11.1	-
Beryllium (µg/Rm^3) (1)	<0.045	<0.045	<0.045	<0.045	-
Chromium (µg/Rm^3) (1)	0.78	0.92	0.69	0.80	-
Cobalt (µg/Rm^3) (1)	0.040	<0.045	<0.045	<0.043	-
Copper (µg/Rm^3) (1)	1.45	1.14	1.00	1.20	-
Molybdenum (µg/Rm^3) (1)	4.12	4.05	4.03	4.07	-
Nickel (µg/Rm^3) (1)	0.47	1.41	0.39	0.75	-
Selenium (µg/Rm^3) (1)	<0.22	<0.23	<0.22	<0.22	-
Silver (µg/Rm^3) (1)	<0.045	<0.045	<0.045	<0.045	-
Thallium (µg/Rm^3) (1)	<0.045	<0.045	<0.045	<0.045	-
Vanadium (µg/Rm^3) (1)	<0.11	<0.11	<0.11	<0.11	-
Zinc (µg/Rm^3) (1)	11.8	12.0	10.5	11.4	-
Dioxins and Furans (pg TEQ/Rm^3) (3)	<2.67	<2.26	<1.82	<2.25	60
Total Chlorobenzenes (ng/Rm^3) (1)	<490	<429	<333	<417	-
Total Chlorophenols (ng/Rm^3) (1)	<465	<460	<474	<466	-
Total PAHs (ng/Rm^3) (1)	<157	<608	<196	<320	-
VOCs (µg/Rm^3) (1)	<45.9	<23.8	<28.2	<32.6	-
Aldehydes (µg/Rm^3) (1)	<393	<517	<589	<499	-
Total VOCs (µg/Rm^3) (1) (4)	<439	<541	<617	<532	-
Quench Inlet Organic Matter (THC) (ppm, dry) (2)	3.1	1.0	0.6	1.6	50

* based on process data provided by Covanta

(1) dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

(2) dry basis as equivalent methane (average of each 60 minute test with data recorded in 1-minute intervals)

(3) calculated using the NATO/CCMS (1989) toxicity equivalence factors and the full detection limit for those isomers below the analytical detection limit, dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

(4) Includes all components from the volatile organic compounds test list in the ECA (i.e. Volatile Organic Sampling Train and Aldehyde Sampling train components).

The average results for the tests conducted at Boiler No. 2, along with the respective in-stack emission limits, are summarized in the following table:

Parameter	Test No. 1	Test No. 2	Test No. 3	Average	In-Stack Limit
Total Power Output (MWh/day)*	-	-	-	374	-
Average Combustion Zone Temp. (°C)*	-	-	-	1199	-
Steam (tonnes/day)*	-	-	-	793	-
MSW Combusted (tonnes/day)*	-	-	-	210	-
NO_X Reagent Injection Rate (liters/day)*	-	-	-	562	-
Carbon Injection (kg/day)*	-	-	-	124	-
Lime Injection (kg/day)*	-	-	-	3347	-
Filterable Particulate (mg/Rm^3) (1)	<0.39	<0.47	<0.32	<0.39	9
PM_{10} with Condensable (mg/Rm^3) (1)	<4.99	<4.25	<3.70	<4.32	-
$PM_{2.5}$ with Condensable (mg/Rm^3) (1)	<4.71	<3.98	<3.42	<4.04	-
Hydrogen Fluoride (mg/Rm^3) (1)	<0.11	<0.11	<0.11	<0.11	-
Ammonia (mg/Rm^3) (1)	0.53	0.54	0.51	0.53	-
Cadmium (µg/Rm^3) (1)	1.51	0.11	0.032	0.55	7
Lead (µg/Rm^3) (1)	0.38	0.44	0.37	0.39	50
Mercury (µg/Rm^3) (1)	<0.14	0.028	<0.13	<0.099	15
Antimony (µg/Rm^3) (1)	<0.046	<0.047	<0.045	<0.046	-
Arsenic (µg/Rm^3) (1)	<0.11	<0.12	<0.11	<0.12	-
Barium (µg/Rm^3) (1)	10.9	11.6	10.7	11.1	-
Beryllium (µg/Rm^3) (1)	<0.046	<0.047	<0.045	<0.046	-
Chromium (µg/Rm^3) (1)	0.81	0.95	0.78	0.85	-
Cobalt (µg/Rm^3) (1)	0.046	0.064	<0.023	<0.044	-
Copper (µg/Rm^3) (1)	1.51	1.45	2.05	1.67	-
Molybdenum (µg/Rm^3) (1)	4.02	4.26	3.84	4.04	-
Nickel (µg/Rm^3) (1)	0.53	1.03	0.45	0.67	-
Selenium (µg/Rm^3) (1)	<0.23	<0.24	<0.23	<0.23	-
Silver (µg/Rm^3) (1)	<0.046	<0.047	<0.045	<0.046	-
Thallium (µg/Rm^3) (1)	<0.046	<0.047	<0.045	<0.046	-
Vanadium (µg/Rm^3) (1)	<0.11	<0.12	<0.11	<0.12	-
Zinc (µg/Rm^3) (1)	10.9	15.7	12.2	12.9	-
Dioxins and Furans (pg TEQ/Rm^3) (3)	<2.90	<2.35	-	<2.63	60
Total Chlorobenzenes (ng/Rm^3) (1)	<243	<416	-	<330	-
Total Chlorophenols (ng/Rm^3) (1)	<490	<492	-	<491	-
Total PAHs (ng/Rm^3) (1)	<180	<167	-	<174	-
VOCs (µg/Rm^3) (1)	<34.6	<26.2	<26.7	<29.2	-
Aldehydes (µg/Rm^3) (1)	<663	<768	<714	<715	-
Total VOCs (µg/Rm^3) (1) (4)	<698	<794	<741	<744	-
Quench Inlet Organic Matter (THC) (ppm, dry) (2)	0.5	0.3	0.3	0.4	50

* based on process data provided by Covanta
(1) dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume
(2) dry basis as equivalent methane (average of each 60 minute test with data recorded in 1-minute intervals)
(3) calculated using the NATO/CCMS (1989) toxicity equivalence factors and the full detection limit for those isomers below the analytical detection limit, dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume
(4) Includes all components from the volatile organic compounds test list in the ECA (i.e. Volatile Organic Sampling Train and Aldehyde Sampling train components).

A summary of the minimum, average and maximum concentrations for the combustion gases measured by the DYEC CEMS with in-stack limits listed in the ECA is provided below for the two units.

Boiler No.	Parameter	Minimum	Average	Maximum	In-Stack Limit
Boiler No. 1	Carbon Monoxide (mg/Rm^3) (1)	5.8	13.3	26.0	40
	Hydrogen Chloride (mg/Rm^3) (2)	0.1	0.6	1.1	9
	Nitrogen Oxides (mg/Rm^3) (2)	110	111	111	121
	Sulphur Dioxide (mg/Rm^3) (2)	3.5	7.2	10.6	35
Boiler No. 2	Carbon Monoxide (mg/Rm^3) (1)	9.8	15.8	26.5	40
	Hydrogen Chloride (mg/Rm^3) (2)	1.5	2.1	3.3	9
	Nitrogen Oxides (mg/Rm^3) (2)	108	109	110	121
	Sulphur Dioxide (mg/Rm^3) (2)	0	1.8	4.3	35

(1) 4-hour average measured by DYEC CEMS, dry at 25°C and 1 atmosphere adjusted to 11% oxygen by volume
(2) 24-hour average measured by DYEC CEMS, dry at 25°C and 1 atmosphere adjusted to 11% oxygen by volume

The emission data measured at each Boiler BH Outlet during the testing program was combined and used to assess the emissions from the Main Stack against the current point of impingement criteria detailed in Ontario Regulation 419/05.

Dispersion modelling was completed using the CALPUFF model (using Version 7.2.1 level 150618 as approved by the MECP in December 2021) by WSP Canada Inc. (formerly Golder Associates). A summary of the results are provided in the tables appended to this report (Appendix 27) based on calculated ground level Point of Impingement (POI) concentrations for the average total Main Stack emissions. As shown in the tables, the calculated impingement concentrations for all the contaminants were well below the relevant MECP standards.

In summary, the key results of the emission testing program are:

- The facility was maintained within the operational parameters defined by the amended ECA that constitutes normal operation during the stack test periods. Testing was conducted at a steam production rate of greater than 780 tonnes of steam per day for each Boiler (approximately 96.6% of maximum continuous rating). The maximum continuous rating for the facility is 1614.7 tonnes of steam per day for the two Boilers combined (33.64 tonnes of steam per hour or 807.4 tonnes per day for each Boiler).
- The in-stack concentrations of the components listed in the ECA were all below the concentration limits provided in Schedule C of the ECA.
- Using CALPUFF dispersion modelling techniques, the predicted maximum point of impingement concentrations, based on the average test results for both boilers, show DYEC to be operating well below all current standards in Regulation 419/05 under the Ontario Environmental Protection Act and other MECP criteria including guidelines and upper risk thresholds.

Tables referenced in this report for the tests conducted at Boiler No. 1 and Boiler No. 2 are provided in Appendix 1 and Appendix 2, respectively.

Oversight of December 2024 Voluntary Air Emission Source Testing at the Durham York Energy Centre

Final Report

May 23, 2025

Prepared for:
Regional Municipality of Durham

Prepared by:
Stantec Consulting Ltd.

Project/File:
160901178

Stantec

Limitations and Sign-off

The conclusions in the Report titled Oversight of December 2024 Voluntary Air Emission Source Testing at the Durham York Energy Centre are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Appendix A Field Notes (Adomait Environmental Services)

Acronyms / Abbreviations

ADMP	Air Dispersion Modelling Plan
Adomait	Adomait Environmental Services
ATG	Alliance Technical Group
CARB	California Air Resources Board
CB	chlorobenzenes
CEM	Continuous Emissions Monitoring
CO	carbon monoxide
CP	chlorophenols
D/F	dioxins and furans
DYEC	Durham York Energy Centre
ECA	Environmental Compliance Approval
LCS	laboratory control sample
MECP	Ministry of the Environment, Conservation and Parks
MSW	municipal solid waste
NOx	nitrogen oxides
O2	molecular oxygen
O. Reg. 419/05	Ontario Regulation 419/05
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
POI	Point of Impingement
QA/QC	Quality Assurance/Quality Control
Region	Regional Municipality of Durham

SO2	sulphur dioxide
Stantec	Stantec Consulting Ltd.
SVOCs	semi-volatile organic compounds
TEQ	Toxic Equivalents
THC	Total Hydrocarbons
US EPA	United States Environmental Protection Agency

List of Symbols and Units of Measure

dscm/h	dry standard cubic metre per hour
g/s	gram per second
hr	hour
kg/hr	kilogram per hour
m^3/hour	cubic metre per hour
min	minutes
mg/m^3	milligram per cubic metre
µg/m^3	microgram per cubic metre
ppm	parts per million
tonnes/hr	tonnes per hour
µg/s	microgram per second
ng/s	nanogram per second
ng TEQ/s	nanogram of toxic equivalents per second
pg TEQ/Rm^3	picogram of toxic equivalents per reference cubic metre

°F	degrees Fahrenheit
°C	degrees Celsius
%	percent

1 Introduction

The Durham York Energy Centre (DYEC) is a thermal treatment facility with a maximum thermal treatment rate of 140,000 tonnes/year of municipal solid waste (MSW). The facility was built to operate 24 hours/day, seven days/weeks, 365 days/year. MSW may be delivered to the facility six days per week between 7:00 am to 7:00 pm.

The facility performs annual source testing as required per the facility's Amended Environmental Compliance Approval (ECA) (No. 7306-8FDKNX). Section 7(1) of the ECA states that "the owner shall perform annual source testing, in accordance with the procedures and schedule outlined in the attached Schedule E, to determine the rates of emissions of the test contaminants from the stack".

Stantec Consulting Ltd. (Stantec) was retained by The Regional Municipality of Durham (the Region) to provide oversight services of the air emission source testing campaign conducted at the DYEC between December 2nd to December 5th, 2024, by Alliance Technical Group (ATG), formerly ORTECH Consulting Inc.

2 On-Site Source Testing Observations

Stantec sub-contracted the on-site auditing of the testing to Adomait Environmental Solutions Inc. (Adomait). Adomait staff, led by Martin Adomait, M.Sc., P.Eng., were on on-site December 3rd to observe the sampling for semi-volatile organic compounds (SVOCs), including dioxins and furans (D/F). The on-site review of the Stack Sampling Protocol was conducted to check that the testing follows sampling methods described in the Ontario Source Testing Code, and includes a review of:

1. On-site observations of testing
2. Sampling locations
3. Sampling procedures

4. Sample recovery and analysis, and
5. Process parameter review.

The following sections were provided to the Region in a memorandum dated March 26th, 2025. They are replicated here for completeness and to provide the Region with a single document summarizing the entirety of the peer review.

2.1 Testing Schedule

The Fall Source test was planned for the week of December 2nd, 2024, with sampling of semi-volatile organic compounds (SVOCs) scheduled to occur on December 4th and 5th. Adomait Environmental Solutions Inc. (Adomait) was scheduled to attend the Fall Voluntary Source testing to observe sampling of SVOCs conducted by ATG.

Following the preliminary setup and testing conducted by ATG on Friday, November 29th, Stantec was informed that SVOC testing was tentatively scheduled for Monday, December 2nd. In consultation with the Stantec audit team, the testing schedule was adjusted to commence on Tuesday, December 3rd. Upon arrival at the site on December 3rd, Adomait was advised that SVOC tests for both boilers had been conducted on December 2nd. Given this development, it was agreed that the Stantec audit team would proceed with the planned observations as outlined in this report.

The third test on Boiler No. 1 proceeded on Tuesday, December 3rd; however, the third test for Boiler No. 2 was postponed. A feed chute plug prevented completion of the third scheduled test run for SVOCs on Boiler No. 2. Despite best efforts to resolve the malfunction promptly, the malfunction rendered it infeasible to proceed with the third run. Boiler 2 was subsequently taken off-line for inspection and repair. Therefore, the observation team was only present for one SVOC test conducted on Boiler 1 on December 3rd. Furthermore, the SVOC data for Boiler No. 2 will only include results from the two completed test runs.

2.2 Process Operations Centre Observations

The auditor was stationed in a conference room equipped with a screen to display real-time and recent data related to parameters being monitored. Occasional visits to the control room also took place when necessary. In addition, Excel files containing one-minute data were provided to the auditor daily. The one-minute data summarized the various system parameters for Boiler 1 and Boiler 2 lines discussed below, except for the quench-tower inlet/outlet temperatures and moisture levels. The inlet/outlet temperatures were provided separately, while moisture data could only be accessed directly from the system monitors in the control room. Therefore, moisture values were calculated from available wet and dry oxygen readings.

The dioxin and furan emission sampling process and the incineration operations were generally stable throughout. Two dioxin/furan sampling runs were completed on December 2nd at both boilers, with a third sampling run completed on Boiler No. 1 on December 3rd. However, on December 3rd, a feed chute plug prevented completion of the third scheduled test run for Boiler No. 2. As noted above, the issue could not be resolved to allow for testing to occur. Therefore, the SVOC data for Boiler No. 2 will only include results from the two completed test runs.

The on-site auditors monitored the real-time display of trending data, took notes of anomalies and discussed any deviations, and any corrective measures taken, with facility staff. After the monitoring periods, Adomait staff further reviewed the recorded data in Excel files, as provided by facility staff. Various monitoring parameters in the Excel files were more closely examined, eliminating data that may have been influenced by calibration or purging events that took place during this time. These parameters are summarized in Table 1, which includes oxygen (O_2) one-minute average, carbon monoxide (CO) one-minute average and 4-hour rolling average, nitrogen oxides (NOx) 24-hour rolling average (for the portion of day that data was collected), sulphur dioxide (SO_2) 24-hour rolling average (for the portion of day that data was collected), the calculated moisture content, combustion temperatures, and steam production. These parameters were examined by the auditors for both December 2nd and 3rd when the dioxin and furan sampling was conducted. The stack testing period review was limited from 7:00 to 19:00 on December 2nd, and 7:00 to 17:00 on December 3rd, 2024. Table 1 also includes the emissions criteria for these parameters, as provided in the facility's Environmental Compliance Approval (ECA).

Table 1 Summary of System Monitoring Parameters (December 2nd – 3rd)

Parameter	Oxygen (%) 1 min averages	CO (mg/m^3) 4-hr maximum & average	NO_x (mg/m^3) average over testing period	SO_2 (mg/m^3) average over testing period	Moisture (%) 1 min value range (average over testing period)	Combustion Temp (°C) 1 hr value range (average over testing period)	Steam Production (10^3 kg/hr) 1 min value range (average over testing period)
Boiler 1 Dec. 2	7.05 - 10.38	14.0 & 11.92	110	2.8	-0.9 - 34.1 (23.11)	1097 - 1212 (1164)	30.9 - 35.1 (33.2)
Boiler 1 Dec. 3	6.36 - 12.15	23.00 & 13.75	108	2.53	-7.9 - 34.0 (23.3)	1109 - 1179 (1152)	29.5 - 35.6 (33.1)
Boiler 2 Dec. 2	7.50 - 10.19	15.0 & 13.08	110	2.2	-0.7 - 28.4 (18.3)	1034 - 1103 (1067)	29.8 - 35.1 (33.2)
Boiler 2 Dec. 3	7.39 - 10.79	16.00 & 11.42	107	0.04	-1.7 - 33.3 (19.2)	1030 - 1084 (1063)	29.68 - 35.26 (33.12)
Criteria	>6.0	40 (4 hr)	121 (24 hr)	35 (24 hr)	-	1000	33.6

The following conclusions of the Process Operations Center observations and review of the monitoring parameters were made for the stack testing period.

1. Oxygen concentrations ranged from 6.36% to 12.15% at Boiler 1, and 7.39 % to 10.79% at Boiler 2 on December 2nd and 3rd, 2024. The higher oxygen readings were typically recorded when the sampling system was influenced by calibration activities. The ECA specifies that the oxygen concentration shall not be less than 6%, as recorded by the CEM system. The operation complied with this requirement during the testing period.
2. CO concentrations at Boiler 1 were generally stable throughout the tests, ranging between 0.0 and 98.6 milligram per cubic metre (mg/m^3) at 1 minute interval readings. The calculated 4-hour average ranged from 7 to 23 mg/m^3. CO concentrations at Boiler 2 were also generally stable throughout the tests, ranging between 0.1 and 78.4 mg/m^3 at 1 minute interval readings. The calculated 4-hour average ranged from 10 to 16 mg/m^3. Occasional spikes in CO concentration were likely due to cold CO spikes that may be attributed to incomplete combustion. These were typical of previous tests and generally did not persist beyond one minute. The occurrence of CO spikes is normal, and the immediate suppression of spikes indicate that the systems are operating effectively. The 4-hour averages of CO were less than the in-stack emission limit of 40 mg/m^3.
3. The rolling average 1-hour NOx concentrations over two days, during the testing periods, ranged between 107 and 110 mg/m^3 for both units (Table 1). This implies that, if extrapolated over a 24-hour operating period, emissions of NOx from both units would be below the in-stack emission limit of 121 mg/m^3 calculated as a 24-hour rolling arithmetic average. Consequently, the auditors are satisfied that the 24-hour rolling average meets the required standards during the stack sampling period.

4. The SO2 concentrations were stable throughout the monitoring period with 1-min values between 0.0 and 34.3 mg/m^3 for both units. This pattern was generally consistent given the constant lime injection rate of 135 kg/h for Boiler 1 on December 3rd. Lime feed rates at Boiler 2 were not observed, as auditing staff were not present for testing on Boiler 2. During the testing, the SO2 concentrations rose to a maximum of 34 mg/m^3. The system responded effectively by increasing the lime injection rate. After approximately 10 to 20 minutes, the SO2 concentrations consistently declined due to the increased lime injection. This implies that, if extrapolated over a 24-hour operating period, emissions of SO2 from both units would be below the in-stack emission limit of 35 mg/m^3 calculated as a 24-hour rolling arithmetic average. Consequently, the auditors are satisfied that the 24-hour rolling average meets the required standards during the stack sampling period.
5. The moisture content at this facility was determined via a mathematical relationship utilizing continuous monitoring and the dry and wet oxygen readings. Table 1 summarized the range and average moisture content from both Boiler 1 and Boiler 2 process lines. The range from both lines can report erroneous negative or very low moisture levels (e.g. -0.7% or -7.9%). This can be a typical artifact of an unstable wet oxygen analyzer. The negative or very low levels, however, appeared very infrequently and were isolated. Since the discrepancies were very isolated, these values do not greatly affect the average moisture levels. The average moisture levels as presented in Table 1 for Boiler 1 were elevated relative to the measured gravimetric moistures reported by ATG (~16%). Boiler 2 had more realistic moisture levels (18 - 19%), but still slightly high. However, it is the understanding of the auditors that the moisture levels shown in Table 1 are not used in any calculations, either for dry flow rates or emission rates, for use in the source testing results. Consequently, as long as the moisture data is not used for compliance testing reporting purposes, it should not create erroneous emission data.

6. The combustion zone temperatures for each boiler were maintained above the minimum temperature of 1000°C. The averaging time required by the ECA for record keeping and compliance is one hour (ECA Schedule F). All one-hour averages were greater than 1000ºC.
7. The quench tower inlet and outlet temperatures showed consistent control, reducing inlet temperatures by ~19°C on average on December 3rd. The inlet temperatures have been known to increase gradually each day, but on this occasion, there was practically no change. The outlet temperatures generally remained consistent at ~65.5°C (150°F). As a result of consistent outlet temperatures from the quench towers, Boiler 1 baghouse inlet temperatures remained steady, near the midpoint of the performance requirement of 120°C to 185°C set out in the ECA (Section 6(2)(h)). Therefore, the system was operating in compliance with the conditions in the ECA.
8. The real-time display of the average feed rate of carbon dosing for Boiler 1 remained consistent and stable at ~5 kg/h. Average carbon dosage at Boiler 2 had similar rates on the day of testing. Carbon is used to control emissions of dioxin and furans and, therefore, consistent concentrations are required. Long term averages of ~5 kg/h have shown to be an effective control measure based on experience with this facility.
9. Production at the plant is often evaluated in terms of steam flow. The target was 33.6 thousand kg/h. Steam flow for Boiler 1 averaged 33.2 and 33.1 thousand kg/h on December 2nd and 3rd, respectively. Steam flow for Boiler 2 averaged 33.2 and 33.1 thousand kg/h on December 2nd and 3rd, respectively. All averages were within 90% of the target. The range of the nominal steam generation is within the 72 thousand kg/h of steam listed in the ECA. The production was similar to levels observed by the auditors during previous years' stack testing campaigns at this facility.

2.3 Observations of the Stack Testing Operations

Observations of the stack testing procedures were undertaken during the SVOC sampling part of the program. The field observations are provided in a series of tables in Appendix A.

1. Where possible, leak checks were observed at both the start, traverse change, and at the conclusion of all SVOC tests conducted. When the leak checks were successful, the tests could be regarded as valid. Leak checks were always performed in a systematic and non-rushed manner to ensure good Quality Assurance/Quality Control (QA/QC). The summary of Adomait field observations is provided in Appendix A.
2. Previous aberrations in the stack velocity measurements were reduced by using metal plates and rubber sealer plates to reduce and almost eliminate these problems. This set-up was similar to previous stack testing regimes.
3. Impinger/adsorbent temperatures were checked repeatedly at each sampling train. ATG supplied plenty of ice to the crews. The temperatures were maintained in the range of 4.4°C to 12.7°C (40°F to 55°F). Maintaining low adsorbent temperatures improves adsorption of dioxins/furans on the sampling media. The temperatures were maintained at reasonably low levels and were deemed acceptable.
4. The audit team also recorded dry gas meter corrections and pitot factors for comparison with the final report.
5. As per standard operating procedures, all sampling trains operating at the baghouse outlet locations were inserted and withdrawn from the stack while the sampling train was running.
6. No review of the sample recovery procedures conducted by ATG staff were performed.

Based on audit staff observations, ATG staff followed all appropriate sampling and recovery procedures as noted by the sampling methods (EPS 1/RM/2 and US EPA Method 23).

3 Report Review

ATG's draft source sampling report was provided to Stantec on March 14th, 2025. ATG's final source sampling report (the "Report") was provided to Stantec on March 31st, 2025. Stantec and Adomait conducted a review of the Report, with focus given to a detailed review of all SVOC-related sections.

3.1 Review of Source Testing Protocols

Adomait has conducted a review of the source testing report as it relates to the dioxins and furans and has found no discrepancies between the methods described in the report compared to the observations made during testing. A further review of the dioxin/furan emission results at Boiler 1 compared to that of Boiler 2 was also undertaken. A comparison of the speciated dioxins and furans concentrations showed similar characteristics between the two boilers with minor exceptions. This is inline with expectations given that both boilers are processing a similar waste stream, and both boilers used similar combustion practices. Furthermore, the concentrations and patterns of the dioxins and furans suggested a consistent pattern when compared to the historical testing record from 2017 to 2024, except for the tests conducted during the period of 2020-2021 (see Table 2). For comparison, the in-stack limit is a combined value of 60 pg TEQ/Rm^3. A plugged baghouse in 2020 posed problems for Boiler 1. Given the consistency of the results between boilers, and the historical record, it was concluded that the boilers are operating as intended during the 2024 Voluntary Source Testing. Furthermore, given the consistency of the results with the historical record, Adomait was satisfied that all sampling/analytical protocols were followed according to appropriate methodologies. Consequently, Adomait has no concerns over the validity of collected samples, and the dioxin and furan results.

Table 2: Summary of Historical the Dioxin and Furan Concentrations (pg TEQ/Rm^3)

Campaign	Boiler 1 Average	Boiler 2 Average	Difference
2017 Spring	<5.32	<7.67	-2.35
2017 Fall	<5.94	<10.1	-4.16
2018 Spring	<10.4	<10.5	-0.1
2018 Fall	<5.05	<3.22	1.83
2019 Spring	<4.55	<4.58	-0.03
2019 Fall	<1.51	<3.24	-1.73
2020 Spring	<1.82	<2.53	-0.71
2020 Fall	<28.7	<7.26	21.4
2021 Spring	<4.10	<7.35	-3.25
2021 Fall	<14.7	<2.56	12.1
2022 Spring	<7.28	<4.10	3.18
2022 Fall	<3.68	<3.91	-0.23
2023 Spring	<6.61	<9.18	-2.57
2023 Fall	<10.9	<4.43	6.47
2024 Spring	<2.30	<1.88	0.42
2024 Fall	<2.25	<2.63	-0.38

Notes: All data was calculated using NATO/CCMS (1989) toxicity equivalence factors and full detection limit for those isomers below the analytical detection limit, dry at 25°C, and 1 atmosphere, adjusted to 11% oxygen.

3.2 Review of Analytical Reporting

Stantec has conducted a review of the source testing report. While the source testing report was reviewed in its entirety, focus was given to a detailed review of all SVOC-related sections. As per the contract with the Region, the project did not include the oversight and audit review of actual laboratory work. Therefore, no statement of efficacy is provided regarding the processing, handling, and analysis of laboratory samples.

Based on this review, Stantec provides the following comments:

1. Dioxins and Furans
    a. The recoveries of Field Spike Standards of all D/F samples were within the acceptable range of recoveries provided in Environment Canada Reference Method EPS 1/RM/2 (EPS 1/RM/2) (70% – 130%).
    b. The recoveries of Extraction Standards for all D/F samples are within the acceptable range of recoveries provided in EPS 1/RM/2, which is either 40% – 130% or 25 – 130%, depending on the specific D/F, for all but one sample (TEST #2 APC OUTLET #1).
    c. The recoveries of Cleanup Standards of all D/F samples were within the acceptable range of recoveries provided in EPS 1/RM/2 (40% – 130%), for all but one sample (TEST #2 APC OUTLET #1).
    d. Stantec was able to trace and confirm the D/F congener group emission rate calculations presented by ATG provided in Section 7.9.1 (Pages 43 & 44).
    e. Stantec was able to trace and confirm the D/F and dioxin-like PCB toxic equivalents (TEQ's) emission rate calculations (ng TEQ/s) presented by ATG provided in Section 7.9.1 (Page 45).
    f. Stantec was able to trace and confirm the in-stack TEQ concentration calculations presented by ATG (see Section 7.9.1, Page 46) and confirm that the D/F TEQ concentrations are below the maximum in-stack limit of 60 pgTEQ/Rm^3.
2. PCBs
    a. The recoveries of the Extraction Standards for PCBs are within the acceptable range of recoveries provided in US EPA Method 1668C (10% – 145%).

b. The recoveries of Cleanup Standards of all PCB samples were within the acceptable range of recoveries provided in US EPA Method 1668C (5% – 145%, or 10% – 145%).

c. PCB samples were not blank corrected based on the blank sampling train and laboratory blank results. This is an acceptable methodology and will provide an over-estimate of the true concentrations within the samples.

3. Chlorobenzenes

    a. Chlorobenzene samples were not blank corrected based on the blank sampling train and laboratory blank results. This is an acceptable methodology and will provide an over-estimate of the true concentrations within the samples.

    b. Stantec was able to trace and confirm the chlorobenzene emission rate calculations (µg/s) presented by ATG provided in Section 7.9.2 (Page 47).

4. Chlorophenols

    a. All CP samples experienced low Extraction Standard recoveries (i.e., outside the accepted window of 50 – 150%) for at least one standard, which indicates a potential low bias on the samples. As per previous testing campaigns, CP sample concentrations were not corrected for this low bias. Furthermore, most CP sample concentrations were found to be below the detection limit. Therefore, as has been noted before, correction for this bias would not have been statistically meaningful. While the reduced recoveries may result in increased error in the determined concentrations, there is currently no concern that the error may lead to values over and above relevant ambient air quality standards.

    b. The Report notes (page 34) that the detection limit for a number of chlorophenol compounds are elevated due to poor recoveries below method control limits. However, the modelling results indicated that all CP values are well below the corresponding standards. Consequently, there is no concern that CP POI values may be over and above relevant ambient air quality standards.

c. Stantec was able to trace and confirm the chlorophenol emission rate calculations (µg/s) presented by ATG provided in Section 7.9.2 (Page 47).

5. Polycyclic Aromatic Hydrocarbons

    a. The recoveries of Field Sampling Standards for PAHs are within the acceptable range of recoveries provided in CARB Method 429 (50% – 150%).

    b. The recoveries of the Extraction Standards for multiple PAHs were outside the acceptable range of recoveries provided in CARB Method 429, which is 50% – 150%. In all cases the recoveries were biased low, which indicates a potential low bias on the sample results. PAH sample concentrations were not corrected for this low bias. This may result in an underestimation of facility emission rates for PAHs. However, the target analyte recoveries are all in control for the LCS. Therefore, no significant bias to the sample results is expected. Furthermore, based on modelling results all PAH values are well below the corresponding standards. Therefore, a correction factor for the decreased recoveries would still indicate PAH levels well below the standard. Consequently, there is currently no concern that the error may lead to values that would have approached or exceeded the relevant in-stack or ambient standards.

    c. PAH samples were not blank corrected based on the blank sampling train and laboratory blank results. This is an acceptable methodology and will provide an estimate of worst-case concentrations within the samples.

    d. Stantec was able to trace and confirm the PAH emission rate calculations (µg/s) presented by ATG provided in Section 7.9.3 (Page 48).

3.3 Review of Dispersion Modelling

Appendix 27 of the Report presents the results of dispersion modelling based on results of the source testing program. The dispersion modelling provided in the appendix was completed by WSP, who provided Stantec with all relevant modelling files (e.g., input files, output files, etc.) for review.

Based on this review, Stantec provides the following comments:

1. Section 2.0 of WSP's memorandum indicates that "[t]hree tests were completed for each unit and averaged." To avoid confusion with the main body of ATG's report, this sentence should be revised to reflect that only two tests were conducted on Boiler 2.
2. Table 5 of WSP's memorandum states that emission rates were updated to use "March 2024 Source Testing Data." The month and/or year should be corrected to clarify what set of data is being used in the current assessment.
3. Stantec confirmed that the CALPUFF and CALPOST version numbers and level numbers used in the model (as indicated in the corresponding input file) matched those provided in WSP's memorandum.
4. Stantec reviewed the CALPUFF options outlined in Table 2 of WSP's memorandum. These options match those in the supplied input files for modelling years 2015, 2017, and 2018. Note that the model was run for meteorological years 2014 to 2018.
5. Stantec reviewed the source parameters provided in Table 3 of WSP's memorandum and confirmed that the parameters match those determined from the source testing. These source parameters also match those in the supplied input files for modelling years 2015, 2017, and 2018.
6. Stantec reviewed the Dispersion Factors (without meteorological anomaly removed) provided in Table 4 of WSP's memorandum to confirm that they matched the maximum value provided in the CALPOST output files for all five

years modelled. The values provided in the report equalled those in the output files. Minor discrepancies are expected to be the result of number rounding.

Averaging Period	10-min	½-hr	1-hr	24-hr	30-day	Annual
WSP Dispersion Factor before meteorological anomaly removal [µg/m³ per g/s]	45.04	32.76	27.30	1.24	0.17	0.06
Output File Dispersion Factor without meteorological anomaly removal [µg/m³ per g/s]	45.08	33.15	27.30	1.24	0.17	0.06

7. Stantec reviewed the Site-Wide Emission Inventory provided in Appendix A of WSP's memorandum. The following SVOCs were reviewed, and emission rates were found to match those calculated in ATG's report, which also equalled those calculated by Stantec.
   a. Monochlorobenzene
   b. 2,6-dichlorophenol
   c. Benzo(a)Pyrene
   d. Phenanthrene

   The emission rate for Dioxins, Furans and Dioxin-like PCBs is listed as 0.000097 µg TEQ/s. This number does not match the values listed in Table 50 in Appendix 1 and Table 48 in Appendix 2, which sum to a value of 0.000084 µg TEQ/s. However, since the value used in the assessment is larger than the value determined from the laboratory data, the current assessment can be considered a conservative estimate of the POI value for Dioxins, Furans and Dioxin-like PCBs.

8. Stantec reviewed key SVOCs from the Emission Summary Table (Appendix B of WSP's memorandum) to ensure that Maximum POI Concentrations were estimated appropriately from the Dispersion Factors shown in Table 4. The list of substances reviewed were:
   a. Benzo(a)pyrene
   b. Monochlorobenzene
   c. Dioxins, Furans, and Dioxin-like PCBs (assuming an emission rate of 0.000097 μg TEQ/s)

As summarized in the above discussion, there were minor concerns with some aspects of the modelling. However, the POI values presented in Appendix 27 of the Report provide a conservative estimate of potential impacts and are well below MECP criteria. The minor concerns discussed do not materially affect the conclusions of the overall dispersion modelling work.

4 Conclusions

Based on a review of the Source Testing Report, and the on-site observations, there are no concerns about the validity of the source testing data reported by ATG. Stantec is satisfied that the conduct of the source testing, the analytical analysis, and the analytical calculations were carried out in a professional manner and followed all relevant guidelines, protocols, and best practices.

Based on a review of the CALPUFF Modelling (Appendix 27), Stantec is satisfied that the modelling was completed in accordance with the facility's ECA (Condition 6.1 and Schedule B), as well as O. Reg. 419/05. However, some minor discrepancies were found between the model input files and the source testing data. We recommend that WSP should be provided our comments for their consideration and be given the opportunity to decide if revisions may be warranted. These revisions, however, are not expected to change the compliance status of the facility, as the facility's POI values are well below the specified MECP standards, based on the provided analysis.

Appendices

Appendix A Field Notes (Adomait Environmental Services)

Reference: Oversight of December 2024 Voluntary Air Emission Source Testing at the Durham York Energy Centre

	Semi-Volatiles-3		**Metals/Particulate-1**	
Date	December 3, 2024		December 3, 2024	
Observation	Boiler #1		Boiler #2	
Nozzle Size/Type	0.2508/glass		0.2498	
Meter Cal/ID	1.01 / ΔH@ 1.819		1.008 / / ΔH@ 1.835	
Pitot cal	0.839		0.842	
Calc Moisture	16%		16%	
Static	-10.5		-10.9	
Pitot Leak Check	Pass		Pass	
Pre-traverse Leak Check	.08 @15		<.001 @15	
SVOC Test Start Time	8:28		9:20	
Running On Insertion	Yes		Yes	
Stack temperature ºF	277,278,279,280		277,280,280,278,277,275	
Trap temperature ºF	40,40,40,40,39,40,42,44,46		48,49,49,50,52	
Traverse Completed	10:28		10:50	
Post-traverse Leak Check	.006 @ 15		<0.001@15	
Running on removal	Yes		Yes	
Pre-traverse Leak Check	0.004 @ 15	0.004 @ 15	<0.001@10	<.001@15
SVOC Traverse Start Time		10:36		11:03
Running On Insertion		Yes		Yes
Stack temperature ºF		246,274,283,284,284,287,286		281,281,281,282,281,279,281
Trap temperature ºF		42,44,45,41,42,42,44,55		46,46,47,47,46,48,48,48,48
Traverse Completed		12:36		12:34
Final Leak Check		.004@15		<0.001@15
Running on removal		Yes		Yes