2022

EMISSION SUMMARY & DISPERSION MODELLING

FACILITY REPORT

As per Ontario Regulation 419/05

Prepared for:

A.O. Smith Enterprises Ltd.
768 Erie St.
Stratford, Ontario N4Z 1A2

Project No.: 22ELC029

ENVIROLUM CONSULTING INC.
KITCHENER, ON
SEPTEMBER 20, 2022

Executive Summary

This Emission Summary and Dispersion Modelling (*ESDM*) report has been updated to support an application for amendment of the Certificate of Approval #8-1078-83-006 for the A.O. Smith facility located at 768 Erie Street in Stratford, Ontario.

This amendment is intended to add new air sources identified as two (2) hot water heaters for the alkaline cleaner. All potential sources and contaminants have been identified and assessed for significance; those deemed insignificant have been rationalized and tabulated.

This report has been prepared in accordance with the following:

- s.26 of O. Reg. 419/05 (amended to O. Reg. 90/22),
- the Procedure for Preparing an Emission Summary and Dispersion Modelling Report, Version 4.1, March 2018 (PIBS: 3614e04.1),
- Part 11.1 of the Environmental Protection Act, and
- Section 9 of the Environmental Protection Act, R.S.O. 1990.

A. O. Smith manufactures pump tanks and pressure tanks for the water heater and boiler industry. Processes include a metal forming press, saw cutting, parts washer, an electrostatic powder paint line and bake oven, welding, hot melt glue spray station, parts cleaning bath and dry off oven, brazing, cooling and assembly. Emission sources include combustion emissions from one (1) paint bake oven, one (1) dry-off oven, and two (2) NEW hot water heaters for one (1) Alkaline cleaner; one (1) 6-stage bath parts cleaner, MIG welding, and natural gas-fired comfort heating units.

Dispersion modelling of the maximum emission scenario was conducted using the AERMOD version 19191 A comparison of the ground level POI concentrations with applicable Ministry of Environment, Conservation and Parks (*Ministry*) criteria indicates that emissions based on the maximum emission scenario are below Ministry limits and in compliance with O. Reg. 419/05.

Revision Summary

Version	Date	Description	Project #
0.0	June 15, 2022	Updated ESDM Report	22ELC029

Table 1.1: Emission Summary Table

Contaminant	CAS #	Total Facility Emission Rate	Air Dispersion Model Used	Maximum POI Concentration	Averaging Period	MOECC POI Limit	Limiting Effect	Regulation Schedule*	% of Ministry POI Limit
		(g/s)		(µg/m^3)	(h)	(µg/m^3)			
Manganese	7439-96-5	2.59E-04	AERMOD v19191	0.35	24	0.4	Health	Std-B1	86.7%

***Regulation Schedule**

STD-B1**:** Standard under Ontario Regulation 419/05 - Air Pollution – Local Air Quality.

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1.0 Introduction and Facility Description

This Emission Summary and Dispersion Modelling (*ESDM*) report has been updated to support an application for amendment of the Certificate of Approval #8-1078-83-006 for the A.O. Smith facility located at 768 Erie Street in Stratford, Ontario.

This report has been prepared in accordance with the following:

- s.26 of O. Reg. 419/05 (amended to O. Reg. 90/22),
- the Procedure for Preparing an Emission Summary and Dispersion Modelling Report, Version 4.1, March 2018 (PIBS: 3614e04.1),
- Part 11.1 of the Environmental Protection Act, and
- Section 9 of the Environmental Protection Act, R.S.O. 1990.

The facility is surrounded by land zoned as prime industrial (I1), and general industrial (I2) within 500 metres of the facility. The zoning map is included as Figure 4 in Appendix B.

The site layout of the facility are presented in Figure 1 – Site Location Plan. The identification and location of the emission sources are presented in Figure 2 – Source Location. Dispersion Modelling Receptors are shown in Figure 3. All of these figures can be viewed in Appendix A.

This section provides a description of the facility as required by sub paragraph 1 of s.26(1) of O. Reg. 419/05.

1.1 Purpose and Scope of the ESDM Report

The purpose of this version of the ESDM Report is to update AERMOD version to v19191 and add the following sources:

- two (2) hot water heaters (S13/14) for one (1) Alkaline cleaner (S3),

All previously approved emission sources are included in this application to determine maximum emission scenario. The emission sources include:

- Metal forming press and saw cutter (S1/S2),
- one (1) electrostatic powder paint line (S4),
- one (1) two-tier paint bake oven (S5),
- MIG welders (S6),
- TIG Welder (S7),
- One (1) Hot melt glue spray station (S8)
- one (1) 6-stage bath parts cleaner (S9),
- one (1) dry-off oven (S10),
- Brazing (S11),
- One (1) wash Station for Brazing (S12)
- natural gas-fired comfort heating units (S15 –S17).

Insignificant sources identified have been screened out in accordance with Table B-3 of the ESDM Procedure document and were not included to determine the maximum emission scenario.

1.2 Description of Processes and NAICS Code

A. O. Smith manufactures pump tanks and pressure tanks for the water heater and boiler industry. Processes include a metal forming press, saw cutting, parts washer, an electrostatic powder paint line and bake oven, welding, hot melt glue spray station, parts cleaning bath and dry off oven, brazing, cooling and assembly.

The ESDM Report is updated in accordance with s.25 & s. 26 of O. Reg. 419/05 since the North American Industrial Classification System (*NAICS*) code that applies to A.O. Smith is 332810 – Coating, Engraving, Cold and Heat Treating and allied activities, which classifies A.O. Smith as a Schedule 5 facility.

The main manufacturing processes at the facility include:

- Electrostatic painting and bake oven
- 6-stage bath parts cleaning
- Brazing (minimal)
- Dry-off oven

1.3 Description of Products and Raw Materials

Raw materials used in the production processes include the following:

- Powdered paints
- Alkaline and phosphate cleaners/solutions
- Hot glue
- Cold-rolled steel
- Hydraulic oils
- Water treatment chemicals
- Welding/brazing materials

1.4 Process Flow Diagram

A process flow diagram for the operations undertaken at the facility is illustrated in Figure 5 of Appendix A.

1.5 Operating Schedule

The plant typically operates from 7:30 am to 4:00 pm, Monday to Friday. However, all contaminants were assessed based on worst-case operating schedule of 24 hrs per day, 7 days per week, 52 weeks per year.

2.0 Initial Identification of Sources and Contaminants

A summary listing of significant and insignificant sources and contaminants emitted from the facility have been identified in Table 2.1 as required by sub paragraphs 2 to 5 of s.26(1) of O. Reg. 419/05.

Insignificant or negligible contaminants are discussed in more detail in Section 3.0.

Facility emissions result from: MIG welding.

2.1 MIG Welding (Source: S6)

One (1) exhaust serving the welding area discharging to the environment at a flow rate of 2.0 cubic metre per second through a stack having exit diameter of 0.25 metre and extending 0.91 metres above the roof and 6.91 metres above grade. The expected contaminant emitted is manganese metal particulates.

Sources and contaminants emitted from the facility are summarized in Table 2.1: Source and Contaminants Identification Table as required by sub paragraph 5 of s.26(1) of O. Reg. 419/05. The identification and locations of the significant emission sources are presented in Figure 2, Appendix A.

Table 2.1: Source and Contaminants Identification Table

Source Information			Expected Contaminants	Significant (Yes/No)?[1]	Rationale
Source ID	Source Description	General Location			
S1	Metal forming press	West Corner	none	No	Not a source of contaminants. Not exhausted to outside.
S2	Saw cutting	West Corner	Particulate Matter	No	Not exhausted to outside.
S3	Parts Alkaline cleaner	West Corner	steam	No	Not a source of contaminants. Only heat.
S4	Electrostatic powder paint line	Northeast side	Particulate Matter	No	Not a source of contaminants. Not exhausted to outside.
S5	Bake oven burners - electrostatic paint line	Northeast side	by-products of combustion	No	Contaminants screened out using an Emission Threshold as per Procedure 7.1.2
S6	MIG Welders (3)	Northeast side	Particulate Matter, metals	Yes	Most contaminants screened out using an Emission Threshold as per Procedure 7.1.2
S7	TIG Welder	Centre of facility	Particulate Matter, metals	No	Not a source of contaminants. Not exhausted to outside. Limited use for rework only.
S8	Hot melt glue spray station		VOCs	No	Not a source of contaminants. Not exhausted to outside.
S9a	6-stage bath parts cleaner - Stage 1	Northeast side	VOCs	No	Contaminants screened out using an Emission Threshold as per Procedure 7.1.2
S9b	6-stage bath parts cleaner - Stage 6	Northeast side	VOCs	No	
S9c	Maxon Gas burner exhaust for 6-stage bath parts cleaner	Northeast side	by-products of combustion	No	Contaminants screened out using an Emission Threshold as per Procedure 7.1.2
S10	Dry off oven for parts cleaning bath	Northeast side	by-products of combustion	No	
S11	Brazing	North central area	none	No	Not a source of contaminants. Minimal use.
S12	Washer for brazing process	North central area	Heat only	No	Not a source of contaminants. Only heat.

S13, S14	Water Heaters for Parts Alkaline cleaner (S3) - 2 units	West Corner	by-products of combustion	No	Contaminants screened out using an Emission Threshold as per Procedure 7.1.2
S15, S16	Air make up units (2)	East wall	by-products of combustion	No	O. Reg. 524/98:EXEMPTIONS FROM SECTION 9 comfort heater
S17	Natural-gas fired comfort heating	various locations	by-products of combustion	No	O. Reg. 524/98:EXEMPTIONS FROM SECTION 9 comfort heater

NOTE: [1] Only significant sources are included in model.

3.0 Assessment of the Significance of Contaminants and Sources

In accordance with s.8 of O. Reg. 419/05 emission rate calculations and dispersion modelling does not have to be performed for emissions from negligible sources or for the emission of negligible contaminants from significant sources.

3.1 Identification of Negligible Contaminants and Sources

A summary of the sources considered negligible or having insignificant contaminant emissions is provided in Table 2.1.

The remainder of the sources are significant and are included in the dispersion modelling for the site. These are discussed in more detail in Section 4.0.

3.2 Rationale for Assessment

For each source in Table 2.1 that has been identified as being negligible, an accompanying documented rationale is provided. Negligible or insignificant sources are not included in the model.

3.2.1 Natural Gas-Fired burners for various process equipment (Source: S5, S6, S9, S13/14)

The following natural gas-fired sources has been screened out using an Emission Threshold, as per S.7.1.2 of the Procedure for Preparing an Emission Summary and Dispersion Modelling Report document.

- S5 - Bake oven burners for Electrostatic paint line
- S6 – most contaminants, except manganese from MIG welders
- S9 – 6-stage bath parts cleaner (emissions of combustion from Maxon burner and VOC emissions)
- S13/S14 – Water heater burner

Calculations are provided in Table C7 of Appendix C.

3.2.2 Natural Gas Fired Heating Furnace Exhaust (Source: S15, S16, S17)

Natural gas-fired sources for comfort heating are exempt from Section 9 as per O.Reg. 524/98.

4.0 Operating Conditions, Emission Estimating, and Data Quality

This section provides a description of the operating conditions used in the calculation of the emission estimates and an assessment of the data quality of the emission estimates for each significant contaminant from the facility as required by sub paragraphs 6 and 7 of s.26(1) of O. Reg. 419/05.

In accordance with s.8 of O. Reg. 419/05, emission rate calculations and dispersion modelling does not have to be performed for emissions from negligible sources or for the emission of negligible contaminants from significant sources.

4.1 Description of Operating Conditions

As noted in Section 1.2, the NAICS code for the facility is 325510 – Paint and Coating Manufacturing. NAICS code 325510 is listed in Schedule 5 of O.Reg. 419/05, therefore s.20 of O.Reg. 419/05 currently applies.

Operating conditions for emission estimating and modeling represent the worst-case operating scenario generating maximum emissions.

4.2 Emissions Basis and Data Quality

Emissions resulting from all significant facility sources have been included in the emission calculations and are listed in the Source Summary Table. Emission rates are derived from standard emission factors (US EPA) and engineering calculations. The emissions basis and data quality for each source and the emission sample calculations are included in Appendix C.

5.0 Source Summary Table and Site Plan

5.1 Source Summary Table

Table 5.1 – Source Summary Table summarizes the contaminant emissions calculated for the worst-case facility emissions scenario. Emission rate estimates for each source of significant contaminants are documented in accordance with requirements of sub paragraph 8 of s.26(1) of O. Reg. 419/05.

Emission calculations for Table 5.1 – Source Summary Table are in Appendix C. Emission estimates based on these sources are discussed and developed in Section 4.0.

5.2 Site Plan

The facility's site layouts and plans of the property from which the contaminants are discharged, drawn to scale that shows the property boundary, coordinates of the property boundary, each source of contaminant, and building height are included in Appendix A.

Table 5.1: Source Summary Table

Source ID	Source Description	Source Data					Emission Data						
		Flow Rate (m3/s)	Exit Gas Temp (°C)	Inner Dia. (m)	Height Above Grade (m)	Height Above Roof (m)	Contaminant	CAS #	Maximum Emission Rate (g/s)	Avg. Period (h)	Emission Estimating Technique	Emissions Data Quality	% of Overall Emissions
S1	Metal forming press (deep draw press)	-	-	-	-	-	Not a source of contaminants						
S2	Saw cutting	-	-	-	-	-	Not a source of contaminants						
S3	Parts Alkaline cleaner exhaust (2-stage washer)	-	-	-	-	-	Not a source of contaminants. Heat only						
S4	Electrostatic powder paint line	-	-	-	-	-	Not a source of contaminants						
S5	Two-tier Paint Bake Oven (E-paint)	flue	120	0.15	7.80	1.8	Nitrogen oxides	10102-44-0	0.031683		EF	AA	34.56%
S5b	Bake oven for electrotatic paint line	flue	ambient	0.15	6.61	0.61	Not a source of contaminants. Heat only						
S6	MIG Welders (3) exhaust	2.0	ambient	0.25	6.91	0.91	Chromium III	7440-47-3	8.14E-07	24	EF	AA	100.00%
							Carbon	7440-44-0	6.35E-06	24	EF	AA	100.00%
							Copper	7440-50-8	2.12E-05	24	EF	AA	100.00%
							Iron Oxide	1309-37-1	6.05E-03	24	EF	AA	100.00%
							Manganese	7439-96-5	2.59E-04	24	EF	AA	100.00%
							Molybdenum	7439-98-7	6.35E-06	24	EF	AA	100.00%
							Nickel	7440-02-0	8.14E-07	8760	EF	AA	100.00%
							Silicon	7440-21-3	4.23E-05	24	EF	AA	100.00%
							Carbon dioxide	124-38-9	4.23E-03	24	EF	AA	100.00%
							Carbon monoxide	630-08-0	4.23E-03	0.5	EF	AA	100.00%
							Nitrogen oxides	10102-44-0	4.23E-03	1, 24	EF	AA	4.62%
							Ozone	10028-15-6	4.23E-03	1	EF	AA	100.00%
							Particulate Matter	n/a	4.23E-03	24	EF	AA	100.00%

S7	TIG Welder	flue	-	-	-	-	no exhaust. Not a source of contaminants						
S8	Hot melt glue spray station	flue	-	-	-	-	no exhaust. Not a source of contaminants						
S9a/b	6-stage bath parts cleaner - Baths 1 & 6	flue	ambient	0.41	7.73	1.73	Ethanol	64-17-5	2.44E-03	1	EC	M	100.00%
S9c	Maxon gas burner exhaust 1 (Stage 1 of 6-stage cleaner)	flue	60	0.1	7.60	1.6	Nitrogen oxides	10102-44-0	1.14E-02	1, 24	EF	AA	12.44%
S9d	Maxon gas burner exhaust 2 (Stage 4 of 6-stage cleaner)	flue	52	0.1	7.90	1.9	Nitrogen oxides	10102-44-0	1.14E-02	1, 24	EF	AA	12.44%
S10	Dry off oven burner exhaust	flue	120	0.13	8.00	2	Nitrogen oxides	10102-44-0	1.27E-02	1, 24	EF	AA	13.82%
S11	Brazing	flue	ambient		6.00		Negligible emissions during maximum scenario						
S12a/b	Washer & burner exhaust for brazing process	flue	60	0.18	7.50	1.5	Nitrogen oxides	10102-44-0	1.01E-02	1, 24	EF	AA	11.06%
S13	Water Heaters for Parts Alkaline cleaner (S3) - 2 units	flue	60	0.15	6.76	0.76	Nitrogen oxides	10102-44-0	5.07E-03	1, 24	EF	AA	5.53%
S14		flue	60	0.15	6.76	0.76	Nitrogen oxides	10102-44-0	5.07E-03	1, 24	EF	AA	5.53%
S15	Air make up units (1)	-	-	-	-	-	Screened out as per Table B-3						
S16	Air make up units (2)	-	-	-	-	-	Screened out as per Table B-3						
S17	Natural Gas Fired HVAC units	-	-	-	-	-	Screened out as per Table B-3						

NOTE:

EC : Engineering Calculation

EF : Emission Factor

AA : Above Average Data Quality

M: Marginal Data Quality

6.0 Dispersion Modelling

Section 20 of O. Reg. 419/05 currently applies to the facility and the modelled impact to 24-hour Point of Impingement (*POI*) criteria can be assessed using AERMOD version 19191.

The dispersion modelling of the maximum emission scenario was conducted in accordance with the Ministry publication "Air Dispersion Modelling Guideline for Ontario" (*ADMGO*) PIBS 5165e03 (February 2017).

The entire building on site was included in the model to allow for building downwash. A multi-tier receptor grid was placed around the facility in accordance with the ADMGO.

The contaminant emissions from the entire facility are modelled as individual point sources.

The emission rates used in the dispersion model meet the requirements of Section 11(1)1 of O. Reg. 419/05, which requires that the emission rate used in the dispersion model is at least as high as the maximum emission rate that the source of contaminant is reasonably capable of for the relevant contaminant. Dispersion modelling has been conducted using contaminant specific emission rates for each source located at the facility and source details as summarized in the Source Summary Table, Table 5.1.

The location and modelling coordinates of the point sources and the facility's property line is labelled in Figure 3 in Appendix A.

There is no child care facility, health care facility, senior's residence, long-term care facility or an educational facility located at the facility. The nearest POI is located greater than 5 metres from the building on which the point of emissions are located; therefore, same structure contamination was not considered.

Dispersion modelling has been conducted using contaminant specific emission rates for each source located at the facility and source details as summarized in the Source Summary Table, Table 5.1.

The resulting 24-hour average concentration for total particulate matter is based on MAXTABLE value, after discarding the highest values, and compared against criteria listed in the publication "Air Contaminants Benchmarks (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", dated April 2018.

6.1 Dispersion Modelling Input Summary Table

The input data used to conduct the AERMOD modelling is summarized in Table 6.1 – Dispersion Modelling Input Summary Table. This table meets both the requirements of s.26(1)11 and sections 8-17 of O. Reg. 419/05 and follows the format provided in the ESDM Procedure Document.

Table 6.1: Dispersion Modelling Input Summary Table

Section of the Regulation	Section Title	Description of How the Approved Dispersion Model was Used
Section 8	Negligible Sources	Not included in modelling. See Table 2.1 – Sources and Contaminants Identification Table.
Section 9	Same Structure Contamination	Not applicable.
Section 10	Operating Conditions	All contaminants based on maximum worst-case operating time of 24 hours per day, 7 days per week, 52 weeks per year.
Section 11	Source of Contaminant Emission Rates	s.11 (1)1: at least as high as worst case emissions. See Table 5.1 and Sections 4.1 and 4.2.
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	The Operating Conditions were estimated in accordance with s.10(1) 1 and s.11(1) of O. Reg. 419 and are therefore considered to result in the highest concentration at the POI that the facility is capable of for the contaminants emitted. See sections 4.1 and 4.2 of the ESDM report.
Section 13	Meteorological Conditions	A 5 year meteorological dataset provided by the MECP was loaded in AERMOD. Southwest Urban surface data for 1996-2000.
Section 14	Area of Modelling Coverage	A nested grid was used in AERMOD to establish receptors around the site as required by s.14. Property line receptors were placed at 10 m spacing.
Section 15	Stack Height for Certain New Sources of Contaminant	Actual stack heights as listed in Table 5.1: Source Summary Table were used in the model.
Section 16	Terrain Data	Four official MECP Digital Elevation GeoTIFF file (040P) was used for the modelling.
Section 17	Average Periods	24hr averaging period was applied to the AERMOD modelling.

6.2 Land Use Zoning Designation Plan

Land Use Zoning Designation Plan found in Appendix B describes the nearby land use. Sub paragraph 10 of s.26(1) of O. Reg. 419/05 requires a description of the local land use conditions if meteorological data described in paragraph 2 of s.13(1) of O. Reg. 419/05 was used. The dispersion modelling of the site did not use the meteorological data described in paragraph 2 of s.13(1); therefore, a detailed description of the local land use conditions is not required.

6.3 Coordinate System

The Universal Transverse Mercator (*UTM*) coordinate system, as per Section 5.2.2 of the ADMGO, was used to specify model object sources, buildings and receptors. All coordinates were defined in the World Geodetic System, 1984 (*WGS84*).

6.4 Meteorology Data and Anomalies

A description of the local land use conditions is provided in this section as per subparagraph 10 of s.26(1) of O.Reg. 419/05, since meteorological data as described in paragraph 2 of s.13(1) of O.Reg. 419/05 is used.

The digital elevation dataset for London from the Ministry's website was entered into the model. The Ministry's 5-year processed regional meteorological dataset for Southwest (URBAN) was entered into the model.

AERMET was not used in this assessment as a pre-processed Ministry meteorological dataset was used.

The resultant 24-hour point of impingement concentrations for each contaminant were assessed and adjusted for meteorological anomalies. As outlined in the ADMGO, for assessments of 24-hour average concentrations, the highest 24-hour average predicted concentration in each single meteorological year was discarded such that compliance is based on the highest concentration after the elimination of these five 24-hour average concentrations.

6.5 Terrain

The GeoTIFF file 040P data is used in this assessment and was obtained from the Ministry.

6.6 Dispersion Modelling Input and Output Files

The input and output files for the dispersion modelling have been provided as an electronic file along with this application.

7.0 Emission Summary Table and Conclusions

7.1 Emission Summary Table

POI concentrations using the facility-wide maximum emission scenario described in section 4.0 are shown in Table 7.1 – Emission Summary Table as required by sub paragraph 14 of s.26(1) of O. Reg. 419/05.

The POI concentrations listed in Table 7.1 – Emission Summary Table, were calculated based on the emission rates listed in Table 5.1 – Source Summary Table.

Contaminants in Table 7.1 were compared against criteria listed in the publication ACB List.

7.2 Assessment of Contaminants with No MECP POI Limits

Subparagraph 14, subsection viii of s.26(1) of O. Reg. 419/05 requires indication of the likelihood, nature and location of any adverse effect if the contaminant is not listed in any of Schedules 1, 2, and 3.

No contaminants were identified as part of this assessment that do not have Ministry POI limits and are not on the Jurisdictional Screening Level (*JSL*) list.

7.3 Conclusions

This ESDM Report was prepared in accordance with s.26 of O. Reg. 419/05. The POI concentrations listed in Table 7.1 – Emission Summary Table were compared against criteria listed on the ACB List.

The ground level POI concentrations were compared with applicable Ministry criteria and indicate that emissions based on the maximum emission scenario are below Ministry limits and in compliance with O. Reg. 419/05.

Table 7.1: Emission Summary Table

Contaminant	CAS #	Total Facility Emission Rate	Air Dispersion Model Used	Maximum POI Concentration	Averaging Period	MOECC POI Limit	Limiting Effect	Regulation Schedule*	% of Ministry POI Limit
		(g/s)		($\mu g/m^3$)	(h)	($\mu g/m^3$)			
Manganese	7439-96-5	2.59E-04	AERMOD v19191	0.35	24	0.4	Health	Std-B1	86.7%

***Regulation Schedule**

STD-B1**:** Standard under Ontario Regulation 419/05 - Air Pollution – Local Air Quality.

APPENDIX A

Figures – Site Plan and Source Locations

ENVIROLUM Consulting Inc.
Kitchener, Ontario

SCALED AREA SITE PLAN
EMISSIONS SUMMARY & DISPERSION MODELLING REPORT

A.O. Smith
Stratford, Ontario

By: CL	Date: August 3, 2022	Project No. 22ELC029

Figure 1

Insignificant Sources
S5: Bake Oven Exhaust
S9a: 6-stage bath, Stage 1 exhaust
S9b: 6-stage bath, Stage 6 exhaust
S9c/d: Maxon gas burner for 6-stage cleaner
S10: Dry-Off Oven burner
S12: Gas burner exhaust for 1-stage washer
S13/S14: Water heater exhausts for Alkaline Cleaner
HVAC Units (S17)
Air Make Up Unit (S15/S16)

Significant Sources
S6: MIG Welding Exhaust

ENVIROLUM Consulting Inc.
Kitchener, Ontario

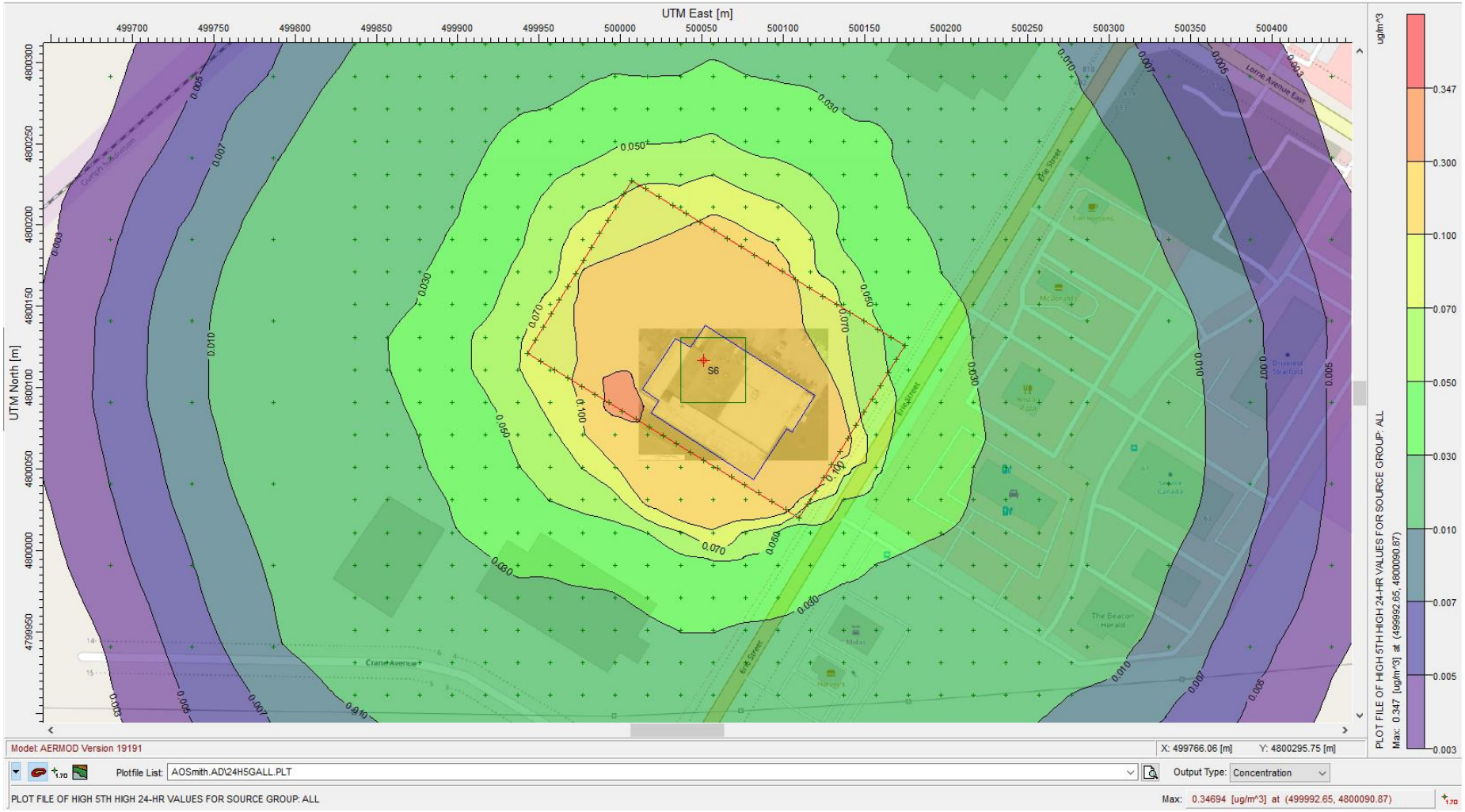
SOURCE LOCATION
EMISSIONS SUMMARY & DISPERSION MODELLING REPORT

N

A.O. Smith
Stratford, Ontario

By:	CL	Date:	August 3, 2022	Project No.	22ELC029

Figure 2



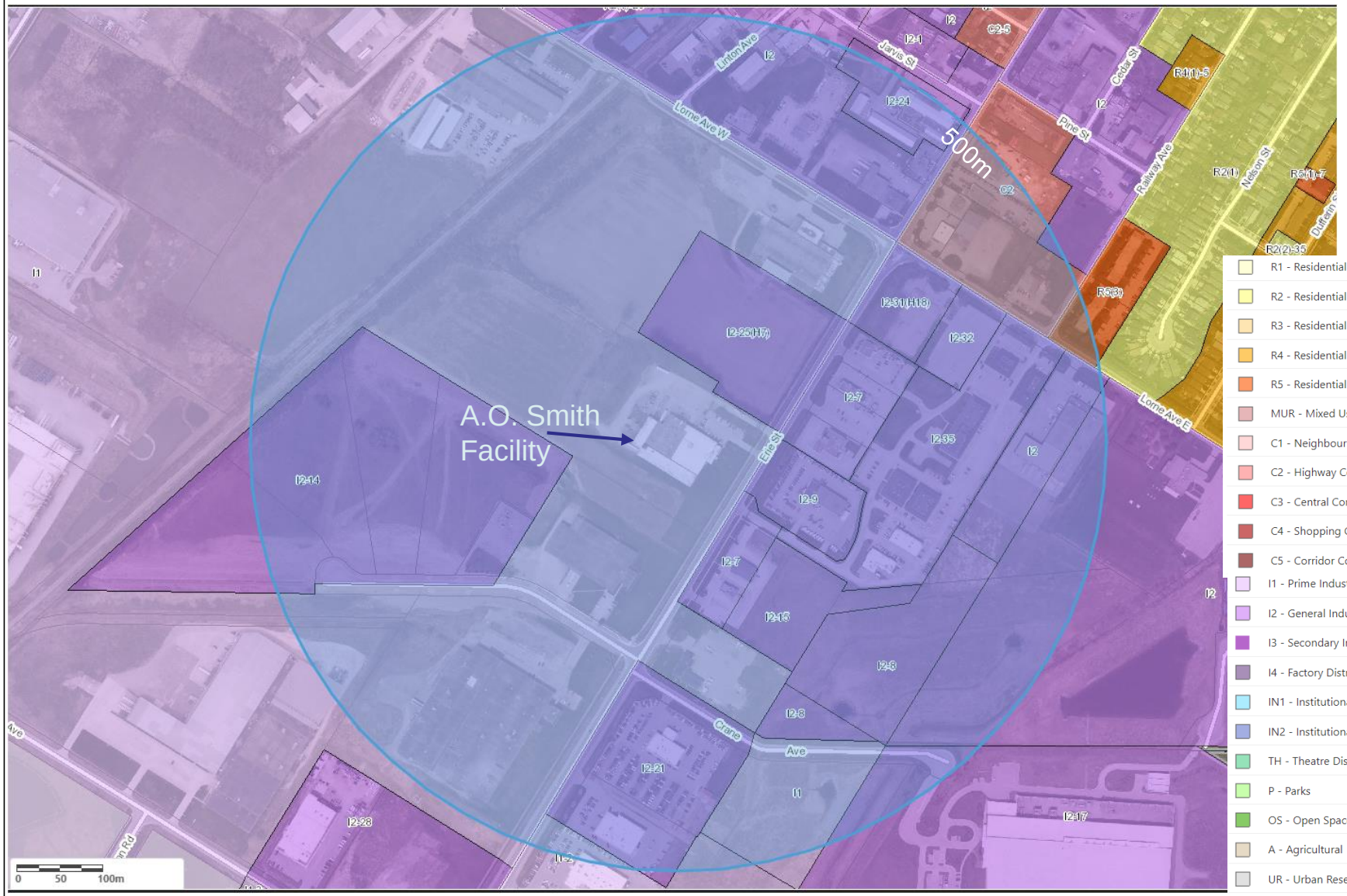
ENVIROLUM Consulting Inc.
Kitchener, Ontario

DISPERSION MODELLING RECEPTORS
EMISSIONS SUMMARY & DISPERSION MODELLING REPORT

A.O. Smith
Stratford, Ontario

By: CL	Date: August 3, 2022	Project No. 22ELC029

Figure 3



ENVIROLUM Consulting Inc.
Kitchener, Ontario

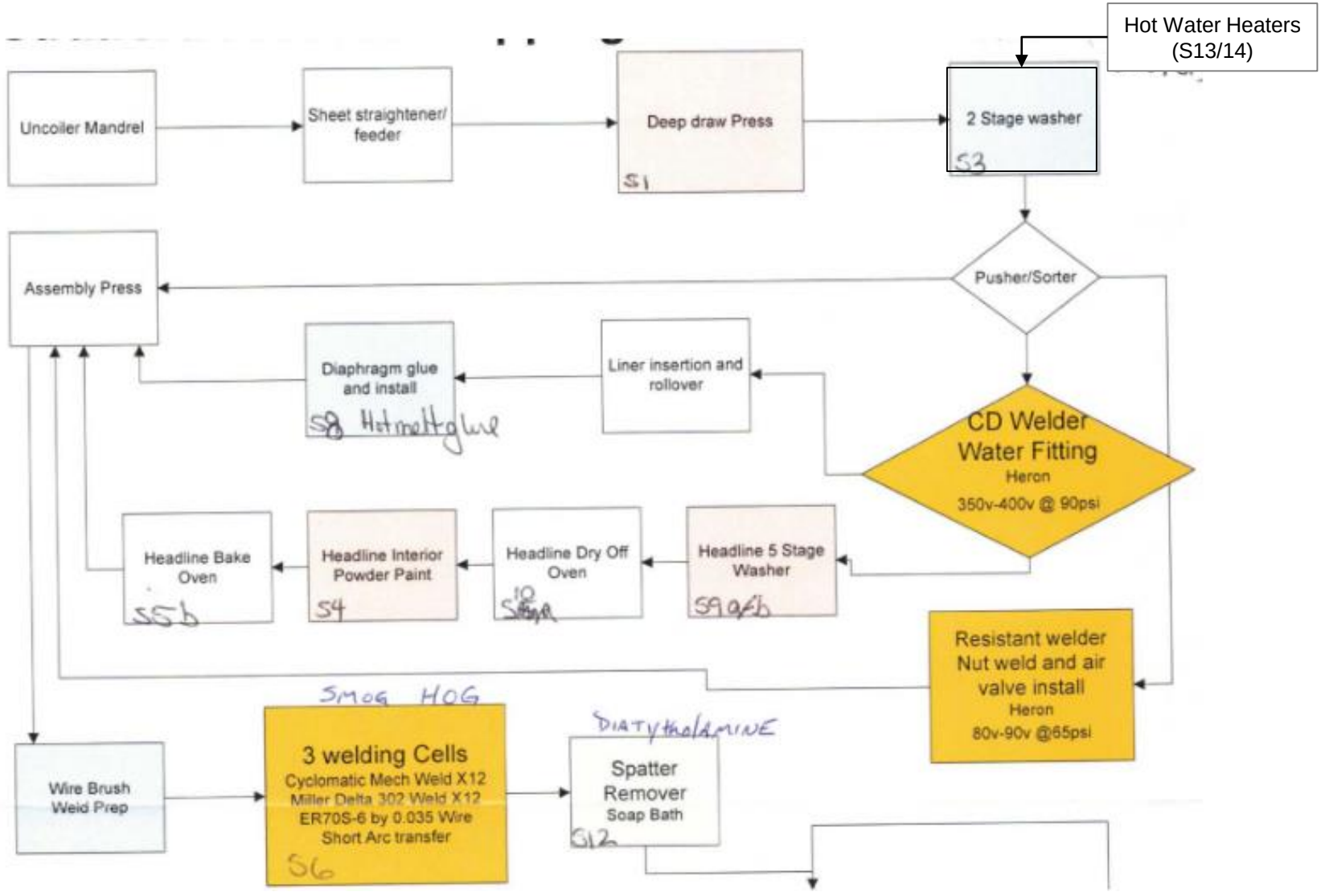
ZONING MAP

EMISSIONS SUMMARY & DISPERSION MODELLING REPORT

A.O. Smith
Stratford, Ontario

By: CL	Date: June 23, 2022	Project No. 22ELC029

Figure 4



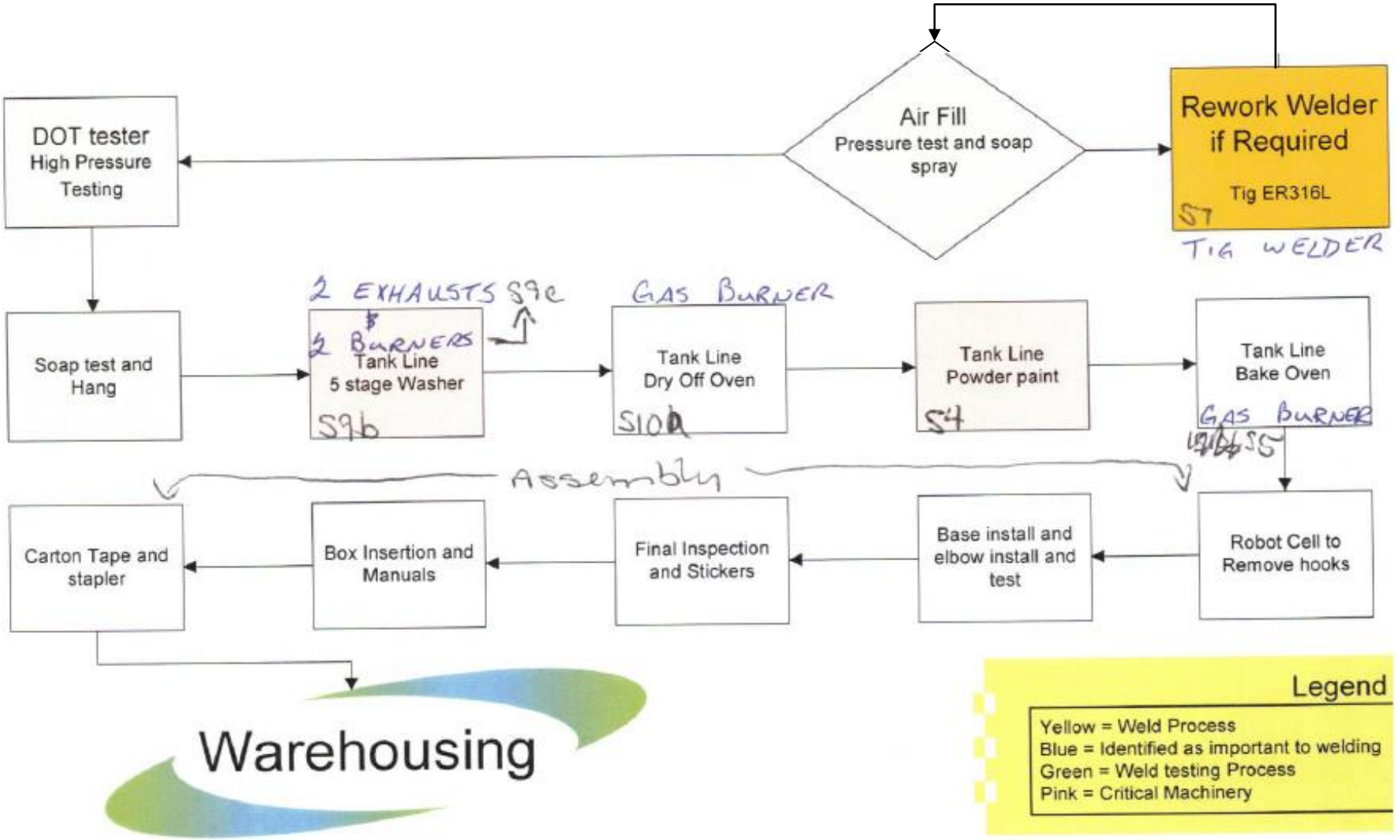
ENVIROLUM Consulting Inc.
Kitchener, Ontario

PROCESS FLOW DIAGRAM 1
EMISSIONS SUMMARY & DISPERSION MODELLING REPORT

A.O. Smith
Stratford, Ontario

By: CL	Date: August 3, 2022	Project No. 22ELC029

Figure 5a



ENVIROLUM Consulting Inc.
Kitchener, Ontario

PROCESS FLOW DIAGRAM 1
EMISSIONS SUMMARY & DISPERSION MODELLING REPORT

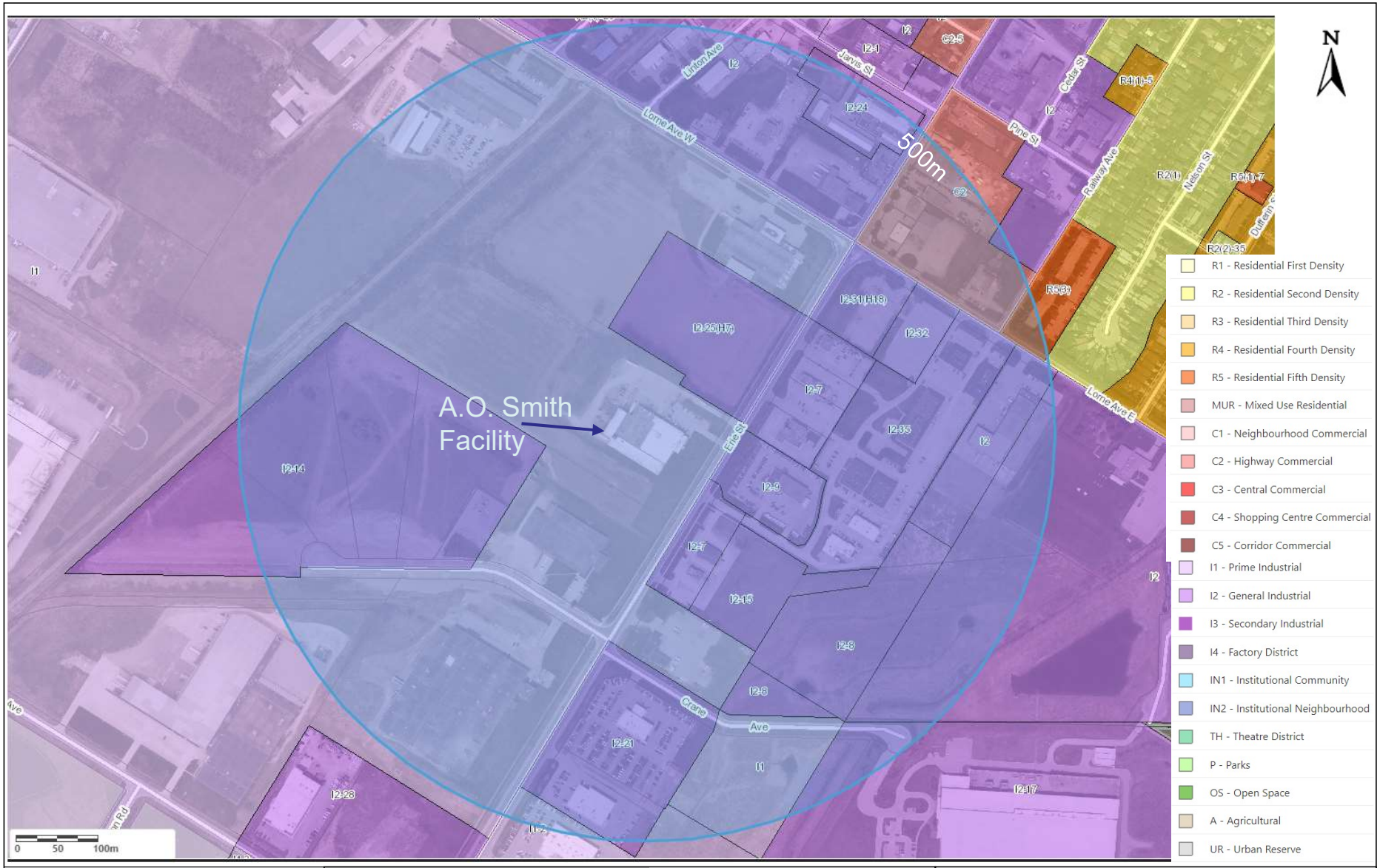
A.O. Smith
Stratford, Ontario

By: CL	Date: August 3, 2022	Project No. 22ELC029

Figure 5b

APPENDIX B

Zoning Map



ENVIROLUM Consulting Inc.
Kitchener, Ontario

ZONING MAP
EMISSIONS SUMMARY & DISPERSION MODELLING REPORT

A.O. Smith
Stratford, Ontario

By: CL	Date: June 23, 2022	Project No. 22ELC029

Figure 4

APPENDIX C

Emission Calculations

Table C1: Natural Gas Combustion

Contaminant	Emission Factor ($g/10^3 m^3$)
Nitrogen Oxide	1600
Gas	**Higher Heating Value (kJ/m^3)**
Natural Gas	37000

Source ID	Source	Quantity	Individual Capacity (BTU)	Individual Capacity (kJ/hr)	Total Capacity (kJ/hr)	Emission Rate NOx (g/s)	
S5	Two-tier Paint Bake oven burners (E-Paint)	1	2,500,000	2,637,650	2,637,650	0.0317	
S9c/d	Maxon gas burners - 6-stage cleaner	2	900,000	949,554	1,899,108	0.0228	
S10	Dry-off oven burner exhaust	1	1,000,000	1,055,060	1,055,060	0.0127	
S12	Washer burner exhaust for brazing process	1	800,000	844,048	844,048	0.0101	
S13, S14	Alkaline Cleaner water heaters	2	400,000	422,024	844,048	0.0101	screened out
S15, S16	Air make up units	2	500,000	527,530	1,055,060	0.0127	screened out
S17	Natural gas-fired comfort heating equipment	4	250,000	263,765	1,055,060	0.0127	screened out
	Total		**6,350,000**	**6,699,631**	**9,390,034**	**0.1128**	

NOTES:

[1] Sources that, in combination, represent less than 5% of total property -wide emissions are considered insignificant. As per S. 7.2.2 of Procedure for Preparing an ESDM Report.

[2] Natural gas fired boilers, water heaters, space heaters and makeup air units when the total facility-wide heat input usage is less than 20Mkj/hr, can be screened out.

[3] USEPA AP-42 Emission Factors. Natural Gas Combustion, Chapter 1.4. Table 1.4-1. July 1998.

Sample Calculation: NOx emissions for Source RT-1

$$ER_{Source\ S13} = 422{,}024\frac{kJ}{hr} \times \frac{1}{37{,}000\frac{kJ}{m^3}} \times \frac{1}{10^3} \times 1{,}600\frac{g}{10^3 m^3} \times \frac{1hr}{3{,}600s} = 0.0051\frac{g}{s}$$

Table C2: Welding Emission Calculations

Operating Conditions:

In 2021, the facility purchased a total of 17,124 kg of electrode weld wire. For a worst-case scenario, it is assumed that the facility can process an additional 50% of the amount of wires used in 2021 for a maximum total of 25,686 kg/yr of weld wire. The total amount of weld wire is the total processed and is divided between the three welders which equal to approximately 8,562 kg/yr per welder. It is assumed that all three welders can operate at the same time.

Source ID:	S6		
Welding Type:	GMAW		
Electrode Type:	E70S		
# of hrs per shift:	24	hrs/day	Mon-Fri
# of days per year:	250	days/yr	
# of Welders:	3		

Material Usage	kg/yr	Hourly Usage (%)	kg/hr	Averaged 24-hr (kg/day)
Murex S-6 wire	8,562		0.977	34.248

Contaminant	CAS	Max % wt of contaminant	US EPA Emission Factor E70S (g/kg)	Emission Rate (g/s)	Emission Estimation Technique	Data Quality
Chromium III	7440-47-3	0.15%	0.001	8.14E-07	EF	AA
Carbon	7440-44-0	0.15%	-	6.35E-06	EF	AA
Copper	7440-50-8	0.5%	-	2.12E-05	EF	AA
Iron Oxide	1309-37-1	100.0%	-	6.05E-03	EF	AA
*Manganese	7439-96-5	5%	0.318	2.59E-04	EF	AA
Molybdenum	7439-98-7	0.15%	-	6.35E-06	EF	AA
Nickel	7440-02-0	0.15%	0.001	8.14E-07	EF	AA
Silicon	7440-21-3	1.00%	-	4.23E-05	EF	AA
*Carbon dioxide	124-38-9	100%	-	4.23E-03	EF	AA
*Carbon monoxide	630-08-0	100%	-	4.23E-03	EF	AA
*Nitrogen oxides	10102-44-0	100%	-	4.23E-03	EF	AA
*Ozone	10028-15-6	100%	-	4.23E-03	EF	AA
Total Particulates	n/a	100%	5.2	4.23E-03	EF	AA

* denotes welding fumes may contain these contaminants, as identified on SDS.

Sample Calculation :

Total Particulates Emission Rate = Feedrate x Emission Factor x Max % wt of contaminant x # of welders

= (0.977 kg/hr x 5.2 g/kg x 3) ÷ 3600 s/hr

= 0.0028 g/s

Emission Estimation Methodology

All contaminants, except Manganese, listed below have been screened out as insignificant using the dispersion factor threshold assesment.

It is assumed that all three (3) welders can operate at the same time and operating at full capacity 24/7.

-The closest wire/rod chemistry was selected from US EPA AP-42, "Electric Arc Welding", Chapter 12.19, 1995. Emissions for individual components on the MSDS with no emission factors were determined by multiplying the US EPA emission factor for total fume emissions by the maximum percent composition of the individual component.

-Particulate Matter emissions were determined based on the US EPA emission factor for total fume emissions for the specific wire/rod selected.

-It is assumed that 100% of the Iron emissions will be converted to Iron Oxide. Therefore, the Iron emission rate was converted to Iron Oxide using a stoichiometric calculation.The iron emission rate has been multiplied by 1.43 (MW of Iron Oxide/2*MW of Iron since it takes 4 mols of Iron to make 2 mols of iron oxide) to account for the weight difference.

Table C3: 6-stage Washer Emissions Estimate

Operating Conditions:

In 2021, the facility purchased a total of 27,515 kg of alkaline and phosphate cleaner/solutions. For worst-case scenario, it is assumed that the facility can use an additional 50%, for a total of 41,000 kg/yr of cleaning solution. The total amount of cleaning solution is divided between the eight cleaning solutions purchased which equals to approximately 5,125 kg/yr per cleaning solution.

Only heat and moisture, with minimal volatile emissions is expected from the wash process. Based on the dispersion factor threshold assessment, ethanol, which is the only VOC, has been screened out as insignificant.

Source ID:	S9		
Max Usage Rate:	5125	kg/yr	per cleaning product
# of hrs per shift:	24	hrs/day	Mon-Fri
# of days per year:	250	days/yr	
Emission Estimation:	Engineering Calculations		
Data Quality:	Marginal/Uncertain		

	Wash Stage	Specific Gravity	Ethanol	Sodium Xylene Suphonate	Sodium Hydroxide	Sodium Nitrate	Hexafluorozirconic acid	Alcohols, C6-C10, ethoxylated propoxylated	Nopol ethoxylated propoxylated
	Volatile:		**Y**	N	N	N	N	N	N
			64-17-5	**1300-72-7**	**1310-73-2**	**7631-99-4**	**12021-95-3**	**68987-81-5**	**174955-61-4**
Product Description									
Gardoclean TP 10367 cleaner	1	1.216		3%	20%				
Gardobond Additive H7302	1	1.037						25%	25%
Gardobond Additive H 7204	6	0.984				5%			
Tech Seal 38645	6	1.026	3%				5%		

Stage 6: Tech Seal 38645

Evaporation	100	%	0.00244	0.000	0.000	0.000	0.000	0.000	0.000
Assume 50% in Mist	50	%	g/s						

Emission Calculation (g/s)

(kg/yr *concentration*1000 g/kg*1 yr/31,557,600s)

Table C4: Paint Emissions - Maximum MSDS Concentrations

Source ID: S4

		Constituent	4,4'-Isopropylidenediphenol (BPA)	Methylimidazole	Iron oxide	Calcium carbonate	TGIC	Barium Sulphate	Amorphous silica	Crystalline Silica, respirable powder	Titanium Dioxide	Phenol, polymer w/ formaldehyde, glycidylether
		P	P	P	P	P	P	P	P	P	P	P
		CAS	80-05-7	693-98-1	1309-37-1	1317-65-3	2451-62-9	7727-43-7	7631-86-9	14808-60-7	13463-67-7	28064-14-4
Product Name	**Product ID Number**	**S.G. g/cm3**										
POWDURA TGIC Polyester Powder Coating - Stratford Red	PRS8-01668	1.48					4.79	16.98			2.05	
POWDURA NSF-61 Certified Powder Coating - Red Oxide	ERS8-70002	1.48	4.36	0.26	4.62	27.58				0.11	0.39	9.71
POWDURA TGIC Polyester Powder Coating - Global tan	PHS9-00006	1.56					4.48	2.14	1.34		27.17	
POWDURA TGIC Polyester Powder Coating - Stratford Blue	PLS9-00014	1.41					5.25	10.48			8.24	

P solid
V volatile

Powder booth overspray is collected in a dust collector which vents into the building. Therefore there are no emissions.

Powder paint SDS indicate 0 % organic solvents.

Table C5: Hot Melt Glue Application

Source ID: S8

Hot melt glue is applied to parts via spray. Approximately 30% glue is used in application. This operation is not exhausted to the outside environment.

Table C6: Insignificant Sources/Contaminants

Processing Area / Equipment	Insignificant	
	Contaminant	Source ID
Metal forming press (deep draw press)	none	S1
Saw cutting	none	S2
Parts Alkaline cleaner exhaust (2-stage washer)	none	S3
Electrostatic powder paint line	none	S4
Bake oven for electrotatic paint line	Heat only	S5b
MIG Welder	Most contaminants screened out using an Emission Threshold as per Procedure 7.1.3	S6
TIG Welder	no exhaust. Not a source of contaminants	S7
Hot melt glue spray station	no exhaust. Not a source of contaminants	S8
6-stage bath parts cleaner - Bath 1	mainly heat /moisture	S9a
6-stage bath parts cleaner - Bath 6	mainly heat /moisture	S9b
Brazing	Negligible emissions during maximum scenario	S11
Air make up units (1)	Screened out as per Table B-3	S15
Air make up units (2)	Screened out as per Table B-3	S16
Natural Gas Fired HVAC units	Screened out as per Table B-3	S17

Table C7: Insignificant Contaminants Based on Emission Threshold

The urban dispersion factor was chosen from Table B-1 of the MOE's "Procedure for Preparing an Emission Summary and Dispersion Modelling Report", Version 4.1, dated March 2018. The shortest distance from the sources nearest to the property line is indicated in Column "Distance to POI". The dispersion factor of 6300 (µg/m3)/(g/s) corresponding to a distance of 40 m was conservatively chosen. The dispersion factor of 2180 (µg/m^3)/(g/s) corresponding to a distance of 50 m was conservatively chosen by converting 5450 (µg/m3)/(g/s) to a 24-hour averaging period using a factor of 0.4 as per the MOE's "Air Dispersion Modelling Guideline for Ontario", Version 3.0, February 2017.

* If the aggregate facility-wide emission rate of a contaminant multiplied by the appropriate dispersion factor from Table B-1 of the Guide is less than the Ministry POI Limit, then the assessment is complete.

Contaminant	CAS #	Nearest Source to POI	Aggregate Facility-wide Emission Rate (g/s)	MOE POI Limit* (µg/m^3)	Distance to POI	Table B1 Dispersion Factor (µg/m^3 per g/s)	Averaging Period	* Screening check (emission rate x dispersion factor) < POI Limit (µg/m^3)	Screened out
Ethanol	64-17-5	S9	2.44E-03	19000	40	6300	1	1.53E+01	Yes
Chromium III	7440-47-3	S6	8.14E-07	0.5	52	2180	24	1.77E-03	Yes
Carbon	7440-44-0	S6	6.35E-06	1.75	52	2180	24	1.38E-02	Yes
Copper	7440-50-8	S6	2.12E-05	50	52	2180	24	4.61E-02	Yes
Iron Oxide	1309-37-1	S6	6.05E-03	25	52	2180	24	1.32E+01	Yes
Manganese	7439-96-5	S6	2.59E-04	0.4	52	2180	24	5.64E-01	-
Molybdenum	7439-98-7	S6	6.35E-06	120	52	2180	24	1.38E-02	Yes
Nickel	7440-02-0	S6	8.14E-07	0.04	52	429	8760	3.49E-04	Yes
Silicon	7440-21-3	S6	4.23E-05	27	52	2180	24	9.23E-02	Yes
Carbon dioxide	124-38-9	S6	4.23E-03	255800	52	2180	24	9.23E+00	Yes
Carbon monoxide	630-08-0	S6	4.23E-03	6000	52	6540	0.5	2.77E+01	Yes
Nitrogen oxides	10102-44-0	S5, S9c/d, S10	6.72E-02	200	52	2180	24	1.46E+02	Yes
				400	52	5450	1	3.66E+02	Yes
Nitrogen oxides (less significant sources)	10102-44-0	S6, S12, S14	2.45E-02	200	20	3480	24	8.53E+01	Yes
				400	20	8700	1	2.13E+02	Yes
Ozone	10028-15-6	S6	4.23E-03	165	52	5450	1	2.31E+01	Yes
Total Particulates	n/a	S6	4.23E-03	120	52	2180	24	9.23E+00	Yes

Sample Calculation for Screening Check

POI Limit Screening for Ethanol = (Facility-wide emission rate x dispersion factor) < POI Limit

= 0.00244 x 6300

= 15.35 µg/m^3 < 19000 Therefore screened out.

APPENDIX D

Dispersion Modelling Files

```
**
**************************************
**
** AERMOD Input Produced by:
** AERMOD View Ver. 9.9.0
** Lakes Environmental Software Inc.
** Date: 2022-09-13
** File: C:\Lakes\AERMOD View\AOSmith\AOSmith.ADI
**
**************************************
**
**
**************************************
** AERMOD Control Pathway
**************************************
**
**
CO STARTING
   TITLEONE C:\Lakes\AERMOD View\AOSmith\AOSmith.isc
   MODELOPT DFAULT CONC
   AVERTIME 24
   URBANOPT 100000 Stratford
   POLLUTID MANGANES
   RUNORNOT RUN
   ERRORFIL AOSmith.err
CO FINISHED
**
**************************************
** AERMOD Source Pathway
**************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
   LOCATION S6           POINTCAP   500050.770  4800116.750
365.000
** DESCRSRC MIG Welding
** Source Parameters **
   SRCPARAM S6           0.00025883     6.910     0.000  40.74367
0.250

** Building Downwash **
   BUILDHGT S6              6.00     6.00     6.00     6.00
6.00     6.00
   BUILDHGT S6              6.00     6.00     6.00     6.00
6.00     6.00
   BUILDHGT S6              6.00     6.00     6.00     6.00
6.00     6.00
   BUILDHGT S6              6.00     6.00     6.00     6.00
6.00     6.00
   BUILDHGT S6              6.00     6.00     6.00     6.00
```

```
6.00     6.00
   BUILDHGT S6               6.00     6.00     6.00     6.00
6.00     6.00

   BUILDWID S6             104.96   100.74    93.46    92.22
97.04    98.90
   BUILDWID S6              99.10    98.45    94.80    88.27
79.06    67.45
   BUILDWID S6              72.83    83.89    92.41    98.46
103.80   105.99
   BUILDWID S6             104.96   100.74    93.46    92.22
97.04    98.90
   BUILDWID S6              99.10    98.45    94.80    88.27
79.06    67.45
   BUILDWID S6              72.83    83.89    92.41    98.46
103.80   105.99

   BUILDLEN S6              88.27    79.06    67.45    72.83
83.89    92.41
   BUILDLEN S6              98.46   103.80   105.99   104.96
100.74    93.46
   BUILDLEN S6              92.22    97.04    98.90    99.10
98.45    94.80
   BUILDLEN S6              88.27    79.06    67.45    72.83
83.89    92.41
   BUILDLEN S6              98.46   103.80   105.99   104.96
100.74    93.46
   BUILDLEN S6              92.22    97.04    98.90    99.10
98.45    94.80

   XBADJ
S6             -66.46   -57.99   -47.77   -45.14   -45.17   -43.8
2
   XBADJ
S6             -41.48   -40.16   -37.63   -33.95   -29.25   -23.6
5
   XBADJ
S6             -21.82   -21.44   -20.41   -20.09   -21.32   -21.9
0
   XBADJ
S6             -21.82   -21.07   -19.68   -27.69   -38.73   -48.5
9
   XBADJ
S6             -56.98   -63.64   -68.36   -71.01   -71.50   -69.8
1
   XBADJ
S6             -70.40   -75.60   -78.50   -79.01   -77.13   -72.9
0

   YBADJ
S6             -18.53   -21.12   -23.08   -24.29   -27.08   -29.0
5
```

```
   YBADJ
S6             -29.46   -27.90   -25.50   -22.32   -18.46   -14.0
4
   YBADJ    S6              -8.73    -3.22     2.39     7.75
11.74    15.37
   YBADJ    S6              18.53    21.12    23.08    24.29
27.08    29.05
   YBADJ    S6              29.46    27.90    25.50    22.32
18.46    14.04
   YBADJ    S6               8.73
3.22    -2.39    -7.75   -11.74   -15.37

   URBANSRC ALL
   SRCGROUP ALL
SO FINISHED
**
****************************************
** AERMOD Receptor Pathway
****************************************
**
**
RE STARTING
   INCLUDED AOSmith.rou
RE FINISHED
**
****************************************
** AERMOD Meteorology Pathway
****************************************
**
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ME STARTING
   SURFFILE Southwest_1_Urban\London_urban_19191.SFC
   PROFFILE Southwest_1_Urban\London_urban_19191.PFL
   SURFDATA 61444 1996 LONDON
   UAIRDATA 726320 1996 WHITE_LAKE
   PROFBASE 278.0 METERS
ME FINISHED
**
****************************************
** AERMOD Output Pathway
****************************************
**
**
OU STARTING
   RECTABLE ALLAVE 1ST 5TH
   RECTABLE 24 1ST 5TH
   MAXTABLE ALLAVE 100
   DAYTABLE ALLAVE
** Auto-Generated Plotfiles
   PLOTFILE 24 ALL 1ST AOSmith.AD\24H1GALL.PLT 31
   PLOTFILE 24 ALL 5TH AOSmith.AD\24H5GALL.PLT 32
   SUMMFILE AOSmith.sum
```

```
OU FINISHED
**
**************************************
** Project Parameters
**************************************
** PROJCTN  CoordinateSystemUTM
** DESCPTN  UTM: Universal Transverse Mercator
** DATUM    World Geodetic System 1984
** DTMRGN   Global Definition
** UNITS    m
**
```

APPENDIX E

Certificate of Approval #8-1078-83-006, Notice 1

CONTENT COPY OF ORIGINAL

Ontario

Ministry of the Environment **Ministère de l'Environnement**

AMENDMENT TO CERTIFICATE OF APPROVAL
AIR
NUMBER 8-1078-83-006
Notice No. 1

A.O. Smith Enterprises Limited
768 Erie Street, P.O. Box 310
Stratford, Ontario
N5A 6T3

Site Location: 768 Erie Street
Stratford City, County Of Perth

You are hereby notified that I have amended Certificate of Approval No. 8-1078-83-006 issued on December 9, 1983 for bondarizing equipment - paint spray booths, both electrostatic and conventional and a paint baking oven, as follows:

The three spray booths consisting of the primer and top coat booths and a manual touch up booth were removed at the beginning of February 2000 and replaced with an electrostatic powder system that requires no external exhaust. The new system has 100% powder recovery. The stacks and fans associated with the former system were removed and the roof has been sealed up. The baking oven is still operational and continues to exhaust to the natural environment.

The reason(s) for this amendment to the Certificate of Approval is (are) as follows:

All in accordance with the Application for a Certificate of Approval (Air), and all supporting information dated May 3, 2000 and signed by Don Strang, P.Eng., Manager of Manufacturing Engineering, A.O. Smith Enterprises Limited, as well as additional information dated August 11, 2000 and signed by Don Strang.

This Notice shall constitute part of the approval issued under Certificate of Approval No. 8-1078-83-006 dated December 9, 1983.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

CONTENT COPY OF ORIGINAL

The Secretary*
Environmental Appeal Board
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 9, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Appeal Board's requirements for an appeal can be obtained directly from the Board at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted works are approved under Section 9 of the Environmental Protection Act

DATED AT TORONTO this 22nd day of September, 2000

Yvonne Hall, P.Eng.
Director
Section 9, *Environmental Protection Act*

CL/
c: District Manager, MOE London - District