REPORT

UNIVERSITY HEALTH NETWORK - TORONTO WESTERN HOSPITAL

TORONTO, ONTARIO

ENVIRONMENTAL ACTIVITY AND SECTOR REGISTRY EMISSION SUMMARY AND DISPERSION MODELLING REPORT

RWDI #1803937

February 23, 2021

SUBMITTED TO

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Ontario

Ministry of the Environment, Conservation and Parks

Emission Summary and Dispersion Modelling Report Checklist

Company Name

University Health Network

Company Address

Unit Number	Street Number	Street Name	PO Box
	610	University Avenue	

City/Town	Province	Postal Code
Toronto	Ontario	M5G 2M9

Location of Facility

Toronto Western Hospital, 399 Bathurst Street, Toronto, Ontario M5T 2S8

The attached Emission Summary and Dispersion Modeling Report was prepared in accordance with s. 26 of O. Reg. 419/05 and the guidance in the MECP document "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2009 and "Air Dispersion Modelling Guideline for Ontario" dated March 2009 and the minimum required information identified in the check-list on the reverse of this sheet has been submitted.

Company Contact

Company Contact

Company Contact Name

Last Name	First Name	Middle Initial
Swail	Ron	

Title	Telephone Number
Vice President, FM-PRO	641-308-2791

Signature	Date (yyyy/mm/dd)
Ron Swail Ron Swail (Jun 11, 2021 10:10 EDT)	Jun 11, 2021

Technical Contact

Technical Contact

Technical Contact Name

Last Name	First Name	Middle Initial
Bailey	Tara	

Representing	Telephone Number
RWDI AIR Inc.	519-823-1311

Signature	Date (yyyy/mm/dd)
Tara Bailey	June 11, 2021

* This checklist is taken from the document titled "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2009.

Emission Summary and Dispersion Modelling Report Checklist

	Required Information	Submitted	Explanation/Reference
	Executive Summary and Emission Summary Table		
	1.1 Overview of ESDM Report	☑ Yes	
	1.2 Emission Summary Table	☑ Yes	
1.0	**Introduction and Facility Description**		
	1.1 Purpose and Scope of ESDM Report (when report only represents a portion of facility)	☑ Yes	
	1.2 Description of Processes and NAICS code(s)	☑ Yes	
	1.3 Description of Products and Raw Materials	☑ Yes	
	1.4 Process Flow Diagram	☑ Yes	
	1.5 Operating Schedule	☑ Yes	
2.0	**Initial Identification of Sources and Contaminants**		
	2.1 Sources and Contaminants Identification Table	☑ Yes	
3.0	**Assessment of the Significance of Contaminants and Sources**		
	3.1 Identification of Negligible Contaminants and Sources	☑ Yes	
	3.2 Rationale for Assessment	☑ Yes	
4.0	**Operating Conditions, Emission Rate Estimating and Data Quality**		
	4.1 Description of operating conditions, for each significant contaminant that results in the maximum POI concentration for that contaminant	☑ Yes	
	4.2 Explanation of Method used to calculate the emission rate for each contaminant	☑ Yes	
	4.3 Sample calculation for each method	☑ Yes	
	4.4 Assessment of Data Quality for each emission rate	☑ Yes	
5.0	**Source Summary Table and Property Plan**		
	5.1 Source Summary Table	☑ Yes	
	5.2 Site Plan (scalable)	☑ Yes	
6.0	**Dispersion Modelling**		
	6.1 Dispersion Modelling Input Summary Table	☑ Yes	
	6.2 Land Use Zoning Designation Plan	☑ Yes	
	6.3 Dispersion Modelling Input and Output Files	☑ Yes	
7.0	**Emission Summary Table and Conclusions**		
	7.1 Emission Summary Table	☑ Yes	
	7.2 Assessment of Contaminants with no MECP POI Limits	☑ Yes	
	7.3 Conclusions	☑ Yes	
	Appendices (Provide supporting information or details such as…)		
	Appendix A: Dispersion Modelling Input & Output Files Appendix B: Natural Gas Combustion Emissions Calculations	☑ Yes	
	Appendix C: No. 2 Fuel Oil Combustion Emissions Calculations Appendix D: Emergency Diesel Generators Emissions Calculations	☑ Yes	

	Required Information	Submitted	Explanation/Reference
	Appendix E: Ethylene Oxide Sterilization System Emissions Calculations Appendix F: Laboratory Fume Hoods Emissions Calculations Appendix G: NOx Monitoring in Air Handling Units: Summary of NOx monitoring data	☑ Yes	

EXECUTIVE SUMMARY

This Environmental Activity and Sector Registry (EASR) Emission Summary and Dispersion Modelling (ESDM) report was prepared in support of a registration under Part II.2 of the Environmental Protection Act (EPA) for activities requiring assessment of air, for the applicant's facility located at 399 Bathurst Street, Toronto, Ontario. This registration will replace any existing Environmental Compliance Approvals for air and noise emissions at the facility. This application is being submitted to achieve compliance of University Health Network Toronto Western Hospital (TWH) operations with the requirements of Section 9 of the Environmental Protection Act (EPA), R.S.O. 1990.

TWH is a hospital facility; therefore, a processing capacity is not applicable. Raw materials used at the facility that relate directly to emissions assessed in this report include diesel fuel for emergency generators, natural gas and no. 2 fuel oil for boilers, ethylene oxide for the sterilization of equipment, and chemicals related to testing and research used in fume hoods. In some portions of the facility, patients and associated staff will be present on a 24-hour basis. Therefore, for the purposes of this application, the facility is assumed to operate 24 hours per day, 365 days per year.

Under the North American Industry Classification System (NAICS) the facility is classified as 622111, General (except paediatric) hospitals.

For the purposes of estimating emissions from the facility, seven operating scenarios were considered.

<u>New Generator Compound Generator Testing, 50% Load:</u>

- All boilers operating simultaneously at maximum capacity on natural gas
- Two New Generator Compound emergency diesel generators operating at 50% load
- HVAC system operating at maximum capacity

<u>New Generator Compound Generator Testing, 100% Load:</u>

- All boilers operating simultaneously at maximum capacity on natural gas
- One New Generator Compound emergency diesel generator operating at 100% load
- HVAC system operating at maximum capacity

<u>Main Pavilion Generator Testing:</u>

- All boilers operating simultaneously at maximum capacity on natural gas
- One Main Pavilion emergency diesel generator operating at 100% load
- HVAC system operating at maximum capacity

KDC Building Generator Testing:

- All boilers operating simultaneously at maximum capacity on natural gas
- One KDC Building emergency diesel generator operating at 100% load
- HVAC system operating at maximum capacity

Operation of Boilers on No. 2 Fuel Oil:

- All boilers operating simultaneously at maximum capacity on backup fuel oil
- HVAC system operating at maximum capacity

Ethylene Oxide Sterilization:

- 100% Ethylene Oxide Sterilizer/Aerator system operating at maximum capacity

Laboratory Fume Hoods:

- A reasonable worst-case scenario of a chemical spill in a single laboratory fume hood was evaluated. This scenario is based on a worst-case upset condition, where a container of a chemical is accidentally overturned in a fume hood, resulting in the chemical covering the entire bench surface and evaporating.

These scenarios were used as the basis for the dispersion modelling analysis, which was conducted for 30-minute, 1-hour, and 24-hour averaging times. Emission rates were determined through emission factors and engineering calculations.

The facility is located at 399 Bathurst Street, Toronto, Ontario, and is surrounded by residential, commercial residential, and open space land use.

Concentrations at points of impingement were predicted using the U.S. EPA AERMOD version 19191 and ASHRAE 2019 dispersion models. Modelling input and output files have been provided in **Appendix A**.

Predicted concentrations of nitrogen oxides were found to be greater than their respective limits under O. Reg. 419/05 at on-site receptors during Main Pavilion and KDC Building generator testing. A monitoring program was completed by RWDI AIR Inc. from May 2020 to September 2020 for nitrogen oxides at the air handling locations that could be potentially impacted by the routine testing of Main Pavilion and KDC Building generators. Overall, at the completion of the monitoring program, observed average nitrogen oxides results were 0 ppm for 11 of the 12 measurements taken during the test period. On June 6th, during testing of the KDC Building generator, occasional 1 ppm nitrogen oxides readings were observed at the McLaughlin Wing air intake. Therefore, TWH is expected to follow the requirements of O. Reg. 419/05.

Predicted concentrations of nitrogen oxides were also found to be greater than their respective limits under O. Reg. 419/05 at on-site receptors during the operation of boilers on no. 2 fuel oil. However, TWH only operates boilers on no. 2 fuel oil during emergency situations. Therefore, TWH is expected to comply with the requirements of O. Reg. 419/05 under normal operating conditions.

For laboratory fume hoods, the maximum predicted concentration, based on a unit emission rate of 1 g/s, occurred at the McLaughlin Wing Air Intake from the Medicinal Lab Fume Hood Exhaust. Based on the maximum predicted concentration, a total of 47 chemicals of the 196 commonly used laboratory chemicals listed in **Table 5.1g** were determined to be subject to release restrictions. For chemicals that are subject to use restrictions, the last column of **Table 5.1g** (Maximum Volume-based Chemical Usage (mL/hour)) provides the maximum volume of chemical that can be used in all fume hoods to ensure regulatory compliance. A Standard Operating Procedure (SOP) should be implemented to limit the usage of the 47 chemicals in the fume hoods. With the restrictions, predicted concentrations for all contaminants were found to be less than or equal to their respective POI limits. Therefore, TWH is expected to comply with the requirements of O. Reg. 419/05.

Emission Summary Table - New Generator Compound Generator Testing, 50% Load

University Health Network - Toronto Western Hospital RWDI# 1803937

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	3.85E+00	AERMOD	152 [3]	0.5	1,880	Health	Schedule 3	B1	8%
					3	1	400	Health	Schedule 3	B1	<1%
					1	24	200	Health	Guideline	N/A	<1%
On-Site Receptors [4]											
East3	Nitrogen Oxides	10102-44-0	3.85E+00	ASHRAE + AERMOD	324	0.5	500	Health	Schedule 3	B1	65%
					81	1	400	Health	Schedule 3	B1	20%
					32	24	200	Health	Guideline	N/A	16%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] As per MECP Guideline A-11, 1-hr POI concentrations are compared to 30 minute POI limits by multiplying by following standard conversions:

30 minute 1.2

[4] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE			AERMOD		
	0.5-hr	1-hr	24-hr	0.5-hr [3]	1-hr	24-hr
East3	93	76	31	231	4	1

Emission Summary Table - New Generator Compound Generator Testing, 100% Load

University Health Network - Toronto Western Hospital RWDI# 1803937

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	4.57E+00	AERMOD	174 [3]	0.5	1,880	Health	Schedule 3	B1	9%
					3	1	400	Health	Schedule 3	B1	<1%
					1	24	200	Health	Guideline	N/A	<1%
On-Site Receptors [4]											
East2	Nitrogen Oxides	10102-44-0	4.57E+00	ASHRAE + AERMOD	310	0.5	500	Health	Schedule 3	B1	62%
					81	1	400	Health	Schedule 3	B1	20%
					32	24	200	Health	Guideline	N/A	16%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] As per MECP Guideline A-11, 1-hr POI concentrations are compared to 30 minute POI limits by multiplying by following standard conversions:

30 minute 1.2

[4] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE			AERMOD		
	0.5-hr	1-hr	24-hr	0.5-hr [3]	1-hr	24-hr
East2	93	76	31	218	4	1

Emission Summary Table - Main Pavilion Generator Testing, 100% Load

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	5.86E+00	AERMOD	547 [3]	0.5	1,880	Health	Schedule 3	B1	29%
					39	1	400	Health	Schedule 3	B1	10%
					15	24	200	Health	Guideline	N/A	8%
On-Site Receptors											
Main1	Nitrogen Oxides	10102-44-0	5.86E+00	ASHRAE + AERMOD	568	0.5	500	Health	Schedule 3	B1	114%
McLaughlin					319	1	400	Health	Schedule 3	B1	80%
					130	24	200	Health	Guideline	N/A	65%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] As per MECP Guideline A-11, 1-hr POI concentrations are compared to 30 minute POI limits by multiplying by following standard conversions:

30 minute 1.2

[4] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE			AERMOD		
	0.5-hr	1-hr	24-hr	0.5-hr	1-hr	24-hr
Main1	564	--	--	4	--	--
McLaughlin	--	315	129	--	4	1

Emission Summary Table - KDC Building Generator Testing, 100% Load

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	4.37E+00	AERMOD	144 [3]	0.5	1,880	Health	Schedule 3	B1	8%
					39	1	400	Health	Schedule 3	B1	10%
					15	24	200	Health	Guideline	N/A	8%
On-Site Receptors											
McLaughlin	Nitrogen Oxides	10102-44-0	4.37E+00	ASHRAE + AERMOD	1,309	0.5	500	Health	Schedule 3	B1	262%
					319	1	400	Health	Schedule 3	B1	80%
					130	24	200	Health	Guideline	N/A	65%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] As per MECP Guideline A-11, 1-hr POI concentrations are compared to 30 minute POI limits by multiplying by following standard conversions:

30 minute 1.2

[4] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE			AERMOD		
	0.5-hr	1-hr	24-hr	0.5-hr	1-hr	24-hr
McLaughlin	1,304	315	129	5	4	1

Emission Summary Table - Operation of Boilers on No. 2 Fuel Oil

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	3.44E+00	AERMOD	94	1	400	Health	Schedule 3	B1	24%
					36	24	200	Health	Schedule 3	B1	18%
On-Site Receptors											
McLaughlin	Nitrogen Oxides	10102-44-0	3.44E+00	ASHRAE + AERMOD	766	1	400	Health	Schedule 3	B1	192%
					314	24	200	Health	Schedule 3	B1	157%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE		AERMOD	
	1-hr	24-hr	1-hr	24-hr
McLaughlin	760	312	6	1

Emission Summary Table - Ethylene Oxide Sterilization

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Ethylene Oxide	75-21-8	#N/A	AERMOD	1.50E-04	24	0.2	Health	Schedule 3	B1	<1%
					1.50E-04	24	20	Health	Schedule 3	B1	<1%
On-Site Receptors											
McLaughlin	Ethylene Oxide	75-21-8	#N/A	ASHRAE	1.16E-02	24	0.2	Health	Schedule 3	B1	6%
					1.16E-02	24	20	Health	Schedule 3	B1	<1%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

Emission Summary Table - Laboratory Fume Hoods

University Health Network - Toronto Western Hospital

RWDI# 1803937

Receptor	Contaminant	CAS Number	Usage Restriction?	Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)				MECP POI Limit [1] (µg/m³)				Limiting Effect				Regulation Schedule #				Percentage of MECP POI Limit [2] (%)			
						24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17
Property Line	Acetaldehyde	75-07-0	Yes	2.41E-01	AERMOD	2.49E+02	--	5.00E+02	--	5.00E+02	--	5.00E+02	--	Health	--	Health	--	3	--	3	--	49.80%	--	100.00%	--
Property Line	Acetic Acid	64-19-7	No	7.65E-02	AERMOD	5.50E+00	--	--	--	2.50E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Acetone	67-64-1	No	1.17E+00	AERMOD	8.43E+01	--	--	--	1.19E+04	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Acetonitrile	75-05-8	No	3.26E-01	AERMOD	2.35E+01	--	--	--	7.00E+01	--	--	--	Health	--	--	--	3	--	--	--	33.58%	--	--	--
Property Line	Acetophenone	98-86-2	No	2.51E-03	AERMOD	--	4.34E+00	--	7.16E+00	--	1.17E+03	--	8.50E+02	--	Health	--	Odour	--	Guideline	--	Guideline	--	<1%	--	<1%
Property Line	Acetylene	74-86-2	No	7.10E-02	AERMOD	5.11E+00	--	--	--	5.60E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Acrolein	107-02-8	Yes	2.60E-03	AERMOD	4.00E-01	4.50E+00	--	--	4.00E-01	4.50E+00	--	--	Health	Health	--	--	3	3	--	--	100.00%	100.00%	--	--
Property Line	Acrylonitrile	107-13-1	Yes	8.33E-03	AERMOD	6.00E-01	--	--	--	6.00E-01	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Allyl Glycidyl Ether	106-92-3	No	3.10E-02	AERMOD	2.23E+00	--	--	--	6.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	3.72%	--	--	--
Property Line	Ammonia	7664-41-7	No	4.64E-02	AERMOD	3.34E+00	--	--	--	1.00E+02	--	--	--	Health	--	--	--	3	--	--	--	3.34%	--	--	--
Property Line	Ammonium Chloride	12125-02-9	No	5.19E-03	AERMOD	3.73E-01	--	--	--	1.20E+02	--	--	--	Particulate	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Arsine	7784-42-1	Yes	4.82E-03	AERMOD	5.00E+00	--	1.00E+01	--	5.00E+00	--	1.00E+01	--	Health	--	Health	--	3	--	3	--	100.00%	--	100.00%	--
Property Line	Benzothiazole	95-16-9	No	2.51E-01	AERMOD	1.81E+01	--	--	--	7.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	25.83%	--	--	--
Property Line	Benzoyl Chloride	98-88-4	No	4.65E-03	AERMOD	3.35E-01	--	--	--	1.25E+02	--	--	--	Corrosion and Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Benzyl Alcohol	100-51-6	No	7.46E-04	AERMOD	5.37E-02	--	--	--	8.80E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Biphenyl, 1,1-	92-52-4	No	6.28E-05	AERMOD	--	1.08E-01	--	--	--	6.00E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Boron Tribromide	10294-33-4	No	3.70E-01	AERMOD	2.67E+01	--	--	--	3.50E+01	--	--	--	Corrosion	--	--	--	3	--	--	--	76.15%	--	--	--
Property Line	Boron Trichloride	10294-34-5	No	3.19E-01	AERMOD	2.30E+01	--	--	--	3.50E+01	--	--	--	Corrosion	--	--	--	3	--	--	--	65.67%	--	--	--
Property Line	Bromine	7726-95-6	Yes	2.78E-01	AERMOD	2.00E+01	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Bromoform	75-25-2	No	7.21E-02	AERMOD	5.19E+00	--	--	--	5.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	9.44%	--	--	--
Property Line	Butanol, n-	71-36-3	No	3.37E-02	AERMOD	2.43E+00	--	--	9.61E+01	9.20E+02	--	--	2.10E+03	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	4.57%
Property Line	Butoxy-2-Propanol, 1-	5131-66-8	No	5.64E-03	AERMOD	4.06E-01	--	--	--	3.30E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Butyl Acetate, n-	123-86-4	No	8.05E-02	AERMOD	--	1.39E+02	--	2.29E+02	--	1.50E+04	--	1.00E+03	--	Health	--	Odour	--	Guideline	--	Guideline	--	<1%	--	22.94%
Property Line	Butyl Acrylate, n-	141-32-2	No	3.64E-02	AERMOD	2.62E+00	--	--	--	1.20E+02	--	--	--	Particulate	--	--	--	Guideline	--	--	--	2.18%	--	--	--
Property Line	Carbon Disulphide	75-15-0	No	2.17E+00	AERMOD	1.56E+02	--	--	--	3.30E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	47.31%	--	--	--
Property Line	Carbon Tetrachloride	56-23-5	Yes	3.33E-02	AERMOD	2.40E+00	--	--	--	2.40E+00	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Chlorine	7782-50-5	Yes	8.07E-02	AERMOD	1.00E+01	--	--	2.30E+02	1.00E+01	--	--	2.30E+02	Health	--	--	Odour	3	--	--	Guideline	100.00%	--	--	100.00%
Property Line	Chlorine Dioxide	10049-04-4	Yes	2.78E-02	AERMOD	2.00E+00	--	--	--	2.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Chlorobenzene	108-90-7	No	8.21E-02	AERMOD	--	1.42E+02	--	2.34E+02	--	3.50E+03	--	4.50E+03	--	Health	--	Odour	--	Guideline	--	Guideline	--	4.05%	--	5.20%
Property Line	Chlorodifluoromethane	75-45-6	No	2.36E-01	AERMOD	1.70E+01	--	--	--	3.50E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Chloroethane	75-00-3	No	1.76E-01	AERMOD	1.27E+01	--	--	--	5.60E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Chloroform	67-66-3	Yes	1.39E-02	AERMOD	1.00E+00	--	--	--	1.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Cresol (o, m, & p-Isomers)	1319-77-3	No	1.27E-03	AERMOD	9.16E-02	--	--	--	7.50E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Cyanogen Chloride	506-77-4	Yes	1.67E-01	AERMOD	1.20E+01	--	--	--	1.20E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Cyclohexane	110-82-7	No	5.52E-01	AERMOD	3.97E+01	--	--	--	6.10E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Decene, 1-	872-05-9	No	1.00E-02	AERMOD	7.21E-01	--	--	--	6.00E+04	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Di(2-Ethylhexyl) Phthalate	117-81-7	No	6.60E-10	AERMOD	4.75E-08	--	--	--	5.00E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Diacetone Alcohol	123-42-2	No	1.11E-02	AERMOD	--	--	--	3.15E+01	--	--	--	1.35E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	2.34%
Property Line	Diazinon	333-41-5	No	7.31E-07	AERMOD	5.26E-05	--	--	--	3.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Diborane	19287-45-7	No	7.54E-02	AERMOD	5.43E+00	--	--	--	1.00E+01	--	--	--	Health	--	--	--	3	--	--	--	54.28%	--	--	--
Property Line	Dibutyl Phthalate	84-74-2	No	1.51E-07	AERMOD	1.09E-05	--	--	--	5.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dichloro-1,1,2,2,-Tetrafluoroethane, 1,2	76-14-2	No	4.66E-01	AERMOD	3.35E+01	--	--	--	7.00E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dichlorobenzene, o- (1,2-)	95-50-1	No	1.17E-02	AERMOD	--	2.02E+01	--	--	--	3.05E+04	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Dichlorobenzene, p- (1,4-)	106-46-7	No	1.50E-02	AERMOD	1.08E+00	--	--	--	9.50E+01	--	--	--	Health	--	--	--	3	--	--	--	1.14%	--	--	--
Property Line	Dichloroethane, 1,1-	75-34-3	No	1.61E+00	AERMOD	1.16E+02	--	--	--	1.65E+02	--	--	--	Health	--	--	--	3	--	--	--	70.31%	--	--	--
Property Line	Dichloroethylene, Cis-1,2-	156-59-2	No	1.41E+00	AERMOD	1.01E+02	--	--	--	1.05E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	96.56%	--	--	--
Property Line	Dichloroethylene, Sym-1,2-	540-59-0	Yes	1.46E+00	AERMOD	1.05E+02	--	--	--	1.05E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Dichloroethylene, Trans-1,2-	156-60-5	Yes	1.46E+00	AERMOD	1.05E+02	--	--	--	1.05E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Diethyl Phthalate	84-66-2	No	1.68E-04	AERMOD	1.21E-02	--	--	--	1.25E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Diethylene Glycol Monoethyl Ether	111-90-0	No	8.81E-04	AERMOD	--	--	--	2.51E+00	--	--	--	1.10E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%
Property Line	Diethylene Glycol Monomethyl Ether	111-77-3	No	1.23E-03	AERMOD	8.87E-02	--	--	--	1.20E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Difluorodichloromethane	75-71-8	No	3.30E-01	AERMOD	2.37E+01	--	--	--	5.00E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Diisobutyl Ketone	108-83-8	No	1.13E-02	AERMOD	8.11E-01	--	--	3.21E+01	3.50E+03	--	--	6.49E+02	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	4.95%
Property Line	Dimethyl Acetamide, n-	127-19-5	No	3.31E-03	AERMOD	2.38E-01	--	--	--	3.00E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dimethyl Disulphide	624-92-0	Yes	1.96E-02	AERMOD	--	--	--	5.60E+01	--	--	--	5.60E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100.00%
Property Line	Dimethyl Phthalate	131-11-3	No	7.55E-05	AERMOD	5.44E-03	--	--	--	1.25E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dimethyl Sulfoxide	67-68-5	No	3.69E-03	AERMOD	2.65E-01	--	--	--	2.10E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dimethyl Sulphide	75-18-3	Yes	1.05E-02	AERMOD	--	--	--	3.00E+01	--	--	--	3.00E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100.00%
Property Line	Dimethyl-1,3-Diaminopropane, n-	109-55-7	No	3.03E-02	AERMOD	2.18E+00	--	--	--	2.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	10.89%	--	--	--
Property Line	Dioxolane, 1,3-	646-06-0	Yes	1.39E-01	AERMOD	1.00E+01	--	--	--	1.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Ethoxyethanol, 2-	110-80-5	No	3.17E-02	AERMOD	2.28E+00	--	--	9.04E+01	3.80E+02	--	--	1.10E+03	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	8.22%
Property Line	Ethoxyethyl Acetate, 2-	111-15-9	No	1.24E-02	AERMOD	8.89E-01	--	--	3.52E+01	5.40E+02	--	--	3.00E+02	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	11.74%
Property Line	Ethyl Acetate	141-78-6	No	5.11E-01	AERMOD	--	8.83E+02	--	--	--	1.90E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	4.65%	--	--
Property Line	Ethyl Acrylate	140-88-5	Yes	2.60E-03	AERMOD	--	4.50E+00	--	--	--	4.50E+00	--	--	--	Odour	--	--	--	Guideline	--	--	--	100.00%	--	--
Property Line	Ethyl Alcohol	64-17-5	No	2.36E-01	AERMOD	--	4.08E+02	--	--	--	1.90E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	2.15%	--	--
Property Line	Ethyl Benzene	100-41-4	No	6.36E-02	AERMOD	4.58E+00	--	--	1.81E+02	1.00E+03	--	--	1.90E+03	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	9.54%
Property Line	Ethyl Ether	60-29-7	Yes	3.33E-01	AERMOD	1.77E+02	--	--	9.50E+02	8.00E+03	--	--	9.50E+02	Health	--	--	Odour	3	--	--	Guideline	2.22%	--	--	100.00%
Property Line	Ethyl Hexanol, 2-	104-76-7	No	9.30E-04	AERMOD	--	1.61E+00	--	--	--	6.00E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Ethyl-3-Ethoxypropionate	763-69-9	No	7.54E-03	AERMOD	--	--	--	2.15E+01	--	--	--	2.00E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	10.74%
Property Line	Ethylene Dibromide	106-93-4	Yes	4.17E-02	AERMOD	3.00E+00	--	--	--	3.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Ethylene Dichloride	107-06-2	Yes	2.78E-02	AERMOD	2.00E+00	--	--	--	2.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Ethylene glycol butyl ether Butyl cellosolve	111-76-2	No	7.36E-03	AERMOD	5.30E-01	--	--	2.10E+01	2.40E+03	--	--	5.00E+02	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	4.19%
Property Line	Ethylene Glycol Dinitrate	628-96-6	No	5.31E-04	AERMOD	3.82E-02	--	--	--	3.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	1.27%	--	--	--
Property Line	Ethylene Glycol Monobutyl Ether Acetate	112-07-2	No	2.54E-03	AERMOD	1.83E-01	--	--	7.25E+00	3.25E+03	--	--	7.00E+02	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	1.04%
Property Line	Ethylene Oxide	75-21-8	Yes	2.78E-03	AERMOD	2.00E-01	--	--	--	2.00E-01	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Formaldehyde Solution (37 %)	50-00-0	No	4.33E-03	AERMOD	3.11E-01	--	--	--	6.50E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Formic Acid	64-18-6	No	1.28E-01	AERMOD	9.23E+00	--	--	--	5.00E+02	--	--	--	Health	--	--	--	3	--	--	--	1.85%	--	--	--

Emission Summary Table - Laboratory Fume Hoods

University Health Network - Toronto Western Hospital

RWDI# 1803937

Receptor	Contaminant	CAS Number	Usage Restriction?	Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)				MECP POI Limit [1] (µg/m³)				Limiting Effect				Regulation Schedule #				Percentage of MECP POI Limit [2] (%)			
						24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17
Property Line	Furfural	98-01-1	No	1.44E-02	AERMOD	--	2.49E+01	--	--	--	1.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	2.49%	--	--
Property Line	Furfuryl Alcohol	98-00-0	No	4.76E-03	AERMOD	3.43E-01	--	--	--	1.00E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Glutaraldehyde (100 %)	111-30-8	No	3.87E-03	AERMOD	2.79E-01	--	--	1.10E+01	1.40E+01	--	--	3.50E+01	Health	--	--	Health	Guideline	--	--	Guideline	1.99%	--	--	31.55%
Property Line	Glutaraldehyde (50 %)	111-30-8	No	5.90E-04	AERMOD	4.25E-02	--	--	1.68E+00	1.40E+01	--	--	3.50E+01	Health	--	--	Health	Guideline	--	--	Guideline	<1%	--	--	4.81%
Property Line	Heptane, n-	142-82-5	No	2.59E-01	AERMOD	1.87E+01	--	--	--	1.10E+04	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hexachlorocyclopentadiene	77-47-4	No	1.12E-03	AERMOD	8.05E-02	--	--	--	2.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	4.03%	--	--	--
Property Line	Hexamethyldisilazane	999-97-3	Yes	2.78E-02	AERMOD	2.00E+00	--	--	--	2.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Hexamethylene Diisocyanate (HDI) Biuret (HDI-Bt)	4035-89-6	No	8.17E-07	AERMOD	5.88E-05	--	--	--	3.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hexamethylene Diisocyanate (HDI) Isocyanurate	3779-63-3	No	5.87E-11	AERMOD	4.22E-09	--	--	--	3.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hexamethylene Diisocyanate (HDI) Monomer	822-06-0	Yes	4.17E-04	AERMOD	3.00E-02	--	--	--	3.00E-02	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Hexamethylene Diisocyanate (HDI) Polyisocyanate	28182-81-2	No	8.26E-07	AERMOD	5.95E-05	--	--	--	3.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hexane, n-	110-54-3	No	1.57E+00	AERMOD	1.13E+02	--	--	--	2.50E+03	--	--	--	Health	--	--	--	3	--	--	--	4.51%	--	--	--
Property Line	Hexylene Glycol	107-41-5	No	4.94E-04	AERMOD	--	8.53E-01	--	--	--	1.20E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Hydrobromic Acid (50%)	10035-10-6	No	2.40E-03	AERMOD	--	4.14E+00	--	--	--	6.68E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Hydrochloric Acid (10%)	7647-01-0	No	2.54E-05	AERMOD	1.83E-03	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hydrochloric Acid (20 %)	7647-01-0	No	1.23E-03	AERMOD	8.84E-02	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hydrochloric Acid (30 %)	7647-01-0	No	5.86E-02	AERMOD	4.22E+00	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	21.09%	--	--	--
Property Line	Hydrochloric Acid (35 %)	7647-01-0	Yes	2.78E-01	AERMOD	2.00E+01	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Hydrochloric Acid (40 %)	7647-01-0	Yes	2.78E-01	AERMOD	2.00E+01	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Hydrofluoric Acid (30%)	7664-39-3	No	4.09E-03	AERMOD	2.94E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	34.23%	--	--	--
Property Line	Hydrofluoric Acid (40%)	7664-39-3	Yes	1.19E-02	AERMOD	8.60E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Hydrofluoric Acid (50%)	7664-39-3	Yes	1.19E-02	AERMOD	8.60E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Hydrofluoric Acid (60%)	7664-39-3	Yes	1.19E-02	AERMOD	8.60E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Hydrogen Bromide	10035-10-6	No	2.20E-01	AERMOD	--	3.81E+02	--	--	--	6.68E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	57.03%	--	--
Property Line	Hydrogen Chloride	7647-01-0	No	9.94E-02	AERMOD	7.15E+00	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	35.76%	--	--	--
Property Line	Hydrogen Cyanide	74-90-8	Yes	1.11E-01	AERMOD	8.00E+00	--	--	--	8.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Hydrogen Fluoride	7664-39-3	Yes	1.19E-02	AERMOD	8.60E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Hydrogen Peroxide (35 %)	7722-84-1	No	1.61E-03	AERMOD	1.16E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Hydrogen Peroxide (50 %)	7722-84-1	No	2.55E-03	AERMOD	1.84E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Hydrogen Peroxide (70 %)	7722-84-1	No	4.15E-03	AERMOD	2.99E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Hydrogen Peroxide (90 %)	7722-84-1	No	6.32E-03	AERMOD	4.55E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	1.52%	--	--	--
Property Line	Hydrogen Sulphide	7783-06-4	Yes	4.56E-03	AERMOD	6.69E+00	--	--	1.30E+01	7.00E+00	--	--	1.30E+01	Health	--	--	Odour	3	--	--	3	95.51%	--	--	100.00%
Property Line	Isobutanol	78-83-1	No	5.43E-02	AERMOD	3.91E+00	--	--	1.55E+02	4.60E+03	--	--	2.34E+03	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	6.62%
Property Line	Isobutyl Acetate	110-19-0	No	1.15E-01	AERMOD	--	--	--	3.29E+02	--	--	--	1.66E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	19.82%
Property Line	Isopropyl Acetate	108-21-4	No	3.64E-01	AERMOD	--	--	--	1.04E+03	--	--	--	2.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	51.93%
Property Line	Isopropyl Alcohol	67-63-0	No	2.09E-01	AERMOD	1.51E+01	--	--	--	7.30E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Isopropyl Benzene	98-82-8	No	2.97E-02	AERMOD	2.14E+00	--	--	--	4.00E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Isopropyl Ether	108-20-3	No	8.69E-01	AERMOD	6.25E+01	--	--	--	1.10E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Malathion	121-75-5	No	1.56E-06	AERMOD	1.13E-04	--	--	--	1.20E+02	--	--	--	Particulate	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Mercury (Hg)	7439-97-6	No	2.42E-05	AERMOD	1.74E-03	--	--	--	2.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Methacrylic Acid	79-41-4	No	5.39E-03	AERMOD	3.88E-01	--	--	--	2.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Methane Diphenyl Diisocyanate (MDI)	101-68-8	No	3.37E-08	AERMOD	2.42E-06	--	--	--	7.00E-01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Methanol	67-56-1	No	4.02E-01	AERMOD	2.90E+01	--	--	--	4.00E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Methyl Acrylate	96-33-3	Yes	2.32E-03	AERMOD	--	4.00E+00	--	--	--	4.00E+00	--	--	--	Odour	--	--	--	Guideline	--	--	--	100.00%	--	--
Property Line	Methyl Bromide	74-83-9	No	2.59E-01	AERMOD	1.86E+01	--	--	--	1.35E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	1.38%	--	--	--
Property Line	Methyl Chloride	74-87-3	No	1.38E-01	AERMOD	9.90E+00	--	--	--	3.20E+02	--	--	--	Health	--	--	--	3	--	--	--	3.10%	--	--	--
Property Line	Methyl Chloroform	71-55-6	No	1.06E+00	AERMOD	7.61E+01	--	--	--	1.15E+05	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Methyl Ethyl Ketone	78-93-3	No	4.47E-01	AERMOD	3.22E+01	--	--	--	1.00E+03	--	--	--	Health	--	--	--	3	--	--	--	3.22%	--	--	--
Property Line	Methyl Isobutyl Ketone	108-10-1	No	1.24E-01	AERMOD	8.91E+00	--	--	--	1.20E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Methyl Isocyanate	624-83-9	Yes	1.39E-02	AERMOD	1.00E+00	--	--	--	1.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Methyl Mercaptan	74-93-1	Yes	4.56E-03	AERMOD	--	--	--	1.30E+01	--	--	--	1.30E+01	--	--	--	Odour	--	--	--	3	--	--	--	100.00%
Property Line	Methyl Methacrylate	80-62-6	No	2.43E-01	AERMOD	1.75E+01	--	--	--	8.60E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	2.04%	--	--	--
Property Line	Methyl Salicylate	119-36-8	No	8.25E-04	AERMOD	5.94E-02	--	--	--	1.00E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Methyl Tert-Butyl Ether	1634-04-4	No	1.39E+00	AERMOD	1.00E+02	--	--	--	7.00E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	1.43%	--	--	--
Property Line	Methyl-2-Hexanone, 5-	110-12-3	No	3.34E-02	AERMOD	--	--	--	9.52E+01	--	--	--	6.30E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	15.11%
Property Line	Methylal	109-87-5	No	2.14E+00	AERMOD	1.54E+02	--	--	--	6.20E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	2.49%	--	--	--
Property Line	Methylcyclopentadienyl Manganese Tricarbonyl	12108-13-3	No	3.30E-04	AERMOD	2.37E-02	--	--	--	1.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Methylene Chloride	75-09-2	No	2.82E+00	AERMOD	2.03E+02	--	--	--	2.20E+02	--	--	--	Health	--	--	--	3	--	--	--	92.31%	--	--	--
Property Line	Methylene Iodide	75-11-6	No	1.34E-02	AERMOD	9.68E-01	--	--	--	6.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	1.49%	--	--	--
Property Line	Monomethyl Amine (40%)	74-89-5	Yes	3.47E-01	AERMOD	2.50E+01	--	--	--	2.50E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Naphtha (Mineral Spirits)	8030-30-6	No	3.03E-02	AERMOD	2.18E+00	--	--	--	2.60E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Naphthalene	91-20-3	No	5.77E-04	AERMOD	4.16E-02	--	--	1.65E+00	2.25E+01	--	--	5.00E+01	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	3.29%
Property Line	Naphthol, 1-	90-15-3	No	7.16E-03	AERMOD	5.15E-01	--	--	--	1.00E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Nickel Carbonyl	13463-39-3	Yes	6.95E-03	AERMOD	5.00E-01	--	--	--	5.00E-01	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Nitric Acid (70 %)	7697-37-2	No	2.29E-02	AERMOD	1.65E+00	--	--	--	3.50E+01	--	--	--	Corrosion	--	--	--	3	--	--	--	4.70%	--	--	--
Property Line	Nitroglycerin	55-63-0	No	2.82E-06	AERMOD	2.03E-04	--	--	--	3.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Nitrous Oxide	10024-97-2	No	1.20E-01	AERMOD	8.63E+00	--	--	--	9.00E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Octane	111-65-9	No	8.36E-02	AERMOD	--	--	--	2.38E+02	--	--	--	6.18E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%
Property Line	Oleic Acid	112-80-1	No	5.42E-08	AERMOD	--	9.37E-05	--	--	--	5.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Oxalic Acid	144-62-7	No	7.25E-06	AERMOD	5.22E-04	--	--	--	2.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Oxo-Heptyl Acetate	90438-79-2	No	3.32E-03	AERMOD	2.39E-01	--	--	--	8.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Oxo-Hexyl Acetate	88230-35-7	No	9.34E-03	AERMOD	6.72E-01	--	--	--	8.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Ozone	10028-15-6	Yes	9.55E-02	AERMOD	--	1.65E+02	--	--	--	1.65E+02	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--
Property Line	Pentaborane	19624-22-7	Yes	1.39E-02	AERMOD	1.00E+00	--	--	--	1.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Pentachlorophenol	87-86-5	No	1.50E-06	AERMOD	1.08E-04	--	--	--	2.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Perchloroethylene	127-18-4	No	1.83E-01	AERMOD	1.32E+01	--	--	--	3.60E+02	--	--	--	Health	--	--	--	3	--	--	--	3.65%	--	--	--
Property Line	Phenol	108-95-2	No	2.57E-03	AERMOD	1.85E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--

Emission Summary Table - Laboratory Fume Hoods

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Usage Restriction?	Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)				MECP POI Limit [1] (µg/m³)				Limiting Effect				Regulation Schedule #				Percentage of MECP POI Limit [2] (%)			
						24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17
Property Line	Phosgene	75-44-5	No	2.70E-01	AERMOD	1.94E+01	--	--	--	4.50E+01	--	--	--	Health	--	--	--	3	--	--	--	43.12%	--	--	--
Property Line	Phosphine	7803-51-2	No	9.26E-02	AERMOD	6.67E+00	--	--	--	1.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	66.70%	--	--	--
Property Line	Phosphoric Acid (75 %)	7664-38-2	No	7.24E-05	AERMOD	5.21E-03	--	--	--	7.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Phosphoric Acid (85 %)	7664-38-2	No	1.12E-04	AERMOD	8.03E-03	--	--	--	7.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Phosphorus Oxychloride	10025-87-3	Yes	1.67E-01	AERMOD	1.20E+01	--	--	--	1.20E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Polymeric Methane Diphenyl Diisocyanate (PMDI)	9016-87-9	No	1.68E-08	AERMOD	1.21E-06	--	--	--	7.00E-01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Propionaldehyde	123-38-6	Yes	3.51E-03	AERMOD	--	--	--	1.00E+01	--	--	--	1.00E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100.00%
Property Line	Propionic Acid	79-09-4	No	2.29E-02	AERMOD	--	3.96E+01	--	--	--	1.00E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	39.61%	--	--
Property Line	Propyl Acetate, n-	109-60-4	No	2.09E-01	AERMOD	1.50E+01	--	--	--	6.60E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Propyl Alcohol, n-	71-23-8	No	9.28E-02	AERMOD	6.68E+00	--	--	--	1.60E+04	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Propylene	115-07-1	No	1.15E-01	AERMOD	8.26E+00	--	--	--	4.00E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Propylene Dichloride	78-87-5	No	3.60E-01	AERMOD	2.59E+01	--	--	--	2.40E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	1.08%	--	--	--
Property Line	Propylene Glycol	57-55-6	No	8.22E-04	AERMOD	5.92E-02	--	--	--	1.20E+02	--	--	--	Particulate	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Propylene Glycol 1-Methyl Ether	107-98-2	No	7.08E-02	AERMOD	--	--	--	2.02E+02	--	--	--	1.21E+05	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%
Property Line	Propylene Glycol-1-Methyl Ether-2-Acetate	108-65-6	No	2.52E-02	AERMOD	1.81E+00	--	--	--	5.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Propylene Oxide	75-56-9	Yes	2.08E-02	AERMOD	1.50E+00	--	--	--	1.50E+00	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Pyridine	110-86-1	Yes	2.81E-02	AERMOD	8.37E+00	--	--	8.00E+01	1.50E+02	--	--	8.00E+01	Health	--	--	Odour	Guideline	--	--	Guideline	5.58%	--	--	100.00%
Property Line	Silane	7803-62-5	No	8.75E-02	AERMOD	6.30E+00	--	--	--	1.50E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	4.20%	--	--	--
Property Line	Stoddard Solvent	8052-41-3	No	2.90E-02	AERMOD	2.09E+00	--	--	--	2.60E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Styrene, Monomer	100-42-5	No	3.81E-02	AERMOD	2.74E+00	--	--	--	4.00E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Sulphur Hexafluoride	2551-62-4	No	3.98E-01	AERMOD	2.87E+01	--	--	--	6.00E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Sulphuric Acid (100 %)	7664-93-9	No	2.69E-07	AERMOD	1.94E-05	--	--	--	5.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Sulphuric Acid (78 %)	7664-93-9	No	2.71E-09	AERMOD	1.95E-07	--	--	--	5.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Sulphuric Acid (93 %)	7664-93-9	No	1.17E-07	AERMOD	8.40E-06	--	--	--	5.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Sulphuric Acid (98 %)	7664-93-9	No	2.21E-07	AERMOD	1.59E-05	--	--	--	5.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Tetrahydrofuran	109-99-9	No	8.71E-01	AERMOD	6.27E+01	--	--	--	9.30E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Toluene	108-88-3	No	1.80E-01	AERMOD	1.30E+01	--	--	--	2.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Toluene Di-Isocyanate, 2,4-	584-84-9	No	2.13E-04	AERMOD	1.53E-02	--	--	--	2.00E-01	--	--	--	Health	--	--	--	3	--	--	--	7.67%	--	--	--
Property Line	Toluene Di-Isocyanate, 2,4- and 2,6- (Mixed Isomers)	26471-62-5	No	1.61E-04	AERMOD	1.16E-02	--	--	--	2.00E-01	--	--	--	Health	--	--	--	3	--	--	--	5.81%	--	--	--
Property Line	Trichloro-1,2,2-Trifluoroethane, 1,2,2-	76-13-1	No	4.03E+00	AERMOD	2.90E+02	--	--	--	8.00E+05	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Trichlorobenzene, 1,2,4-	120-82-1	No	4.52E-03	AERMOD	3.25E-01	--	--	--	4.00E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Trichloroethylene (TCE)	79-01-6	Yes	1.67E-01	AERMOD	1.20E+01	--	--	--	1.20E+01	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Trichlorofluoromethane	75-69-4	Yes	8.33E+01	AERMOD	6.00E+03	--	--	--	6.00E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Trifluoroacetic Acid	76-05-1	Yes	2.08E-01	AERMOD	1.50E+01	--	--	--	1.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	100.00%	--	--	--
Property Line	Trimethylamine (40 %)	75-50-3	Yes	2.89E-04	AERMOD	--	5.00E-01	--	--	--	5.00E-01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100.00%	--	--
Property Line	Trimethylbenzene, 1,2,3- (individual isomer or Trimethylbenzene mixture)	526-73-8	No	9.83E-03	AERMOD	7.08E-01	--	--	--	2.20E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Trimethylbenzene, 1,2,4- (individual isomer or Trimethylbenzene mixture)	95-63-6	No	1.47E-02	AERMOD	1.05E+00	--	--	--	2.20E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Trimethylbenzene, 1,3,5- (individual isomer or Trimethylbenzene mixture)	108-67-8	No	1.60E-02	AERMOD	1.15E+00	--	--	--	2.20E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Vinyl Chloride	75-01-4	Yes	1.39E-02	AERMOD	1.00E+00	--	--	--	1.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Vinylidene Chloride	75-35-4	Yes	1.39E-01	AERMOD	1.00E+01	--	--	--	1.00E+01	--	--	--	Health	--	--	--	3	--	--	--	100.00%	--	--	--
Property Line	Xylene (o,m, p-Isomers)	1330-20-7	No	4.99E-02	AERMOD	3.59E+00	--	--	1.42E+02	7.30E+02	--	--	3.00E+03	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	4.74%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- air quality standards in Schedules 1, 2 and 3 of the Regulation; and
- the guidelines for contaminants set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", version 2.0, April 2018.

[2] Contaminants with concentrations that are at 100% if the POI limit have hourly usage restrictions which allow the site to remain in compliance.

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Ontario

Ministry of the Environment and Climate Change

Odour Screening Report

Note: Based on the information you have submitted you are not required to complete any additional documentation at this time as none of the circumstances set out in paragraphs 3 or 5 of section 24 of the Regulation exist at the facility. Please note, additional information may be required from the facility at the discretion of the Ministry. In the event of a conflict between the OSR and the Air Emissions EASR Regulation, the regulatory requirements shall determine the appropriate approach.

Facility Information

Company Name *
University Health Network

Site Name *
Toronto Western Hospital

Site Address - Street information (address that has civic numbering and street information includes street number, name, type and direction)

Unit/Suite Number	Street Number *	Street Name *	
	399	Bathurst Street	
Street Type (Street, Road, etc.)	Street Direction (N, S, E, W, NE, SW, etc.)		PO Box

Survey Address (used for a rural location specified for a subdivided township, an unsubdivided township or unsurveyed territory)

Non Address Information (includes any additional information to clarify client's physical location)

Municipality/Unorganized Township	County/District	
City/Town *	Province *	Postal Code *
Toronto	Ontario	M5T 2S8

Personal Information

Owner Information

Legal Name of Owner

Last Name *	First Name *	Middle Initial
University Health Network	-	

Name of Owner used to carry on business (if different from the Legal Name)

Last Name	First Name	Middle Initial

Address ☐ Same as Site Address

Unit/Suite Number	Street Number *	Street Name *	
	610	University Avenue	
Street Type (Street, Road, etc.)	Street Direction (N, S, E, W, NE, SW, etc.)		PO Box

City/Town *	Province *	Postal Code *
Toronto	Ontario	M5G 2M9

Operator Information

Legal Name of Operator ☐ Same as Owner

Last Name *	First Name *	Middle Initial
Swail	Ron	

Name of Operator used to carry on business (if different from the Legal Name)

Last Name	First Name	Middle Initial

Address ☐ Same as Site Address

Unit/Suite Number	Street Number *	Street Name *
	610	University Avenue

Street Type (Street, Road, etc.)	Street Direction (N, S, E, W, NE, SW, etc.)	PO Box

City/Town *	Province *	Postal Code *
Toronto	Ontario	M5G 2M9

Civic Address (includes street number, name, type and direction)

☑ Same as Site Address

Unit/Suite Number	Street Number *	Street Name *
	399	Bathurst Street

Street Type (Street, Road, etc.)	Street Direction (N, S, E, W, NE, SW, etc.)	PO Box

Municipality	Postal Station

Province/State *	Country *	Postal Code *
Ontario	Canada	M5T 2S8

Telephone Number (include area code) *	Fax Number (including area code)
647 308-2791 ext.	

Email Address
Ron.Swail@uhn.ca

Question 1: What is the primary and secondary NAICS Code at your facility?

62 Health care and social assistance

6221 General medical and surgical hospitals

622111 General (except paediatric) hospitals CAN

Secondary NAICS Code

Select Secondary NAICS Code

Question 2: Please select any of the following Odorous Processes that occur at your facility?

- ☐ Cooking or Drying Animal Products
- ☐ Food Frying
- ☐ Plastic Extrusion and Melting
- ☐ Printing
- ☐ Scented Products Manufacturing
- ☐ Spraying Operations
- ☐ Using Phenolic Resin
- ☐ Wastewater Treatment
- ☑ None of the above

Signature

By completing and signing this form you are verifying that:

- I am the registrant or have been retained by the registrant, for the purposes of completing this Odour Screening Form;
- I have accurately completed the Odour Screening Form and have accurately identified all NAICS Codes, Odorous Processes and setback distances that apply as required;
- An activity engaged in at the facility is prescribed by O. Reg. 1/17.

Preparer

Last Name *	First Name *	Middle Initial
Bailey	Tara	

Title *
Senior Air Quality Engineer

Signature	Date (yyyy/mm/dd) *

Please print this form and ensure that a signed copy is at the facility at all times.

EASR ESDM REPORT SUPPLEMENT

The information contained in this form is intended to satisfy the requirements for an EASR ESDM report supplement under s. 13 of Ontario Regulation 1/17.

General	**O. Reg. 1/17 s.13(1) p.1**
Name of Licensed Engineering Practitioner:	Tara Bailey

Site Ownership & Equipment Operation	**O. Reg. 1/17 s.13(1) p.3 and p.4**
Name of Site Owner (legal name of individual or organization as evidenced by legal documents):	
University Health Network	
Name of Operator (legal name of individual or organization as evidenced by legal documents, if different from above):	
Toronto Western Hospital	

Facility Information	**O. Reg. 1/17 s.13(1) p.5**
Street Information	399 Bathurst Street
Municipality / Township / Territory	Toronto
Postal Code	M5T 2S8

Statement of Proponent	**O. Reg. 1/17 s.13(1) p.6**
I confirm that all information given to the licensed engineering practitioner in order to prepare the EASR ESDM report was complete and accurate.	
Name of Proponent:	Company:
Ron Swail	University Health Network
Signature	Date
Ron Swail Ron Swail (Jun 11, 2021 10:10 EDT)	Jun 11, 2021

Statement of Licensed Engineering Practitioner	**O. Reg. 1/17 s.13(1) p.7**
Accuracy	
I hereby confirm that, based on the information provided by the proponent, the information in the report is accurate as of the date it was signed and sealed.	
Regulatory Compliance	
I hereby confirm that this EASR ESDM report was prepared in accordance with section 26 of Ontario Regulation 419/05 and with subsection 12 (2) of Ontario Regulation 1/17.	
Dispersion Modelling	
I hereby confirm that one or more approved dispersion models were used to prepare the EASR ESDM report and that the models were used in accordance with sections 9 to 17 of Ontario Regulation 419/05.	

Concentration of Contaminants

I hereby confirm that the information set out in the EASR ESDM report under paragraph 5 of subsection 12 (1) of Ontario Regulation 1/17 with respect to the concentration of contaminants is based on existing and proposed discharges.

Minimization of Errors and Omissions

The following methods and procedures that were employed in preparing the report to ensure minimization of errors and omissions:

- All work has been reviewed by a competent individual; and,
- The work has been reviewed by the project proponent.

Operational Parameters

The operational parameters that were determined for the purpose of preparing the EASR ESDM report, including the maximum rates of production, process limits, performance limits and parameters relating to equipment and infrastructure are as follows:

<u>New Generator Compound Generator Testing, 50% Load:</u>

- All boilers operating simultaneously at maximum capacity on natural gas
- Two New Generator Compound emergency diesel generators operating at 50% load
- HVAC system operating at maximum capacity

<u>New Generator Compound Generator Testing, 100% Load:</u>

- All boilers operating simultaneously at maximum capacity on natural gas
- One New Generator Compound emergency diesel generator operating at 100% load
- HVAC system operating at maximum capacity

<u>Main Pavilion Generator Testing:</u>

- All boilers operating simultaneously at maximum capacity on natural gas
- One Main Pavilion emergency diesel generator operating at 100% load
- HVAC system operating at maximum capacity

<u>KDC Building Generator Testing:</u>

- All boilers operating simultaneously at maximum capacity on natural gas
- One KDC Building emergency diesel generator operating at 100% load
- HVAC system operating at maximum capacity

<u>Operation of Boilers on No. 2 Fuel Oil:</u>

- All boilers operating simultaneously at maximum capacity on backup fuel oil
- HVAC system operating at maximum capacity

<u>Ethylene Oxide Sterilization:</u>

- 100% Ethylene Oxide Sterilizer/Aerator system operating at maximum capacity

Laboratory Fume Hoods:

- A reasonable worst-case scenario of a chemical spill in a single laboratory fume hood was evaluated. This scenario is based on a worst-case upset condition, where a container of a chemical is accidentally overturned in a fume hood, resulting in the chemical covering the entire bench surface and evaporating.

Operating and Maintenance Procedures

The operating and maintenance procedures required to ensure that the facility is operating within the operational parameters referred to above, are as follows:

- Implement a Standard Operating Procedure (SOP) to limit the usage of the 47 chemicals in the laboratory fume hoods.
- The inspection and maintenance schedules for all equipment will be followed.

Statement of Licensed Engineering Practitioner – Combustion Equipment **O. Reg. 1/17 s.13(1) p.8**

I hereby confirm that:

- Each piece of combustion equipment listed in subsection (2) of s. 13 of Ontario Regulation 1/17 that is used or proposed to be used at the facility is designed to discharge the contaminants set out in Chapter 1 of the MECP publication "Environmental Activity and Sector Registry - Limits and Other Requirements", version 1.1, dated January 2017, with respect to the piece of combustion equipment in an amount that is less than or equal to the applicable limit set out for the contaminant in that Chapter.
- The basis for my determination with respect to each piece of combustion equipment referred to above is as follows:

Boilers and Heaters:

Source ID	Date Installed or Proposed to be Installed	Date of Most Recent Modification	Maximum Energy Input Capacity (GJ/hr)	Primary Fuel Type	Non-Primary Fuel Type(s)	Annual Hours Non-Primary Fuel(s) Used	Air Pollution Control Equipment Installed or Attached	Total Annual Hours of Intended Use	Emissions Estimation Technique
KDC_SF1001		N/A	19.88	Natural Gas	No. 2 Fuel Oil	0	N/A		Emission Factors
KDC_SF1002		N/A	19.88	Natural Gas	No. 2 Fuel Oil	0	N/A		Emission Factors
KDC_BF		N/A	26.49	Natural Gas	No. 2 Fuel Oil	0	N/A		Emission Factors
KDC_SBF		N/A	26.49	Natural Gas	No. 2 Fuel Oil	0	N/A		Emission Factors

Signature of Licensed Engineering Practitioner

Signature of Licensed Engineering Practitioner:	Date:
Jas Bailey	June 11, 2021

1 INTRODUCTION

1.1 Purpose and Scope of ESDM

This Environmental Activity and Sector Registry (EASR) Emission Summary and Dispersion Modelling (ESDM) report was prepared in support of a registration under Part II.2 of the Environmental Protection Act (EPA) for activities requiring assessment of air, for the applicant's facility located at 399 Bathurst Street, Toronto, Ontario. This registration will replace any existing Environmental Compliance Approvals for air and noise emissions at the facility. This application is being submitted to achieve compliance of University Health Network Toronto Western Hospital (TWH) operations with the requirements of Section 9 of the Environmental Protection Act (EPA), R.S.O. 1990.

1.2 Description of Process and NAICS Code(s)

TWH is an academic health science centre. The facility includes:

- An emergency department
- Clinics and inpatient units
- Arthritis program
- Neuroscience program
- Medical and community programs
- Surgery and critical care programs

Under the North American Industry Classification System (NAICS) the facility is classified as 622111, General (except paediatric) hospitals.

1.3 Description of Products and Raw Materials

TWH is a hospital facility; therefore, a processing capacity is not applicable. Raw materials used at the facility, that relate directly to emissions assessed in this report, include diesel fuel for emergency generators, natural gas and no. 2 fuel oil for boilers, ethylene oxide for the sterilization of equipment, and chemicals related to testing and research used in fume hoods.

1.4 Process Flow Diagram

Figures 1.4a-e in the **Figures Section** provide the process flow diagrams for the facility.

1.5 Operating Schedule

In some portions of TWH, patients and associated staff will be present on a 24-hour basis. Therefore, for the purposes of this application, the facility is assumed to operate 24 hours per day, 365 days per year.

2 INITIAL IDENTIFICATION OF SOURCES & CONTAMINANTS

Table 2.1 in the **Tables Section** provides the Source and Contaminants Identification Table. Detailed source parameters are provided on **Tables 5.1a-g**. A list of the sources included in this ESDM Report is provided below:

2.1 Sources Requiring Registration

- Three natural gas-fired boilers with no. 2 fuel oil backup (Dual Fuel Boiler #1, Dual Fuel Boiler #2, Dual Fuel Boiler #3), each with a maximum heat input rating of 21,500,000 BTU/hr (22,683,790 kJ/hr), located at the Power Plant, and exhausting through the Power Plant boiler exhaust stack (PWP_BoilerExh)
- Two natural gas-fired boilers with no. 2 fuel oil backup (Dual Fuel Boiler #4, Dual Fuel Boiler #5), each with a maximum heat input rating of 16,700,000 BTU/hr (17,619,502 kJ/hr), located at the Power Plant, and exhausting through the Power Plant boiler exhaust stack (PWP_BoilerExh)
- One ethylene oxide sterilization system (MP_ExS12) located at the Main Pavilion
- Two emergency diesel generators (MP_GenExh1, MP_GenExh2), each with a maximum output rating of 880 ekW, and located at the Main Pavilion
- One medicinal lab fume hood exhaust (KDC_ChemLabExh) located at the KDC Building
- Four level 5/6/7/8 wet lab fume hood exhausts (KDC_EF1101, KDC_EF1102, KDC_EF1103, KDC_EF1104) located at the KDC Building
- Two natural gas-fired steam boilers with no. 2 fuel oil backup (KDC_SF1001, KDC_SF1002), each with a maximum heat input rating of 18,844,000 BTU/hr (19,881,551 kJ/hr), and located at the KDC Building
- Two natural gas-fired glycol boilers with no. 2 fuel oil backup (KDC_BF, KDC_SBF), each with a maximum heat input rating of 25,106,000 BTU/hr (26,488,336 kJ/hr), and located at the KDC Building

2.2 Exempt Sources

- One cooling tower (PWP_CT1) with a cooling ton rating of 1,161 tons and located at the Power Plant
- One cooling tower (PWP_CT2) with a cooling ton rating of 3,283 tons and located at the Power Plant
- Two cooling towers (KDC_CT1, KDC_CT2), each with a cooling ton rating of 942 tons and located at the KDC Building

The following sources are exempt from requiring approval under Section 9 of the EPA as per O. Reg. 524/98 but have been included in this assessment to consider like emissions with other sources requiring approval.

- Two emergency diesel generators (GC_GenExh1, GC_GenExh2), each with a maximum output rating of 1,200 ekW, and located at the New Generator Compound
- One medicinal lab air handling unit (KDC_AHU501) with a maximum heat input rating of 1,875,000 BTU/hr (1,978,238 kJ/hr) and located at the KDC Building
- Two emergency diesel generators (KDC_GEN1101Exh, KDC_GEN1102Exh), each with a maximum output rating of 1250 ekW, and located at the KDC Building

3 SIGNIFICANCE OF SOURCES & CONTAMINANTS

3.1 Identification of Negligible Sources

3.1.1 Insignificant Sources

KDC_AHU501 was determined to be insignificant.

3.1.2 Rationale for Assessment

3.1.2.1 KDC_AHU501

Section 7.2.2 of the Ministry of the Environment, Conservation and Parks (MECP) Guideline A-10: Procedure for Preparing an ESDM Report, Version 4.1, March 2018 (Guideline A-10) states "sources that, in combination, represent less than 5% of total property-wide emissions of a contaminant can, in many cases, be considered insignificant". Emissions from KDC_AHU501 represent less than 5% of the total property-wide emissions and have therefore been considered insignificant.

3.2 Identification of Insignificant Contaminants

3.2.1 Insignificant Contaminants

The following contaminants were determined to be insignificant:

- Contaminants other than nitrogen oxides from natural gas-fired combustion equipment
- Contaminants other than nitrogen oxides from emergency generators
- Contaminants other than nitrogen oxides from the operation of boilers on no. 2 Fuel Oil

3.2.2 Rationale for Assessment

3.2.2.1 Contaminants other than Nitrogen Oxides from Natural Gas-Fired Combustion Equipment

As per the MECP Guideline A-10, the significant contaminant for the combustion of natural gas and propane may be nitrogen oxides. Other contaminants, for this type of source, are generally emitted in negligible amounts.

3.2.2.2 Contaminants other than Nitrogen Oxides from Emergency Generators

The MECP emergency generator guideline, Information for Proponents Applying for a Certificate of Approval (Air) for an Emergency Generator, August 2008, states that the significant contaminants emitted to the atmosphere from an emergency generator are nitrogen oxides. Other contaminants, for these types of sources, are generally emitted in negligible amounts.

3.2.2.3 Contaminants other than nitrogen oxides from the operation of boilers on No. 2 Fuel Oil

The main contaminants of interest from the operation of boilers on no. 2 Fuel Oil are nitrogen oxides, sulphur dioxide, carbon monoxide, and particulate matter. Nitrogen oxides is the limiting contaminant, based on the ratio of its site-wide emissions to the applicable Schedule 3 Standard. A comparison of the calculated site-wide emissions from the operation of boilers on no. 2 Fuel Oil at the facility to the Schedule 3 Standards for each contaminant is presented in **Table 3.2.2**. Since nitrogen oxides is the limiting contaminant, sulphur dioxide, carbon monoxide, and particulate matter were not considered in this assessment.

4 OPERATING CONDITIONS, EMISSIONS ESTIMATING & DATA QUALITY

4.1 Description of Operating Conditions

Section 10 of O. Reg. 419/05 states that, for the purposes of an ESDM report, an acceptable operating scenario to consider is one that would result, for a given contaminant, in the highest concentration of that contaminant at Points of Impingement that the facility is capable of causing. To satisfy this requirement, a maximum production scenario was developed in consultation with TWH.

For the purposes of estimating emissions from the facility, seven operating scenarios were considered.

4.1.1 New Generator Compound Generator Testing, 50% Load:

- All boilers operating simultaneously at maximum capacity on natural gas
- Two New Generator Compound emergency diesel generators operating at 50% load
- HVAC system operating at maximum capacity

4.1.2 New Generator Compound Generator Testing, 100% Load

- All boilers operating simultaneously at maximum capacity on natural gas
- One New Generator Compound emergency diesel generator operating at 100% load
- HVAC system operating at maximum capacity

4.1.3 Main Pavilion Generator Testing

- All boilers operating simultaneously at maximum capacity on natural gas
- One Main Pavilion emergency diesel generator operating at 100% load
- HVAC system operating at maximum capacity

4.1.4 KDC Building Generator Testing

- All boilers operating simultaneously at maximum capacity on natural gas
- One KDC Building emergency diesel generator operating at 100% load
- HVAC system operating at maximum capacity

4.1.5 Operation of Boilers on No. 2 Fuel Oil

- All boilers operating simultaneously at maximum capacity on backup fuel oil
- HVAC system operating at maximum capacity

4.1.6 Ethylene Oxide Sterilization

- 100% Ethylene Oxide Sterilizer/Aerator system operating at maximum capacity

4.1.7 Laboratory Fume Hoods

- A reasonable worst-case scenario of a chemical spill in a single laboratory fume hood was evaluated. This scenario is based on a worst-case upset condition, where a container of a chemical is accidentally overturned in a fume hood, resulting in the chemical covering the entire bench surface and evaporating.

4.2 Explanation of Method Used to Calculate the Emission Rate

4.2.1 Natural Gas-Fired Combustion Equipment

4.2.1.1 Natural Gas-Fired Boilers with No. 2 Fuel Oil Backup

Dual Fuel Boilers

Emission rates for Dual Fuel Boiler #1, Dual Fuel Boiler #2, Dual Fuel Boiler #3, Dual Fuel Boiler #4, and Dual Fuel Boiler #5 were calculated using the individual thermal input for each unit and AP-42 emission factors from Chapter 1.4, Natural Gas Combustion. The boilers were installed at the facility before March 31, 2001 and have not been modified since installation. Further detail is presented in **Appendices B1 and B2**.

Dual Fuel Steam Boilers and Dual Fuel Glycol Boilers

Under O. Reg. 1/17, boilers installed at the facility after March 31, 2001 with a heat input greater than 10.5 GJ/hr are required to meet maximum nitrogen oxides emission intensity rates. For dual-fueled equipment, boiler operation only needs to meet the emission intensity rates for the primary fuel (natural gas) if the secondary fuel (no. 2 fuel oil) is used less than 500 hours per year.

Emissions of nitrogen oxides during operation of Dual Fuel Steam Boiler #1, Dual Fuel Steam Boiler #2, Dual Fuel Glycol Boiler #1, and Dual Fuel Glycol Boiler #2 on natural gas were calculated based on an emission intensity of 26 g/GJ, which represents the maximum allowable emission intensity under O. Reg 1/17. Further detail is presented in **Appendix B3**.

4.2.1.2 Natural Gas-Fired Comfort Heating Equipment

Emission rates for HVAC equipment were calculated using the individual thermal input for each unit and AP-42 emission factors from Chapter 1.4, Natural Gas Combustion. Further detail is presented in **Appendix B4**.

4.2.2 No. 2 Fuel Oil-Fired Combustion Equipment

Emission rates for boilers operating on backup no. 2 fuel oil were calculated using the individual thermal input for each boiler and AP-42 emission factors from Chapter 1.3, Fuel Oil Combustion. Further detail is presented in **Appendix C**.

4.2.3 Emergency Diesel Generators

Emission rates for the New Generator Compound and KDC Building emergency diesel generators were calculated using manufacturer specifications and emissions data. Manufacturer specifications and emissions data for the generators were provided by TWH and are included in **Appendix D**. Emission rates for the Main Pavilion emergency diesel generators were calculated using the engine horsepower for the unit and AP-42 emission factors from Chapter 3.4, Large Stationary Diesel and All Stationary Dual-fuel Engines. Emission rate calculations are provided in **Appendix D**.

4.2.4 Ethylene Oxide Sterilization

The facility operates a 100% Ethylene Oxide Sterilizer/Aerator system. This system uses 100-gram ethylene oxide single dose gas cartridges. The system is preprogrammed with default sterilize/aerate cycles. The shortest (worst-case) cycle operates over 13 hours (1-hour sterilize time, 12-hour aeration time). Therefore, the maximum amount of ethylene oxide that the facility can use in a 24-hour period is approximately 200 grams.

The system is attached to an Ethylene Oxide Disposer. The disposer converts ethylene oxide gas in the exhaust from the sterilizer/aerator to carbon dioxide and water vapour through a catalytic reaction. The disposer operates at 99.9% removal efficiency. Further detail is presented in **Appendix E**.

4.2.5 Laboratory Fume Hoods

The methodology for estimating fume hood emissions is provided in **Appendix F**. These estimates are based on engineering calculations and the physical properties of various potential contaminants. Please refer to this appendix for a full discussion of this approach.

4.3 Sample Calculation for Each Method

Sample calculations for natural gas-fired combustion equipment are provided in **Appendix B**. Sample calculations for no. 2 fuel oil-fired combustion equipment are provided in **Appendix C**. Sample calculations for emergency diesel generators are provided in **Appendix D**. Sample calculations for the ethylene oxide sterilization system are provided in **Appendix E**. Sample calculations for fume hoods are provided in **Appendix F**.

4.4 Assessment of Data Quality for Each Emission Rate

The assessment of data quality for each emission rate is provided in the Source Summary Table and is based on the AP-42 data quality ratings. In summary, the calculated emission rates for combustion of natural gas and no. 2 fuel oil had a data quality rating of Above-Average, the calculated emission rates for emergency diesel generators had a data quality rating of Average, the calculated emission rates for the ethylene oxide sterilization system had a data quality rating of Average, and the calculated emission rates for fume hoods had a data quality rating of Average and Above-Average.

5 SOURCE SUMMARY TABLE & PROPERTY PLAN

5.1 Source Summary Table

Tables 5.1a-g in the **Tables Section** provides the Source Summary Tables for the facility.

5.2 Site plan (Scaleable)

Figure 5.2 in the **Figures Section** provides the site plan for the facility.

6 DISPERSION MODELLING

6.1 Dispersion Modelling Input Summary Table

Table 6.1 in the **Tables Section** provides the Dispersion Modelling Input Summary Table for the facility. Additional information on specific elements of the modelling analysis is provided in the following sections.

6.1.1 Meteorological Conditions

The facility is located in Toronto, Ontario; therefore, the Central Region meteorological data set is recommended by the MECP for use at this site. This includes surface data from Pearson International Airport in Toronto, Ontario and upper air data from Buffalo, New York. Within each region, the MECP provides alternative data sets with the choice of data set depending on the character of the terrain at the study site. The area surrounding the facility is

primarily residential and commercial residential with some open spaces in the vicinity of the site. The default data set for "urban" was used based on the land use patterns surrounding the site. The meteorological data set were pre-processed by the MECP using the 19191 version of AERMET.

The ASHRAE 2019 assessment utilized ASHRAE Fundamentals 2017 to determine a maximum wind speed for the Toronto area. An approach roughness of 3 was used based on the land use patterns surrounding the site.

6.1.2 Area of Modelling Coverage

The area of modelling coverage was designed to meet the requirements outlined in Section 14 of O. Reg. 419/05. A multi-tiered receptor grid was developed as per Section 7.2 of Guideline A-11, Version 3.0, February 2017. Interval spacing was dependent on receptor distance from on-site sources. Receptors on site were removed from the assessment.

Self-contamination impacts were assessed at the facility. These receptor locations are indicated on Figure 5.2 and are described in Table 6.1.2 in the Tables Section. Figure 6.1.2 illustrates the approach used to calculate B-small and B-large for the ASHRAE assessment.

6.1.3 Stack Height for Certain New Sources of Contaminant

All stack heights are within the allowable stack height obtained using the stack height formula defined under Section 15 of O. Reg. 419/05. As such, building downwash effects have been considered in the dispersion modelling by using the US-EPA's Building Profile Input Program (BPIP) associated with the AERMOD model.

Stack heights were also considered for the ASHRAE modelling.

6.1.4 Terrain Data

Terrain information for the area surrounding the facility was obtained from the MECP Regional Meteorological and Terrain Data for Air Dispersion Modelling website. The terrain data is based on the North American Datum 1983 (NAD83) horizontal reference datum. These data were run through the AERMAP terrain pre-processor by the MECP to estimate base elevations for sources and receptors to help the model account for changes in elevation in the surrounding terrain.

The ASHRAE model does not consider terrain.

6.1.5 Averaging Periods Used

One-hour and 24-hour averaging times were used with the AERMOD model to compare to Schedule 3 Standards, Upper Risk Thresholds, and other limits listed in the MECP Workbook Air Contaminants Benchmarks (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants, Version 2.0 - April 2018. Half-hour average values were calculated from the 1-hour predicted concentrations using a factor of 1.2, as given in Table 4.1 of Guideline A-11.

The ASHRAE 2019 model was used with a 15-minute averaging period to compare to Schedule 3 Standards, Upper Risk Thresholds, and other limits listed in the MECP ACB List. Other averaging time values were calculated from the predicted concentrations using the averaging time exponent 0.28, as given in the ASHRAE guidance.

6.2 Land Use Designation Plan

Figure 6.2 in the **Figures Section** provides the zoning documentation.

TWH is bounded by Nassau Street to the north, Leonard Avenue to the east, Dundas Street West to the South, and Bathurst Street to the west. The site is zoned for residential use and surrounded by residential, commercial residential, and open space land uses.

6.3 Dispersion Modelling Input and Output Files

Modelling input and output files have been provided in **Appendix A**.

7 EMISSION SUMMARY TABLE & CONCLUSIONS

7.1 Emission Summary Table

Tables 7.1a-g in the **Tables Section** provides the Emission Summary Table for the facility.

7.2 Contaminants without Standards or Guidelines under O. Reg. 419/05

All the contaminants identified in the emission inventory have established limits under O. Reg. 419/05.

7.3 Conclusions

Concentrations at points of impingement were predicted using the U.S. EPA AERMOD version 19191 and ASHRAE 2019 dispersion models. Modelling input and output files have been provided in **Appendix A**.

Predicted concentrations of nitrogen oxides were found to be greater than their respective limits under O. Reg. 419/05 at on-site receptors during Main Pavilion and KDC Building generator testing. A monitoring program was completed by RWDI AIR Inc. from May 2020 to September 2020 for nitrogen oxides at the air handling locations that could be potentially impacted by the routine testing of Main Pavilion and KDC Building generators. Overall, at the completion of the monitoring program, observed average nitrogen oxides results were 0 ppm for 11 of the 12 measurements taken during the test period. On June 6th, during testing of the KDC Building generator, occasional 1 ppm nitrogen oxides readings were observed at the McLaughlin Wing air intake. The monitoring program results are provided in **Appendix G**. Therefore, TWH is expected to comply with the requirements of O. Reg. 419/05.

Predicted concentrations of nitrogen oxides were also found to be greater than their respective limits under O. Reg. 419/05 at on-site receptors during the operation of boilers on no. 2 fuel oil. However, TWH only operates boilers on no. 2 fuel oil during emergency situations. Therefore, TWH is expected to comply with the requirements of O. Reg. 419/05.

For laboratory fume hoods, the maximum predicted concentration, based on a unit emission rate of 1 g/s, occurred at the McLaughlin Wing Air Intake from the Medicinal Lab Fume Hood Exhaust. Based on the maximum predicted concentration, a total of 47 chemicals of the 196 commonly used laboratory chemicals listed in **Table 5.1g** were determined to be subject to release restrictions. For chemicals that are subject to use restrictions, the last column of **Table 5.1g** (Maximum Volume-based Chemical Usage (mL/hour)) provides the maximum volume of chemical that can be used in all fume hoods to ensure regulatory compliance. A Standard Operating Procedure (SOP) should be implemented to limit the usage of the 47 chemicals in the fume hoods. With the restrictions, predicted concentrations for all contaminants were found to be less than or equal to their respective POI limits. Therefore, TWH is expected to follow the requirements of O. Reg. 419/05.

TABLES

2.1 Sources and Contaminant Identification Table

RWDI# 1803937

University Health Network - Toronto Western Hospital

Source Information						Expected Contaminants	Included in Modelling? (Yes / No)	Significant? (Yes / No)	Reference
Source ID	Previous Source ID	Source Description or Title	Thermal Input Rating BTU/hr	Thermal Input Rating KJ/hr	General Location				
Power Plant									
PWP_BoilerExh	1	Dual Fuel Boiler #1	21,500,000	22,683,790	Power Plant	Products of Combustion	Yes	Yes	[1]
		Dual Fuel Boiler #2	21,500,000	22,683,790	Power Plant	Products of Combustion	Yes	Yes	[1]
		Dual Fuel Boiler #3	21,500,000	22,683,790	Power Plant	Products of Combustion	Yes	Yes	[1]
		Dual Fuel Boiler #4	16,700,000	17,619,502	Power Plant	Products of Combustion	Yes	Yes	[1]
		Dual Fuel Boiler #5	16,700,000	17,619,502	Power Plant	Products of Combustion	Yes	Yes	[1]
PWP_CT1	10	Cooling Tower #1	N/A	N/A	Power Plant	Particulate Matter	No	No	[2]
PWP_CT2	11	Cooling Tower #2	N/A	N/A	Power Plant	Particulate Matter	No	No	[2]
New Generator Compound									
GC_GenExh1	N/A	Emergency Diesel Generator Exhaust #1	N/A	N/A	New Generator Compound	Products of Combustion	Yes	Yes	[3],[4]
GC_GenExh2	N/A	Emergency Diesel Generator Exhaust #1	N/A	N/A	New Generator Compound	Products of Combustion	Yes	Yes	[3],[4]
Main Pavilion									
MP_ExS12	9	Ethylene Oxide Sterilization System Exhaust	N/A	N/A	Main Pavilion	Ethylene Oxide	Yes	Yes	
MP_GenExh1	12	Emergency Diesel Generator Exhaust #1	N/A	N/A	Main Pavilion	Products of Combustion	Yes	Yes	[4]
MP_GenExh2	13	Emergency Diesel Generator Exhaust #2	N/A	N/A	Main Pavilion	Products of Combustion	Yes	Yes	[4]
KDC Building									
KDC_AHU501	AHU-501	Medicinal Lab Air Handling Unit	1,875,000	1,978,238	KDC Building	Products of Combustion	No	No	[1],[3],[5]
KDC_ChemLabExh	AHU-501-Lab Exhaust	Medicinal Lab Fume Hood Exhaust	N/A	N/A	KDC Building	Laboratory Chemicals	Yes	Yes	
KDC_CT1	CT-1101	Cooling Tower #1	N/A	N/A	KDC Building	Particulate Matter	No	No	[2]
KDC_CT2	CT-1102	Cooling Tower #2	N/A	N/A	KDC Building	Particulate Matter	No	No	[2]
KDC_GEN1101Exh	Gen 1101	Emergency Diesel Generator Exhaust #1	N/A	N/A	KDC Building	Products of Combustion	Yes	Yes	[3],[4]
KDC_GEN1102Exh	Gen 1102	Emergency Diesel Generator Exhaust #2	N/A	N/A	KDC Building	Products of Combustion	Yes	Yes	[3],[4]
KDC_EF1101	EF-1101	Level 5/6/7/8 Wet Lab Fume Hood Exhaust #1	N/A	N/A	KDC Building	Laboratory Chemicals	Yes	Yes	
KDC_EF1102	EF-1102	Level 5/6/7/8 Wet Lab Fume Hood Exhaust #2	N/A	N/A	KDC Building	Laboratory Chemicals	Yes	Yes	
KDC_EF1103	EF-1103	Level 5/6/7/8 Wet Lab Fume Hood Exhaust #3	N/A	N/A	KDC Building	Laboratory Chemicals	Yes	Yes	
KDC_EF1104	EF-1104	Level 5/6/7/8 Wet Lab Fume Hood Exhaust #4 (Standby)	N/A	N/A	KDC Building	Laboratory Chemicals	Yes	Yes	
KDC_SF1001, KDC_SF1002	B-1001	Dual Fuel Steam Boiler #1	18,844,000	19,881,551	KDC Building	Products of Combustion	Yes	Yes	[1]
	B-1002	Dual Fuel Steam Boiler #2	18,844,000	19,881,551	KDC Building	Products of Combustion	Yes	Yes	[1]
KDC_BF, KDC_SBF	B-1003	Dual Fuel Glycol Boiler #1	25,106,000	26,488,336	KDC Building	Products of Combustion	Yes	Yes	[1]
	B-1004	Dual Fuel Glycol Boiler #2	25,106,000	26,488,336	KDC Building	Products of Combustion	Yes	Yes	[1]

Notes:

[1] As per Guideline A-10, Section 7.1.1, all contaminants emitted through natural gas combustion except for nitrogen oxides are considered negligible.

[2] This source is exempt from requiring approval under Section 9 of the EPA as per O. Reg. 524/98.

[3] This source is exempt from requiring approval under Section 9 of the EPA as per O. Reg. 524/98 but has been included in this assessment to consider like emissions with other sources requiring approval.

[4] As per the MECP Emergency Generator Checklist, all contaminants emitted though combustion by an emergency generator except for nitrogen oxides are considered negligible.

[5] As per Guideline A-10, Section 7.2.2, these sources in combination represent less than 5% of total facility emissions, and are therefore deemed insignificant.

3.2.2 Assessment of Significance

RWDI# 1803937

University Health Network - Toronto Western Hospital

Contaminant	CAS Number	Site-Wide Emissions from Operation of Boilers on No. 2 Fuel Oil (g/s)	Averaging Period (hours)	MECP Schedule 3 Standard (µg/m³)	Ratio of Site-Wide Emissions to Standard
Sulphur Dioxide	7446-09-5	1.61E-02	1	690	0.002%
			24	275	0.006%
Nitrogen Oxides	10102-44-0	1.51E+00	1	400	0.378%
			24	200	0.755%
Carbon Monoxide	630-08-0	3.78E-01	0.5	6,000	0.006%
Particulate Matter	N/A-PM	1.51E-01	24	120	0.126%

5.1a Source Summary Table - New Generator Compound Generator Testing, 50% Load

RWDI# 1803937

University Health Network - Toronto Western Hospital

Source ID	Source Type	Source Description	Source Data								Emission Data						
			Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temperature (°C)	Stack Inner Diameter (m)	Stack Exit Velocity (m/s)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates X (m)	Source Coordinates Y (m)	Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique [1]	Emissions Data Quality [2]	Percentage of Overall Emissions (%)
Power Plant																	
PWP_BoilerExh	Point	Dual Fuel Boiler #1	13.06	180	1.50	7.39	86.0	N/A	628655	4834563	Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	7%
		Dual Fuel Boiler #2									Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	7%
		Dual Fuel Boiler #3									Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	7%
		Dual Fuel Boiler #4									Nitrogen Oxides	10102-44-0	2.06E-01	1,24	EF	Above-Average	5%
		Dual Fuel Boiler #5									Nitrogen Oxides	10102-44-0	2.06E-01	1,24	EF	Above-Average	5%
New Generator Compound																	
GC_GenExh1	Point	Emergency Diesel Generator Exhaust #1	3.57	376	0.45	22.42	45.0	N/A	628638	4834596	Nitrogen Oxides	10102-44-0	9.75E-01	1,24	EF	Average	25%
GC_GenExh2	Point	Emergency Diesel Generator Exhaust #2	3.57	376	0.45	22.42	45.0	N/A	628638	4834595	Nitrogen Oxides	10102-44-0	9.75E-01	1,24	EF	Average	25%
KDC Building																	
KDC_AHU501 [3]	N/A	Medicinal Lab Air Handling Unit	N/A								Nitrogen Oxides	10102-44-0	2.32E-02	1,24	EF	Above-Average	<1%
KDC_SF1001, KDC_SF1002	Point	Dual Fuel Steam Boiler #1	5.03	180	0.80	10.00	63.2	14.0	628582	4834717	Nitrogen Oxides	10102-44-0	1.44E-01	1,24	EF	Above-Average	4%
		Dual Fuel Steam Boiler #2									Nitrogen Oxides	10102-44-0	1.44E-01	1,24	EF	Above-Average	4%
KDC_BF, KDC_SBF	Point	Dual Fuel Glycol Boiler #1	6.70	180	0.80	13.33	63.2	14.0	628586	4834705	Nitrogen Oxides	10102-44-0	1.91E-01	1,24	EF	Above-Average	5%
		Dual Fuel Glycol Boiler #2									Nitrogen Oxides	10102-44-0	1.91E-01	1,24	EF	Above-Average	5%
Total		Total of all listed sources									Nitrogen Oxides	10102-44-0	3.85E+00				100%

Notes:

[1] Emission Estimating Technique Short-Forms are V-ST (Validated Source Test), “ST” (Source Test), EF (Emission Factor), MB (Mass Balance), and EC (Engineering Calculation).

[2] Data Quality Categories: Highest; Above-Average; Average; and Marginal.

[3] As per Guideline A-10, Section 7.2.2, these sources in combination represent less than 5% of total facility emissions, and are therefore deemed insignificant.

5.1b Source Summary Table - New Generator Compound Generator Testing, 100% Load

RWDI# 1803937

University Health Network - Toronto Western Hospital

Source ID	Source Type	Source Description	Source Data								Emission Data						
			Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temperature (°C)	Stack Inner Diameter (m)	Stack Exit Velocity (m/s)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates X (m)	Source Coordinates Y (m)	Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique [1]	Emissions Data Quality [2]	Percentage of Overall Emissions (%)
Power Plant																	
PWP_BoilerExh	Point	Dual Fuel Boiler #1	13.06	180	1.50	7.39	86.0	N/A	628655	4834563	Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	6%
		Dual Fuel Boiler #2									Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	6%
		Dual Fuel Boiler #3									Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	6%
		Dual Fuel Boiler #4									Nitrogen Oxides	10102-44-0	2.06E-01	1,24	EF	Above-Average	5%
		Dual Fuel Boiler #5									Nitrogen Oxides	10102-44-0	2.06E-01	1,24	EF	Above-Average	5%
New Generator Compound																	
GC_GenExh2 [3]	Point	Emergency Diesel Generator Exhaust #2	5.56	471	0.45	34.97	45.0	N/A	628638	4834595	Nitrogen Oxides	10102-44-0	2.67E+00	1,24	EF	Average	58%
KDC Building																	
KDC_AHU501 [4]		Medicinal Lab Air Handling Unit	N/A								Nitrogen Oxides	10102-44-0	2.32E-02	1,24	EF	Above-Average	<1%
KDC_SF1001, KDC_SF1002	Point	Dual Fuel Steam Boiler #1	5.03	180	0.80	10.00	63.2	14.0	628582	4834717	Nitrogen Oxides	10102-44-0	1.44E-01	1,24	EF	Above-Average	3%
		Dual Fuel Steam Boiler #2									Nitrogen Oxides	10102-44-0	1.44E-01	1,24	EF	Above-Average	3%
KDC_BF, KDC_SBF	Point	Dual Fuel Glycol Boiler #1	6.70	180	0.80	13.33	63.2	14.0	628586	4834705	Nitrogen Oxides	10102-44-0	1.91E-01	1,24	EF	Above-Average	4%
		Dual Fuel Glycol Boiler #2									Nitrogen Oxides	10102-44-0	1.91E-01	1,24	EF	Above-Average	4%
Total		Total of all listed sources									Nitrogen Oxides	10102-44-0	4.57E+00				100%

Notes:

[1] Emission Estimating Technique Short-Forms are V-ST (Validated Source Test), "ST" (Source Test), EF (Emission Factor), MB (Mass Balance), and EC (Engineering Calculation).

[2] Data Quality Categories: Highest; Above-Average; Average; and Marginal.

[3] Only one emergency generator is operated at a time. The worst-case impacts result from GC_GenExh2.

[4] As per Guideline A-10, Section 7.2.2, these sources in combination represent less than 5% of total facility emissions, and are therefore deemed insignificant.

5.1c Source Summary Table - Main Pavilion Generator Testing, 100% Load

RWDI# 1803937

University Health Network - Toronto Western Hospital

Source ID	Source Type	Source Description	Source Data								Emission Data						
			Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temperature (°C)	Stack Inner Diameter (m)	Stack Exit Velocity (m/s)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates X (m)	Source Coordinates Y (m)	Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique [1]	Emissions Data Quality [2]	Percentage of Overall Emissions (%)
Power Plant																	
PWP_BoilerExh	Point	Dual Fuel Boiler #1	13.06	180	1.50	7.39	86.0	N/A	628655	4834563	Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	5%
		Dual Fuel Boiler #2									Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	5%
		Dual Fuel Boiler #3									Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	5%
		Dual Fuel Boiler #4									Nitrogen Oxides	10102-44-0	2.06E-01	1,24	EF	Above-Average	4%
		Dual Fuel Boiler #5									Nitrogen Oxides	10102-44-0	2.06E-01	1,24	EF	Above-Average	4%
Main Pavilion																	
MP_GenExh1 [3]	Point	Emergency Diesel Generator Exhaust #1	2.96	482	0.25	58.41	71.0	8.0	628579	4834653	Nitrogen Oxides	10102-44-0	3.96E+00	1,24	EF	Average	68%
KDC Building																	
KDC_AHU501 [4]		Medicinal Lab Air Handling Unit	N/A								Nitrogen Oxides	10102-44-0	2.32E-02	1,24	EF	Above-Average	<1%
KDC_SF1001, KDC_SF1002	Point	Dual Fuel Steam Boiler #1	5.03	180	0.80	10.00	63.2	14.0	628582	4834717	Nitrogen Oxides	10102-44-0	1.44E-01	1,24	EF	Above-Average	2%
		Dual Fuel Steam Boiler #2									Nitrogen Oxides	10102-44-0	1.44E-01	1,24	EF	Above-Average	2%
KDC_BF, KDC_SBF	Point	Dual Fuel Glycol Boiler #1	6.70	180	0.80	13.33	63.2	14.0	628586	4834705	Nitrogen Oxides	10102-44-0	1.91E-01	1,24	EF	Above-Average	3%
		Dual Fuel Glycol Boiler #2									Nitrogen Oxides	10102-44-0	1.91E-01	1,24	EF	Above-Average	3%
Total		Total of all listed sources									Nitrogen Oxides	10102-44-0	5.86E+00				100%

Notes:
[1] Emission Estimating Technique Short-Forms are V-ST (Validated Source Test), “ST” (Source Test), EF (Emission Factor), MB (Mass Balance), and EC (Engineering Calculation).
[2] Data Quality Categories: Highest; Above-Average; Average; and Marginal.
[3] Only one emergency generator is operated at a time. The worst-case impacts result from MP_GenExh1.
[4] As per Guideline A-10, Section 7.2.2, these sources in combination represent less than 5% of total facility emissions, and are therefore deemed insignificant.

5.1d Source Summary Table - KDC Building Generator Testing, 100% Load

RWDI# 1803937

University Health Network - Toronto Western Hospital

Source ID	Source Type	Source Description	Source Data								Emission Data						
			Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temperature (°C)	Stack Inner Diameter (m)	Stack Exit Velocity (m/s)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates X (m)	Source Coordinates Y (m)	Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique [1]	Emissions Data Quality [2]	Percentage of Overall Emissions (%)
Power Plant																	
PWP_BoilerExh	Point	Dual Fuel Boiler #1	13.06	180	1.50	7.39	86.0	N/A	628655	4834563	Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	6%
		Dual Fuel Boiler #2									Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	6%
		Dual Fuel Boiler #3									Nitrogen Oxides	10102-44-0	2.66E-01	1,24	EF	Above-Average	6%
		Dual Fuel Boiler #4									Nitrogen Oxides	10102-44-0	2.06E-01	1,24	EF	Above-Average	5%
		Dual Fuel Boiler #5									Nitrogen Oxides	10102-44-0	2.06E-01	1,24	EF	Above-Average	5%
KDC Building																	
KDC_AHU501 [3]		Medicinal Lab Air Handling Unit	N/A								Nitrogen Oxides	10102-44-0	2.32E-02	1,24	EF	Above-Average	<1%
KDC_GEN1102Exh [4]	Point	Emergency Diesel Generator Exhaust #1	7.38	505	0.40	58.75	62.2	6.0	628616	4834695	Nitrogen Oxides	10102-44-0	2.47E+00	1,24	EF	Average	56%
KDC_SF1001, KDC_SF1002	Point	Dual Fuel Steam Boiler #1	5.03	180	0.80	10.00	63.2	14.0	628582	4834717	Nitrogen Oxides	10102-44-0	1.44E-01	1,24	EF	Above-Average	3%
		Dual Fuel Steam Boiler #2									Nitrogen Oxides	10102-44-0	1.44E-01	1,24	EF	Above-Average	3%
KDC_BF, KDC_SBF	Point	Dual Fuel Glycol Boiler #1	6.70	180	0.80	13.33	63.2	14.0	628586	4834705	Nitrogen Oxides	10102-44-0	1.91E-01	1,24	EF	Above-Average	4%
		Dual Fuel Glycol Boiler #2									Nitrogen Oxides	10102-44-0	1.91E-01	1,24	EF	Above-Average	4%
Total		Total of all listed sources									Nitrogen Oxides	10102-44-0	4.37E+00				100%

Notes:

[1] Emission Estimating Technique Short-Forms are V-ST (Validated Source Test), “ST” (Source Test), EF (Emission Factor), MB (Mass Balance), and EC (Engineering Calculation).

[2] Data Quality Categories: Highest; Above-Average; Average; and Marginal.

[3] As per Guideline A-10, Section 7.2.2, these sources in combination represent less than 5% of total facility emissions, and are therefore deemed insignificant.

[4] Only one emergency generator is operated at a time. The worst-case impacts result from KDC_GEN1102Exh.

5.1e Source Summary Table - Operation of Boilers on No. 2 Fuel Oil

RWDI# 1803937

University Health Network - Toronto Western Hospital

Source ID	Source Type	Source Description	Source Data								Emission Data						
			Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temperature (°C)	Stack Inner Diameter (m)	Stack Exit Velocity (m/s)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates X (m)	Source Coordinates Y (m)	Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique [1]	Emissions Data Quality [2]	Percentage of Overall Emissions (%)
Power Plant																	
PWP_BoilerExh	Point	Dual Fuel Boiler #1	12.96	180	1.50	7.34	86.0	N/A	628655	4834563	Nitrogen Oxides	10102-44-0	3.95E-01	1,24	EF	Above-Average	11%
		Dual Fuel Boiler #2									Nitrogen Oxides	10102-44-0	3.95E-01	1,24	EF	Above-Average	11%
		Dual Fuel Boiler #3									Nitrogen Oxides	10102-44-0	3.95E-01	1,24	EF	Above-Average	11%
		Dual Fuel Boiler #4									Nitrogen Oxides	10102-44-0	3.07E-01	1,24	EF	Above-Average	9%
		Dual Fuel Boiler #5									Nitrogen Oxides	10102-44-0	3.07E-01	1,24	EF	Above-Average	9%
KDC Building																	
KDC_AHU501 [3]		Medicinal Lab Air Handling Unit	N/A								Nitrogen Oxides	10102-44-0	2.32E-02	1,24	EF	Above-Average	<1%
KDC_SF1001, KDC_SF1002	Point	Dual Fuel Steam Boiler #1	4.99	180	0.80	9.92	63.2	14.0	628582	4834717	Nitrogen Oxides	10102-44-0	3.46E-01	1,24	EF	Above-Average	10%
		Dual Fuel Steam Boiler #2									Nitrogen Oxides	10102-44-0	3.46E-01	1,24	EF	Above-Average	10%
KDC_BF, KDC_SBF	Point	Dual Fuel Glycol Boiler #1	6.65	180	0.80	13.24	63.2	14.0	628586	4834705	Nitrogen Oxides	10102-44-0	4.62E-01	1,24	EF	Above-Average	13%
		Dual Fuel Glycol Boiler #2									Nitrogen Oxides	10102-44-0	4.62E-01	1,24	EF	Above-Average	13%
Total		Total of all listed sources									Nitrogen Oxides	10102-44-0	3.44E+00				100%

Notes:

[1] Emission Estimating Technique Short-Forms are V-ST (Validated Source Test), "ST" (Source Test), EF (Emission Factor), MB (Mass Balance), and EC (Engineering Calculation).

[2] Data Quality Categories: Highest; Above-Average; Average; and Marginal.

[3] As per Guideline A-10, Section 7.2.2, these sources in combination represent less than 5% of total facility emissions, and are therefore deemed insignificant.

5.1f Source Summary Table - Ethylene Oxide Sterilization

RWDI# 1803937

University Health Network - Toronto Western Hospital

Source ID	Source Type	Source Description	Source Data								Emission Data						
			Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temperature (°C)	Stack Inner Diameter (m)	Stack Exit Velocity (m/s)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates X (m)	Source Coordinates Y (m)	Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique [1]	Emissions Data Quality [2]	Percentage of Overall Emissions (%)
Main Pavilion																	
MP_ExS12	Point	Sterilization System Exhaust	0.92	232	0.4	7.32	73	10	628579	4834646	Ethylene Oxide	75-21-8	5.56E-05	24	EC	Average	100%

Notes:

[1] Emission Estimating Technique Short-Forms are V-ST (Validated Source Test), "ST" (Source Test), EF (Emission Factor), MB (Mass Balance), and EC (Engineering Calculation).

[2] Data Quality Categories: Highest; Above-Average; Average; and Marginal.

5.1g Source Summary Table - Laboratory Fume Hoods

RWDI# 1803937

University Health Network - Toronto Western Hospital

Source ID	Source Type [1]	Source Description	Source Data							
			Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temp. (°C)	Stack Inner Diameter (m)	Stack Exit Velocity (m/s)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates X (m)	Source Coordinates Y (m)
KDC_ChemLabExh	Point	Medicinal Lab Fume Hood Exhaust	7.55	25	1.07	8.44	60	43	628579	4834703
KDC_EF1101	Point	Level 5/6/7/8 Wet Lab Fume Hood Exhaust #1	23.30	25	1.90	8.22	56.7	7.5	628608	4834709
KDC_EF1102	Point	Level 5/6/7/8 Wet Lab Fume Hood Exhaust #2	23.30	25	1.90	8.22	56.7	7.5	628609	4834706
KDC_EF1103	Point	Level 5/6/7/8 Wet Lab Fume Hood Exhaust #3	23.30	25	1.90	8.22	56.7	7.5	628606	4834708
KDC_EF1104	Point	Level 5/6/7/8 Wet Lab Fume Hood Exhaust #4 (Standby)	23.30	25	1.90	8.22	56.7	7.5	628607	4834705

Emission Data							
Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique	Sample Calculation Identifier	Emissions Data Quality	Maximum Volume-based Chemical Usage [1] (mL/hour)
Acetaldehyde	75-07-0	2.41E-01	1	EC	Appendix G	Average	1108.24
Acetic Acid	64-19-7	7.65E-02	1	EC	Appendix G	Average	--
Acetone	67-64-1	1.17E+00	1	EC	Appendix G	Average	--
Acetonitrile	75-05-8	3.26E-01	1	EC	Appendix G	Average	--
Acetophenone	98-86-2	2.51E-03	1	EC	Appendix G	Average	--
Acetylene	74-86-2	7.10E-02	1	EC	Appendix G	Average	--
Acrolein	107-02-8	2.60E-03	1	EC	Appendix G	Average	11
Acrylonitrile	107-13-1	8.33E-03	1	EC	Appendix G	Average	37
Allyl Glycidyl Ether	106-92-3	3.10E-02	1	EC	Appendix G	Average	--
Ammonia	7664-41-7	4.64E-02	1	EC	Appendix G	Average	--
Ammonium Chloride	12125-02-9	5.19E-03	1	EC	Appendix G	Average	--
Arsine	7784-42-1	4.82E-03	1	EC	Appendix G	Average	5450
Benzothiazole	95-16-9	2.51E-01	1	EC	Appendix G	Average	--
Benzoyl Chloride	98-88-4	4.65E-03	1	EC	Appendix G	Average	--
Benzyl Alcohol	100-51-6	7.46E-04	1	EC	Appendix G	Average	--
Biphenyl, 1,1-	92-52-4	6.28E-05	1	EC	Appendix G	Average	--
Boron Tribromide	10294-33-4	3.70E-01	1	EC	Appendix G	Average	--
Boron Trichloride	10294-34-5	3.19E-01	1	EC	Appendix G	Average	--
Bromine	7726-95-6	2.78E-01	1	EC	Appendix G	Average	322
Bromoform	75-25-2	7.21E-02	1	EC	Appendix G	Average	--
Butanol, n-	71-36-3	3.37E-02	1	EC	Appendix G	Average	--
Butoxy-2-Propanol, 1-	5131-66-8	5.64E-03	1	EC	Appendix G	Average	--
Butyl Acetate, n-	123-86-4	8.05E-02	1	EC	Appendix G	Average	--
Butyl Acrylate, n-	141-32-2	3.64E-02	1	EC	Appendix G	Average	--
Carbon Disulphide	75-15-0	2.17E+00	1	EC	Appendix G	Average	--
Carbon Tetrachloride	56-23-5	3.33E-02	1	EC	Appendix G	Average	75
Chlorine	7782-50-5	8.07E-02	1	EC	Appendix G	Average	100213
Chlorine Dioxide	10049-04-4	2.78E-02	1	EC	Appendix G	Average	36275
Chlorobenzene	108-90-7	8.21E-02	1	EC	Appendix G	Average	--
Chlorodifluoromethane	75-45-6	2.36E-01	1	EC	Appendix G	Average	--
Chloroethane	75-00-3	1.76E-01	1	EC	Appendix G	Average	--
Chloroform	67-66-3	1.39E-02	1	EC	Appendix G	Average	34
Cresol (o, m, & p-Isomers)	1319-77-3	1.27E-03	1	EC	Appendix G	Average	--
Cyanogen Chloride	506-77-4	1.67E-01	1	EC	Appendix G	Average	238825
Cyclohexane	110-82-7	5.52E-01	1	EC	Appendix G	Average	--
Decene, 1-	872-05-9	1.00E-02	1	EC	Appendix G	Average	--
Di(2-Ethylhexyl) Phthalate	117-81-7	6.60E-10	1	EC	Appendix G	Average	--
Diacetone Alcohol	123-42-2	1.11E-02	1	EC	Appendix G	Average	--
Diazinon	333-41-5	7.31E-07	1	EC	Appendix G	Average	--
Diborane	19287-45-7	7.54E-02	1	EC	Appendix G	Average	--
Dibutyl Phthalate	84-74-2	1.51E-07	1	EC	Appendix G	Average	--
Dichloro-1,1,2,2,-Tetrafluoroethane, 1,2	76-14-2	4.66E-01	1	EC	Appendix G	Average	--

Emission Data							
Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique	Sample Calculation Identifier	Emissions Data Quality	Maximum Volume-based Chemical Usage [1] (mL/hour)
Dichlorobenzene, o- (1,2-)	95-50-1	1.17E-02	1	EC	Appendix G	Average	--
Dichlorobenzene, p- (1,4-)	106-46-7	1.50E-02	1	EC	Appendix G	Average	--
Dichloroethane, 1,1-	75-34-3	1.61E+00	1	EC	Appendix G	Average	--
Dichloroethylene, Cis-1,2-	156-59-2	1.41E+00	1	EC	Appendix G	Average	--
Dichloroethylene, Sym-1,2-	540-59-0	1.46E+00	1	EC	Appendix G	Average	4179
Dichloroethylene, Trans-1,2-	156-60-5	1.46E+00	1	EC	Appendix G	Average	4179
Diethyl Phthalate	84-66-2	1.68E-04	1	EC	Appendix G	Average	--
Diethylene Glycol Monoethyl Ether	111-90-0	8.81E-04	1	EC	Appendix G	Average	--
Diethylene Glycol Monomethyl Ether	111-77-3	1.23E-03	1	EC	Appendix G	Average	--
Difluorodichloromethane	75-71-8	3.30E-01	1	EC	Appendix G	Average	--
Diisobutyl Ketone	108-83-8	1.13E-02	1	EC	Appendix G	Average	--
Dimethyl Acetamide, n-	127-19-5	3.31E-03	1	EC	Appendix G	Average	--
Dimethyl Disulphide	624-92-0	1.96E-02	1	EC	Appendix G	Average	67
Dimethyl Phthalate	131-11-3	7.55E-05	1	EC	Appendix G	Average	--
Dimethyl Sulfoxide	67-68-5	3.69E-03	1	EC	Appendix G	Average	--
Dimethyl Sulphide	75-18-3	1.05E-02	1	EC	Appendix G	Average	45
Dimethyl-1,3-Diaminopropane, n-	109-55-7	3.03E-02	1	EC	Appendix G	Average	--
Dioxolane, 1,3-	646-06-0	1.39E-01	1	EC	Appendix G	Average	472
Ethoxyethanol, 2-	110-80-5	3.17E-02	1	EC	Appendix G	Average	--
Ethoxyethyl Acetate, 2-	111-15-9	1.24E-02	1	EC	Appendix G	Average	--
Ethyl Acetate	141-78-6	5.11E-01	1	EC	Appendix G	Average	--
Ethyl Acrylate	140-88-5	2.60E-03	1	EC	Appendix G	Average	10
Ethyl Alcohol	64-17-5	2.36E-01	1	EC	Appendix G	Average	--
Ethyl Benzene	100-41-4	6.36E-02	1	EC	Appendix G	Average	--
Ethyl Ether	60-29-7	3.33E-01	1	EC	Appendix G	Average	1681
Ethyl Hexanol, 2-	104-76-7	9.30E-04	1	EC	Appendix G	Average	--
Ethyl-3-Ethoxypropionate	763-69-9	7.54E-03	1	EC	Appendix G	Average	--
Ethylene Dibromide	106-93-4	4.17E-02	1	EC	Appendix G	Average	69
Ethylene Dichloride	107-06-2	2.78E-02	1	EC	Appendix G	Average	80
Ethylene glycol butyl ether Butyl cellosolve	111-76-2	7.36E-03	1	EC	Appendix G	Average	--
Ethylene Glycol Dinitrate	628-96-6	5.31E-04	1	EC	Appendix G	Average	--
Ethylene Glycol Monobutyl Ether Acetate	112-07-2	2.54E-03	1	EC	Appendix G	Average	--
Ethylene Oxide	75-21-8	2.78E-03	1	EC	Appendix G	Average	5554
Formaldehyde Solution (37 %)	50-00-0	4.33E-03	1	EC	Appendix G	Average	--
Formic Acid	64-18-6	1.28E-01	1	EC	Appendix G	Average	--
Furfural	98-01-1	1.44E-02	1	EC	Appendix G	Average	--
Furfuryl Alcohol	98-00-0	4.76E-03	1	EC	Appendix G	Average	--
Glutaraldehyde (100 %)	111-30-8	3.87E-03	1	EC	Appendix G	Average	--
Glutaraldehyde (50 %)	111-30-8	5.90E-04	1	EC	Appendix G	Average	--
Heptane, n-	142-82-5	2.59E-01	1	EC	Appendix G	Average	--
Hexachlorocyclopentadiene	77-47-4	1.12E-03	1	EC	Appendix G	Average	--
Hexamethyldisilazane	999-97-3	2.78E-02	1	EC	Appendix G	Average	129
Hexamethylene Diisocyanate (HDI) Biuret (HDI-Bt)	4035-89-6	8.17E-07	1	EC	Appendix G	Average	--
Hexamethylene Diisocyanate (HDI) Isocyanurate	3779-63-3	5.87E-11	1	EC	Appendix G	Average	--
Hexamethylene Diisocyanate (HDI) Monomer	822-06-0	4.17E-04	1	EC	Appendix G	Above-Average	1
Hexamethylene Diisocyanate (HDI) Polyisocyanate	28182-81-2	8.26E-07	1	EC	Appendix G	Above-Average	--
Hexane, n-	110-54-3	1.57E+00	1	EC	Appendix G	Above-Average	--
Hexylene Glycol	107-41-5	4.94E-04	1	EC	Appendix G	Above-Average	--
Hydrobromic Acid (50%)	10035-10-6	2.40E-03	1	EC	Appendix G	Above-Average	--
Hydrochloric Acid (10%)	7647-01-0	2.54E-05	1	EC	Appendix G	Above-Average	--
Hydrochloric Acid (20 %)	7647-01-0	1.23E-03	1	EC	Appendix G	Above-Average	--
Hydrochloric Acid (30 %)	7647-01-0	5.86E-02	1	EC	Appendix G	Above-Average	--
Hydrochloric Acid (35 %)	7647-01-0	2.78E-01	1	EC	Appendix G	Above-Average	2422
Hydrochloric Acid (40 %)	7647-01-0	2.78E-01	1	EC	Appendix G	Above-Average	2084
Hydrofluoric Acid (30%)	7664-39-3	4.09E-03	1	EC	Appendix G	Above-Average	--
Hydrofluoric Acid (40%)	7664-39-3	1.19E-02	1	EC	Appendix G	Above-Average	95
Hydrofluoric Acid (50%)	7664-39-3	1.19E-02	1	EC	Appendix G	Above-Average	74
Hydrofluoric Acid (60%)	7664-39-3	1.19E-02	1	EC	Appendix G	Above-Average	60

Emission Data							
Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique	Sample Calculation Identifier	Emissions Data Quality	Maximum Volume-based Chemical Usage [1] (mL/hour)
Hydrogen Bromide	10035-10-6	2.20E-01	1	EC	Appendix G	Above-Average	--
Hydrogen Chloride	7647-01-0	9.94E-02	1	EC	Appendix G	Above-Average	--
Hydrogen Cyanide	74-90-8	1.11E-01	1	EC	Appendix G	Above-Average	582
Hydrogen Fluoride	7664-39-3	1.19E-02	1	EC	Appendix G	Above-Average	52590
Hydrogen Peroxide (35 %)	7722-84-1	1.61E-03	1	EC	Appendix G	Above-Average	--
Hydrogen Peroxide (50 %)	7722-84-1	2.55E-03	1	EC	Appendix G	Above-Average	--
Hydrogen Peroxide (70 %)	7722-84-1	4.15E-03	1	EC	Appendix G	Above-Average	--
Hydrogen Peroxide (90 %)	7722-84-1	6.32E-03	1	EC	Appendix G	Above-Average	--
Hydrogen Sulphide	7783-06-4	4.56E-03	1	EC	Appendix G	Above-Average	11784
Isobutanol	78-83-1	5.43E-02	1	EC	Appendix G	Above-Average	--
Isobutyl Acetate	110-19-0	1.15E-01	1	EC	Appendix G	Above-Average	--
Isopropyl Acetate	108-21-4	3.64E-01	1	EC	Appendix G	Above-Average	--
Isopropyl Alcohol	67-63-0	2.09E-01	1	EC	Appendix G	Above-Average	--
Isopropyl Benzene	98-82-8	2.97E-02	1	EC	Appendix G	Above-Average	--
Isopropyl Ether	108-20-3	8.69E-01	1	EC	Appendix G	Above-Average	--
Malathion	121-75-5	1.56E-06	1	EC	Appendix G	Above-Average	--
Mercury (Hg)	7439-97-6	2.42E-05	1	EC	Appendix G	Above-Average	--
Methacrylic Acid	79-41-4	5.39E-03	1	EC	Appendix G	Above-Average	--
Methane Diphenyl Diisocyanate (MDI)	101-68-8	3.37E-08	1	EC	Appendix G	Above-Average	--
Methanol	67-56-1	4.02E-01	1	EC	Appendix G	Above-Average	--
Methyl Acrylate	96-33-3	2.32E-03	1	EC	Appendix G	Above-Average	9
Methyl Bromide	74-83-9	2.59E-01	1	EC	Appendix G	Above-Average	--
Methyl Chloride	74-87-3	1.38E-01	1	EC	Appendix G	Above-Average	--
Methyl Chloroform	71-55-6	1.06E+00	1	EC	Appendix G	Above-Average	--
Methyl Ethyl Ketone	78-93-3	4.47E-01	1	EC	Appendix G	Above-Average	--
Methyl Isobutyl Ketone	108-10-1	1.24E-01	1	EC	Appendix G	Above-Average	--
Methyl Isocyanate	624-83-9	1.39E-02	1	EC	Appendix G	Above-Average	54
Methyl Mercaptan	74-93-1	4.56E-03	1	EC	Appendix G	Above-Average	8349
Methyl Methacrylate	80-62-6	2.43E-01	1	EC	Appendix G	Above-Average	--
Methyl Salicylate	119-36-8	8.25E-04	1	EC	Appendix G	Above-Average	--
Methyl Tert-Butyl Ether	1634-04-4	1.39E+00	1	EC	Appendix G	Above-Average	--
Methyl-2-Hexanone, 5-	110-12-3	3.34E-02	1	EC	Appendix G	Above-Average	--
Methylal	109-87-5	2.14E+00	1	EC	Appendix G	Above-Average	--
Methylcyclopentadienyl Manganese Tricarbonyl	12108-13-3	3.30E-04	1	EC	Appendix G	Above-Average	--
Methylene Chloride	75-09-2	2.82E+00	1	EC	Appendix G	Above-Average	--
Methylene Iodide	75-11-6	1.34E-02	1	EC	Appendix G	Above-Average	--
Monomethyl Amine (40%)	74-89-5	3.47E-01	1	EC	Appendix G	Above-Average	4764
Naphtha (Mineral Spirits)	8030-30-6	3.03E-02	1	EC	Appendix G	Above-Average	--
Naphthalene	91-20-3	5.77E-04	1	EC	Appendix G	Above-Average	--
Naphthol, 1-	90-15-3	7.16E-03	1	EC	Appendix G	Above-Average	--
Nickel Carbonyl	13463-39-3	6.95E-03	1	EC	Appendix G	Above-Average	19
Nitric Acid (70 %)	7697-37-2	2.29E-02	1	EC	Appendix G	Above-Average	--
Nitroglycerin	55-63-0	2.82E-06	1	EC	Appendix G	Above-Average	--
Nitrous Oxide	10024-97-2	1.20E-01	1	EC	Appendix G	Above-Average	--
Octane	111-65-9	8.36E-02	1	EC	Appendix G	Above-Average	--
Oleic Acid	112-80-1	5.42E-08	1	EC	Appendix G	Above-Average	--
Oxalic Acid	144-62-7	7.25E-06	1	EC	Appendix G	Above-Average	--
Oxo-Heptyl Acetate	90438-79-2	3.32E-03	1	EC	Appendix G	Above-Average	--
Oxo-Hexyl Acetate	88230-35-7	9.34E-03	1	EC	Appendix G	Above-Average	--
Ozone	10028-15-6	9.55E-02	1	EC	Appendix G	Above-Average	175234
Pentaborane	19624-22-7	1.39E-02	1	EC	Appendix G	Above-Average	82
Pentachlorophenol	87-86-5	1.50E-06	1	EC	Appendix G	Above-Average	--
Perchloroethylene	127-18-4	1.83E-01	1	EC	Appendix G	Above-Average	--
Phenol	108-95-2	2.57E-03	1	EC	Appendix G	Above-Average	--
Phosgene	75-44-5	2.70E-01	1	EC	Appendix G	Above-Average	--
Phosphine	7803-51-2	9.26E-02	1	EC	Appendix G	Above-Average	--
Phosphoric Acid (75 %)	7664-38-2	7.24E-05	1	EC	Appendix G	Above-Average	--
Phosphoric Acid (85 %)	7664-38-2	1.12E-04	1	EC	Appendix G	Above-Average	--

Emission Data							
Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission Estimating Technique	Sample Calculation Identifier	Emissions Data Quality	Maximum Volume-based Chemical Usage [1] (mL/hour)
Phosphorus Oxychloride	10025-87-3	1.67E-01	1	EC	Appendix G	Above-Average	365
Polymeric Methane Diphenyl Diisocyanate (PMDI)	9016-87-9	1.68E-08	1	EC	Appendix G	Above-Average	--
Propionaldehyde	123-38-6	3.51E-03	1	EC	Appendix G	Above-Average	15
Propionic Acid	79-09-4	2.29E-02	1	EC	Appendix G	Above-Average	--
Propyl Acetate, n-	109-60-4	2.09E-01	1	EC	Appendix G	Above-Average	--
Propyl Alcohol, n-	71-23-8	9.28E-02	1	EC	Appendix G	Above-Average	--
Propylene	115-07-1	1.15E-01	1	EC	Appendix G	Above-Average	--
Propylene Dichloride	78-87-5	3.60E-01	1	EC	Appendix G	Above-Average	--
Propylene Glycol	57-55-6	8.22E-04	1	EC	Appendix G	Above-Average	--
Propylene Glycol 1-Methyl Ether	107-98-2	7.08E-02	1	EC	Appendix G	Above-Average	--
Propylene Glycol-1-Methyl Ether-2-Acetate	108-65-6	2.52E-02	1	EC	Appendix G	Above-Average	--
Propylene Oxide	75-56-9	2.08E-02	1	EC	Appendix G	Above-Average	87
Pyridine	110-86-1	2.81E-02	1	EC	Appendix G	Above-Average	103
Silane	7803-62-5	8.75E-02	1	EC	Appendix G	Above-Average	--
Stoddard Solvent	8052-41-3	2.90E-02	1	EC	Appendix G	Above-Average	--
Styrene, Monomer	100-42-5	3.81E-02	1	EC	Appendix G	Above-Average	--
Sulphur Hexafluoride	2551-62-4	3.98E-01	1	EC	Appendix G	Above-Average	--
Sulphuric Acid (100 %)	7664-93-9	2.69E-07	1	EC	Appendix G	Above-Average	--
Sulphuric Acid (78 %)	7664-93-9	2.71E-09	1	EC	Appendix G	Above-Average	--
Sulphuric Acid (93 %)	7664-93-9	1.17E-07	1	EC	Appendix G	Above-Average	--
Sulphuric Acid (98 %)	7664-93-9	2.21E-07	1	EC	Appendix G	Above-Average	--
Tetrahydrofuran	109-99-9	8.71E-01	1	EC	Appendix G	Above-Average	--
Toluene	108-88-3	1.80E-01	1	EC	Appendix G	Above-Average	--
Toluene Di-Isocyanate, 2,4-	584-84-9	2.13E-04	1	EC	Appendix G	Above-Average	--
Toluene Di-Isocyanate, 2,4- and 2,6- (Mixed Isomers)	26471-62-5	1.61E-04	1	EC	Appendix G	Above-Average	--
Trichloro-1,2,2-Trifluoroethane, 1,2,2-	76-13-1	4.03E+00	1	EC	Appendix G	Above-Average	--
Trichlorobenzene, 1,2,4-	120-82-1	4.52E-03	1	EC	Appendix G	Above-Average	--
Trichloroethylene (TCE)	79-01-6	1.67E-01	1	EC	Appendix G	Above-Average	410
Trichlorofluoromethane	75-69-4	8.33E+01	1	EC	Appendix G	Above-Average	201659
Trifluoroacetic Acid	76-05-1	2.08E-01	1	EC	Appendix G	Above-Average	489
Trimethylamine (40 %)	75-50-3	2.89E-04	1	EC	Appendix G	Above-Average	4
Trimethylbenzene, 1,2,3- (individual isomer or Trimethylbenzene mixture)	526-73-8	9.83E-03	1	EC	Appendix G	Above-Average	--
Trimethylbenzene, 1,2,4- (individual isomer or Trimethylbenzene mixture)	95-63-6	1.47E-02	1	EC	Appendix G	Above-Average	--
Trimethylbenzene, 1,3,5- (individual isomer or Trimethylbenzene mixture)	108-67-8	1.60E-02	1	EC	Appendix G	Above-Average	--
Vinyl Chloride	75-01-4	1.39E-02	1	EC	Appendix G	Above-Average	19575
Vinylidene Chloride	75-35-4	1.39E-01	1	EC	Appendix G	Above-Average	412
Xylene (o,m, p-Isomers)	1330-20-7	4.99E-02	1	EC	Appendix G	Above-Average	--

Notes:
[1] Contaminants with concentrations that are at 100% of the POI limit have hourly usage restrictions, which allow the facility to remain in compliance.

6.1.2 Receptor Summary Table

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University Health Network - Toronto Western Hospital

Receptor ID	Location			Description
	X (m)	Y (m)	Z (m) [1]	
East	628633	4834624	38.5	East Wing Air Intake
McLaughlin	628572	4834688	32	McLaughlin Wing Air Intake
Main1	628576	4834661	31	Main Pavilion AHU 1
Main2	628558	4834658	6.95	Main Pavilion AHU 2
Fell1	628607	4834581	9	Fell Pavilion AHUs
Fell2	628565	4834561	24	Fell Pavilion Air Intakes
Gamma	628544	4834684	6.95	Gamma Knife AHU
KDC	628585	4834681	12	KDC Air Intake

Note:
[1] Height in meters above grade.

6.1 Dispersion Modelling Input Summary Table

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University Health Network - Toronto Western Hospital

Relevant Section of the Regulation	Section Title	Description of How the Approved Dispersion Model was Used
Section 8	Negligible Sources	KDC_AHU501 was considered negligible as per Guideline A-10, Section 7.2.2. This source represents less than 5% of total facility emissions and was therefore not included in the modelling.
Section 9	Same Structure Contamination	Same structure contamination was assessed at the facility using the methods described in Chapter 44 of the ASHRAE Handbook – HVAC Applications. See the MECP Guideline A-11 for more detailed guidance on Chapter 44 of the ASHRAE Handbook.
Section 10	Operating Conditions	Please refer to Section 4.1 of the ESDM report. For the purposes of estimating emissions from the facility, seven operating scenarios were considered: **New Generator Compound Generator Testing, 50% Load:** • All boilers operating simultaneously at maximum capacity on natural gas • Two New Generator Compound emergency diesel generators operating at 50% load • HVAC system operating at maximum capacity **New Generator Compound Generator Testing, 100% Load:** • All boilers operating simultaneously at maximum capacity on natural gas • One New Generator Compound emergency diesel generator operating at 100% load • HVAC system operating at maximum capacity **Main Pavilion Generator Testing:** • All boilers operating simultaneously at maximum capacity on natural gas • One Main Pavilion emergency diesel generator operating at 100% load • HVAC system operating at maximum capacity **KDC Building Generator Testing:** • All boilers operating simultaneously at maximum capacity on natural gas • One KDC Building emergency diesel generator operating at 100% load • HVAC system operating at maximum capacity **Operation of Boilers on No. 2 Fuel Oil:** • All boilers operating simultaneously at maximum capacity on backup fuel oil • HVAC system operating at maximum capacity **Ethylene Oxide Sterilization:** • 100% Ethylene Oxide Sterilizer/Aerator system operating at maximum capacity **Laboratory Fume Hoods:** A reasonable worst-case scenario of a chemical spill in a single laboratory fume hood was evaluated.
Section 11	Source of Contaminant Emission Rates	Please refer to section 4.0 of the ESDM report for an explanation of the methods used to estimate contaminant emissions. The source summary tables (Table 5.1a-f) includes an assessment of how accurately the methods estimate the emission rate.
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	The operating conditions and emission rates (as described in previous sections) were used in approved dispersion models. The models predicted results that were less than the applicable POI limits; therefore, no further refinements were made to either the operating conditions or the emission rates.
Section 13	Meteorological Conditions	Please refer to Section 6.1.1 of the ESDM report. The facility is located in Toronto, Ontario; therefore, the Central Region meteorological data set is recommended by the MECP for use at this site. This includes surface data from Pearson International Airport in Toronto, Ontario and upper air data from Buffalo, New York. Within each region, the MECP provides alternative data sets with the choice of data set depending on the character of the terrain at the study site. The area surrounding the facility is primarily residential, commercial residential, and open space; therefore, the default data set for "urban" was used. The ASHRAE 2019 assessment utilized ASHRAE Fundamentals 2017 to determine a maximum wind speed for the Toronto area. An approach roughness of 3 was used based on the land use patterns surrounding the site.
Section 14	Area of Modelling Coverage	Please refer to Section 6.1.2 of the ESDM report. The area of modelling coverage was designed to meet the requirements outlined in Section 14 of O. Reg. 419/05. A multi-tiered receptor grid was developed as per Section 7.2 of Guideline A-11, Version 3.0, February 2017. Interval spacing was dependent on receptor distance from on-site sources. Receptors on site were removed from the assessment. Self-contamination impacts were assessed at the facility. These receptor locations are indicated on Figure 5.2 and are described in Table 6.1.2 in the Tables Section. Figure 6.1.2 illustrates the approach used to calculate B-small and B-large for the ASHRAE assessment.
Section 15	Stack Height for Certain New Sources of Contaminant	Please refer to Section 6.1.3 of the ESDM report. All stack heights are within the allowable stack height obtained using the stack height formula defined under Section 15 of O. Reg. 419/05. As such, building downwash effects have been considered in the dispersion modelling by using the US-EPA's Building Profile Input Program (BPIP) associated with the AERMOD model. Stack heights were also considered for the ASHRAE modelling.
Section 16	Terrain Data	Please refer to Section 6.1.4 of the ESDM report. Terrain information for the area surrounding the facility was obtained from the MECP Regional Meteorological and Terrain Data for Air Dispersion Modelling website. The terrain data is based on the North American Datum 1983 (NAD83) horizontal reference datum. These data were run through the AERMAP terrain pre-processor by the MECP to estimate base elevations for sources and receptors to help the model account for changes in elevation in the surrounding terrain. The ASHRAE model does not consider terrain.
Section 17	Averaging Periods	Please refer to Section 6.1.5 of the ESDM report. Emissions were modelled using the 1-hour and 24-hour averaging period options in the AERMOD dispersion model and the 15-min averaging period in the ASHRAE 2019 model to compare to the MECP's ACB List dated April 2018. Half-hour results from AERMOD and half hour, 1-hour, and 24-hour results from AHSRAE were calculated based on the conversion factor equation provided in Guideline A-10, Table 7-1.

7.1a Emission Summary Table - New Generator Compound Generator Testing, 50% Load

University Health Network - Toronto Western Hospital RWDI# 1803937

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	3.85E+00	AERMOD	152 [3]	0.5	1,880	Health	Schedule 3	B1	8%
					3	1	400	Health	Schedule 3	B1	<1%
					1	24	200	Health	Guideline	N/A	<1%
On-Site Receptors [4]											
East3	Nitrogen Oxides	10102-44-0	3.85E+00	ASHRAE + AERMOD	324	0.5	500	Health	Schedule 3	B1	65%
					81	1	400	Health	Schedule 3	B1	20%
					32	24	200	Health	Guideline	N/A	16%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] As per MECP Guideline A-11, 1-hr POI concentrations are compared to 30 minute POI limits by multiplying by following standard conversions:

30 minute 1.2

[4] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE			AERMOD		
	0.5-hr	1-hr	24-hr	0.5-hr [3]	1-hr	24-hr
East3	93	76	31	231	4	1

7.1b Emission Summary Table - New Generator Compound Generator Testing, 100% Load

University Health Network - Toronto Western Hospital RWDI# 1803937

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	4.57E+00	AERMOD	174 [3]	0.5	1,880	Health	Schedule 3	B1	9%
					3	1	400	Health	Schedule 3	B1	<1%
					1	24	200	Health	Guideline	N/A	<1%
On-Site Receptors [4]											
East2	Nitrogen Oxides	10102-44-0	4.57E+00	ASHRAE + AERMOD	310	0.5	500	Health	Schedule 3	B1	62%
					81	1	400	Health	Schedule 3	B1	20%
					32	24	200	Health	Guideline	N/A	16%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] As per MECP Guideline A-11, 1-hr POI concentrations are compared to 30 minute POI limits by multiplying by following standard conversions:

30 minute 1.2

[4] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE			AERMOD		
	0.5-hr	1-hr	24-hr	0.5-hr [3]	1-hr	24-hr
East2	93	76	31	218	4	1

7.1c Emission Summary Table - Main Pavilion Generator Testing, 100% Load

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	5.86E+00	AERMOD	547 [3]	0.5	1,880	Health	Schedule 3	B1	29%
					39	1	400	Health	Schedule 3	B1	10%
					15	24	200	Health	Guideline	N/A	8%
On-Site Receptors											
Main1 McLaughlin	Nitrogen Oxides	10102-44-0	5.86E+00	ASHRAE + AERMOD	568	0.5	500	Health	Schedule 3	B1	114%
					319	1	400	Health	Schedule 3	B1	80%
					130	24	200	Health	Guideline	N/A	65%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] As per MECP Guideline A-11, 1-hr POI concentrations are compared to 30 minute POI limits by multiplying by following standard conversions:

30 minute 1.2

[4] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE			AERMOD		
	0.5-hr	1-hr	24-hr	0.5-hr	1-hr	24-hr
Main1	564	--	--	4	--	--
McLaughlin	--	315	129	--	4	1

7.1d Emission Summary Table - KDC Building Generator Testing, 100% Load

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	4.37E+00	AERMOD	144 [3]	0.5	1,880	Health	Schedule 3	B1	8%
					39	1	400	Health	Schedule 3	B1	10%
					15	24	200	Health	Guideline	N/A	8%
On-Site Receptors											
McLaughlin	Nitrogen Oxides	10102-44-0	4.37E+00	ASHRAE + AERMOD	1,309	0.5	500	Health	Schedule 3	B1	262%
					319	1	400	Health	Schedule 3	B1	80%
					130	24	200	Health	Guideline	N/A	65%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] As per MECP Guideline A-11, 1-hr POI concentrations are compared to 30 minute POI limits by multiplying by following standard conversions:

30 minute 1.2

[4] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE			AERMOD		
	0.5-hr	1-hr	24-hr	0.5-hr	1-hr	24-hr
McLaughlin	1,304	315	129	5	4	1

7.1e Emission Summary Table - Operation of Boilers on No. 2 Fuel Oil

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Nitrogen Oxides	10102-44-0	3.44E+00	AERMOD	94	1	400	Health	Schedule 3	B1	24%
					36	24	200	Health	Schedule 3	B1	18%
On-Site Receptors											
McLaughlin	Nitrogen Oxides	10102-44-0	3.44E+00	ASHRAE + AERMOD	766	1	400	Health	Schedule 3	B1	192%
					314	24	200	Health	Schedule 3	B1	157%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

[3] Maximum POI concentrations at on-site receptors were determind by totalling the results from ASHRAE and AERMOD assessments. The results of each assessment are listed below.

	ASHRAE		AERMOD	
	1-hr	24-hr	1-hr	24-hr
McLaughlin	760	312	6	1

7.1f Emission Summary Table - Ethylene Oxide Sterilization

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Emission Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	MECP POI Limit [1] (µg/m³)	Limiting Effect	Regulation Schedule #	Benchmark Category [2]	Percentage of MECP POI Limit (%)
Off-Site Receptors											
Property Line	Ethylene Oxide	75-21-8	#N/A	AERMOD	1.50E-04	24	0.2	Health	Schedule 3	B1	<1%
					1.50E-04	24	20	Health	Schedule 3	B1	<1%
On-Site Receptors											
McLaughlin	Ethylene Oxide	75-21-8	#N/A	ASHRAE	1.16E-02	24	0.2	Health	Schedule 3	B1	6%
					1.16E-02	24	20	Health	Schedule 3	B1	<1%

Notes:

[1] The term "MECP POI Limit" identified in Table D-4 of Guideline A-10 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- Air quality Standards, Guidelines or SL-JSLs set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", 01 April 2018;
- The Daily Assessment Values (DAV) from the MECP ACB List;
- The Annual Assessment Values (AAV) from the MECP ACB List; or,
- Upper Risk Threshold (URT) from the MECP ACB List; or,
- An acceptable concentration for contaminants with no standards or guidelines.

[2] Benchmark Categories are set out in the MECP ACB List; Benchmark 1 (B1) refers to Standards or Guidelines, Benchmark 2 (B2) refers to Screening Levels.

7.1g Emission Summary Table - Laboratory Fume Hoods

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Usage Restriction?	Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)				MECP POI Limit [1] (µg/m³)				Limiting Effect				Regulation Schedule #				Percentage of MECP POI Limit [2] (%)			
						24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17
Property Line	Acetaldehyde	75-07-0	Yes	2.41E-01	AERMOD	2.49E+02	--	5.00E+02	--	500	--	5.00E+02	--	Health	--	Health	--	3	--	3	--	50%	--	100%	--
Property Line	Acetic Acid	64-19-7	No	7.65E-02	AERMOD	5.50E+00	--	--	--	2500	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Acetone	67-64-1	No	1.17E+00	AERMOD	8.43E+01	--	--	--	11880	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Acetonitrile	75-05-8	No	3.26E-01	AERMOD	2.35E+01	--	--	--	7.00E+01	--	--	--	Health	--	--	--	3	--	--	--	34%	--	--	--
Property Line	Acetophenone	98-86-2	No	2.51E-03	AERMOD	--	4.34E+00	--	7.16E+00	--	1.17E+03	--	8.50E+02	--	Health	--	Odour	--	Guideline	--	Guideline	--	<1%	--	<1%
Property Line	Acetylene	74-86-2	No	7.10E-02	AERMOD	5.11E+00	--	--	--	5.60E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Acrolein	107-02-8	Yes	2.60E-03	AERMOD	4.00E-01	4.50E+00	--	--	4.00E-01	4.50E+00	--	--	Health	Health	--	--	3	3	--	--	100%	100%	--	--
Property Line	Acrylonitrile	107-13-1	Yes	8.33E-03	AERMOD	6.00E-01	--	--	--	6.00E-01	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Allyl Glycidyl Ether	106-92-3	No	3.10E-02	AERMOD	2.23E+00	--	--	--	6.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	4%	--	--	--
Property Line	Ammonia	7664-41-7	No	4.64E-02	AERMOD	3.34E+00	--	--	--	1.00E+02	--	--	--	Health	--	--	--	3	--	--	--	3%	--	--	--
Property Line	Ammonium Chloride	12125-02-9	No	5.19E-03	AERMOD	3.73E-01	--	--	--	1.20E+02	--	--	--	Particulate	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Arsine	7784-42-1	Yes	4.82E-03	AERMOD	5.00E+00	--	1.00E+01	--	5.00E+00	--	1.00E+01	--	Health	--	Health	--	3	--	3	--	100%	--	100%	--
Property Line	Benzothiazole	95-16-9	No	2.51E-01	AERMOD	1.81E+01	--	--	--	7.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	26%	--	--	--
Property Line	Benzoyl Chloride	98-88-4	No	4.65E-03	AERMOD	3.35E-01	--	--	--	1.25E+02	--	--	--	Corrosion and Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Benzyl Alcohol	100-51-6	No	7.46E-04	AERMOD	5.37E-02	--	--	--	8.80E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Biphenyl, 1,1-	92-52-4	No	6.28E-05	AERMOD	--	1.08E-01	--	--	--	6.00E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Boron Tribromide	10294-33-4	No	3.70E-01	AERMOD	2.67E+01	--	--	--	3.50E+01	--	--	--	Corrosion	--	--	--	3	--	--	--	76%	--	--	--
Property Line	Boron Trichloride	10294-34-5	No	3.19E-01	AERMOD	2.30E+01	--	--	--	3.50E+01	--	--	--	Corrosion	--	--	--	3	--	--	--	66%	--	--	--
Property Line	Bromine	7726-95-6	Yes	2.78E-01	AERMOD	2.00E+01	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Bromoform	75-25-2	No	7.21E-02	AERMOD	5.19E+00	--	--	--	5.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	9%	--	--	--
Property Line	Butanol, n-	71-36-3	No	3.37E-02	AERMOD	2.43E+00	--	--	9.61E+01	9.20E+02	--	--	2.10E+03	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	5%
Property Line	Butoxy-2-Propanol, 1-	5131-66-8	No	5.64E-03	AERMOD	4.06E-01	--	--	--	3.30E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Butyl Acetate, n-	123-86-4	No	8.05E-02	AERMOD	--	1.39E+02	--	2.29E+02	--	1.50E+04	--	1.00E+03	--	Health	--	Odour	--	Guideline	--	Guideline	--	<1%	--	23%
Property Line	Butyl Acrylate, n-	141-32-2	No	3.64E-02	AERMOD	2.62E+00	--	--	--	1.20E+02	--	--	--	Particulate	--	--	--	Guideline	--	--	--	2%	--	--	--
Property Line	Carbon Disulphide	75-15-0	No	2.17E+00	AERMOD	1.56E+02	--	--	--	3.30E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	47%	--	--	--
Property Line	Carbon Tetrachloride	56-23-5	Yes	3.33E-02	AERMOD	2.40E+00	--	--	--	2.40E+00	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Chlorine	7782-50-5	Yes	8.07E-02	AERMOD	1.00E+01	--	--	2.30E+02	1.00E+01	--	--	2.30E+02	Health	--	--	Odour	3	--	--	Guideline	100%	--	--	100%
Property Line	Chlorine Dioxide	10049-04-4	Yes	2.78E-02	AERMOD	2.00E+00	--	--	--	2.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Chlorobenzene	108-90-7	No	8.21E-02	AERMOD	--	1.42E+02	--	2.34E+02	--	3.50E+03	--	4.50E+03	--	Health	--	Odour	--	Guideline	--	Guideline	--	4%	--	5%
Property Line	Chlorodifluoromethane	75-45-6	No	2.36E-01	AERMOD	1.70E+01	--	--	--	3.50E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Chloroethane	75-00-3	No	1.76E-01	AERMOD	1.27E+01	--	--	--	5.60E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Chloroform	67-66-3	Yes	1.39E-02	AERMOD	1.00E+00	--	--	--	1.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Cresol (o, m, & p-Isomers)	1319-77-3	No	1.27E-03	AERMOD	9.16E-02	--	--	--	7.50E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Cyanogen Chloride	506-77-4	Yes	1.67E-01	AERMOD	1.20E+01	--	--	--	1.20E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Cyclohexane	110-82-7	No	5.52E-01	AERMOD	3.97E+01	--	--	--	6.10E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Decene, 1-	872-05-9	No	1.00E-02	AERMOD	7.21E-01	--	--	--	6.00E+04	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Di(2-Ethylhexyl) Phthalate	117-81-7	No	6.60E-10	AERMOD	4.75E-08	--	--	--	5.00E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Diacetone Alcohol	123-42-2	No	1.11E-02	AERMOD	--	--	--	3.15E+01	--	--	--	1.35E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	2%
Property Line	Diazinon	333-41-5	No	7.31E-07	AERMOD	5.26E-05	--	--	--	3.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Diborane	19287-45-7	No	7.54E-02	AERMOD	5.43E+00	--	--	--	1.00E+01	--	--	--	Health	--	--	--	3	--	--	--	54%	--	--	--
Property Line	Dibutyl Phthalate	84-74-2	No	1.51E-07	AERMOD	1.09E-05	--	--	--	5.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dichloro-1,1,2,2,-Tetrafluoroethane, 1,2	76-14-2	No	4.66E-01	AERMOD	3.35E+01	--	--	--	7.00E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dichlorobenzene, o- (1,2-)	95-50-1	No	1.17E-02	AERMOD	--	2.02E+01	--	--	--	3.05E+04	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Dichlorobenzene, p- (1,4-)	106-46-7	No	1.50E-02	AERMOD	1.08E+00	--	--	--	9.50E+01	--	--	--	Health	--	--	--	3	--	--	--	1%	--	--	--
Property Line	Dichloroethane, 1,1-	75-34-3	No	1.61E+00	AERMOD	1.16E+02	--	--	--	1.65E+02	--	--	--	Health	--	--	--	3	--	--	--	70%	--	--	--
Property Line	Dichloroethylene, Cis-1,2-	156-59-2	No	1.41E+00	AERMOD	1.01E+02	--	--	--	1.05E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	97%	--	--	--
Property Line	Dichloroethylene, Sym-1,2-	540-59-0	Yes	1.46E+00	AERMOD	1.05E+02	--	--	--	1.05E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Dichloroethylene, Trans-1,2-	156-60-5	Yes	1.46E+00	AERMOD	1.05E+02	--	--	--	1.05E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Diethyl Phthalate	84-66-2	No	1.68E-04	AERMOD	1.21E-02	--	--	--	1.25E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Diethylene Glycol Monoethyl Ether	111-90-0	No	8.81E-04	AERMOD	--	--	--	2.51E+00	--	--	--	1.10E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%
Property Line	Diethylene Glycol Monomethyl Ether	111-77-3	No	1.23E-03	AERMOD	8.87E-02	--	--	--	1.20E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Difluorodichloromethane	75-71-8	No	3.30E-01	AERMOD	2.37E+01	--	--	--	5.00E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Diisobutyl Ketone	108-83-8	No	1.13E-02	AERMOD	8.11E-01	--	--	3.21E+01	3.50E+03	--	--	6.49E+02	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	5%
Property Line	Dimethyl Acetamide, n-	127-19-5	No	3.31E-03	AERMOD	2.38E-01	--	--	--	3.00E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dimethyl Disulphide	624-92-0	Yes	1.96E-02	AERMOD	--	--	--	5.60E+01	--	--	--	5.60E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100%
Property Line	Dimethyl Phthalate	131-11-3	No	7.55E-05	AERMOD	5.44E-03	--	--	--	1.25E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dimethyl Sulfoxide	67-68-5	No	3.69E-03	AERMOD	2.65E-01	--	--	--	2.10E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Dimethyl Sulphide	75-18-3	Yes	1.05E-02	AERMOD	--	--	--	3.00E+01	--	--	--	3.00E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100%
Property Line	Dimethyl-1,3-Diaminopropane, n-	109-55-7	No	3.03E-02	AERMOD	2.18E+00	--	--	--	2.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	11%	--	--	--
Property Line	Dioxolane, 1,3-	646-06-0	Yes	1.39E-01	AERMOD	1.00E+01	--	--	--	1.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Ethoxyethanol, 2-	110-80-5	No	3.17E-02	AERMOD	2.28E+00	--	--	9.04E+01	3.80E+02	--	--	1.10E+03	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	8%
Property Line	Ethoxyethyl Acetate, 2-	111-15-9	No	1.24E-02	AERMOD	8.89E-01	--	--	3.52E+01	5.40E+02	--	--	3.00E+02	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	12%
Property Line	Ethyl Acetate	141-78-6	No	5.11E-01	AERMOD	--	8.83E+02	--	--	--	1.90E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	5%	--	--
Property Line	Ethyl Acrylate	140-88-5	Yes	2.60E-03	AERMOD	--	4.50E+00	--	--	--	4.50E+00	--	--	--	Odour	--	--	--	Guideline	--	--	--	100%	--	--
Property Line	Ethyl Alcohol	64-17-5	No	2.36E-01	AERMOD	--	4.08E+02	--	--	--	1.90E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	2%	--	--
Property Line	Ethyl Benzene	100-41-4	No	6.36E-02	AERMOD	4.58E+00	--	--	1.81E+02	1.00E+03	--	--	1.90E+03	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	10%
Property Line	Ethyl Ether	60-29-7	Yes	3.33E-01	AERMOD	1.77E+02	--	--	9.50E+02	8.00E+03	--	--	9.50E+02	Health	--	--	Odour	3	--	--	Guideline	2%	--	--	100%
Property Line	Ethyl Hexanol, 2-	104-76-7	No	9.30E-04	AERMOD	--	1.61E+00	--	--	--	6.00E+02	--	--	--	Odour	--	--	--	--	--	Guideline	--	<1%	--	--
Property Line	Ethyl-3-Ethoxypropionate	763-69-9	No	7.54E-03	AERMOD	--	--	--	2.15E+01	--	--	--	2.00E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	11%
Property Line	Ethylene Dibromide	106-93-4	Yes	4.17E-02	AERMOD	3.00E+00	--	--	--	3.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Ethylene Dichloride	107-06-2	Yes	2.78E-02	AERMOD	2.00E+00	--	--	--	2.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Ethylene glycol butyl ether Butyl cellosolve	111-76-2	No	7.36E-03	AERMOD	5.30E-01	--	--	2.10E+01	2.40E+03	--	--	5.00E+02	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	4%
Property Line	Ethylene Glycol Dinitrate	628-96-6	No	5.31E-04	AERMOD	3.82E-02	--	--	--	3.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	1%	--	--	--
Property Line	Ethylene Glycol Monobutyl Ether Acetate	112-07-2	No	2.54E-03	AERMOD	1.83E-01	--	--	7.25E+00	3.25E+03	--	--	7.00E+02	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	1%
Property Line	Ethylene Oxide	75-21-8	Yes	2.78E-03	AERMOD	2.00E-01	--	--	--	2.00E-01	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Formaldehyde Solution (37 %)	50-00-0	No	4.33E-03	AERMOD	3.11E-01	--	--	--	6.50E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Formic Acid	64-18-6	No	1.28E-01	AERMOD	9.23E+00	--	--	--	5.00E+02	--	--	--	Health	--	--	--	3	--	--	--	2%	--	--	--

7.1g Emission Summary Table - Laboratory Fume Hoods

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Usage Restriction?	Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)				MECP POI Limit [1] (µg/m³)				Limiting Effect				Regulation Schedule #				Percentage of MECP POI Limit [2] (%)			
						24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17
Property Line	Furfural	98-01-1	No	1.44E-02	AERMOD	--	2.49E+01	--	--	--	1.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	2%	--	--
Property Line	Furfuryl Alcohol	98-00-0	No	4.76E-03	AERMOD	3.43E-01	--	--	--	1.00E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Glutaraldehyde (100 %)	111-30-8	No	3.87E-03	AERMOD	2.79E-01	--	--	1.10E+01	1.40E+01	--	--	3.50E+01	Health	--	--	Health	Guideline	--	--	Guideline	2%	--	--	32%
Property Line	Glutaraldehyde (50 %)	111-30-8	No	5.90E-04	AERMOD	4.25E-02	--	--	1.68E+00	1.40E+01	--	--	3.50E+01	Health	--	--	Health	Guideline	--	--	Guideline	<1%	--	--	5%
Property Line	Heptane, n-	142-82-5	No	2.59E-01	AERMOD	1.87E+01	--	--	--	1.10E+04	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hexachlorocyclopentadiene	77-47-4	No	1.12E-03	AERMOD	8.05E-02	--	--	--	2.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	4%	--	--	--
Property Line	Hexamethyldisilazane	999-97-3	Yes	2.78E-02	AERMOD	2.00E+00	--	--	--	2.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Hexamethylene Diisocyanate (HDI) Biuret (HDI-Bt)	4035-89-6	No	8.17E-07	AERMOD	5.88E-05	--	--	--	3.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hexamethylene Diisocyanate (HDI) Isocyanurate	3779-63-3	No	5.87E-11	AERMOD	4.22E-09	--	--	--	3.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hexamethylene Diisocyanate (HDI) Monomer	822-06-0	Yes	4.17E-04	AERMOD	3.00E-02	--	--	--	3.00E-02	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Hexamethylene Diisocyanate (HDI) Polyisocyanate	28182-81-2	No	8.26E-07	AERMOD	5.95E-05	--	--	--	3.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hexane, n-	110-54-3	No	1.57E+00	AERMOD	1.13E+02	--	--	--	2.50E+03	--	--	--	Health	--	--	--	3	--	--	--	5%	--	--	--
Property Line	Hexylene Glycol	107-41-5	No	4.94E-04	AERMOD	--	8.53E-01	--	--	--	1.20E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Hydrobromic Acid (50%)	10035-10-6	No	2.40E-03	AERMOD	--	4.14E+00	--	--	--	6.68E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Hydrochloric Acid (10%)	7647-01-0	No	2.54E-05	AERMOD	1.83E-03	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hydrochloric Acid (20 %)	7647-01-0	No	1.23E-03	AERMOD	8.84E-02	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Hydrochloric Acid (30 %)	7647-01-0	No	5.86E-02	AERMOD	4.22E+00	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	21%	--	--	--
Property Line	Hydrochloric Acid (35 %)	7647-01-0	Yes	2.78E-01	AERMOD	2.00E+01	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Hydrochloric Acid (40 %)	7647-01-0	Yes	2.78E-01	AERMOD	2.00E+01	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Hydrofluoric Acid (30%)	7664-39-3	No	4.09E-03	AERMOD	2.94E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	34%	--	--	--
Property Line	Hydrofluoric Acid (40%)	7664-39-3	Yes	1.19E-02	AERMOD	8.60E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Hydrofluoric Acid (50%)	7664-39-3	Yes	1.19E-02	AERMOD	8.60E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Hydrofluoric Acid (60%)	7664-39-3	Yes	1.19E-02	AERMOD	8.60E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Hydrogen Bromide	10035-10-6	No	2.20E-01	AERMOD	--	3.81E+02	--	--	--	6.68E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	57%	--	--
Property Line	Hydrogen Chloride	7647-01-0	No	9.94E-02	AERMOD	7.15E+00	--	--	--	2.00E+01	--	--	--	Health	--	--	--	3	--	--	--	36%	--	--	--
Property Line	Hydrogen Cyanide	74-90-8	Yes	1.11E-01	AERMOD	8.00E+00	--	--	--	8.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Hydrogen Fluoride	7664-39-3	Yes	1.19E-02	AERMOD	8.60E-01	--	--	--	8.60E-01	--	--	--	Vegetation	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Hydrogen Peroxide (35 %)	7722-84-1	No	1.61E-03	AERMOD	1.16E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Hydrogen Peroxide (50 %)	7722-84-1	No	2.55E-03	AERMOD	1.84E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Hydrogen Peroxide (70 %)	7722-84-1	No	4.15E-03	AERMOD	2.99E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Hydrogen Peroxide (90 %)	7722-84-1	No	6.32E-03	AERMOD	4.55E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	2%	--	--	--
Property Line	Hydrogen Sulphide	7783-06-4	Yes	4.56E-03	AERMOD	6.69E+00	--	--	1.30E+01	7.00E+00	--	--	1.30E+01	Health	--	--	Odour	3	--	--	3	96%	--	--	100%
Property Line	Isobutanol	78-83-1	No	5.43E-02	AERMOD	3.91E+00	--	--	1.55E+02	4.60E+03	--	--	2.34E+03	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	7%
Property Line	Isobutyl Acetate	110-19-0	No	1.15E-01	AERMOD	--	--	--	3.29E+02	--	--	--	1.66E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	20%
Property Line	Isopropyl Acetate	108-21-4	No	3.64E-01	AERMOD	--	--	--	1.04E+03	--	--	--	2.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	52%
Property Line	Isopropyl Alcohol	67-63-0	No	2.09E-01	AERMOD	1.51E+01	--	--	--	7.30E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Isopropyl Benzene	98-82-8	No	2.97E-02	AERMOD	2.14E+00	--	--	--	4.00E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Isopropyl Ether	108-20-3	No	8.69E-01	AERMOD	6.25E+01	--	--	--	1.10E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Malathion	121-75-5	No	1.56E-06	AERMOD	1.13E-04	--	--	--	1.20E+02	--	--	--	Particulate	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Mercury (Hg)	7439-97-6	No	2.42E-05	AERMOD	1.74E-03	--	--	--	2.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Methacrylic Acid	79-41-4	No	5.39E-03	AERMOD	3.88E-01	--	--	--	2.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Methane Diphenyl Diisocyanate (MDI)	101-68-8	No	3.37E-08	AERMOD	2.42E-06	--	--	--	7.00E-01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Methanol	67-56-1	No	4.02E-01	AERMOD	2.90E+01	--	--	--	4.00E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Methyl Acrylate	96-33-3	Yes	2.32E-03	AERMOD	--	4.00E+00	--	--	--	4.00E+00	--	--	--	Odour	--	--	--	Guideline	--	--	--	100%	--	--
Property Line	Methyl Bromide	74-83-9	No	2.59E-01	AERMOD	1.86E+01	--	--	--	1.35E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	1%	--	--	--
Property Line	Methyl Chloride	74-87-3	No	1.38E-01	AERMOD	9.90E+00	--	--	--	3.20E+02	--	--	--	Health	--	--	--	3	--	--	--	3%	--	--	--
Property Line	Methyl Chloroform	71-55-6	No	1.06E+00	AERMOD	7.61E+01	--	--	--	1.15E+05	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Methyl Ethyl Ketone	78-93-3	No	4.47E-01	AERMOD	3.22E+01	--	--	--	1.00E+03	--	--	--	Health	--	--	--	3	--	--	--	3%	--	--	--
Property Line	Methyl Isobutyl Ketone	108-10-1	No	1.24E-01	AERMOD	8.91E+00	--	--	--	1.20E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Methyl Isocyanate	624-83-9	Yes	1.39E-02	AERMOD	1.00E+00	--	--	--	1.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Methyl Mercaptan	74-93-1	Yes	4.56E-03	AERMOD	--	--	--	1.30E+01	--	--	--	1.30E+01	--	--	--	Odour	--	--	--	3	--	--	--	100%
Property Line	Methyl Methacrylate	80-62-6	No	2.43E-01	AERMOD	1.75E+01	--	--	--	8.60E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	2%	--	--	--
Property Line	Methyl Salicylate	119-36-8	No	8.25E-04	AERMOD	5.94E-02	--	--	--	1.00E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Methyl Tert-Butyl Ether	1634-04-4	No	1.39E+00	AERMOD	1.00E+02	--	--	--	7.00E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	1%	--	--	--
Property Line	Methyl-2-Hexanone, 5-	110-12-3	No	3.34E-02	AERMOD	--	--	--	9.52E+01	--	--	--	6.30E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	15%
Property Line	Methylal	109-87-5	No	2.14E+00	AERMOD	1.54E+02	--	--	--	6.20E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	2%	--	--	--
Property Line	Methylcyclopentadienyl Manganese Tricarbonyl	12108-13-3	No	3.30E-04	AERMOD	2.37E-02	--	--	--	1.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Methylene Chloride	75-09-2	No	2.82E+00	AERMOD	2.03E+02	--	--	--	2.20E+02	--	--	--	Health	--	--	--	3	--	--	--	92%	--	--	--
Property Line	Methylene Iodide	75-11-6	No	1.34E-02	AERMOD	9.68E-01	--	--	--	6.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	1%	--	--	--
Property Line	Monomethyl Amine (40%)	74-89-5	Yes	3.47E-01	AERMOD	2.50E+01	--	--	--	2.50E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Naphtha (Mineral Spirits)	8030-30-6	No	3.03E-02	AERMOD	2.18E+00	--	--	--	2.60E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Naphthalene	91-20-3	No	5.77E-04	AERMOD	4.16E-02	--	--	1.65E+00	2.25E+01	--	--	5.00E+01	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	3%
Property Line	Naphthol, 1-	90-15-3	No	7.16E-03	AERMOD	5.15E-01	--	--	--	1.00E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Nickel Carbonyl	13463-39-3	Yes	6.95E-03	AERMOD	5.00E-01	--	--	--	5.00E-01	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Nitric Acid (70 %)	7697-37-2	No	2.29E-02	AERMOD	1.65E+00	--	--	--	3.50E+01	--	--	--	Corrosion	--	--	--	3	--	--	--	5%	--	--	--
Property Line	Nitroglycerin	55-63-0	No	2.82E-06	AERMOD	2.03E-04	--	--	--	3.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Nitrous Oxide	10024-97-2	No	1.20E-01	AERMOD	8.63E+00	--	--	--	9.00E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Octane	111-65-9	No	8.36E-02	AERMOD	--	--	--	2.38E+02	--	--	--	6.18E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%
Property Line	Oleic Acid	112-80-1	No	5.42E-08	AERMOD	--	9.37E-05	--	--	--	5.00E+00	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--
Property Line	Oxalic Acid	144-62-7	No	7.25E-06	AERMOD	5.22E-04	--	--	--	2.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Oxo-Heptyl Acetate	90438-79-2	No	3.32E-03	AERMOD	2.39E-01	--	--	--	8.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Oxo-Hexyl Acetate	88230-35-7	No	9.34E-03	AERMOD	6.72E-01	--	--	--	8.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Ozone	10028-15-6	Yes	9.55E-02	AERMOD	--	1.65E+02	--	--	--	1.65E+02	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--
Property Line	Pentaborane	19624-22-7	Yes	1.39E-02	AERMOD	1.00E+00	--	--	--	1.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Pentachlorophenol	87-86-5	No	1.50E-06	AERMOD	1.08E-04	--	--	--	2.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Perchloroethylene	127-18-4	No	1.83E-01	AERMOD	1.32E+01	--	--	--	3.60E+02	--	--	--	Health	--	--	--	3	--	--	--	4%	--	--	--
Property Line	Phenol	108-95-2	No	2.57E-03	AERMOD	1.85E-01	--	--	--	3.00E+01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--

7.1g Emission Summary Table - Laboratory Fume Hoods

RWDI# 1803937

University Health Network - Toronto Western Hospital

Receptor	Contaminant	CAS Number	Usage Restriction?	Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)				MECP POI Limit [1] (µg/m³)				Limiting Effect				Regulation Schedule #				Percentage of MECP POI Limit [2] (%)			
						24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17	24	1	0.5	0.17
Property Line	Phosgene	75-44-5	No	2.70E-01	AERMOD	1.94E+01	--	--	--	4.50E+01	--	--	--	Health	--	--	--	3	--	--	--	43%	--	--	--
Property Line	Phosphine	7803-51-2	No	9.26E-02	AERMOD	6.67E+00	--	--	--	1.00E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	67%	--	--	--
Property Line	Phosphoric Acid (75 %)	7664-38-2	No	7.24E-05	AERMOD	5.21E-03	--	--	--	7.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Phosphoric Acid (85 %)	7664-38-2	No	1.12E-04	AERMOD	8.03E-03	--	--	--	7.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Phosphorus Oxychloride	10025-87-3	Yes	1.67E-01	AERMOD	1.20E+01	--	--	--	1.20E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Polymeric Methane Diphenyl Diisocyanate (PMDI)	9016-87-9	No	1.68E-08	AERMOD	1.21E-06	--	--	--	7.00E-01	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Propionaldehyde	123-38-6	Yes	3.51E-03	AERMOD	--	--	--	1.00E+01	--	--	--	1.00E+01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100%
Property Line	Propionic Acid	79-09-4	No	2.29E-02	AERMOD	--	3.96E+01	--	--	--	1.00E+02	--	--	--	Odour	--	--	--	Guideline	--	--	--	40%	--	--
Property Line	Propyl Acetate, n-	109-60-4	No	2.09E-01	AERMOD	1.50E+01	--	--	--	6.60E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Propyl Alcohol, n-	71-23-8	No	9.28E-02	AERMOD	6.68E+00	--	--	--	1.60E+04	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Propylene	115-07-1	No	1.15E-01	AERMOD	8.26E+00	--	--	--	4.00E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Propylene Dichloride	78-87-5	No	3.60E-01	AERMOD	2.59E+01	--	--	--	2.40E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	1%	--	--	--
Property Line	Propylene Glycol	57-55-6	No	8.22E-04	AERMOD	5.92E-02	--	--	--	1.20E+02	--	--	--	Particulate	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Propylene Glycol 1-Methyl Ether	107-98-2	No	7.08E-02	AERMOD	--	--	--	2.02E+02	--	--	--	1.21E+05	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%
Property Line	Propylene Glycol-1-Methyl Ether-2-Acetate	108-65-6	No	2.52E-02	AERMOD	1.81E+00	--	--	--	5.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Propylene Oxide	75-56-9	Yes	2.08E-02	AERMOD	1.50E+00	--	--	--	1.50E+00	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Pyridine	110-86-1	Yes	2.81E-02	AERMOD	8.37E+00	--	--	8.00E+01	1.50E+02	--	--	8.00E+01	Health	--	--	Odour	Guideline	--	--	Guideline	6%	--	--	100%
Property Line	Silane	7803-62-5	No	8.75E-02	AERMOD	6.30E+00	--	--	--	1.50E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	4%	--	--	--
Property Line	Stoddard Solvent	8052-41-3	No	2.90E-02	AERMOD	2.09E+00	--	--	--	2.60E+03	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Styrene, Monomer	100-42-5	No	3.81E-02	AERMOD	2.74E+00	--	--	--	4.00E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Sulphur Hexafluoride	2551-62-4	No	3.98E-01	AERMOD	2.87E+01	--	--	--	6.00E+05	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Sulphuric Acid (100 %)	7664-93-9	No	2.69E-07	AERMOD	1.94E-05	--	--	--	5.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Sulphuric Acid (78 %)	7664-93-9	No	2.71E-09	AERMOD	1.95E-07	--	--	--	5.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Sulphuric Acid (93 %)	7664-93-9	No	1.17E-07	AERMOD	8.40E-06	--	--	--	5.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Sulphuric Acid (98 %)	7664-93-9	No	2.21E-07	AERMOD	1.59E-05	--	--	--	5.00E+00	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Tetrahydrofuran	109-99-9	No	8.71E-01	AERMOD	6.27E+01	--	--	--	9.30E+04	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Toluene	108-88-3	No	1.80E-01	AERMOD	1.30E+01	--	--	--	2.00E+03	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Toluene Di-Isocyanate, 2,4-	584-84-9	No	2.13E-04	AERMOD	1.53E-02	--	--	--	2.00E-01	--	--	--	Health	--	--	--	3	--	--	--	8%	--	--	--
Property Line	Toluene Di-Isocyanate, 2,4- and 2,6- (Mixed Isomers)	26471-62-5	No	1.61E-04	AERMOD	1.16E-02	--	--	--	2.00E-01	--	--	--	Health	--	--	--	3	--	--	--	6%	--	--	--
Property Line	Trichloro-1,2,2-Trifluoroethane, 1,2,2-	76-13-1	No	4.03E+00	AERMOD	2.90E+02	--	--	--	8.00E+05	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Trichlorobenzene, 1,2,4-	120-82-1	No	4.52E-03	AERMOD	3.25E-01	--	--	--	4.00E+02	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--
Property Line	Trichloroethylene (TCE)	79-01-6	Yes	1.67E-01	AERMOD	1.20E+01	--	--	--	1.20E+01	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Trichlorofluoromethane	75-69-4	Yes	8.33E+01	AERMOD	6.00E+03	--	--	--	6.00E+03	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Trifluoroacetic Acid	76-05-1	Yes	2.08E-01	AERMOD	1.50E+01	--	--	--	1.50E+01	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--
Property Line	Trimethylamine (40 %)	75-50-3	Yes	2.89E-04	AERMOD	--	5.00E-01	--	--	--	5.00E-01	--	--	--	Odour	--	--	--	Guideline	--	--	--	100%	--	--
Property Line	Trimethylbenzene, 1,2,3- (individual isomer or Trimethylbenzene mixture)	526-73-8	No	9.83E-03	AERMOD	7.08E-01	--	--	--	2.20E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Trimethylbenzene, 1,2,4- (individual isomer or Trimethylbenzene mixture)	95-63-6	No	1.47E-02	AERMOD	1.05E+00	--	--	--	2.20E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Trimethylbenzene, 1,3,5- (individual isomer or Trimethylbenzene mixture)	108-67-8	No	1.60E-02	AERMOD	1.15E+00	--	--	--	2.20E+02	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--
Property Line	Vinyl Chloride	75-01-4	Yes	1.39E-02	AERMOD	1.00E+00	--	--	--	1.00E+00	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Vinylidene Chloride	75-35-4	Yes	1.39E-01	AERMOD	1.00E+01	--	--	--	1.00E+01	--	--	--	Health	--	--	--	3	--	--	--	100%	--	--	--
Property Line	Xylene (o,m, p-Isomers)	1330-20-7	No	4.99E-02	AERMOD	3.59E+00	--	--	1.42E+02	7.30E+02	--	--	3.00E+03	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	5%

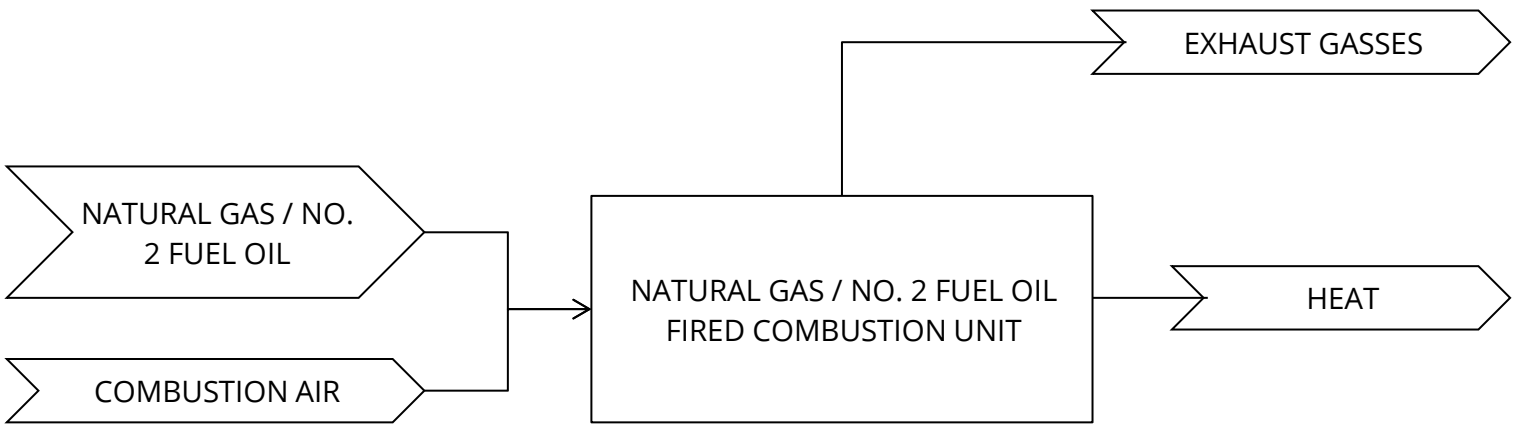
Notes:

[1] The term "MECP POI Limit" identified in Table D-4 refers to the following information (there may be more than one relevant MECP POI Limit for each contaminant):

- air quality standards in Schedules 1, 2 and 3 of the Regulation; and
- the guidelines for contaminants set out the MECP publication, "Air Contaminants Benchmark (ACB) List: Standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", version 2.0, April 2018.

[2] Contaminants with concentrations that are at 100% if the POI limit have hourly usage restrictions which allow the site to remain in compliance.

FIGURES

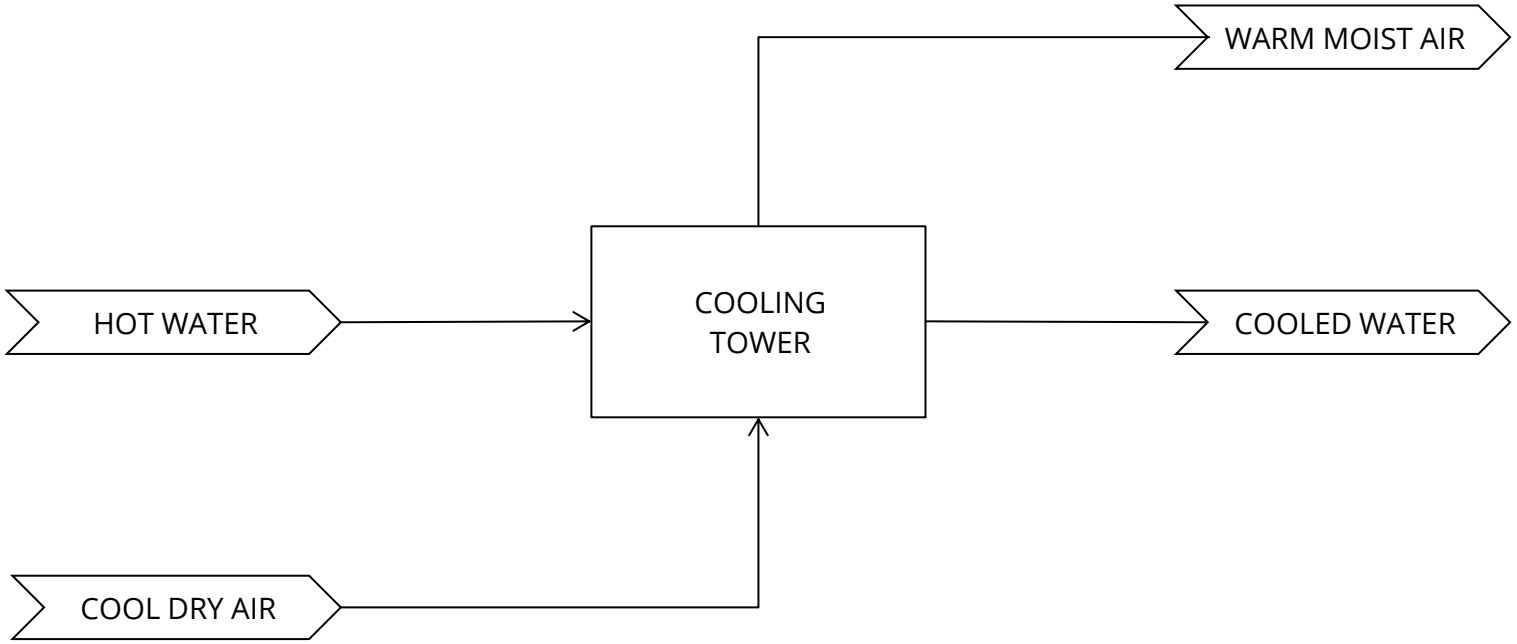


Process Flow Diagram
Natural Gas / No. 2 Fuel Oil Fired Combustion Equipment

University Health Network - Toronto Western Hospital - 399 Bathurst Street, Toronto, Ontario M5T 2S8, ON

RWDI# 1803937

Drawn by: AKG	Figure: 1.4a
Approx. Scale: not to scale	
Date Revised: 2020-10-01	



Process Flow Diagram
Cooling Tower

University Health Network - Toronto Western Hospital - 399 Bathurst Street, Toronto, Ontario M5T 2S8, ON

RWDI# 1803937

Drawn by: AKG	Figure: 1.4b
Approx. Scale: not to scale	
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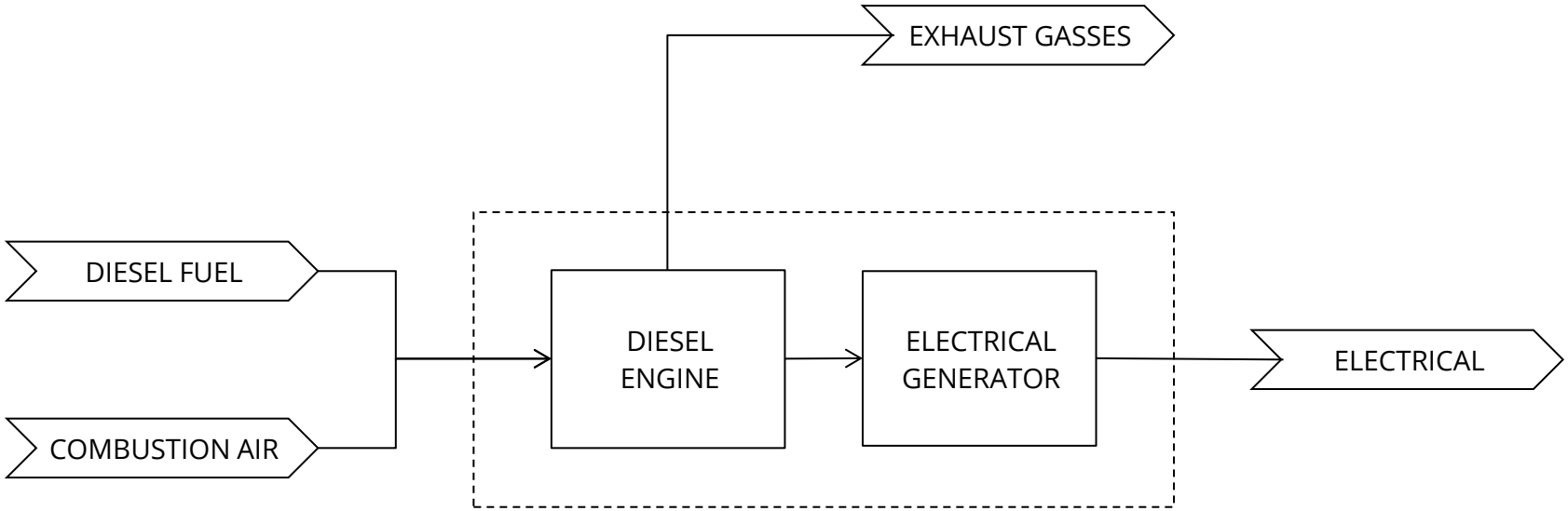
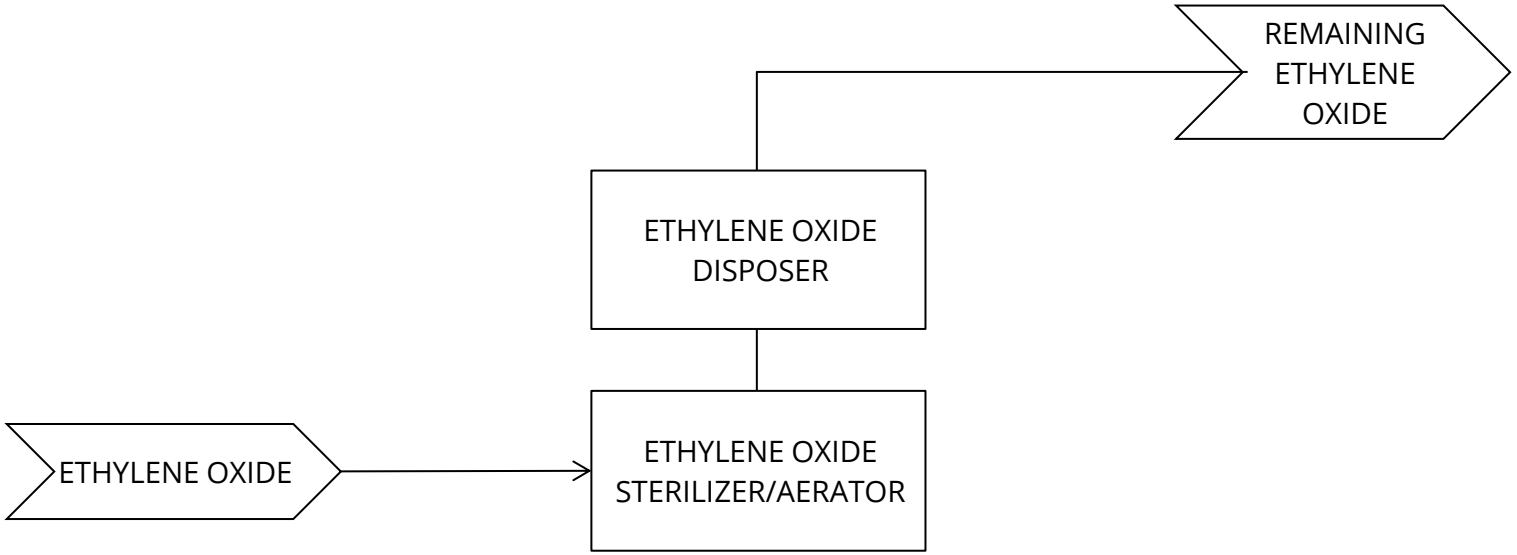


Process Flow Diagram
Emergency Diesel Generator

University Health Network - Toronto Western Hospital - 399 Bathurst Street, Toronto, Ontario M5T 2S8, ON

RWDI# 1803937

Drawn by: AKG	Figure: 1.4c
Approx. Scale: not to scale	
Date Revised: 2020-10-01	

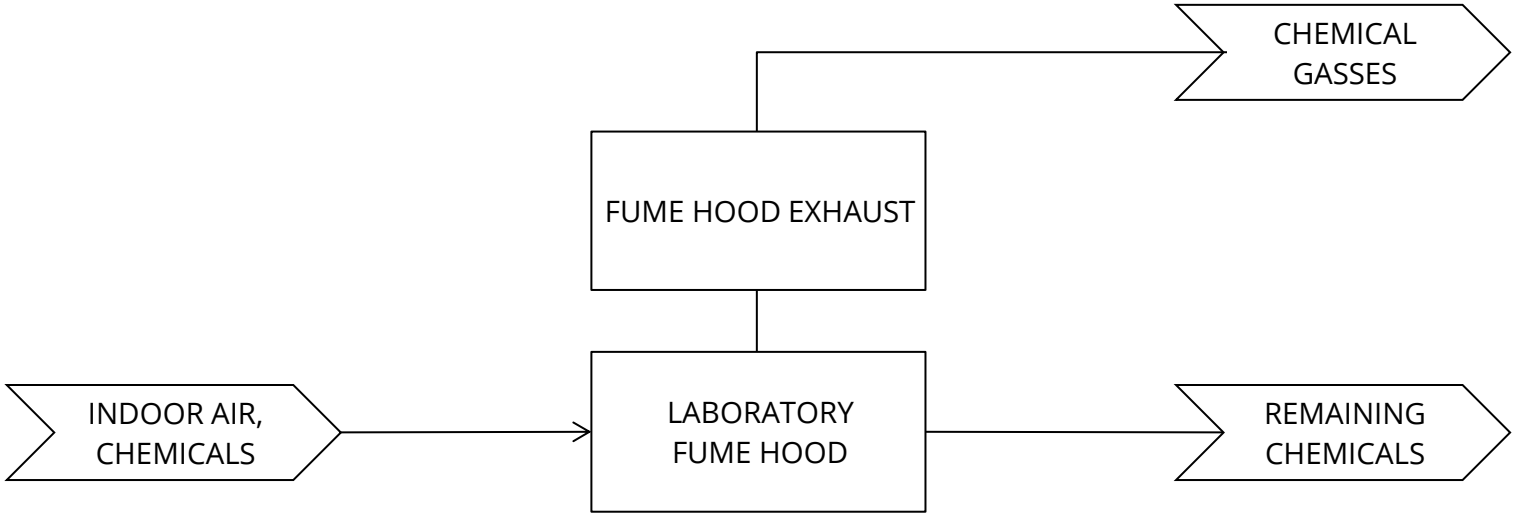


Process Flow Diagram
Ethylene Oxide Sterilization

University Health Network - Toronto Western Hospital - 399 Bathurst Street, Toronto, Ontario M5T 2S8, ON

RWDI# 1803937

Drawn by: AKG	Figure: 1.4d
Approx. Scale: not to scale	
Date Revised: 2020-10-01	

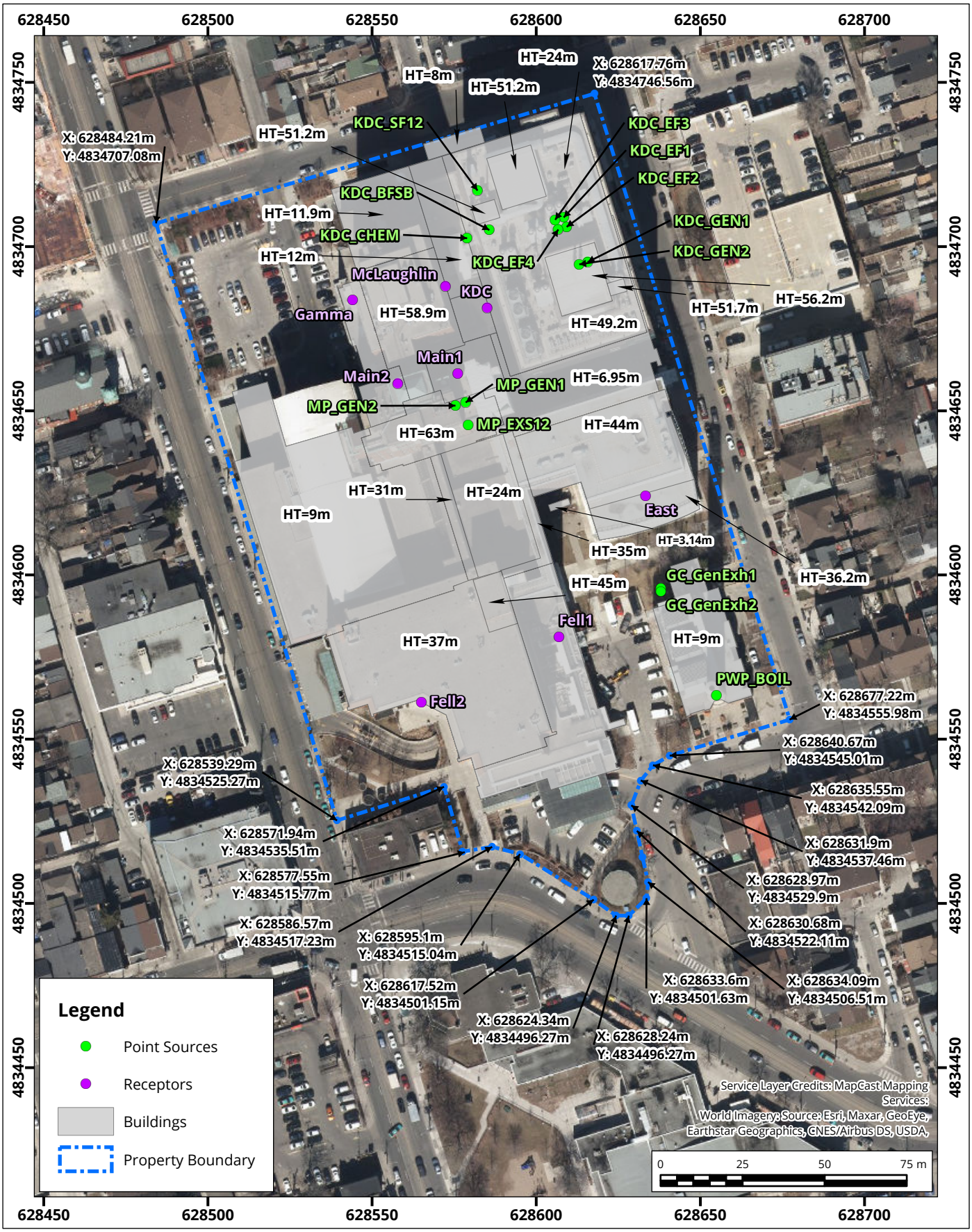


Process Flow Diagram
Laboratory Fume Hood

University Health Network - Toronto Western Hospital - 399 Bathurst Street, Toronto, Ontario M5T 2S8, ON

RWDI# 1803937

Drawn by: AKG	Figure: 1.4e	
Approx. Scale: not to scale		
Date Revised: 2020-10-01		



Site Plan Showing Significant Sources, Buildings, and Property Boundary

True North

Map Projection: NAD 1983 UTM Zone 17N

Toronto Western Hospital EASR, Toronto ON

Project #: 1803937

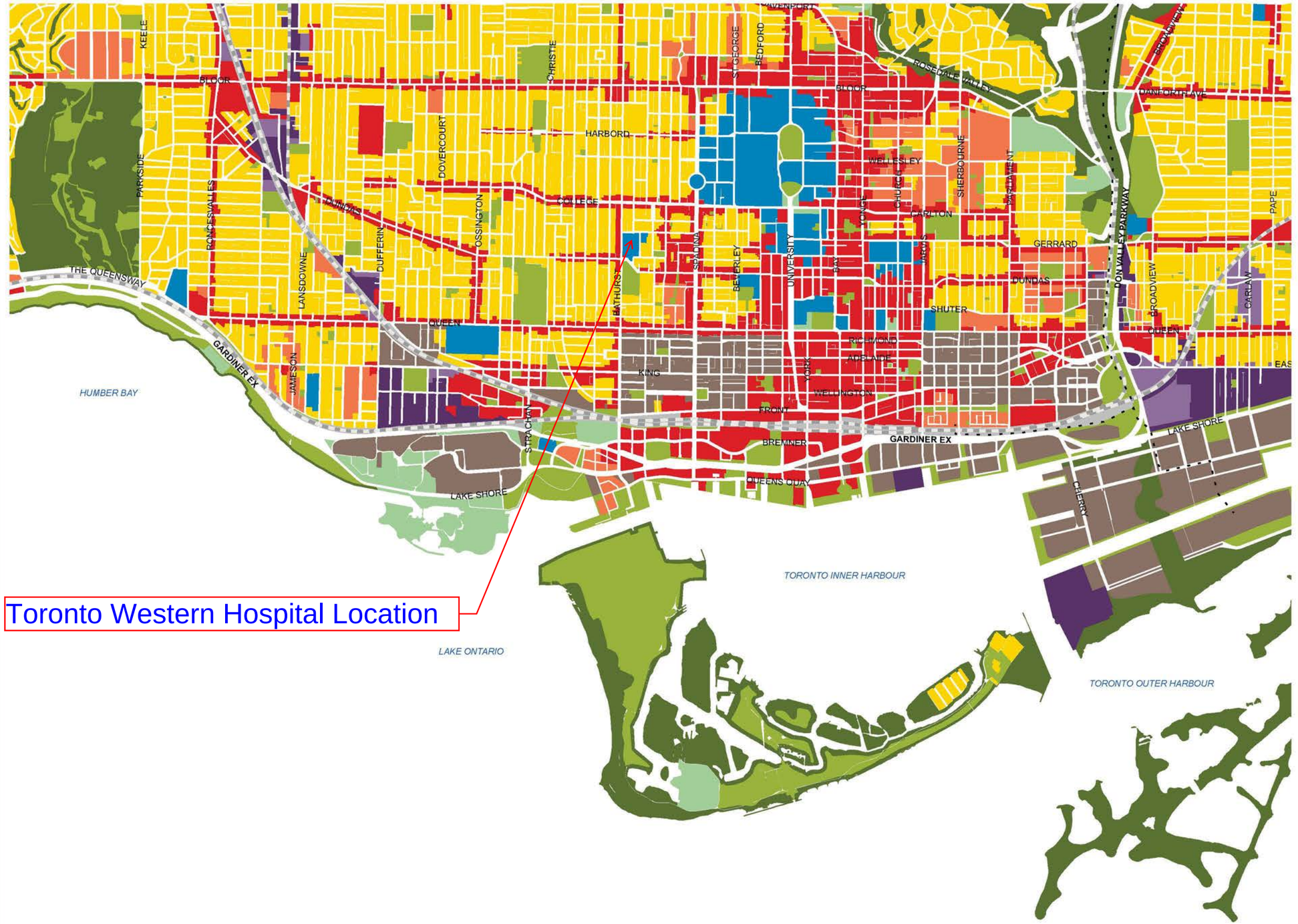
Drawn by: LJN	Figure: 5.2
Approx. Scale:	1:1,600
Date Revised:	Feb 18, 2021

Map Document: K:\1803937\4. Analysis\GIS\FIG 5.2\1803937_TorontoWesternHospitalEASR.aprx

Toronto Official Plan

Map 18
Land Use Plan

February 2019



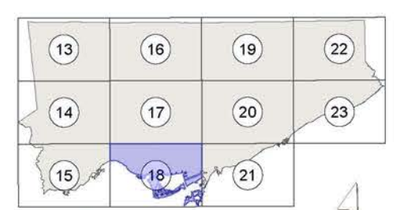
Land Use Designations

- Neighbourhoods
- Apartment Neighbourhoods
- Mixed Use Areas
- Natural Areas
- Parks
- Other Open Space Areas (Including Golf Courses, Cemetaries, Public Utilities)
- Institutional Areas
- Regeneration Areas
- General Employment Areas
- Core Employment Areas
- Utility Corridors

- Streets and Highways
- Railway Lines
- Hydro Corridors

0 500 1000 1500 m

TORONTO



Key Map

N
Not to Scale

APPENDIX A

Dispersion Modelling Files ASHRAE following AERMOD on attached CD

Appendix A: ASHRAE 2019, New Generator Compound Generator Testing, 0.5 Hour, 1 Hour and 24 Hour

RWDI# 1803937

University Health Network - Toronto Western Hospital

Exhaust Details

Operating Scenario	Powerhouse Generator Testing		
Contaminant			
Model Averaging Time	15 min		
Criteria Averaging Time(s)	30 min	60 min	1440 min
Averaging Time Exponent	0.28		

Site Details

Umin	1	m/s
Umax	13.3	m/s
Ambient Temp	Not Used	°C

Comments on Site Details
Umin set to 1 m/s
Umax set to slightly higher than local 1% wind speeds.
Toronto Billy Bishop Airport = 13.3 m/s, 1% wind speed, ASHRAE Fundamentals 2017
Temperature not required

Recirculation Zone Calculations

Wind Condition		B-small	B-large	R	H_c	X_c	L_c	Building Edge to source distance (m)	Source Impacted By Recirculation Zone?	Is there a another tier in the same wind direction? (Yes/No)	Distance between first tier and edge of second tier (Xstep)	Bubbles combine? (Y/N)
N	KDC Building	39.7	49.1	42.6	9.4	21.3	38.3					

Approach Roughness ID

ID	Description	Z^o (m)	n	delta (m)
1	Flat, water, desert	0.01	0.1	213
2	Flat, airport, grassland	0.05	0.14	274
3	Suburban	0.65	0.22	365
4	Urban	2	0.33	457

Model will also use 0.5 and 1.5 times the roughness to check

Dilution Calculations

Wind Condition	Source ID	Receptor ID	Internal Dilution	BETA Cap? 1=False 0=True	Qe Flow Rate (m^3/s)	De Exhaust Diameter (m)	Ve Exhaust Velocity (m/s)	Hs Stack Height Above Roof (m)	Htop Rooftop Obstr. Height (m)	X Stretched String Distance (m)		H (z) Roof Height Above Grade (m)	RID Approach Rough. ID (1-4)	PROT Receptor Protected? (P or U)	Minimum Dilution	Distance to Worst Case Dilution (m)	Speed for Worst Case Dilution (m/s)	Rough. For Worst Case Dilution	Conc. For 1 g/s 15 min µg/m³	Pollutant Emission Rate (g/s)	Pollutant Conc. 30 min µg/m³	Pollutant Conc. 60 min µg/m³	Pollutant Conc. 1440 min µg/m³
										Min	Max												
N	KDC_SF1001, KDC_SF1002	East	1	1	5.03	0.80	10.00	14.0	9.4	94	94	49.2	4	P	966	94	3.0	3.00	206	2.87E-01	49	40	16
N	KDC_BF, KDC_SBF	East	1	1	6.70	0.80	13.33	14.0	9.4	106	106	49.2	4	P	1,069	106	3.5	3.00	140	3.83E-01	44	36	15
																Total Emissions at:		East	winds from:	N	93	76	31

Appendix A: ASHRAE 2019, New Generator Compound Generator Testing, 0.5 Hour, 1 Hour and 24 Hour

Variables from N wind direction on source Dilution Calculations

Variable	Parameter	Metric		English		Sample Calculations or Variable Selection (Metric only)
		Value	Units	Value	Units	
Hs	Stack Height above Local Roof	14	m	45.934	ft	
Qe	Exhaust Flow Rate	5.026	m^3/s	10650.094	ft^3/min	
De	Exhaust Diameter	0.8	m	2.6248	ft	
Ve	Exhaust Exit Velocity	10.0	m/s	1968.60	fpm	
H	Roof Height above Grade	49.2	m	161.4252	ft	
X	Separation Distance (min of range)	94	m	308.414	ft	
RID	Approach Roughness ID	4				Model will also pick ID+1 and ID-1 to check for worst-case roughness
Htop	Rooftop Obstruction Height	9.3684817	m	30.737988	ft	Maximum height of nearby recirculation zones, obstacles, or height of intake above roof)
PROT	Protected/Unprotected Receptor	P				A protected receptor means plume has to negotiate a significant turn or corner before reaching receptor, or receptor is significant distance below roof
BETA	Stack Cap Factor	1				0 = capped, 1 = uncapped
q	Contaminant Emission Rate	0.287178	g/s	2.3	lb/h	
Z-anem	Meteorological Height for Wind measurement	10	m	33	ft	Assumed 10 m anemometer height at airport
DELTA-anem	Boundary Layer Height at Airport	274	m	900	ft	Assumed as 900 ft for ID=2 airport
U-anem	Wind Speed at Airport	3.0	m/s	591	fpm	Model returns the wind speed that corresponds to the worst-case dilution
A-anem	Boundary Layer Exponent at Airport	0.14				Assumed as 0.14 for ID = 2 (airport)

Detailed Calculation from N wind direction on source KDC_SF1001, KDC_SF1002

Variable	Parameter	Formula	Metric		English		Sample Calculation or Variable Selection (Metric only)
			Value	Units	Value	Units	
Z^o	Surface roughness boundary layer	based on land use	3.000	m	9.84	ft	= 0.01m; 0.05m; 0.65m; or, 2.0m for roughness ID 1; 2; 3; and, 4, respectively
a (n)	exponent of boundary layer	based on land use	0.289				= 0.1; 0.14; 0.22; or, 0.33 for roughness ID 1; 2; 3; or, 4, respectively.
DELTA	Boundary layer depth	based on land use	457.200	m	1500.0732	ft	= 700ft (213m); 900ft (274m); 1200ft (366m); or, 1500ft (457m) for roughnes ID 1; 2; 3; or 4, respectively
Fm	Momentum Flux	= Ve^2 * De^2 / 4	16	m4/s2	6674940.595	ft4/min2	= $(10\ m/s)^2$ * $(0.8\ m)^2$ / 4
UH	Building Top Wind Speed	= U-anem * (DELTA-anem / Z-anem) ^ A-anem * (H / DELTA) ^ a	2.500	m/s	492.150	fpm	= (3 m/s) * ((274 m) / (10 m)) ^ (0.14) * ((49.2 m) / (457.2 m)) ^ (0.289)
BETAj	Jet entrainment coeff	= 1/3 + UH / Ve	0.583		0.583		= 1/3 + (2.5 m/s) / (10 m/s)
U*	Friction Velocity	= UH / (2.5 * ln (H / Zo)	0.357	m/s	70.279	fpm	= (2.5 m/s) / (2.5 * ln ((49.2 m) / (3 m)))
Hx	Plume Rise with X	= (3 * Fm * X /BETA j^2 / UH^2) ^ (1/3)	12.854	m	42.174	ft	= (3 * (16 $m4/s^2$) * (94 m) / $(0.583)^2$ / $(2.5\ m/s)^2$) ^ (1/3)
Hf	Final Plume Rise	= 0.9 * (Fm * UH / U*) ^ 0.5 / (UH * BETAj)	6.536	m	21.445	ft	= 0.9 * ((16 $m4/s^2$) * (2.5 m/s) / (0.357 m/s)) ^ 0.5 / ((2.5 ms) * (0.583))
Hr	Plume Rise	= Minimum of BETA * Hx or BETA * Hf	6.536	m	21.445	ft	= Minimum of ((1) * (12.854 m)) or ((1) * (6.536 m))
Hd	Downwash adjustment	= Maximum of De * (3 - BETA * Ve / UH) or 0	0.000	m	0.000	ft	= Maximum of ((0.8 m) * (3 - (1) * (10 m/s) / (2.5 m/s)) or 0
H-plume	Plume height	= Hs + Hr - Hd	20.536	m	67.379	ft	= (14 m) + (6.536 m) - (0 m)
ZETA	Plume Separation	= Maximum of H-plume - Htop or 0	11.168	m	36.642	ft	= Maximum of ((20.536 m) - (9.36848169914365 m)) or 0
N	Constant	= 0.24 + 0.096 * LOG10 (Zo) + 0.016 * (LOG10 (Zo)) ²	0.289				= 0.24 + 0.096 * LOG10 (3 m) + 0.016 * (LOG10 (3 m))²
i-x	Turbluence intensity in x	= N * LN (30 / Zo) / LN (H / Zo)	0.238				= (0.289) * LN (30 / (3 m)) / LN ((49.2 m) / (3 m))
i-y	Turbluence Intensity in y	= 0.75 * i-x	0.179				= 0.75 * (0.238)
i-z	Turbluence Intensity in z	= 0.5 * i-x	0.119				= 0.5 * (0.238)
SIG-o	Sigma-initial	= 0.35 * De	0.280	m	0.919	ft	= 0.35 * (0.8 m)
SIG-y	Sigma-y	= (i-y^2 * X^2 + SIG-o^2) ^0.5	16.828	m	55.213	ft	= ((0.179)² * (94 m)² + (0.28 m)²) ^0.5
SIG-z	Sigma-z	= (i-z^2 * X^2 + SIG-o^2) ^0.5	11.190	m	36.714	ft	= ((0.119)² * (94 m)² + (0.28 m)²) ^0.5
D-unp	Dilution, unprotected	= 4 * UH * SIG-y * SIG-z / (Ve * De^2) * e ($ZETA^2$ / (2 * SIG-z^2))	484				= 4 * (2.5 m/s) * (16.828 m) * (11.19 m) / ((10 m/s) * $(0.8\ m)^2$) * e (($(11.168\ m)^2$ / (2 * $(11.19\ m)^2$))
D	Dilution	= If protected, D-unp * 2, otherwise, D-unp	968				= If protected, (484) * 2, otherwise, 484
C-unit,15	15-minute Concentration at 1 g/s	= Unit Emission Rate / Qe / D	206	µg/m³			= (1 g/s) (1000000 µg/g) / (5.026 m³/s) / (968)
C-unit	30-minute Concentration at 1 g/s	= D-unit,15 * (Model Avg. Time) / (Criteria Avg. Time) ^ Exponent	170	µg/m³			= (206 µg/m³) * ((15 min) / (30 min)) ^ (0.28)
C	30-minute Concentration	= q * C-unit / Unit Emission Rate	49	µg/m³			= (0.287177953688889 g/s) * (170 µg/m²) / (1 g/s)

Note: The unit emission rate calculated in the Detailed Calculation Sample Calculations may be slightly different than the emission rate displayed in the Dilution Calculations Table above due to step-by-step rounding.

Appendix A: ASHRAE 2019, Main Pavilion Generator Testing, 100% Load, 0.5 Hour, 1 Hour and 24 Hour

University Health Network - Toronto Western Hospital

RWDI# 1803937

Exhaust Details

Operating Scenario	Main Pavilion Generator Testing, 100% Load		
Contaminant			
Model Averaging Time	15 min		
Criteria Averaging Time(s)	30 min	60 min	1440 min
Averaging Time Exponent	0.28		

Site Details

Umin	1	m/s
Umax	11.4	m/s
Ambient Temp	Not Used	°C

Comments on Site Details
Umin set to 1 m/s
Umax set to slightly higher than local 1% wind speeds.
Toronto Billy Bishop Airport = 11.4 m/s, 1% wind speed, ASHRAE Fundamentals 2013
Temperature not required

Recirculation Zone Calculations

Wind Condition		B-small	B-large	R	Hc	Xc	Lc	Building Edge to source distance (m)	Is distance > Lc?
N	East Bldg Tier 1	32.21	35.07	32.0	7.0	16.0	28.8		
N	East Bldg Tier 2	6.13	30.33	10.2	2.2	5.1	9.2		
N	East Bldg Comb			42.2	9.3	21.1	38.0		
N	MP Bldg N Face Tier 1	24.16	11.78	18.5	4.1	9.2	16.6		
N	MP Bldg N Face Tier 2	24.16	43.33	28.4	6.2	14.2	25.5		
N	MP Bldg N Face Tier 3	4.40	15.47	6.6	1.4	3.3	5.9		
N	Comp Bubble Tier 2 & 3			34.9	7.7	17.5	31.4		
N	MP Bldg N Face Tier 4	1.60	6.49	2.5	0.6	1.3	2.3		
N	Comp Bubble Tier 3 & 4			37.5	8.2	18.7	33.7		
N	KDC Bldg N Face Tier 1	39.70	49.09	41.0	9.0	20.5	36.9		
E	KDC Bldg E Face	50.04	70.04	53.8	11.8	26.9	48.4		
E	KDC Blgd E Face Penthouse	6.71	18.40	9.2	2.0	4.6	8.3		
E	KDC E Face Penthouse Comp			63.0	13.8	31.5	56.7		
N	MP Bldg S Face	17.58	22.90	18.6	4.1	9.3	16.8		
N	East Bldg North Face	41.60	50.00	21.3	4.7	10.6	19.2		
N	East Bldg East Face	37.00	41.60	37.1	8.2	18.5	33.4		
N	Fell Building Penthouse N Face	16.00	17.30	8.0	1.8	4.0	7.2		
N	Fell Building N Face	8.00	43.20	6.8	1.5	3.4	6.2		
E	MP Bldg East Face (Skinny)	16.40	44.00	22.1	4.9	11.0	19.9		
S	MP Bldg, South Face (Whole Face)	22.14	42.00	26.5	5.8	13.3	23.9		

Comments on Building
Building is a hospital complex with serval large sections. Impacts for the worst case wind direction was predicted for each contamiant and each identified air intake.

Approach Roughness ID

ID	Description	Z_o (m)	n	delta (m)
1	Flat, water, desert	0.01	0.1	213
2	Flat, airport, grassland	0.05	0.14	274
3	Suburban	0.65	0.22	365
4	Urban	2	0.33	457

Model will also use 0.5 and 1.5 times the roughness to check

Dilution Calculations

Wind Condition	Source ID	Receptor ID	Internal Dilution	BETA Cap? 1=False 0=True	Ve Flow Rate (m^3/s)	De Exhaust Diameter (m)	Ve Exhaust Velocity (m/s)	Stack Height Above Grade (m)	Hs Stack Height Above Roof (m)	Htop Rooftop Obstr. Height (m)	X Stretched String Distance (m)		H Roof Height Above Grade (m)	RID Approach Rough. ID (1-4)	PROT Receptor Protected? (P or U)	Minimum Dilution	Distance to Worst Case Dilution (m)	Speed for Worst Case Dilution (m/s)	Rough. For Worst Case Dilution	Conc. For 1 g/s 15 min µg/m³	Pollutant Emission Rate (g/s)	Pollutant Conc. 30 min µg/m³	Pollutant Conc. 60 min µg/m³	Pollutant Conc. 1440 min µg/m³
											Min	Max												
N	KDC_SF12	East	1	1	5.03	0.80	10.00	63.2	14.0	9.0	94	95	49.2	4	P	999	94	3.0	3.00	199	2.87E-01	47	39	16
E	KDC_BFSB	McLaughlin	1	1	6.70	0.80	13.33	63.2	14.0	11.8	36	36	49.2	4	P	223	36	8.5	1.00	669	3.83E-01	211	174	71
E	KDC_SF12	McLaughlin	1	1	5.03	0.80	10.00	63.2	14.0	11.8	42	42	49.2	4	P	274	42	6.0	1.00	726	2.87E-01	172	141	58
E	KDC_BFSB	KDC	1	1	6.70	0.80	13.33	63.2	14.0	9.0	53	53	49.2	4	P	609	53	8.0	1.00	245	3.83E-01	77	64	26
SW	MP_GEN1	KDC	1	1	2.96	0.25	58.41	71.0	8.0	5.8	59	60	63.0	4	P	1,979	59	9.0	3.00	171	3.96E+00	557	N/A	N/A
N	KDC_BFSB	Main1	1	1	6.70	0.80	13.33	63.2	14.0	11.8	56	56	49.2	4	P	400	56	6.5	1.00	373	3.83E-01	118	97	40
S	MP_GEN2	Main1	1	1	2.96	0.25	58.41	71.0	8.0	5.0	43	43	63.0	4	P	1,956	43	11.0	3.00	173	3.96E+00	564	N/A	N/A
E	MP_GEN1	Main2	1	1	2.96	0.25	58.41	71.0	8.0	5.0	74	75	63.0	4	P	2,693	74	7.5	3.00	125	3.96E+00	409	N/A	N/A
N	KDC_BFSB	Fell1	1	1	6.70	0.80	13.33	63.2	14.0	9.0	141	142	49.2	4	P	1,418	141	2.5	3.00	105	3.83E-01	33	27	11
N	MP_GEN1	Fell2	1	1	2.96	0.25	58.41	71.0	8.0	5.0	100	100	63.0	4	P	3,458	100	5.5	3.00	98	3.96E+00	319	N/A	N/A
N	KDC_BFSB	Fell2	1	1	6.70	0.80	13.33	63.2	14.0	9.0	155	156	49.2	4	P	1,560	155	2.5	1.00	96	3.83E-01	30	25	10
E	KDC_BFSB	Gamma	1	1	6.70	0.80	13.33	63.2	14.0	5.0	87	87	49.2	4	P	1,508	87	4.5	3.00	99	3.83E-01	31	26	11
SE	MP_GEN2	Gamma	1	1	2.96	0.25	58.41	71.0	8.0	5.0	76	77	63.0	4	P	2,750	76	7.5	3.00	123	3.96E+00	401	N/A	N/A
																	Total Emissions at:		East	winds from:	N	47	39	16
																	Total Emissions at:		McLaughlin	winds from:	E	383	315	129
																	Total Emissions at:		Gamma	winds from:	E	31	26	11
																	Total Emissions at:		Gamma	winds from:	SE	401	0	0
																	Total Emissions at:		Fell2	winds from:	N	349	25	10
																	Total Emissions at:		Fell1	winds from:	N	33	27	11
																	Total Emissions at:		Main2	winds from:	E	409	0	0
																	Total Emissions at:		Main1	winds from:	N	118	97	40
																	Total Emissions at:		Main1	winds from:	S	564	0	0
																	Total Emissions at:		KDC	winds from:	E	77	64	26
																	Total Emissions at:		KDC	winds from:	SW	557	0	0

Appendix A: ASHRAE 2019, Main Pavilion Generator Testing, 100% Load, 0.5 Hour, 1 Hour and 24 Hour

Variables from SW wind direction on source MP_GEN1

Variable	Parameter	Metric		English		Sample Calculations or Variable Selection (Metric only)
		Value	Units	Value	Units	
Hs	Stack Height above Local Roof	8.0	m	26.248	ft	
Qe	Exhaust Flow Rate	3.0	m^3/s	6272.24	ft^3/min	
De	Exhaust Diameter	0.25	m	0.8203	ft	
Ve	Exhaust Exit Velocity	58.4	m/s	11498.59	fpm	
H	Roof Height above Grade	63	m	206.703	ft	
X	Separation Distance (min of range)	59	m	193.579	ft	
RID	Approach Roughness ID	4				Model will also pick ID+1 and ID-1 to check for worst-case roughness
Htop	Rooftop Obstruction Height	5.8	m	19.0298	ft	Maximum height of nearby recirculation zones, obstacles, or height of intake above roof)
PROT	Protected/Unprotected Receptor	P				A protected receptor means plume has to negotiate a significant turn or corner before reaching receptor, or receptor is significant distance below roof
BETA	Stack Cap Factor	1				0 = capped, 1 = uncapped
q	Contaminant Emission Rate	3.96E+00	g/s	31.5	lb/h	
Z-anem	Meteorological Height for Wind measurement	10	m	33	ft	Assumed 10 m anemometer height at airport
DELTA-anem	Boundary Layer Height at Airport	274	m	900	ft	Assumed as 900 ft for ID=2 airport
U-anem	Wind Speed at Airport	9.0	m/s	1772	fpm	Model returns the wind speed that corresponds to the worst-case dilution
A-anem	Boundary Layer Exponent at Airport	0.14				Assumed as 0.14 for ID = 2 (airport)

Detailed Calculation from SW wind direction on source MP_GEN1

Variable	Parameter	Formula	Metric		English		Sample Calculation or Variable Selection (Metric only)
			Value	Units	Value	Units	
Z^o	Surface roughness boundary layer	based on land use	3.000	m	9.84	ft	= 0.01m; 0.05m; 0.65m; or, 2.0m for roughness ID 1; 2; 3; and, 4, respectively
a	exponent of boundary layer	based on land use	0.289				= 0.1; 0.14; 0.22; or, 0.33 for roughness ID 1; 2; 3; or, 4, respectively.
DELTA	Boundary layer depth	based on land use	457.200	m	1500.0732	ft	= 700ft (213m); 900ft (274m); 1200ft (366m); or, 1500ft (457m) for roughnes ID 1; 2; 3; or 4, respectively
Fm	Momentum Flux	= Ve^2 * De^2 / 4	53.31	m4/s2	22240067.7	ft4/min2	= (58.41 m/s)² * (0.25 m)² / 4
UH	Building Top Wind Speed	= U-anem * (DELTA-anem / Z-anem) ^ A-anem * (H / DELTA) ^ a	8.060	m/s	1586.692	fpm	= (9 m/s) * ((274 m) / (10 m)) ^ (0.14) * ((63 m) / (457.2 m)) ^ (0.289)
BETAj	Jet entrainment coeff	= 1/3 + UH / Ve	0.471		0.471		= 1/3 + (8.06 m/s) / (58.41 m/s)
U*	Friction Velocity	= UH / (2.5 * ln (H / Zo)	1.059	m/s	208.475	fpm	= (8.06 m/s) / (2.5 * ln ((63 m) / (3 m)))
Hx	Plume Rise with X	= (3 * Fm * X / j^2 / UH^2) ^ (1/3)	8.683	m	28.489	ft	= (3 * (53.31 m4/s²) * (59 m) / (0.471)² / (8.06 m/s)²) ^ (1/3)
Hf	Final Plume Rise	= 0.9 * (Fm * UH / U*) ^ 0.5 / (UH * BETAj)	4.775	m	15.667	ft	= 0.9 * ((53.31 m4/s²) * (8.06 m/s) / (1.059 m/s)) ^ 0.5 / ((8.06 ms) * (0.471))
Hr	Plume Rise	= Minimum of BETA * Hx or BETA * Hf	4.775	m	15.667	ft	= Minimum of ((1) * (8.683 m)) or ((1) * (4.775 m))
Hd	Downwash adjustment	= Maximum of De * (3 - BETA * Ve / UH) or 0	0.000	m	0.000	ft	= Maximum of ((0.25 m) * (3 - (1) * (58.41 m/s) / (8.06 m/s)) or 0
H-plume	Plume height	= Hs + Hr - Hd	12.775	m	41.915	ft	= (8 m) + (4.775 m) - (0 m)
ZETA	Plume Separation	= Maximum of H-plume - Htop or 0	6.975	m	22.885	ft	= Maximum of ((12.775 m) - (5.8 m)) or 0
N	Constant	= 0.24 + 0.096 * LOG10 (Zo) + 0.016 * (LOG10 (Zo)) ²	0.289				= 0.24 + 0.096 * LOG10 (3 m) + 0.016 * (LOG10 (3 m))²
i-x	Intensity in x	= N * LN (30 / Zo) / LN (H / Zo)	0.219				= (0.289) * LN (30 / (3 m)) / LN ((63 m) / (3 m))
i-y	Intensity in y	= 0.75 * i-x	0.164				= 0.75 * (0.219)
i-z	Intensity in z	= 0.5 * i-x	0.110				= 0.5 * (0.219)
SIG-o	Sigma-initial	= 0.35 * De	0.088	m	0.289	ft	= 0.35 * (0.25 m)
SIG-y	Sigma-y	= (i-y^2 * X^2 + SIG-o^2) ^0.5	9.676	m	31.747	ft	= ((0.164)² * (59 m)² + (0.088 m)²) ^0.5
SIG-z	Sigma-z	= (i-z^2 * X^2 + SIG-o^2) ^0.5	6.491	m	21.297	ft	= ((0.11)² * (59 m)² + (0.088 m)²) ^0.5
D-unp	Dilution, unprotected	= 4 * UH * SIG-y * SIG-z / (Ve * De^2) * e (ZETA² / (2 * SIG-z^2))	988				= 4 * (8.06 m/s) * (9.676 m) * (6.491 m) / ((58.41 m/s) * (0.25 m)²) * e ((6.975 m)² / (2 * (6.491 m)²))
D	Dilution	= If protected, D-unp * 2, otherwise, D-unp	1976				= If protected, (988) * 2, otherwise, 988
C-unit,15	15-minute Concentration at 1 g/s	= Unit Emission Rate / Qe / D	171	µg/m³			= (1 g/s) (1000000 µg/g) / (2.96 m³/s) / (1976)
C-unit	30-minute Concentration at 1 g/s	= D-unit,15 * (Model Avg. Time) / (Criteria Avg. Time) ^ Exponent	141	µg/m³			= (171 µg/m³) * ((15 min) / (30 min)) ^ (0.28)
C	30-minute Concentration	= q * C-unit / Unit Emission Rate	559	µg/m³			= (3.96204561540741 g/s) * (141 µg/m²) / (1 g/s)

Note: The unit emission rate calculated in the Detailed Calculation Sample Calculations may be slightly different than the emission rate displayed in the Dilution Calculations Table above due to step-by-step rounding.

Appendix A: ASHRAE 2019, KDC Building Generator Testing, 100% Load, 0.5 Hour, 1 Hour and 24 Hour

University Health Network - Toronto Western Hospital

RWDI# 1803937

Exhaust Details

Operating Scenario	KDC Building Generator Testing, 100% Load		
Contaminant			
Model Averaging Time	15 min		
Criteria Averaging Time(s)	30 min	60 min	1440 min
Averaging Time Exponent	0.28		

Site Details

Umin	1	m/s
Umax	11.4	m/s
Ambient Temp	Not Used	°C

Comments on Site Details
Umin set to 1 m/s
Umax set to slightly higher than local 1% wind speeds.
Toronto Billy Bishop Airport = 11.4 m/s, 1% wind speed, ASHRAE Fundamentals 2013
Temperature not required

Recirculation Zone Calculations

Wind Condition		B-small	B-large	R	Hc	Xc	Lc	Building Edge to source distance (m)	Is distance > Lc?
N	East Bldg Tier 1	32.21	35.07	32.0	7.0	16.0	28.8		
N	East Bldg Tier 2	6.13	30.33	10.2	2.2	5.1	9.2		
N	East Bldg Comb			42.2	9.3	21.1	38.0		
N	MP Bldg N Face Tier 1	24.16	11.78	18.5	4.1	9.2	16.6		
N	MP Bldg N Face Tier 2	24.16	43.33	28.4	6.2	14.2	25.5		
N	MP Bldg N Face Tier 3	4.40	15.47	6.6	1.4	3.3	5.9		
N	Comp Bubble Tier 2 & 3			34.9	7.7	17.5	31.4		
N	MP Bldg N Face Tier 4	1.60	6.49	2.5	0.6	1.3	2.3		
N	Comp Bubble Tier 3 & 4			37.5	8.2	18.7	33.7		
N	KDC Bldg N Face Tier 1	39.70	49.09	41.0	9.0	20.5	36.9		
E	KDC Bldg E Face	50.04	70.04	53.8	11.8	26.9	48.4		
E	KDC Blgd E Face Penthouse	6.71	18.40	9.2	2.0	4.6	8.3		
E	KDC E Face Penthouse Comp			63.0	13.8	31.5	56.7		
N	MP Bldg S Face	17.58	22.90	18.6	4.1	9.3	16.8		
N	East Bldg North Face	41.60	50.00	21.3	4.7	10.6	19.2		
N	East Bldg East Face	37.00	41.60	37.1	8.2	18.5	33.4		
N	Fell Building Penthouse N Face	16.00	17.30	8.0	1.8	4.0	7.2		
N	Fell Building N Face	8.00	43.20	6.8	1.5	3.4	6.2		
E	MP Bldg East Face (Skinny)	16.40	44.00	22.1	4.9	11.0	19.9		
S	MP Bldg, South Face (Whole Face)	22.14	42.00	26.5	5.8	13.3	23.9		

Comments on Building
Building is a hospital complex with serval large sections. Impacts for the worst case wind direction was predicted for each contamiant and each identified air intake.

Approach Roughness ID

ID	Description	Z_o (m)	n	delta (m)
1	Flat, water, desert	0.01	0.1	213
2	Flat, airport, grassland	0.05	0.14	274
3	Suburban	0.65	0.22	365
4	Urban	2	0.33	457

Model will also use 0.5 and 1.5 times the roughness to check

Dilution Calculations

Wind Condition	Source ID	Receptor ID	Internal Dilution	BETA Cap? 1=False 0=True	Ve Flow Rate (m^3/s)	De Exhaust Diameter (m)	Ve Exhaust Velocity (m/s)	Stack Height Above Grade (m)	Hs Stack Height Above Roof (m)	Htop Rooftop Obstr. Height (m)	X Stretched String Distance (m)		H Roof Height Above Grade (m)	RID Approach Rough. ID (1-4)	PROT Receptor Protected? (P or U)	Minimum Dilution	Distance to Worst Case Dilution (m)	Speed for Worst Case Dilution (m/s)	Rough. For Worst Case Dilution	Conc. For 1 g/s 15 min µg/m³	Pollutant Emission Rate (g/s)	Pollutant Conc. 30 min µg/m³	Pollutant Conc. 60 min µg/m³	Pollutant Conc. 1440 min µg/m³
											Min	Max												
N	KDC_SF12	East	1	1	5.03	0.80	10.00	63.2	14.0	9.0	94	95	49.2	4	P	999	94	3.0	3.00	199	0.00E+00	0	0	0
E	KDC_BFSB	McLaughlin	1	1	6.70	0.80	13.33	63.2	14.0	11.8	36	36	49.2	4	P	223	36	8.5	1.00	669	3.83E-01	211	174	71
E	KDC_SF12	McLaughlin	1	1	5.03	0.80	10.00	63.2	14.0	11.8	42	42	49.2	4	P	274	42	6.0	1.00	726	2.87E-01	172	141	58
E	KDC_GEN2	McLaughlin	1	1	7.38	0.40	58.75	62.2	6.0	11.8	49	49	56.2	4	P	299	49	9.0	1.00	453	2.47E+00	922	N/A	N/A
E	KDC_BFSB	KDC	1	1	6.70	0.80	13.33	63.2	14.0	9.0	53	53	49.2	4	P	609	53	8.0	1.00	245	3.83E-01	77	64	26
E	KDC_GEN2	KDC	1	1	7.38	0.40	58.75	62.2	6.0	9.0	61	62	56.2	4	P	580	61	10.0	1.00	234	2.47E+00	475	N/A	N/A
E	KDC_GEN2	Main1	1	1	7.38	0.40	58.75	62.2	6.0	11.8	60	61	56.2	4	P	434	60	8.5	1.00	312	2.47E+00	635	N/A	N/A
N	KDC_BFSB	Main1	1	1	6.70	0.80	13.33	63.2	14.0	11.8	56	56	49.2	4	P	400	56	6.5	1.00	373	3.83E-01	118	97	40
N	KDC_BFSB	Fell1	1	1	6.70	0.80	13.33	63.2	14.0	9.0	141	142	49.2	4	P	1,418	141	2.5	3.00	105	3.83E-01	33	27	11
N	KDC_BFSB	Fell2	1	1	6.70	0.80	13.33	63.2	14.0	9.0	155	156	49.2	4	P	1,560	155	2.5	1.00	96	3.83E-01	30	25	10
E	KDC_BFSB	Gamma	1	1	6.70	0.80	13.33	63.2	14.0	5.0	87	87	49.2	4	P	1,508	87	4.5	3.00	99	3.83E-01	31	26	11
																	Total Emissions at:		East	winds from:	N	0	0	0
																	Total Emissions at:		McLaughlin	winds from:	E	1,304	315	129
																	Total Emissions at:		Gamma	winds from:	E	31	26	11
																	Total Emissions at:		Fell2	winds from:	N	30	25	10
																	Total Emissions at:		Fell1	winds from:	N	33	27	11
																	Total Emissions at:		Main1	winds from:	N	118	97	40
																	Total Emissions at:		Main1	winds from:	E	635	0	0
																	Total Emissions at:		KDC	winds from:	E	552	64	26

Appendix A: ASHRAE 2019, KDC Building Generator Testing, 100% Load, 0.5 Hour, 1 Hour and 24 Hour

Variables from E wind direction on source KDC_GEN2

Variable	Parameter	Metric		English		Sample Calculations or Variable Selection (Metric only)
		Value	Units	Value	Units	
Hs	Stack Height above Local Roof	6.0	m	19.686	ft	
Qe	Exhaust Flow Rate	7.4	m^3/s	15638.22	ft^3/min	
De	Exhaust Diameter	0.40	m	1.3124	ft	
Ve	Exhaust Exit Velocity	58.8	m/s	11565.53	fpm	
H	Roof Height above Grade	56.2	m	184.3922	ft	
X	Separation Distance (min of range)	49	m	159.7519	ft	
RID	Approach Roughness ID	4				Model will also pick ID+1 and ID-1 to check for worst-case roughness
Htop	Rooftop Obstruction Height	11.8	m	38.7158	ft	Maximum height of nearby recirculation zones, obstacles, or height of intake above roof)
PROT	Protected/Unprotected Receptor	P				A protected receptor means plume has to negotiate a significant turn or corner before reaching receptor, or receptor is significant distance below roof
BETA	Stack Cap Factor	1				0 = capped, 1 = uncapped
q	Contaminant Emission Rate	2.47E+00	g/s	19.6	lb/h	
Z-anem	Meteorological Height for Wind measurement	10	m	33	ft	Assumed 10 m anemometer height at airport
DELTA-anem	Boundary Layer Height at Airport	274	m	900	ft	Assumed as 900 ft for ID=2 airport
U-anem	Wind Speed at Airport	9.0	m/s	1772	fpm	Model returns the wind speed that corresponds to the worst-case dilution
A-anem	Boundary Layer Exponent at Airport	0.14				Assumed as 0.14 for ID = 2 (airport)

Detailed Calculation from E wind direction on source KDC_GEN2

Variable	Parameter	Formula	Metric		English		Sample Calculation or Variable Selection (Metric only)
			Value	Units	Value	Units	
Z^o	Surface roughness boundary layer	based on land use	3.000	m	9.84	ft	= 0.01m; 0.05m; 0.65m; or, 2.0m for roughness ID 1; 2; 3; and, 4, respectively
a	exponent of boundary layer	based on land use	0.289				= 0.1; 0.14; 0.22; or, 0.33 for roughness ID 1; 2; 3; or, 4, respectively.
DELTA	Boundary layer depth	based on land use	457.200	m	1500.0732	ft	= 700ft (213m); 900ft (274m); 1200ft (366m); or, 1500ft (457m) for roughnes ID 1; 2; 3; or 4, respectively
Fm	Momentum Flux	= Ve^2 * De^2 / 4	138.06	m4/s2	57596393.66	ft4/min2	= (58.75 m/s)² * (0.4 m)² / 4
UH	Building Top Wind Speed	= U-anem * (DELTA-anem / Z-anem) ^ A-anem * (H / DELTA) ^ a	7.800	m/s	1535.508	fpm	= (9 m/s) * ((274 m) / (10 m)) ^ (0.14) * ((56.2 m) / (457.2 m)) ^ (0.289)
BETAj	Jet entrainment coeff	= 1/3 + UH / Ve	0.466		0.466		= 1/3 + (7.8 m/s) / (58.75 m/s)
U*	Friction Velocity	= UH / (2.5 * ln (H / Zo)	1.065	m/s	209.656	fpm	= (7.8 m/s) / (2.5 * ln ((56.2 m) / (3 m)))
Hx	Plume Rise with X	= (3 * Fm * X / j^2 / UH^2) ^ (1/3)	11.514	m	37.777	ft	= (3 * (138.06 m4/s²) * (48.6899986267089 m) / (0.466)² / (7.8 m/s)²) ^ (1/3)
Hf	Final Plume Rise	= 0.9 * (Fm * UH / U*) ^ 0.5 / (UH * BETAj)	7.874	m	25.835	ft	= 0.9 * ((138.06 m4/s²) * (7.8 m/s) / (1.065 m/s)) ^ 0.5 / ((7.8 ms) * (0.466))
Hr	Plume Rise	= Minimum of BETA * Hx or BETA * Hf	7.874	m	25.835	ft	= Minimum of ((1) * (11.514 m)) or ((1) * (7.874 m))
Hd	Downwash adjustment	= Maximum of De * (3 - BETA * Ve / UH) or 0	0.000	m	0.000	ft	= Maximum of ((0.4 m) * (3 - (1) * (58.75 m/s) / (7.8 m/s)) or 0
H-plume	Plume height	= Hs + Hr - Hd	13.874	m	45.521	ft	= (6 m) + (7.874 m) - (0 m)
ZETA	Plume Separation	= Maximum of H-plume - Htop or 0	2.074	m	6.805	ft	= Maximum of ((13.874 m) - (11.8 m)) or 0
N	Constant	= 0.24 + 0.096 * LOG10 (Zo) + 0.016 * (LOG10 (Zo)) ²	0.289				= 0.24 + 0.096 * LOG10 (3 m) + 0.016 * (LOG10 (3 m))²
i-x	Intensity in x	= N * LN (30 / Zo) / LN (H / Zo)	0.227				= (0.289) * LN (30 / (3 m)) / LN ((56.2 m) / (3 m))
i-y	Intensity in y	= 0.75 * i-x	0.170				= 0.75 * (0.227)
i-z	Intensity in z	= 0.5 * i-x	0.114				= 0.5 * (0.227)
SIG-o	Sigma-initial	= 0.35 * De	0.140	m	0.459	ft	= 0.35 * (0.4 m)
SIG-y	Sigma-y	= (i-y^2 * X^2 + SIG-o^2) ^0.5	8.278	m	27.160	ft	= ((0.17)² * (48.6899986267089 m)² + (0.14 m)²) ^0.5
SIG-z	Sigma-z	= (i-z^2 * X^2 + SIG-o^2) ^0.5	5.552	m	18.216	ft	= ((0.114)² * (48.6899986267089 m)² + (0.14 m)²) ^0.5
D-unp	Dilution, unprotected	= 4 * UH * SIG-y * SIG-z / (Ve * De^2) * e (ZETA² / (2 * SIG-z^2))	164				= 4 * (7.8 m/s) * (8.278 m) * (5.552 m) / ((58.75 m/s) * (0.4 m)²) * e ((2.074 m)² / (2 * (5.552 m)²))
D	Dilution	= If protected, D-unp * 2, otherwise, D-unp	328				= If protected, (164) * 2, otherwise, 164
C-unit,15	15-minute Concentration at 1 g/s	= Unit Emission Rate / Qe / D	413	µg/m³			= (1 g/s) (1000000 µg/g) / (7.38 m³/s) / (328)
C-unit	30-minute Concentration at 1 g/s	= D-unit,15 * (Model Avg. Time) / (Criteria Avg. Time) ^ Exponent	340	µg/m³			= (413 µg/m³) * ((15 min) / (30 min)) ^ (0.28)
C	30-minute Concentration	= q * C-unit / Unit Emission Rate	840	µg/m³			= (2.46913580246914 g/s) * (340 µg/m²) / (1 g/s)

Note: The unit emission rate calculated in the Detailed Calculation Sample Calculations may be slightly different than the emission rate displayed in the Dilution Calculations Table above due to step-by-step rounding.

Appendix A: ASHRAE 2019, Operation of Boilers on No. 2 Fuel Oil, 1 Hour, 24 Hour

RWDI# 1803937

University Health Network - Toronto Western Hospital

Exhaust Details

Operating Scenario		Operation of Boilers on No. 2 Fuel Oil	
Contaminant			
Model Averaging Time		15 min	
Criteria Averaging Time(s)	60 min	1440 min	
Averaging Time Exponent		0.28	

Site Details

Umin	1	m/s
Umax	11.4	m/s
Ambient Temp	Not Used	°C

Comments on Site Details
Umin set to 1 m/s
Umax set to slightly higher than local 1% wind speeds.
Toronto Billy Bishop Airport = 11.4 m/s, 1% wind speed, ASHRAE Fundamentals 2013
Temperature not required

Recirculation Zone Calculations

Wind Condition		B-small	B-large	R	Hc	Xc	Lc	Building Edge to source distance (m)	Is distance > Lc?
N	East Bldg Tier 1	32.21	35.07	32.0	7.0	16.0	28.8		
N	East Bldg Tier 2	6.13	30.33	10.2	2.2	5.1	9.2		
N	East Bldg Comb			42.2	9.3	21.1	38.0		
N	MP Bldg N Face Tier 1	24.16	11.78	18.5	4.1	9.2	16.6		
N	MP Bldg N Face Tier 2	24.16	43.33	28.4	6.2	14.2	25.5		
N	MP Bldg N Face Tier 3	4.40	15.47	6.6	1.4	3.3	5.9		
N	Comp Bubble Tier 2 & 3			34.9	7.7	17.5	31.4		
N	MP Bldg N Face Tier 4	1.60	6.49	2.5	0.6	1.3	2.3		
N	Comp Bubble Tier 3 & 4			37.5	8.2	18.7	33.7		
N	KDC Bldg N Face Tier 1	39.70	49.09	41.0	9.0	20.5	36.9		
E	KDC Bldg E Face	50.04	70.04	53.8	11.8	26.9	48.4		
E	KDC Blgd E Face Penthouse	6.71	18.40	9.2	2.0	4.6	8.3		
E	KDC E Face Penthouse Comp			63.0	13.8	31.5	56.7		
N	MP Bldg S Face	17.58	22.90	18.6	4.1	9.3	16.8		
N	East Bldg North Face	41.60	50.00	21.3	4.7	10.6	19.2		
N	East Bldg East Face	37.00	41.60	37.1	8.2	18.5	33.4		
N	Fell Building Penthouse N Face	16.00	17.30	8.0	1.8	4.0	7.2		
N	Fell Building N Face	8.00	43.20	6.8	1.5	3.4	6.2		
E	MP Bldg East Face (Skinny)	16.40	44.00	22.1	4.9	11.0	19.9		
S	MP Bldg, South Face (Whole Face)	22.14	42.00	26.5	5.8	13.3	23.9		

Comments on Building
Building is a hospital complex with serval large sections. Impacts for the worst case wind direction was predicted for each contamiant and each identified air intake.

Approach Roughness ID

ID	Description	Z_o (m)	n	delta (m)
1	Flat, water, desert	0.01	0.1	213
2	Flat, airport, grassland	0.05	0.14	274
3	Suburban	0.65	0.22	365
4	Urban	2	0.33	457

Model will also use 0.5 and 1.5 times the roughness to check

Dilution Calculations

Wind Condition	Source ID	Receptor ID	Internal Dilution	BETA Cap? 1=False 0=True	Ve Flow Rate (m^3/s)	De Exhaust Diameter (m)	Ve Exhaust Velocity (m/s)	Stack Height Above Grade (m)	Hs Stack Height Above Roof (m)	Htop Rooftop Obstr. Height (m)	X Stretched String Distance (m)		H Roof Height Above Grade (m)	RID Approach Rough. ID (1-4)	PROT Receptor Protected? (P or U)	Minimum Dilution	Distance to Worst Case Dilution (m)	Speed for Worst Case Dilution (m/s)	Rough. For Worst Case Dilution	Conc. For 1 g/s 15 min µg/m³	Pollutant Emission Rate (g/s)	Pollutant Conc. 60 min µg/m³	Pollutant Conc. 1440 min µg/m³
											Min	Max											
N	KDC_SF12	East	1	1	5.03	0.80	10.00	63.2	14.0	9.0	94	95	49.2	4	P	999	94	3.0	3.00	199	6.93E-01	94	38
E	KDC_BFSB	McLaughlin	1	1	6.70	0.80	13.33	63.2	14.0	11.8	36	36	49.2	4	P	223	36	8.5	1.00	669	9.24E-01	419	172
E	KDC_SF12	McLaughlin	1	1	5.03	0.80	10.00	63.2	14.0	11.8	42	42	49.2	4	P	274	42	6.0	1.00	726	6.93E-01	341	140
E	KDC_BFSB	KDC	1	1	6.70	0.80	13.33	63.2	14.0	9.0	53	53	49.2	4	P	609	53	8.0	1.00	245	9.24E-01	154	63
N	KDC_BFSB	Main1	1	1	6.70	0.80	13.33	63.2	14.0	11.8	56	56	49.2	4	P	400	56	6.5	1.00	373	9.24E-01	234	96
N	KDC_BFSB	Fell1	1	1	6.70	0.80	13.33	63.2	14.0	9.0	141	142	49.2	4	P	1,418	141	2.5	3.00	105	9.24E-01	66	27
N	KDC_BFSB	Fell2	1	1	6.70	0.80	13.33	63.2	14.0	9.0	155	156	49.2	4	P	1,560	155	2.5	1.00	96	9.24E-01	60	25
E	KDC_BFSB	Gamma	1	1	6.70	0.80	13.33	63.2	14.0	5.0	87	87	49.2	4	P	1,508	87	4.5	3.00	99	9.24E-01	62	25
																	Total Emissions at:		East	winds from:	N	94	38
																	Total Emissions at:		McLaughlin	winds from:	E	760	312
																	Total Emissions at:		Gamma	winds from:	E	62	25
																	Total Emissions at:		Fell2	winds from:	N	60	25
																	Total Emissions at:		Fell1	winds from:	N	66	27
																	Total Emissions at:		Main1	winds from:	N	234	96
																	Total Emissions at:		KDC	winds from:	E	154	63

Appendix A: ASHRAE 2019, Operation of Boilers on No. 2 Fuel Oil, 1 Hour, 24 Hour

Variables from N wind direction on source KDC_SF12

Variable	Parameter	Metric		English		Sample Calculations or Variable Selection (Metric only)
		Value	Units	Value	Units	
Hs	Stack Height above Local Roof	14.0	m	45.934	ft	
Qe	Exhaust Flow Rate	5.0	m^3/s	10658.57	ft^3/min	
De	Exhaust Diameter	0.80	m	2.6248	ft	
Ve	Exhaust Exit Velocity	10.0	m/s	1968.60	fpm	
H	Roof Height above Grade	49.2	m	161.4252	ft	
X	Separation Distance (min of range)	94	m	308.414	ft	
RID	Approach Roughness ID	4				Model will also pick ID+1 and ID-1 to check for worst-case roughness
Htop	Rooftop Obstruction Height	9.0	m	29.529	ft	Maximum height of nearby recirculation zones, obstacles, or height of intake above roof)
PROT	Protected/Unprotected Receptor	P				A protected receptor means plume has to negotiate a significant turn or corner before reaching receptor, or receptor is significant distance below roof
BETA	Stack Cap Factor	1				0 = capped, 1 = uncapped
q	Contaminant Emission Rate	6.93E-01	g/s	5.5	lb/h	
Z-anem	Meteorological Height for Wind measurement	10	m	33	ft	Assumed 10 m anemometer height at airport
DELTA-anem	Boundary Layer Height at Airport	274	m	900	ft	Assumed as 900 ft for ID=2 airport
U-anem	Wind Speed at Airport	3.0	m/s	591	fpm	Model returns the wind speed that corresponds to the worst-case dilution
A-anem	Boundary Layer Exponent at Airport	0.14				Assumed as 0.14 for ID = 2 (airport)

Detailed Calculation from N wind direction on source KDC_SF12

Variable	Parameter	Formula	Metric		English		Sample Calculation or Variable Selection (Metric only)
			Value	Units	Value	Units	
Z^o	Surface roughness boundary layer	based on land use	3.000	m	9.84	ft	= 0.01m; 0.05m; 0.65m; or, 2.0m for roughness ID 1; 2; 3; and, 4, respectively
a	exponent of boundary layer	based on land use	0.289				= 0.1; 0.14; 0.22; or, 0.33 for roughness ID 1; 2; 3; or, 4, respectively.
DELTA	Boundary layer depth	based on land use	457.200	m	1500.0732	ft	= 700ft (213m); 900ft (274m); 1200ft (366m); or, 1500ft (457m) for roughnes ID 1; 2; 3; or 4, respectively
Fm	Momentum Flux	= Ve^2 * De^2 / 4	16	m4/s2	6674940.595	ft4/min2	= (10 m/s)² * (0.8 m)² / 4
UH	Building Top Wind Speed	= U-anem * (DELTA-anem / Z-anem) ^ A-anem * (H / DELTA) ^ a	2.500	m/s	492.150	fpm	= (3 m/s) * ((274 m) / (10 m)) ^ (0.14) * ((49.2 m) / (457.2 m)) ^ (0.289)
BETAj	Jet entrainment coeff	= 1/3 + UH / Ve	0.583		0.583		= 1/3 + (2.5 m/s) / (10 m/s)
U*	Friction Velocity	= UH / (2.5 * ln (H / Zo)	0.357	m/s	70.279	fpm	= (2.5 m/s) / (2.5 * ln ((49.2 m) / (3 m)))
Hx	Plume Rise with X	= (3 * Fm * X / j^2 / UH^2) ^ (1/3)	12.854	m	42.174	ft	= (3 * (16 m4/s²) * (94 m) / (0.583)² / (2.5 m/s)²) ^ (1/3)
Hf	Final Plume Rise	= 0.9 * (Fm * UH / U*) ^ 0.5 / (UH * BETAj)	6.536	m	21.445	ft	= 0.9 * ((16 m4/s²) * (2.5 m/s) / (0.357 m/s)) ^ 0.5 / ((2.5 ms) * (0.583))
Hr	Plume Rise	= Minimum of BETA * Hx or BETA * Hf	6.536	m	21.445	ft	= Minimum of ((1) * (12.854 m)) or ((1) * (6.536 m))
Hd	Downwash adjustment	= Maximum of De * (3 - BETA * Ve / UH) or 0	0.000	m	0.000	ft	= Maximum of ((0.8 m) * (3 - (1) * (10 m/s) / (2.5 m/s)) or 0
H-plume	Plume height	= Hs + Hr - Hd	20.536	m	67.379	ft	= (14 m) + (6.536 m) - (0 m)
ZETA	Plume Separation	= Maximum of H-plume - Htop or 0	11.536	m	37.850	ft	= Maximum of ((20.536 m) - (9 m)) or 0
N	Constant	= 0.24 + 0.096 * LOG10 (Zo) + 0.016 * (LOG10 (Zo)) ²	0.289				= 0.24 + 0.096 * LOG10 (3 m) + 0.016 * (LOG10 (3 m))²
i-x	Intensity in x	= N * LN (30 / Zo) / LN (H / Zo)	0.238				= (0.289) * LN (30 / (3 m)) / LN ((49.2 m) / (3 m))
i-y	Intensity in y	= 0.75 * i-x	0.179				= 0.75 * (0.238)
i-z	Intensity in z	= 0.5 * i-x	0.119				= 0.5 * (0.238)
SIG-o	Sigma-initial	= 0.35 * De	0.280	m	0.919	ft	= 0.35 * (0.8 m)
SIG-y	Sigma-y	= (i-y^2 * X^2 + SIG-o^2) ^0.5	16.828	m	55.213	ft	= ((0.179)² * (94 m)² + (0.28 m)²) ^0.5
SIG-z	Sigma-z	= (i-z^2 * X^2 + SIG-o^2) ^0.5	11.190	m	36.714	ft	= ((0.119)² * (94 m)² + (0.28 m)²) ^0.5
D-unp	Dilution, unprotected	= 4 * UH * SIG-y * SIG-z / (Ve * De^2) * e (ZETA² / (2 * SIG-z^2))	501				= 4 * (2.5 m/s) * (16.828 m) * (11.19 m) / ((10 m/s) * (0.8 m)²) * e ((11.536 m)² / (2 * (11.19 m)²))
D	Dilution	= If protected, D-unp * 2, otherwise, D-unp	1002				= If protected, (501) * 2, otherwise, 501
C-unit,15	15-minute Concentration at 1 g/s	= Unit Emission Rate / Qe / D	198	µg/m³			= (1 g/s) (1000000 µg/g) / (5.03 m³/s) / (1002)
C-unit	60-minute Concentration at 1 g/s	= D-unit,15 * (Model Avg. Time) / (Criteria Avg. Time) ^ Exponent	134	µg/m³			= (198 µg/m³) * ((15 min) / (60 min)) ^ (0.28)
C	60-minute Concentration	= q * C-unit / Unit Emission Rate	93	µg/m³			= (0.692988388888889 g/s) * (134 µg/m²) / (1 g/s)

Note: The unit emission rate calculated in the Detailed Calculation Sample Calculations may be slightly different than the emission rate displayed in the Dilution Calculations Table above due to step-by-step rounding.

Appendix A: ASHRAE 2019, Ethylene Oxide Sterilization, 24 Hour

RWDI# 1803937

University Health Network - Toronto Western Hospital

Exhaust Details

Operating Scenario	Ethylene Oxide Sterilization		
Contaminant			
Model Averaging Time	15 min		
Criteria Averaging Time(s)	1440 min		
Averaging Time Exponent	0.28		

Site Details

Umin	1	m/s
Umax	11.4	m/s
Ambient Temp	Not Used	°C

Comments on Site Details
Umin set to 1 m/s
Umax set to slightly higher than local 1% wind speeds.
Toronto Billy Bishop Airport = 11.4 m/s, 1% wind speed, ASHRAE Fundamentals 2013
Temperature not required

Recirculation Zone Calculations

Wind Condition		B-small	B-large	R	Hc	Xc	Lc	Building Edge to source distance (m)	Is distance > Lc?
N	East Bldg Tier 1	32.21	35.07	32.0	7.0	16.0	28.8	10.0	no
N	East Bldg Tier 2	6.13	30.33	10.2	2.2	5.1	9.2		
N	East Bldg Comb			42.2	9.3	21.1	38.0		
N	MP Bldg N Face Tier 1	24.16	11.78	18.5	4.1	9.2	16.6		
N	MP Bldg N Face Tier 2	24.16	43.33	28.4	6.2	14.2	25.5		
N	MP Bldg N Face Tier 3	4.40	15.47	6.6	1.4	3.3	5.9		
N	Comp Bubble Tier 2 & 3			34.9	7.7	17.5	31.4		
N	MP Bldg N Face Tier 4	1.60	6.49	2.5	0.6	1.3	2.3		
N	Comp Bubble Tier 3 & 4			37.5	8.2	18.7	33.7		
N	KDC Bldg N Face Tier 1	39.70	49.09	41.0	9.0	20.5	36.9		
E	KDC Bldg E Face	50.04	70.04	53.8	11.8	26.9	48.4		
E	KDC Blgd E Face Penthouse	6.71	18.40	9.2	2.0	4.6	8.3		
E	KDC E Face Penthouse Comp			63.0	13.8	31.5	56.7		
N	MP Bldg S Face	17.58	22.90	18.6	4.1	9.3	16.8		
N	East Bldg North Face	41.60	50.00	21.3	4.7	10.6	19.2		
N	East Bldg East Face	37.00	41.60	37.1	8.2	18.5	33.4		
N	Fell Building Penthouse N Face	16.00	17.30	8.0	1.8	4.0	7.2		
N	Fell Building N Face	8.00	43.20	6.8	1.5	3.4	6.2		
E	MP Bldg East Face (Skinny)	16.40	44.00	22.1	4.9	11.0	19.9		
S	MP Bldg, South Face (Whole Face)	22.14	42.00	26.5	5.8	13.3	23.9		

Comments on Building
Building is a hospital complex with serval large sections. Impacts for the worst case wind direction was predicted for each contamiant and each identified air intake.

Approach Roughness ID

ID	Description	Z_o (m)	n	delta (m)
1	Flat, water, desert	0.01	0.1	213
2	Flat, airport, grassland	0.05	0.14	274
3	Suburban	0.65	0.22	365
4	Urban	2	0.33	457

Model will also use 0.5 and 1.5 times the roughness to check

Dilution Calculations

Wind Condition	Source ID	Receptor ID	Internal Dilution	BETA Cap? 1=False 0=True	Ve Flow Rate (m^3/s)	De Exhaust Diameter (m)	Ve Exhaust Velocity (m/s)	Stack Height Above Grade (m)	Hs Stack Height Above Roof (m)	Htop Rooftop Obstr. Height (m)	X Stretched String Distance (m)		H Roof Height Above Grade (m)	RID Approach Rough. ID (1-4)	PROT Receptor Protected? (P or U)	Minimum Dilution	Distance to Worst Case Dilution (m)	Speed for Worst Case Dilution (m/s)	Rough. For Worst Case Dilution	Conc. For 1 g/s 15 min µg/m³	Pollutant Emission Rate (g/s)	Pollutant Conc. 1440 min µg/m³
											Min	Max										
NW	MP_EXS12	East	1	1	0.92	0.40	7.32	73.0	10.0	5.0	61	61	63.0	4	P	1,838	61	2.0	3.00	591	5.56E-05	9.15E-03
SW	MP_EXS12	McLaughlin	1	1	0.92	0.40	7.32	73.0	10.0	5.8	49	49	63.0	4	P	1,449	49	2.5	3.00	750	5.56E-05	1.16E-02
SW	MP_EXS12	KDC	1	1	0.92	0.40	7.32	73.0	10.0	5.8	64	64	63.0	4	P	1,641	64	2.0	3.00	662	5.56E-05	1.03E-02
SE	MP_EXS12	Main1	1	1	0.92	0.40	7.32	73.0	10.0	5.0	45	46	63.0	4	P	1,743	45	3.0	3.00	624	5.56E-05	9.65E-03
E	MP_EXS12	Main2	1	1	0.92	0.40	7.32	73.0	10.0	5.0	50	51	63.0	4	P	1,775	50	2.5	3.00	612	5.56E-05	9.48E-03
N	MP_EXS12	Fell1	1	1	0.92	0.40	7.32	73.0	10.0	5.0	93	93	63.0	4	P	2,349	93	1.5	2.00	463	5.56E-05	7.16E-03
N	MP_EXS12	Fell2	1	1	0.92	0.40	7.32	73.0	10.0	5.0	105	107	63.0	4	P	2,520	105	1.0	3.00	431	5.56E-05	6.68E-03
SE	MP_EXS12	Gamma	1	1	0.92	0.40	7.32	73.0	10.0	5.0	80	80	63.0	4	P	2,082	80	1.5	3.00	522	5.56E-05	8.08E-03

Total Emissions at:	East	winds from:	NW	9.15E-03
Total Emissions at:	McLaughlin	winds from:	SW	1.16E-02
Total Emissions at:	Gamma	winds from:	SE	8.08E-03
Total Emissions at:	Fell2	winds from:	N	6.68E-03
Total Emissions at:	Fell1	winds from:	N	7.16E-03
Total Emissions at:	Main2	winds from:	E	9.48E-03
Total Emissions at:	Main1	winds from:	SE	9.65E-03
Total Emissions at:	KDC	winds from:	SW	1.03E-02

Appendix A: ASHRAE 2019, Ethylene Oxide Sterilization, 24 Hour

Variables from NW wind direction on source MP_EXS12

Variable	Parameter	Metric		English		Sample Calculations or Variable Selection (Metric only)
		Value	Units	Value	Units	
Hs	Stack Height above Local Roof	10.0	m	32.810	ft	
Qe	Exhaust Flow Rate	0.9	m^3/s	1949.48	ft^3/min	
De	Exhaust Diameter	0.40	m	1.3124	ft	
Ve	Exhaust Exit Velocity	7.3	m/s	1441.02	fpm	
H	Roof Height above Grade	63	m	206.703	ft	
X	Separation Distance (min of range)	61	m	198.5005	ft	
RID	Approach Roughness ID	4				Model will also pick ID+1 and ID-1 to check for worst-case roughness
Htop	Rooftop Obstruction Height	5.0	m	16.405	ft	Maximum height of nearby recirculation zones, obstacles, or height of intake above roof)
PROT	Protected/Unprotected Receptor	P				A protected receptor means plume has to negotiate a significant turn or corner before reaching receptor, or receptor is significant distance below roof
BETA	Stack Cap Factor	1				0 = capped, 1 = uncapped
q	Contaminant Emission Rate	5.56E-05	g/s	0	lb/h	
Z-anem	Meteorological Height for Wind measurement	10	m	33	ft	Assumed 10 m anemometer height at airport
DELTA-anem	Boundary Layer Height at Airport	274	m	900	ft	Assumed as 900 ft for ID=2 airport
U-anem	Wind Speed at Airport	2.0	m/s	394	fpm	Model returns the wind speed that corresponds to the worst-case dilution
A-anem	Boundary Layer Exponent at Airport	0.14				Assumed as 0.14 for ID = 2 (airport)

Detailed Calculation from NW wind direction on source MP_EXS12

Variable	Parameter	Formula	Metric		English		Sample Calculation or Variable Selection (Metric only)
			Value	Units	Value	Units	
Z^o	Surface roughness boundary layer	based on land use	3.000	m	9.84	ft	= 0.01m; 0.05m; 0.65m; or, 2.0m for roughness ID 1; 2; 3; and, 4, respectively
a	exponent of boundary layer	based on land use	0.289				= 0.1; 0.14; 0.22; or, 0.33 for roughness ID 1; 2; 3; or, 4, respectively.
DELTA	Boundary layer depth	based on land use	457.200	m	1500.0732	ft	= 700ft (213m); 900ft (274m); 1200ft (366m); or, 1500ft (457m) for roughnes ID 1; 2; 3; or 4, respectively
Fm	Momentum Flux	= Ve^2 * De^2 / 4	2.14	m4/s2	892773.3046	ft4/min2	= $(7.32\ m/s)^2$ * $(0.4\ m)^2$ / 4
UH	Building Top Wind Speed	= U-anem * (DELTA-anem / Z-anem) ^ A-anem * (H / DELTA) ^ a	1.790	m/s	352.379	fpm	= (2 m/s) * ((274 m) / (10 m)) ^ (0.14) * ((63 m) / (457.2 m)) ^ (0.289)
BETAj	Jet entrainment coeff	= 1/3 + UH / Ve	0.578		0.578		= 1/3 + (1.79 m/s) / (7.32 m/s)
U*	Friction Velocity	= UH / (2.5 * ln (H / Zo)	0.235	m/s	46.262	fpm	= (1.79 m/s) / (2.5 * ln ((63 m) / (3 m)))
Hx	Plume Rise with X	= (3 * Fm * X / j^2 / UH^3) ^ (1/3)	7.133	m	23.403	ft	= (3 * $(2.14\ m4/s^3)$ * (60.5 m) / $(0.578)^2$ / $(1.79\ m/s)^2$) ^ (1/3)
Hf	Final Plume Rise	= 0.9 * (Fm * UH / U*) ^ 0.5 / (UH * BETAj)	3.512	m	11.523	ft	= 0.9 * ($(2.14\ m4/s^2)$ * (1.79 m/s) / (0.235 m/s)) ^ 0.5 / ((1.79 ms) * (0.578))
Hr	Plume Rise	= Minimum of BETA * Hx or BETA * Hf	3.512	m	11.523	ft	= Minimum of ((1) * (7.133 m)) or ((1) * (3.512 m))
Hd	Downwash adjustment	= Maximum of De * (3 - BETA * Ve / UH) or 0	0.000	m	0.000	ft	= Maximum of ((0.4 m) * (3 - (1) * (7.32 m/s) / (1.79 m/s)) or 0
H-plume	Plume height	= Hs + Hr - Hd	13.512	m	44.333	ft	= (10 m) + (3.512 m) - (0 m)
ZETA	Plume Separation	= Maximum of H-plume - Htop or 0	8.512	m	27.928	ft	= Maximum of ((13.512 m) - (5 m)) or 0
N	Constant	= 0.24 + 0.096 * LOG10 (Zo) + 0.016 * (LOG10 (Zo)) ²	0.289				= 0.24 + 0.096 * LOG10 (3 m) + 0.016 * $(LOG10\ (3\ m))^2$
i-x	Intensity in x	= N * LN (30 / Zo) / LN (H / Zo)	0.219				= (0.289) * LN (30 / (3 m)) / LN ((63 m) / (3 m))
i-y	Intensity in y	= 0.75 * i-x	0.164				= 0.75 * (0.219)
i-z	Intensity in z	= 0.5 * i-x	0.110				= 0.5 * (0.219)
SIG-o	Sigma-initial	= 0.35 * De	0.140	m	0.459	ft	= 0.35 * (0.4 m)
SIG-y	Sigma-y	= (i-y^2 * X^2 + SIG-o^2) ^0.5	9.923	m	32.557	ft	= $((0.164)^2$ * $(60.5\ m)^2$ + $(0.14\ m)^2$) ^0.5
SIG-z	Sigma-z	= (i-z^2 * X^2 + SIG-o^2) ^0.5	6.656	m	21.838	ft	= $((0.11)^2$ * $(60.5\ m)^2$ + $(0.14\ m)^2$) ^0.5
D-unp	Dilution, unprotected	= 4 * UH * SIG-y * SIG-z / (Ve * De^2) * e (ZETA² / (2 * SIG-z^2))	915				= 4 * (1.79 m/s) * (9.923 m) * (6.656 m) / ($(7.32\ m/s)$ * $(0.4\ m)^2$) * e $((8.512\ m)^2$ / (2 * $(6.656\ m)^2$))
D	Dilution	= If protected, D-unp * 2, otherwise, D-unp	1830				= If protected, (915) * 2, otherwise, 915
C-unit,15	15-minute Concentration at 1 g/s	= Unit Emission Rate / Qe / D	594	µg/m³			= (1 g/s) (1000000 µg/g) / (0.92 m³/s) / (1830)
C-unit	1440-minute Concentration at 1 g/s	= D-unit,15 * (Model Avg. Time) / (Criteria Avg. Time) ^ Exponent	165	µg/m³			= (594 µg/m³) * ((15 min) / (1440 min)) ^ (0.28)
C	1440-minute Concentration	= q * C-unit / Unit Emission Rate	0	µg/m³			= (5.55555555555556E-05 g/s) * (165 µg/m²) / (1 g/s)

Note: The unit emission rate calculated in the Detailed Calculation Sample Calculations may be slightly different than the emission rate displayed in the Dilution Calculations Table above due to step-by-step rounding.

Appendix A: ASHRAE 2019, Laboratory Fume Hoods, 1 Hour

University Health Network - Toronto Western Hospital

RWDI# 1803937

Exhaust Details

Operating Scenario	Laboratory Fume Hoods		
Contaminant			
Model Averaging Time	15 min		
Criteria Averaging Time(s)	60 min		
Averaging Time Exponent	0.28		

Site Details

Umin	1	m/s
Umax	11.4	m/s
Ambient Temp	Not Used	°C

Comments on Site Details
Umin set to 1 m/s
Umax set to slightly higher than local 1% wind speeds.
Toronto Billy Bishop Airport = 11.4 m/s, 1% wind speed, ASHRAE Fundamentals 2013
Temperature not required

Recirculation Zone Calculations

Wind Condition		B-small	B-large	R	Hc	Xc	Lc	Building Edge to source distance (m)	Is distance > Lc?
N	East Bldg Tier 1	32.21	35.07	32.0	7.0	16.0	28.8		
N	East Bldg Tier 2	6.13	30.33	10.2	2.2	5.1	9.2		
N	East Bldg Comb			42.2	9.3	21.1	38.0		
N	MP Bldg N Face Tier 1	24.16	11.78	18.5	4.1	9.2	16.6		
N	MP Bldg N Face Tier 2	24.16	43.33	28.4	6.2	14.2	25.5		
N	MP Bldg N Face Tier 3	4.40	15.47	6.6	1.4	3.3	5.9		
N	Comp Bubble Tier 2 & 3			34.9	7.7	17.5	31.4		
N	MP Bldg N Face Tier 4	1.60	6.49	2.5	0.6	1.3	2.3		
N	Comp Bubble Tier 3 & 4			37.5	8.2	18.7	33.7		
N	KDC Bldg N Face Tier 1	39.70	49.09	41.0	9.0	20.5	36.9		
E	KDC Bldg E Face	50.04	70.04	53.8	11.8	26.9	48.4		
E	KDC Blgd E Face Penthouse	6.71	18.40	9.2	2.0	4.6	8.3		
E	KDC E Face Penthouse Comp			63.0	13.8	31.5	56.7		
N	MP Bldg S Face	17.58	22.90	18.6	4.1	9.3	16.8		
N	East Bldg North Face	41.60	50.00	21.3	4.7	10.6	19.2		
N	East Bldg East Face	37.00	41.60	37.1	8.2	18.5	33.4		
N	Fell Building Penthouse N Face	16.00	17.30	8.0	1.8	4.0	7.2		
N	Fell Building N Face	8.00	43.20	6.8	1.5	3.4	6.2		
E	MP Bldg East Face (Skinny)	16.40	44.00	22.1	4.9	11.0	19.9		
S	MP Bldg, South Face (Whole Face)	22.14	42.00	26.5	5.8	13.3	23.9		

Comments on Building
Building is a hospital complex with serval large sections. Impacts for the worst case wind direction was predicted for each contamiant and each identified air intake.

Approach Roughness ID

ID	Description	Z_o (m)	n	delta (m)
1	Flat, water, desert	0.01	0.1	213
2	Flat, airport, grassland	0.05	0.14	274
3	Suburban	0.65	0.22	365
4	Urban	2	0.33	457

Model will also use 0.5 and 1.5 times the roughness to check

Dilution Calculations

Wind Condition	Source ID	Receptor ID	Internal Dilution	BETA Cap? 1=False 0=True	Ve Flow Rate (m^3/s)	De Exhaust Diameter (m)	Ve Exhaust Velocity (m/s)	Stack Height Above Grade (m)	Hs Stack Height Above Roof (m)	Htop Rooftop Obstr. Height (m)	X Stretched String Distance (m)		H Roof Height Above Grade (m)	RID Approach Rough. ID (1-4)	PROT Receptor Protected? (P or U)	Minimum Dilution	Distance to Worst Case Dilution (m)	Speed for Worst Case Dilution (m/s)	Rough. For Worst Case Dilution	Conc. For 1 g/s 15 min µg/m³	Pollutant Emission Rate (g/s)	Pollutant Conc. 60 min µg/m³
											Min	Max										
N	KDC_CHEM	East	1	1	7.55	1.07	8.44	60.0	12.5	9.0	93	93	47.5	4	P	562	93	3.5	1.00	236	1.00E+00	160
E	KDC_CHEM	McLaughlin	1	1	7.55	1.07	8.44	60.0	12.5	11.8	24	25	47.5	4	P	52	24	6.0	1.00	2,547	1.00E+00	1,728
E	KDC_EF4	McLaughlin	1	1	23.30	1.90	8.22	56.7	7.5	11.8	45	46	49.2	4	P	37	45	4.0	1.00	1,160	1.00E+00	787
E	KDC_EF3	McLaughlin	1	1	23.30	1.90	8.22	56.7	7.5	11.8	46	47	49.2	4	P	38	46	4.0	1.00	1,129	1.00E+00	766
N	KDC_CHEM	KDC	1	1	7.55	1.07	8.44	60.0	43.0	9.0	49	50	17.0	4	P	305,115	50	11.0	3.00	0	1.00E+00	0
E	KDC_EF3	KDC	1	1	23.30	1.90	8.22	56.7	7.5	9.0	65	66	49.2	4	P	87	65	4.5	1.00	493	1.00E+00	335
E	KDC_EF4	KDC	1	1	23.30	1.90	8.22	56.7	7.5	9.0	64	64	49.2	4	P	83	64	4.5	1.00	517	1.00E+00	351
E	KDC_EF4	Main1	1	1	23.30	1.90	8.22	56.7	7.5	11.8	63	64	49.2	4	P	68	63	4.0	1.00	631	1.00E+00	428
E	KDC_EF3	Main1	1	1	23.30	1.90	8.22	56.7	7.5	11.8	64	65	49.2	4	P	70	64	4.0	1.00	613	1.00E+00	416
N	KDC_CHEM	Main1	1	1	7.55	1.07	8.44	60.0	43.0	11.8	52	52	17.0	4	P	92,548	52	11.0	3.00	1	1.00E+00	1
E	KDC_CHEM	Main2	1	1	7.55	1.07	8.44	60.0	43.0	5.0	98	98	17.0	4	P	15,895	98	4.0	3.00	8	1.00E+00	6
N	KDC_CHEM	Fell1	1	1	7.55	1.07	8.44	60.0	43.0	9.0	139	140	17.0	4	P	5,517	139	2.5	3.00	24	1.00E+00	16
N	KDC_CHEM	Fell2	1	1	7.55	1.07	8.44	60.0	43.0	9.0	154	155	17.0	4	P	5,086	154	2.0	3.00	26	1.00E+00	18
E	KDC_CHEM	Gamma	1	1	7.55	1.07	8.44	60.0	43.0	5.0	84	84	17.0	4	P	27,161	84	6.5	3.00	5	1.00E+00	3

Total Emissions at:	East	winds from:	N	160
Total Emissions at:	McLaughlin	winds from:	E	1,728
Total Emissions at:	Gamma	winds from:	E	3
Total Emissions at:	Fell2	winds from:	N	18
Total Emissions at:	Fell1	winds from:	N	16
Total Emissions at:	Main2	winds from:	E	6
Total Emissions at:	Main1	winds from:	N	1
Total Emissions at:	Main1	winds from:	E	428
Total Emissions at:	KDC	winds from:	N	0
Total Emissions at:	KDC	winds from:	E	351

Appendix A: ASHRAE 2019, Laboratory Fume Hoods, 1 Hour

Variables from N wind direction on source KDC_CHEM

Variable	Parameter	Metric		English		Sample Calculations or Variable Selection (Metric only)
		Value	Units	Value	Units	
Hs	Stack Height above Local Roof	12.5	m	41.013	ft	
Qe	Exhaust Flow Rate	7.6	m^3/s	15998.45	ft^3/min	
De	Exhaust Diameter	1.07	m	3.5107	ft	
Ve	Exhaust Exit Velocity	8.4	m/s	1661.50	fpm	
H	Roof Height above Grade	47.5	m	155.8475	ft	
X	Separation Distance (min of range)	93	m	303.4925	ft	
RID	Approach Roughness ID	4				Model will also pick ID+1 and ID-1 to check for worst-case roughness
Htop	Rooftop Obstruction Height	9.0	m	29.529	ft	Maximum height of nearby recirculation zones, obstacles, or height of intake above roof)
PROT	Protected/Unprotected Receptor	P				A protected receptor means plume has to negotiate a significant turn or corner before reaching receptor, or receptor is significant distance below roof
BETA	Stack Cap Factor	1				0 = capped, 1 = uncapped
q	Contaminant Emission Rate	1.00E+00	g/s	7.9	lb/h	
Z-anem	Meteorological Height for Wind measurement	10	m	33	ft	Assumed 10 m anemometer height at airport
DELTA-anem	Boundary Layer Height at Airport	274	m	900	ft	Assumed as 900 ft for ID=2 airport
U-anem	Wind Speed at Airport	3.5	m/s	689	fpm	Model returns the wind speed that corresponds to the worst-case dilution
A-anem	Boundary Layer Exponent at Airport	0.14				Assumed as 0.14 for ID = 2 (airport)

Detailed Calculation from N wind direction on source KDC_CHEM

Variable	Parameter	Formula	Metric		English		Sample Calculation or Variable Selection (Metric only)
			Value	Units	Value	Units	
Z^o	Surface roughness boundary layer	based on land use	1.000	m	3.28	ft	= 0.01m; 0.05m; 0.65m; or, 2.0m for roughness ID 1; 2; 3; and, 4, respectively
a	exponent of boundary layer	based on land use	0.240				= 0.1; 0.14; 0.22; or, 0.33 for roughness ID 1; 2; 3; or, 4, respectively.
DELTA	Boundary layer depth	based on land use	457.200	m	1500.0732	ft	= 700ft (213m); 900ft (274m); 1200ft (366m); or, 1500ft (457m) for roughnes ID 1; 2; 3; or 4, respectively
Fm	Momentum Flux	= Ve^2 * De^2 / 4	20.39	m4/s2	8506377.421	ft4/min2	= (8.44 m/s)² * (1.07 m)² / 4
UH	Building Top Wind Speed	= U-anem * (DELTA-anem / Z-anem) ^ A-anem * (H / DELTA) ^ a	3.230	m/s	635.858	fpm	= (3.5 m/s) * ((274 m) / (10 m)) ^ (0.14) * ((47.5 m) / (457.2 m)) ^ (0.24)
BETAj	Jet entrainment coeff	= 1/3 + UH / Ve	0.716		0.716		= 1/3 + (3.23 m/s) / (8.44 m/s)
U*	Friction Velocity	= UH / (2.5 * ln (H / Zo)	0.335	m/s	65.948	fpm	= (3.23 m/s) / (2.5 * ln ((47.5 m) / (1 m)))
Hx	Plume Rise with X	= (3 * Fm * X / j^2 / UH^2) ^ (1/3)	10.189	m	33.430	ft	= (3 * (20.39 m4/s²) * (92.5 m) / (0.716)² / (3.23 m/s)²) ^ (1/3)
Hf	Final Plume Rise	= 0.9 * (Fm * UH / U*) ^ 0.5 / (UH * BETAj)	5.457	m	17.904	ft	= 0.9 * ((20.39 m4/s²) * (3.23 m/s) / (0.335 m/s)) ^ 0.5 / ((3.23 ms) * (0.716))
Hr	Plume Rise	= Minimum of BETA * Hx or BETA * Hf	5.457	m	17.904	ft	= Minimum of ((1) * (10.189 m)) or ((1) * (5.457 m))
Hd	Downwash adjustment	= Maximum of De * (3 - BETA * Ve / UH) or 0	0.414	m	1.359	ft	= Maximum of ((1.07 m) * (3 - (1) * (8.44 m/s) / (3.23 m/s)) or 0
H-plume	Plume height	= Hs + Hr - Hd	17.543	m	57.558	ft	= (12.5 m) + (5.457 m) - (0.414086687306502 m)
ZETA	Plume Separation	= Maximum of H-plume - Htop or 0	8.543	m	28.030	ft	= Maximum of ((17.5429133126935 m) - (9 m)) or 0
N	Constant	= 0.24 + 0.096 * LOG10 (Zo) + 0.016 * (LOG10 (Zo)) ²	0.240				= 0.24 + 0.096 * LOG10 (1 m) + 0.016 * (LOG10 (1 m))²
i-x	Intensity in x	= N * LN (30 / Zo) / LN (H / Zo)	0.211				= (0.24) * LN (30 / (1 m)) / LN ((47.5 m) / (1 m))
i-y	Intensity in y	= 0.75 * i-x	0.158				= 0.75 * (0.211)
i-z	Intensity in z	= 0.5 * i-x	0.106				= 0.5 * (0.211)
SIG-o	Sigma-initial	= 0.35 * De	0.375	m	1.230	ft	= 0.35 * (1.07 m)
SIG-y	Sigma-y	= (i-y² * X² + SIG-o²) ^0.5	14.620	m	47.968	ft	= ((0.158)² * (92.5 m)² + (0.375 m)²) ^0.5
SIG-z	Sigma-z	= (i-z² * X² + SIG-o²) ^0.5	9.812	m	32.193	ft	= ((0.106)² * (92.5 m)² + (0.375 m)²) ^0.5
D-unp	Dilution, unprotected	= 4 * UH * SIG-y * SIG-z / (Ve * De^2) * e (ZETA² / (2 * SIG-z²))	280				= 4 * (3.23 m/s) * (14.62 m) * (9.812 m) / ((8.44 m/s) * (1.07 m)²) * e ((8.543 m)² / (2 * (9.812 m)²))
D	Dilution	= If protected, D-unp * 2, otherwise, D-unp	560				= If protected, (280) * 2, otherwise, 280
C-unit,15	15-minute Concentration at 1 g/s	= Unit Emission Rate / Qe / D	237	µg/m³			= (1 g/s) (1000000 µg/g) / (7.55 m³/s) / (560)
C-unit	60-minute Concentration at 1 g/s	= D-unit,15 * (Model Avg. Time) / (Criteria Avg. Time) ^ Exponent	161	µg/m³			= (237 µg/m³) * ((15 min) / (60 min)) ^ (0.28)
C	60-minute Concentration	= q * C-unit / Unit Emission Rate	161	µg/m³			= (1 g/s) * (161 µg/m²) / (1 g/s)

Note: The unit emission rate calculated in the Detailed Calculation Sample Calculations may be slightly different than the emission rate displayed in the Dilution Calculations Table above due to step-by-step rounding.

APPENDIX B

Natural Gas Combustion Emissions Calculations

Appendix B1: External Combustion Spreadsheet for Natural Gas-Fired Process PWP_BoilerExh - Dual Fuel Boiler #1, Dual Fuel Boiler #2, Dual Fuel Boiler #3

University Health Network - Toronto Western Hospital

RWDI# 1803937

RWDI Source ID: PWP_BoilerExh - Dual Fuel Boiler #1, Dual Fuel Boiler #2, Dual Fuel Boiler #3

Parameter	Value	Units
Fuel Type	Natural Gas	
Fuel Heating Value	1020	(Btu/scf)
Fuel Density		(lb/gal)
Firing Configuration	Wall-fired	
Boiler Efficiency		(%)
Excess Air	5%	(%)

Exhaust Information	Value	Units
Exhaust Temperature (°C)	180	(°C)
Calculated Exit Temperature	453	(K)

Fuel Sulphur Information	Value	Units
Natural Gas Sulphur Content	2000	(grains/10^6scf)
Fuel Oil Sulphur Content	0	(%)

Rating (enter one set of units)	Value	Units
Boiler Heat Input (Btu/h)	21,500,000	(Btu/h)
Calculated Heat Input	21.50	(MMBtu/hr)
Boiler Size Cut-off	<100	(MMBtu/hr)

Pollution Controls	Value
NSPS	n/a
Low-NOx Burners	no
Flue-gas Recirculation	no

Fuel & Air Parameters	Value	Units	Sample Calculation / Comment
Fuel Consumption	21078	(scf/h)	= (21.5 MMBTU/h) x (1,000,000 BTU/MMBTU) / (1020 BTU/scf)
	596929	(L/h)	
Fuel Molar Flow Rate (NG Only)	25254	(mol'h)	= (21078 scf/h) x (28.32 L/scf) x (101.3 kPa) / (8.314 L·kPa/mol·K) / (288 K)
Fuel Mass Flow Rate	405	(kg/h)	= (25254 mol/h) x (16.03 g/mol) / (1000 g/kg)
Stoichiometric Ratio (NG only)	10.996	ratio	= 1 CO2 + 2 H2O + 0.05 O2 + 2 x 3.76 x (1 + 0.05) N2 per mol CH4
Theoretical Moist Air (Oil Only)	not applicable		
Combustion Air	252439	(mol/h)	= (25254 mol fuel / h) x (2 mol O2 / mol fuel) x (1 + (15% XS Air)) x (4.76 mol air / mol O2)
	7270	(kg/h)	= (252439 mol air / h) x (28.8 g air / mol air) / (1000 g / kg)
	5656	(m^3/h) @ 0°C	= (252439 mol/h) x (8.314 L·kPa/mol·K) x (288 K) / (101.3 kPa) / (1000 L/m^3)
	3329	(scfm) @ 0°C	= (5656 m^3/h) x (35.31 ft^3/m^3) / (60 min/h)

Exhaust Parameters	Value	Units	Sample Calculation
Exhaust Gas Molar Flow (NG only)	277,693	(mol/h)	= (25254 mol/h) x (10.996 mol exhaust / mol fuel)
Theoretical Flue Gas (Oil Only)	not applicable	(m^3_{air} / L_{fuel})	
Exhaust Gas Mass Flow Rate	7681	(kg/h)	= (25254 mol fuel / h) x (304 g exhaust / mol fuel)
Exhaust Gas Flow	10324	(Am^3/h)	= (277693 mol/h) x (8.314 L·kPa/mol·K) x (453 K) / (101.3 kPa) / (1000 L/m^3)
	2.87	(Am^3/s)	= (10324 m^3 / h) / (3600 s / h)
	6564	(m^3/h) @ 0°C	= (10324 m^3/h) x (288K) / (453K)
	3863	(scfm) @ 0°C	= (6564 m^3 / h) x (35.31 ft^3 / m^3) / (60 min / h)

Criteria Contaminants	Emission Factor Value	Emission Factor Units	Emission Rate Value	Emission Rate Units	Data Quality	Sample Calculation
Oxides of Nitrogen	100	(lb/10^6scf)	2.66E-01	(g/s)	B	= (21078 scf/h) x (100 lb / 10^6 scf) x (453.6 g / lb) / (3600 s / h)

Note: Total Particulate = Filterable + Condensable, if applicable. Lowest data quality rating of either filterable or condensable applied.

Appendix B2: External Combustion Spreadsheet for Natural Gas-Fired Process PWP_BoilerExh - Dual Fuel Boiler #4, Dual Fuel Boiler #5

University Health Network - Toronto Western Hospital

RWDI# 1803937

RWDI Source ID: PWP_BoilerExh - Dual Fuel Boiler #4, Dual Fuel Boiler #5

Parameter	Value	Units
Fuel Type	Natural Gas	
Fuel Heating Value	1020	(Btu/scf)
Fuel Density		(lb/gal)
Firing Configuration	Wall-fired	
Boiler Efficiency		(%)
Excess Air	5%	(%)

Exhaust Information	Value	Units
Exhaust Temperature (°C)	180	(°C)
Calculated Exit Temperature	453	(K)

Fuel Sulphur Information	Value	Units
Natural Gas Sulphur Content	2000	(grains/10^6scf)
Fuel Oil Sulphur Content	0	(%)

Rating (enter one set of units)	Value	Units
Boiler Heat Input (Btu/h)	16,700,000	(Btu/h)
Calculated Heat Input	16.70	(MMBtu/hr)
Boiler Size Cut-off	<100	(MMBtu/hr)

Pollution Controls	Value
NSPS	n/a
Low-NOx Burners	no
Flue-gas Recirculation	no

Fuel & Air Parameters	Value	Units	Sample Calculation / Comment
Fuel Consumption	16373	(scf/h)	= (16.7 MMBTU/h) x (1,000,000 BTU/MMBTU) / (1020 BTU/scf)
	463683	(L/h)	
Fuel Molar Flow Rate (NG Only)	19617	(mol'h)	= (16373 scf/h) x (28.32 L/scf) x (101.3 kPa) / (8.314 L·kPa/mol·K) / (288 K)
Fuel Mass Flow Rate	314	(kg/h)	= (19617 mol/h) x (16.03 g/mol) / (1000 g/kg)
Stoichiometric Ratio (NG only)	10.996	ratio	= 1 CO2 + 2 H2O + 0.05 O2 + 2 x 3.76 x (1 + 0.05) N2 per mol CH4
Theoretical Moist Air (Oil Only)	not applicable		
Combustion Air	196092	(mol/h)	= (19617 mol fuel / h) x (2 mol O2 / mol fuel) x (1 + (15% XS Air)) x (4.76 mol air / mol O2)
	5647	(kg/h)	= (196092 mol air / h) x (28.8 g air / mol air) / (1000 g / kg)
	4394	(m^3/h) @ 0°C	= (196092 mol/h) x (8.314 L·kPa/mol·K) x (288 K) / (101.3 kPa) / (1000 L/m^3)
	2586	(scfm) @ 0°C	= (4394 m^3/h) x (35.31 ft^3/m^3) / (60 min/h)

Exhaust Parameters	Value	Units	Sample Calculation
Exhaust Gas Molar Flow (NG only)	215,709	(mol/h)	= (19617 mol/h) x (10.996 mol exhaust / mol fuel)
Theoretical Flue Gas (Oil Only)	not applicable	(m^3_{air} / L_{fuel})	
Exhaust Gas Mass Flow Rate	5955	(kg/h)	= (19617 mol fuel / h) x (304 g exhaust / mol fuel)
Exhaust Gas Flow	8020	(Am³/h)	= (215709 mol/h) x (8.314 L·kPa/mol·K) x (453 K) / (101.3 kPa) / (1000 L/m^3)
	2.23	(Am³/s)	= (8020 m^3 / h) / (3600 s / h)
	5099	(m^3/h) @ 0°C	= (8020 m^3/h) x (288K) / (453K)
	3001	(scfm) @ 0°C	= (5099 m^3 / h) x (35.31 ft^3 / m^3) / (60 min / h)

Criteria Contaminants	Emission Factor Value	Emission Factor Units	Emission Rate Value	Emission Rate Units	Data Quality	Sample Calculation
Oxides of Nitrogen	100	(lb/10^6scf)	2.06E-01	(g/s)	B	= (16373 scf/h) x (100 lb / 10^6 scf) x (453.6 g / lb) / (3600 s / h)

Note: Total Particulate = Filterable + Condensable, if applicable. Lowest data quality rating of either filterable or condensable applied.

Appendix B3: Natural Gas Combustion Emissions Calculations - Natural Gas-Fired Boilers

RWDI# 1803937

University Health Network - Toronto Western Hospital

Natural gas combustion emissions are calculated based on emission factors from O. Reg. 1/17 and the thermal input rating of the combustion unit. As per O. Reg. 1/17, boiler operation only needs to meet the emission intensity rates for the primary fuel (i.e., natural gas) if the secondary fuel (i.e., no. 2 fuel oil) is used less than 500 hours per year.
As per Guideline A-10, Section 7.1.1, all contaminants emitted through natural gas combustion except for nitrogen oxides are considered negligible.

Exhaust temperature: 180 degrees C

Source ID	Source Description or Title	Thermal Input Rating (GJ/hr)	Maximum Nitrogen Oxides Emission Intensity Rate (g/GJ)	Emission Rate (g/s)
KDC_SF1001, KDC_SF1002	Dual Fuel Steam Boiler #1	19.88	26	1.44E-01
	Dual Fuel Steam Boiler #2	19.88	26	1.44E-01
KDC_BF, KDC_SBF	Dual Fuel Glycol Boiler #1	26.49	26	1.91E-01
	Dual Fuel Glycol Boiler #2	26.49	26	1.91E-01

Emission Rate Sample Calculation for KDC_SF1001, KDC_SF1002

ER = Thermal Input Rating x Maximum Nitrogen Oxides Emission Intensity Rate

$$ER = \frac{19.88\ GJ}{1\ hr} \times \frac{26\ g}{1\ GJ} \times \frac{1\ hr}{3600\ s}$$

ER = 1.44E-01 g/s

Appendix B4: External Combustion Spreadsheet for Natural Gas-Fired Process KDC_AHU501

University Health Network - Toronto Western Hospital

RWDI# 1803937

RWDI Source ID: KDC_AHU501

Parameter	Value	Units
Fuel Type	Natural Gas	
Fuel Heating Value	1020	(Btu/scf)
Fuel Density		(lb/gal)
Firing Configuration	Wall-fired	
Boiler Efficiency		(%)
Excess Air	5%	(%)

Exhaust Information	Value	Units
Exhaust Temperature (°C)	125	(°C)
Calculated Exit Temperature	398	(K)

Fuel Sulphur Information	Value	Units
Natural Gas Sulphur Content	2000	(grains/10^6scf)
Fuel Oil Sulphur Content	0	(%)

Rating (enter one set of units)	Value	Units
Boiler Heat Input (Btu/h)	1,875,000	(Btu/h)
Calculated Heat Input	1.88	(MMBtu/hr)
Boiler Size Cut-off	<100	(MMBtu/hr)

Pollution Controls	Value
NSPS	n/a
Low-NOx Burners	no
Flue-gas Recirculation	no

Fuel & Air Parameters	Value	Units	Sample Calculation / Comment
Fuel Consumption	1843	(scf/h)	= (1.88 MMBTU/h) x (1,000,000 BTU/MMBTU) / (1020 BTU/scf)
	52194	(L/h)	
Fuel Molar Flow Rate (NG Only)	2208	(mol'h)	= (1843 scf/h) x (28.32 L/scf) x (101.3 kPa) / (8.314 L·kPa/mol·K) / (288 K)
Fuel Mass Flow Rate	35	(kg/h)	= (2208 mol/h) x (16.03 g/mol) / (1000 g/kg)
Stoichiometric Ratio (NG only)	10.996	ratio	= 1 CO2 + 2 H2O + 0.05 O2 + 2 x 3.76 x (1 + 0.05) N2 per mol CH4
Theoretical Moist Air (Oil Only)	not applicable		
Combustion Air	22071	(mol/h)	= (2208 mol fuel / h) x (2 mol O2 / mol fuel) x (1 + (15% XS Air)) x (4.76 mol air / mol O2)
	636	(kg/h)	= (22071 mol air / h) x (28.8 g air / mol air) / (1000 g / kg)
	495	(m^3/h) @ 0°C	= (22071 mol/h) x (8.314 L·kPa/mol·K) x (288 K) / (101.3 kPa) / (1000 L/m^3)
	291	(scfm) @ 0°C	= (495 m^3/h) x (35.31 ft^3/m^3) / (60 min/h)

Exhaust Parameters	Value	Units	Sample Calculation
Exhaust Gas Molar Flow (NG only)	24,279	(mol/h)	= (2208 mol/h) x (10.996 mol exhaust / mol fuel)
Theoretical Flue Gas (Oil Only)	not applicable	(m^3_{air} / L_{fuel})	
Exhaust Gas Mass Flow Rate	664	(kg/h)	= (2208 mol fuel / h) x (304 g exhaust / mol fuel)
Exhaust Gas Flow	793	(Am³/h)	= (24279 mol/h) x (8.314 L·kPa/mol·K) x (398 K) / (101.3 kPa) / (1000 L/m^3)
	0.22	(Am³/s)	= (793 m^3 / h) / (3600 s / h)
	574	(m^3/h) @ 0°C	= (793 m^3/h) x (288K) / (398K)
	338	(scfm) @ 0°C	= (574 m^3 / h) x (35.31 ft^3 / m^3) / (60 min / h)

Criteria Contaminants	Emission Factor		Emission Rate		Data Quality	Sample Calculation
	Value	Units	Value	Units		
Oxides of Nitrogen	100	(lb/10^6scf)	2.32E-02	(g/s)	B	= (1843 scf/h) x (100 lb / 10^6 scf) x (453.6 g / lb) / (3600 s / h)

Note: Total Particulate = Filterable + Condensable, if applicable. Lowest data quality rating of either filterable or condensable applied.

APPENDIX C

No. 2 Fuel Oil Combustion Emissions Calculations

Appendix C1: External Combustion Spreadsheet for No. 2 Fuel Oil-Fired Process PWP_BoilerExh - Dual Fuel Boiler #1, Dual Fuel Boiler #2, Dual Fuel Boiler #3

University Health Network - Toronto Western Hospital

RWDI# 1803937

RWDI Source ID: PWP_BoilerExh - Dual Fuel Boiler #1, Dual Fuel Boiler #2, Dual Fuel Boiler #3

Parameter	Value	Units
Fuel Type	No. 2 Fuel Oil	
Fuel Heating Value	137,000	(Btu/gal)
Fuel Density	7.296	(lb/gal)
Firing Configuration	Normal firing	
Boiler Efficiency		(%)
Excess Air	15%	(%)

Exhaust Information	Value	Units
Exhaust Temperature (°C)	180	(°C)
Calculated Exit Temperature	453	(K)

Fuel Sulphur Information	Value	Units
Natural Gas Sulphur Content	0	(grains/10^6scf)
Fuel Oil Sulphur Content	0.0015	(%)

Rating (enter one set of units)	Value	Units
Boiler Heat Input (Btu/h)	21,500,000	(Btu/h)
Calculated Heat Input	21.50	(MMBtu/hr)
Boiler Size Cut-off	<100	(MMBtu/hr)

Pollution Controls	Value
NSPS	n/a
Low-NOx Burners	no
Flue-gas Recirculation	no

Fuel & Air Parameters	Value	Units	Sample Calculation / Comment
Fuel Consumption	156.9	(gal/h)	= (21.5 MMBTU/h) x (1,000,000 BTU/MMBTU) / (137000 BTU/gal)
	594	(L/h)	
Fuel Molar Flow Rate (NG Only)	not applicable		not applicable
Fuel Mass Flow Rate	519	(kg/h)	= (156.9 gal/h) x (7.296 lb/gal) / (2.205 lb/kg)
Stoichiometric Ratio (NG only)	not applicable		not applicable
Theoretical Moist Air (Oil Only)	345	(kg air / MMBTU)	based on 7.5 lb theoretical dry air per 10,000 BTU of fuel oil
Combustion Air	295156	(mol/h)	= (8530 kg air / h) x (1000 g / kg) / (28.8 g air / mol air)
	8530	(kg/h)	= 21.5 MMBTU/h x 345 kg/MMBTU x (115% XS Air)
	6613	(m^3/h) @ 0°C	= (295156 mol/h) x (8.314 L·kPa/mol·K) x (288 K) / (101.3 kPa) / (1000 L/m^3)
	3892	(scfm) @ 0°C	= (6613 m^3/h) x (35.31 ft^3/m^3) / (60 min/h)

Exhaust Parameters	Value	Units	Sample Calculation
Exhaust Gas Molar Flow (NG only)	not applcable	(mol/h)	not applicable
Theoretical Flue Gas (Oil Only)	10.4	(m^3_{air} / L_{fuel})	at standard temperature & pressure
Exhaust Gas Mass Flow Rate	9049	(kg/h)	519 kg fuel / h + 8530 kg air / h
Exhaust Gas Flow	10251	(Am³/h)	= (6178 m^3 air / h) x (453 K) / (288K)
	2.85	(Am³/s)	= (10251 m^3 / h) / (3600 s / h)
	6178	(m^3/h) @ 0°C	= (10.4 m^3 air / L fuel) x (594 L fuel / h)
	3636	(scfm) @ 0°C	= (6178 m^3 / h) x (35.31 ft^3 / m^3) / (60 min / h)

Criteria Contaminants	Emission Factor Value	Emission Factor Units	Emission Rate Value	Emission Rate Units	Data Quality	Sample Calculation
Sulphur Dioxide	0.21	(lb/10^3gal)	4.21E-03	(g/s)	A	= (156.9 gal / h) x (0.213 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)
Oxides of Nitrogen	20	(lb/10^3gal)	3.95E-01	(g/s)	A	= (156.9 gal / h) x (20 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)
Carbon Monoxide	5	(lb/10^3gal)	9.88E-02	(g/s)	A	= (156.9 gal / h) x (5 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)
Filterable Particulate	2	(lb/10^3gal)	3.95E-02	(g/s)	A	= (156.9 gal / h) x (2 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)
Condensable Particulate	--		--			
Total Particulate	2	(lb/10^3gal)	3.95E-02	(g/s)	A	= (156.9 gal / h) x (2 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)

Note: Total Particulate = Filterable + Condensable, if applicable. Lowest data quality rating of either filterable or condensable applied.

Appendix C2: External Combustion Spreadsheet for No. 2 Fuel Oil-Fired Process PWP_BoilerExh - Dual Fuel Boiler #4, Dual Fuel Boiler #5

University Health Network - Toronto Western Hospital

RWDI# 1803937

RWDI Source ID: PWP_BoilerExh - Dual Fuel Boiler #4, Dual Fuel Boiler #5

Parameter	Value	Units
Fuel Type	No. 2 Fuel Oil	
Fuel Heating Value	137,000	(Btu/gal)
Fuel Density	7.296	(lb/gal)
Firing Configuration	Normal firing	
Boiler Efficiency		(%)
Excess Air	15%	(%)

Exhaust Information	Value	Units
Exhaust Temperature (°C)	180	(°C)
Calculated Exit Temperature	453	(K)

Fuel Sulphur Information	Value	Units
Natural Gas Sulphur Content	0	(grains/10^6scf)
Fuel Oil Sulphur Content	0.0015	(%)

Rating (enter one set of units)	Value	Units
Boiler Heat Input (Btu/h)	16,700,000	(Btu/h)
Calculated Heat Input	16.70	(MMBtu/hr)
Boiler Size Cut-off	<100	(MMBtu/hr)

Pollution Controls	Value
NSPS	n/a
Low-NOx Burners	no
Flue-gas Recirculation	no

Fuel & Air Parameters	Value	Units	Sample Calculation / Comment
Fuel Consumption	121.9	(gal/h)	= (16.7 MMBTU/h) x (1,000,000 BTU/MMBTU) / (137000 BTU/gal)
	461	(L/h)	
Fuel Molar Flow Rate (NG Only)	not applicable		not applicable
Fuel Mass Flow Rate	403	(kg/h)	= (121.9 gal/h) x (7.296 lb/gal) / (2.205 lb/kg)
Stoichiometric Ratio (NG only)	not applicable		not applicable
Theoretical Moist Air (Oil Only)	345	(kg air / MMBTU)	based on 7.5 lb theoretical dry air per 10,000 BTU of fuel oil
Combustion Air	229273	(mol/h)	= (6626 kg air / h) x (1000 g / kg) / (28.8 g air / mol air)
	6626	(kg/h)	= 16.7 MMBTU/h x 345 kg/MMBTU x (115% XS Air)
	5137	(m^3/h) @ 0°C	= (229273 mol/h) x (8.314 L·kPa/mol·K) x (288 K) / (101.3 kPa) / (1000 L/m^3)
	3023	(scfm) @ 0°C	= (5137 m^3/h) x (35.31 ft^3/m^3) / (60 min/h)

Exhaust Parameters	Value	Units	Sample Calculation
Exhaust Gas Molar Flow (NG only)	not applicable	(mol/h)	not applicable
Theoretical Flue Gas (Oil Only)	10.4	(m^3_{air} / L_{fuel})	at standard temperature & pressure
Exhaust Gas Mass Flow Rate	7029	(kg/h)	403 kg fuel / h + 6626 kg air / h
Exhaust Gas Flow	7955	(Am³/h)	= (4794 m³ air / h) x (453 K) / (288K)
	2.21	(Am³/s)	= (7955 m³ / h) / (3600 s / h)
	4794	(m³/h) @ 0°C	= (10.4 m³ air / L fuel) x (461 L fuel / h)
	2821	(scfm) @ 0°C	= (4794 m³ / h) x (35.31 ft³ / m³) / (60 min / h)

Criteria Contaminants	Emission Factor		Emission Rate		Data Quality	Sample Calculation
	Value	Units	Value	Units		
Sulphur Dioxide	0.21	(lb/10^3gal)	3.27E-03	(g/s)	A	= (121.9 gal / h) x (0.213 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)
Oxides of Nitrogen	20	(lb/10^3gal)	3.07E-01	(g/s)	A	= (121.9 gal / h) x (20 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)
Carbon Monoxide	5	(lb/10^3gal)	7.68E-02	(g/s)	A	= (121.9 gal / h) x (5 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)
Filterable Particulate	2	(lb/10^3gal)	3.07E-02	(g/s)	A	= (121.9 gal / h) x (2 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)
Condensable Particulate	--		--			
Total Particulate	2	(lb/10^3gal)	3.07E-02	(g/s)	A	= (121.9 gal / h) x (2 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)

Note: Total Particulate = Filterable + Condensable, if applicable. Lowest data quality rating of either filterable or condensable applied.

Appendix C3: External Combustion Spreadsheet for No. 2 Fuel Oil-Fired Process KDC_SF1001, KDC_SF1002

University Health Network - Toronto Western Hospital

RWDI# 1803937

RWDI Source ID: KDC_SF1001, KDC_SF1002

Parameter	Value	Units
Fuel Type	No. 2 Fuel Oil	
Fuel Heating Value	137,000	(Btu/gal)
Fuel Density	7.296	(lb/gal)
Firing Configuration	Normal firing	
Boiler Efficiency		(%)
Excess Air	15%	(%)

Exhaust Information	Value	Units
Exhaust Temperature (°C)	180	(°C)
Calculated Exit Temperature	453	(K)

Fuel Sulphur Information	Value	Units
Natural Gas Sulphur Content	0	(grains/10^6scf)
Fuel Oil Sulphur Content	0.0015	(%)

Rating (enter one set of units)	Value	Units
Boiler Heat Input (Btu/h)	18,844,000	(Btu/h)
Calculated Heat Input	18.84	(MMBtu/hr)
Boiler Size Cut-off	<100	(MMBtu/hr)

Pollution Controls	Value
NSPS	n/a
Low-NOx Burners	no
Flue-gas Recirculation	no

Fuel & Air Parameters	Value	Units	Sample Calculation / Comment
Fuel Consumption	137.5	(gal/h)	= (18.84 MMBTU/h) x (1,000,000 BTU/MMBTU) / (137000 BTU/gal)
	520	(L/h)	
Fuel Molar Flow Rate (NG Only)	not applicable		not applicable
Fuel Mass Flow Rate	455	(kg/h)	= (137.5 gal/h) x (7.296 lb/gal) / (2.205 lb/kg)
Stoichiometric Ratio (NG only)	not applicable		not applicable
Theoretical Moist Air (Oil Only)	345	(kg air / MMBTU)	based on 7.5 lb theoretical dry air per 10,000 BTU of fuel oil
Combustion Air	258651	(mol/h)	= (7475 kg air / h) x (1000 g / kg) / (28.8 g air / mol air)
	7475	(kg/h)	= 18.84 MMBTU/h x 345 kg/MMBTU x (115% XS Air)
	5795	(m³/h) @ 0°C	= (258651 mol/h) x (8.314 L·kPa/mol·K) x (288 K) / (101.3 kPa) / (1000 L/m³)
	3410	(scfm) @ 0°C	= (5795 m³/h) x (35.31 ft³/m³) / (60 min/h)

Exhaust Parameters	Value	Units	Sample Calculation
Exhaust Gas Molar Flow (NG only)	not applcable	(mol/h)	not applicable
Theoretical Flue Gas (Oil Only)	10.4	(m^3_{air} / L_{fuel})	at standard temperature & pressure
Exhaust Gas Mass Flow Rate	7930	(kg/h)	455 kg fuel / h + 7475 kg air / h
Exhaust Gas Flow	8974	(Am³/h)	= (5408 m³ air / h) x (453 K) / (288K)
	2.49	(Am³/s)	= (8974 m³ / h) / (3600 s / h)
	5408	(m³/h) @ 0°C	= (10.4 m³ air / L fuel) x (520 L fuel / h)
	3183	(scfm) @ 0°C	= (5408 m³ / h) x (35.31 ft³ / m³) / (60 min / h)

Criteria Contaminants	Emission Factor		Emission Rate		Data Quality	Sample Calculation
	Value	Units	Value	Units		
Sulphur Dioxide	0.21	(lb/10^3gal)	3.69E-03	(g/s)	A	= (137.5 gal / h) x (0.213 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)
Oxides of Nitrogen	20	(lb/10^3gal)	3.46E-01	(g/s)	A	= (137.5 gal / h) x (20 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)
Carbon Monoxide	5	(lb/10^3gal)	8.66E-02	(g/s)	A	= (137.5 gal / h) x (5 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)
Filterable Particulate	2	(lb/10^3gal)	3.46E-02	(g/s)	A	= (137.5 gal / h) x (2 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)
Condensable Particulate	--		--			
Total Particulate	2	(lb/10^3gal)	3.46E-02	(g/s)	A	= (137.5 gal / h) x (2 lb / 10³ gal) x (453.6 g / lb) / (3600 s / h)

Note: Total Particulate = Filterable + Condensable, if applicable. Lowest data quality rating of either filterable or condensable applied.

Appendix C4: External Combustion Spreadsheet for No. 2 Fuel Oil-Fired Process KDC_BF, KDC_SBF

University Health Network - Toronto Western Hospital

RWDI# 1803937

RWDI Source ID: KDC_BF, KDC_SBF

Parameter	Value	Units
Fuel Type	No. 2 Fuel Oil	
Fuel Heating Value	137,000	(Btu/gal)
Fuel Density	7.296	(lb/gal)
Firing Configuration	Normal firing	
Boiler Efficiency		(%)
Excess Air	15%	(%)

Exhaust Information	Value	Units
Exhaust Temperature (°C)	180	(°C)
Calculated Exit Temperature	453	(K)

Fuel Sulphur Information	Value	Units
Natural Gas Sulphur Content	0	(grains/10^6scf)
Fuel Oil Sulphur Content	0.0015	(%)

Rating (enter one set of units)	Value	Units
Boiler Heat Input (Btu/h)	25,106,000	(Btu/h)
Calculated Heat Input	25.11	(MMBtu/hr)
Boiler Size Cut-off	<100	(MMBtu/hr)

Pollution Controls	Value
NSPS	n/a
Low-NOx Burners	no
Flue-gas Recirculation	no

Fuel & Air Parameters	Value	Units	Sample Calculation / Comment
Fuel Consumption	183.3	(gal/h)	= (25.11 MMBTU/h) x (1,000,000 BTU/MMBTU) / (137000 BTU/gal)
	694	(L/h)	
Fuel Molar Flow Rate (NG Only)	not applicable		not applicable
Fuel Mass Flow Rate	607	(kg/h)	= (183.3 gal/h) x (7.296 lb/gal) / (2.205 lb/kg)
Stoichiometric Ratio (NG only)	not applicable		not applicable
Theoretical Moist Air (Oil Only)	345	(kg air / MMBTU)	based on 7.5 lb theoretical dry air per 10,000 BTU of fuel oil
Combustion Air	344706	(mol/h)	= (9962 kg air / h) x (1000 g / kg) / (28.8 g air / mol air)
	9962	(kg/h)	= 25.11 MMBTU/h x 345 kg/MMBTU x (115% XS Air)
	7723	(m^3/h) @ 0°C	= (344706 mol/h) x (8.314 L·kPa/mol·K) x (288 K) / (101.3 kPa) / (1000 L/m^3)
	4545	(scfm) @ 0°C	= (7723 m^3/h) x (35.31 ft^3/m^3) / (60 min/h)

Exhaust Parameters	Value	Units	Sample Calculation
Exhaust Gas Molar Flow (NG only)	not applcable	(mol/h)	not applicable
Theoretical Flue Gas (Oil Only)	10.4	(m^3_{air} / L_{fuel})	at standard temperature & pressure
Exhaust Gas Mass Flow Rate	10569	(kg/h)	607 kg fuel / h + 9962 kg air / h
Exhaust Gas Flow	11977	(Am^3/h)	= (7218 m^3 air / h) x (453 K) / (288K)
	3.33	(Am^3/s)	= (11977 m^3 / h) / (3600 s / h)
	7218	(m^3/h) @ 0°C	= (10.4 m^3 air / L fuel) x (694 L fuel / h)
	4248	(scfm) @ 0°C	= (7218 m^3 / h) x (35.31 ft^3 / m^3) / (60 min / h)

Criteria Contaminants	Emission Factor		Emission Rate		Data Quality	Sample Calculation
	Value	Units	Value	Units		
Sulphur Dioxide	0.21	(lb/10^3gal)	4.92E-03	(g/s)	A	= (183.3 gal / h) x (0.213 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)
Oxides of Nitrogen	20	(lb/10^3gal)	4.62E-01	(g/s)	A	= (183.3 gal / h) x (20 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)
Carbon Monoxide	5	(lb/10^3gal)	1.15E-01	(g/s)	A	= (183.3 gal / h) x (5 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)
Filterable Particulate	2	(lb/10^3gal)	4.62E-02	(g/s)	A	= (183.3 gal / h) x (2 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)
Condensable Particulate	--		--			
Total Particulate	2	(lb/10^3gal)	4.62E-02	(g/s)	A	= (183.3 gal / h) x (2 lb / 10^3 gal) x (453.6 g / lb) / (3600 s / h)

Note: Total Particulate = Filterable + Condensable, if applicable. Lowest data quality rating of either filterable or condensable applied.

APPENDIX D

Emergency Diesel Generators Emissions Calculations

Appendix D1: Emergency Diesel Generators Emissions Calculations

RWDI# 1803937

University Health Network - Toronto Western Hospital

RWDI Source ID:	GC_GenExh1, GC_GenExh2
Manufacturer:	Cummins Inc.
Engine Model:	QSK50-G4 NR2

Parameter	Units	Value
Engine Fuel		Diesel
Fuel Heating Value	(Btu/gal)	137,000
Stroke Cycle		4-Stroke
Engine Loading	(%)	n/a
Burn Style		n/a
NOx Controlled?		n/a

Manufacturer Emissions Data	Units	Factor
Oxides of Sulphur (SOx)	(g/hp-hr)	
Oxides of Nitrogen (NOx)	(g/hp-hr)	3.93
Carbon Monoxide (CO)	(g/hp-hr)	
Particulate Matter (PM)	(g/hp-hr)	
Source:	Cummins Exhaust Emission Data Sheet 1500DQGAB 60 Hz Diesel generator set	

Rating	Units	Value
Electrical Power Output (kW)	(kW)	600
Generator Transfer Efficiency	(%)	90
Engine Combustion Efficiency	(%)	
Calculated Engine Output	(hp)	893
Calculated Engine Input	(hp)	n/a
Diesel Generator Size Range	(hp)	>600

Fuel Sulphur Information	Units	Value
Natural Gas Sulphur Content	(%)	
Fuel Oil Sulphur Content	(%)	

Exhaust Temperature	Units	Value
Exhaust Temperature (°F)	(°F)	709
Calculated Exit Temperature	(K)	649
Exhaust Flow Rate	CFM	7,557
	m³/s	3.57

Pollutants	Emission Factor		Data	Source of Emission Factor
	Value	Units	Quality	
Oxides of Nitrogen (NOx)	3.93E+00	(g/hp-hr)	C	Cummins Exhaust Emission Data Sheet 1500DQGAB 60 Hz Diesel generator set

Pollutants	Emission Rate		Sample Calculation
	Value	Units	
Oxides of Nitrogen (NOx)	9.75E-01	g/s	= (893 hp) x (3.93 g/hp-hr) / (3,600 s / h)

Appendix D2: Emergency Diesel Generators Emissions Calculations

RWDI# 1803937

University Health Network - Toronto Western Hospital

RWDI Source ID:	GC_GenExh1, GC_GenExh2
Manufacturer:	Cummins Inc.
Engine Model:	QSK50-G4 NR2

Parameter	Units	Value
Engine Fuel		Diesel
Fuel Heating Value	(Btu/gal)	137,000
Stroke Cycle		4-Stroke
Engine Loading	(%)	n/a
Burn Style		n/a
NOx Controlled?		n/a

Manufacturer Emissions Data	Units	Factor
Oxides of Sulphur (SOx)	(g/hp-hr)	
Oxides of Nitrogen (NOx)	(g/hp-hr)	5.38
Carbon Monoxide (CO)	(g/hp-hr)	
Particulate Matter (PM)	(g/hp-hr)	
Source:	Cummins Exhaust Emission Data Sheet 1500DQGAB 60 Hz Diesel generator set	

Rating	Units	Value
Electrical Power Output (kW)	(kW)	1,200
Generator Transfer Efficiency	(%)	90
Engine Combustion Efficiency	(%)	
Calculated Engine Output	(hp)	1,787
Calculated Engine Input	(hp)	n/a
Diesel Generator Size Range	(hp)	>600

Fuel Sulphur Information	Units	Value
Natural Gas Sulphur Content	(%)	
Fuel Oil Sulphur Content	(%)	

Exhaust Temperature	Units	Value
Exhaust Temperature (°F)	(°F)	880
Calculated Exit Temperature	(K)	744
Exhaust Flow Rate	CFM	11,783
	m³/s	5.56

Pollutants	Emission Factor		Data	Source of Emission Factor
	Value	Units	Quality	
Oxides of Nitrogen (NOx)	5.38E+00	(g/hp-hr)	C	Cummins Exhaust Emission Data Sheet 1500DQGAB 60 Hz Diesel generator set

Pollutants	Emission Rate		Sample Calculation
	Value	Units	
Oxides of Nitrogen (NOx)	2.67E+00	g/s	= (1,787 hp) x (5.38 g/hp-hr) / (3,600 s / h)

TWH Generator Replacement
1200KW prime rated outdoor option
03-Dec-20
Due: Tuesday Dec. 8th @ 12:00 Noon

Please submit the following information in one package that can be sent on to PCL using the same item numbers as below.
(as requested by the consultant).

See attached H.H. Angus specifications issued with PCL Post Tender Addendum #1.

Item #	Description	Provided		Comments/Deviations
		Yes	No	
1	Compliant with H.H. Angus specification issued with PCL PT Add. #1			**Exceptions/ clarifications attached.**
1	Engine cut sheet			Cut sheets S-1512
2	Alternator cut sheet			Cut sheets ADS-331
3	Emission data @ 1200KW load			Cut sheets eds-1059
4	Emission data @ 1200KW load			Cut sheets eds-1059
5	Field spectral noise - average			Enclosure will be built as per sound level specified.
6	Field spectral noise - air intake			Enclosure will be built as per sound level specified.
7	Field spectral noise - radiator discharge			Enclosure will be built as per sound level specified.
8	Field spectral noise - engine casing			Enclosure will be built as per sound level specified.
9	Start up & stable voltage 8 sec. or less upon ATS signal			Confirmed.
10	Transient Freq. and voltage preformance incl. % deviation and recovery time back to steady stae under one step conditions i 0-100% (1200KW = 100%) ii 0-125KW and 60 sec. later another one step load of 800Kw at 0.85pf iii 0-200KW and 60 sec. later another one step load of 725KW at 0.85pf iv 0-75%,0-50%,25-100% load steps. (100% = 1200KW)			 Gensizing report 1) attached. Gensizing report 2) attached. Gensizing report 3) attached. Gensizing report 4) attached.
11	Alternator sub-transient reactance X"d minimum of 10% on 1500KVA base for compatibility with downstream distribtution.			Confirmed.
12	Alternator insulation Class H			Confirm. Refer alternator cut sheets above
13	Alternator temp. rise 105 deg C over 40deg ambient			Confirm. Refer alternator cut sheets above
14	Exh. backpressure at the connection point to the enclosure or total pressure drop within the enclosure for: I Full load (1200KW) operation ii 50% load operation			Generator cut sheets d-3334 for 1500kw. Enclosure design will take in to account the allowaable back pressureback pressure for the engine. Detailed calculations can be provided during drawing approval.
15	I Engine Emission data full load 1200KW operation ii 50% load operation			Refer cut sheets eds-1059 above
16	Enclosure seismically certified by P. Eng for post-disaster application in downtown Toronto			Confirmed.
17	Enclosure internal recirculation of air flow such that it will allow the engine to operate continuously at low loads (not less than 400KW) while external ambient temp. outsied enclosure is -30 deg. C			Confirmed.
18	Enclosure controls for air intake,bypass damper and exhaust damper arrangement and space temperature			Confirmed.
19	Enclosure controls for day tank fuel filling level control and alarm.			Confirmed.

20	Enclosure fire protection ready to connect to existing facility fire alarm.			Confirmed.
21	Enclosure sound performance of each octave band at each opening, air intake, discharge and combustion exhaust.			Two options provided 1) 72 dBA at 7 M and 2) 60 dBA at 7 M overall average noise level in free field environmnet for the generator enclosure.
22	Enclosure spring isolator for each engine			Confirmed.
23	Muffler to be hospital grade for max. attenuation			Muffler shall be to suit the soun level above.
24	Bacnet compatible genset controller to interface with TWH BAS for engine status monitoring alarm			Confirmed.
25	Enclosure unit heaters specify size and location			2 #s 5kw distributed in the enclosure.
26	Shore power indicate panel size,rating and location.			3 phase 120/208V, 3 phase 100A
27	Enclosure dimension cut-sheet and overall weight of packaged generator.			For 72 dBA - 520 " L x 160" W x 160" H, weight 75,000 lbs approx.
				For 60 dBA - 550 " L x 160" W x 160" H, weight 78,000 lbs approx.

Our energy working for you.™

Cummins Power Generation

Project Name: 081220-UK-01499-2x1350kw prime, UHN TWH OR Generators

Quotation: O-161154-Q-15214 – Attachment List

1) Engine cut sheets S-1512
2) Alternator cut sheets ADS-331
3) Exhaust emission data sheet eds-1059
4) Sound Data open set FYI msp-1034
5) Prototype test report pts-265
6) Generator cut sheets d-3334
7) Gensizing report 1)
8) Gensizing report 2)
9) Gensizing report 3)
10) Gensizing report 4)

Specification Sheet

Diesel Generator Set QSK50 Series Engine

1100 kW – 1500 kW 60 Hz

Description

Cummins® commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary standby and prime power applications. Codes or standards compliance may not be available with all model configurations – consult factory for availability.

Features

Cummins Heavy-Duty Engine - Rugged 4-cycle, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings; low waveform distortion with non-linear loads, fault clearing short-circuits capability.

Permanent Magnet Generator (PMG) - Offers enhanced motor starting and fault clearing short-circuit.

Control System - The PowerCommand® digital control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, AmpSentry TM protective relay, output metering and auto-shutdown at fault detection and NFPA 110 Level 1 compliance

Cooling System - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and Service - Backed by a comprehensive warranty and worldwide distributor network.

	Standby Rating		Prime Rating		Continuous Rating		Data Sheets	
Model	**60 Hz kW (kVA)**	**50 Hz kW (kVA)**	**60 Hz kW (kVA)**	**50 Hz kW (kVA)**	**60 Hz kW (kVA)**	**50 Hz kW (kVA)**	**60 Hz**	**50 Hz**
DQGAA	1250 (1563)		1100 (1375)				D-3333	
DQGAB	1500 (1875)		1350 (1688)				D-3334	

Generator Set Specifications

Governor regulation class	ISO8528 Part 1 Class G3
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 0.5%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
Radio frequency emissions compliance	IEC 801.2 through IEC 801.5; MIL STD 461C, Part 9

Engine Specifications

Bore	158.8 mm (6.25 in.)
Stroke	158.8 mm (6.25 in.)
Displacement	50.3 Liters (3067 in^3)
Configuration	Cast iron, V 16 cylinder
Battery capacity	1800 amps minimum at ambient temperature of 0 °C (32 °F)
Battery charging alternator	35 amps
Starting voltage	24 volt, negative ground
Fuel system	Cummins' Modular Common Rail System
Fuel filter	Dual Element 10 micron filtration spin-on fuel filter with 15 micron water separator
Air cleaner type	Dry replaceable element
Lube oil filter type(s)	Four spin-on, combination full flow filter and bypass filters
Standard cooling system	High ambient radiator

Alternator Specifications

Design	Brushless, 4 pole, drip-proof revolving field
Stator	2/3 pitch
Rotor	Single bearing, flexible disc
Insulation system	Class H
Standard temperature rise	150 °C standby at 40 °C ambient
Exciter type	PMG (Permanent Magnet Generator)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform Total Harmonic Distortion (THDV)	< 5% no load to full linear load, < 3% for any single harmonic
Telephone Influence Factor (TIF)	< 50 per NEMA MG1-22.43
Telephone Harmonic Factor (THF)	< 3

Available Voltages

60 Hz Line–Neutral/Line-Line			50 Hz Line-Neutral/Line-Line
220/380 255/440	277/480 347/600	2400/4160	

*Note: Consult factory for other voltages.

Generator Set Options

Engine

208/240/480 V thermostatically controlled coolant heater for ambient above 4.5 °C (40 °F)
208/240/480 V thermostatically controlled coolant heater for ambient below 4.5 °C (40 °F)
Dual 120 V 300 W lube oil heaters
Dual 208/240 V 300 W lube oil heaters
Dual 480 V 300 W lube oil heaters

Cooling System

Remote indicator

Control Panel

PowerCommand 3.3
Multiple language support
120/240 V 100 W control anti-condensation heater
Exhaust pyrometer
Ground fault indication
Remote annunciator panel
Paralleling relay package
Shutdown alarm relay package
Audible engine shutdown alarm
AC output analog meters (bargraph)

Exhaust System

Industrial grade exhaust silencer
Residential grade exhaust silencer
Critical grade exhaust silencer
Exhaust packages

Alternator

80 °C rise
105 °C rise
125 °C rise
120/240 V 300 W anti-condensation heater

Generator Set

AC entrance box
Battery
Battery charger
Circuit breaker – set mounted
Disconnect switch - set mounted
PowerCommand Network
Remote annunciator panel
Spring isolations
2 year warranty
5 year warranty
10 year major components warranty

*Note: Some options may not be available on all models - consult factory for availability.

PowerCommand 3.3 – Control System

An integrated microprocessor-based generator set control system providing voltage regulation, engine protection, alternator protection, operator interface and isochronous governing. Refer to document S-1570 for more detailed information on the control.

AmpSentry – Includes integral AmpSentry protection, which provides a full range of alternator protection functions that are matched to the alternator provided.

Power management – Control function provides battery monitoring and testing features and smart starting control system.

Advanced control methodology – Three phase sensing, full wave rectified voltage regulation, with a PWM output for stable operation with all load types.

Communications interface – Control comes standard with PCCNet and Modbus interface.

Regulation compliant – Prototype tested: UL, CSA and CE compliant.

Service - InPower™ PC-based service tool available for detailed diagnostics, setup, data logging and fault simulation.

Easily upgradeable – PowerCommand controls are designed with common control interfaces.

Reliable design – The control system is designed for reliable operation in harsh environment.

Multi-language support

Operator panel features

Operator/display functions

- Displays paralleling breaker status
- Provides direct control of the paralleling breaker
- 320 x 240 pixels graphic LED backlight LCD
- Auto, manual, start, stop, fault reset and lamp test/panel lamp switches
- Alpha-numeric display with pushbuttons
- LED lamps indicating genset running, remote start, not in auto, common shutdown, common warning, manual run mode, auto mode and stop

Paralleling control functions

- First Start Sensor™ system selects first genset to close to bus
- Phase lock loop synchronizer with voltage matching
- Sync check relay
- Isochronous kW and kVar load sharing
- Load govern control for utility paralleling
- Extended paralleling (base load/peak shave) mode
- Digital power transfer control, for use with a breaker pair to provide open transition, closed transition, ramping closed transition, peaking and base load functions.

Alternator data

- Line-to-Neutral and Line-to-Line AC volts
- 3-phase AC current
- Frequency
- kW, kVAr, power factor kVA (three phase and total)

Engine data

- DC voltage
- Engine speed
- Lube oil pressure and temperature
- Coolant temperature
- Comprehensive FAE data (where applicable)

Other data

- Genset model data
- Start attempts, starts, running hours, kW hours
- Load profile (operating hours at % load in 5% increments)
- Fault history
- Data logging and fault simulation (requires InPower)

Standard control functions

Digital governing

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital voltage regulation

- Integrated digital electronic voltage regulator
- 3-phase, 4-wire Line-to-Line sensing
- Configurable torque matching

AmpSentry AC protection

- AmpSentry protective relay
- Over current and short circuit shutdown
- Over current warning
- Single and three phase fault regulation
- Over and under voltage shutdown
- Over and under frequency shutdown
- Overload warning with alarm contact
- Reverse power and reverse Var shutdown
- Field overload shutdown

Engine protection

- Battery voltage monitoring, protection and testing
- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- Low coolant level warning or shutdown
- Low coolant temperature warning
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Cranking lockout
- Sensor failure indication
- Low fuel level warning or shutdown
- Fuel-in-rupture-basin warning or shutdown
- Full authority electronic engine protection

Standard Control Functions (continued)

Control Functions

- Time delay start and cool down
- Real time clock for fault and event time stamping
- Exerciser clock and time of day start/stop
- Data logging
- Cycle cranking
- Load shed
- Configurable inputs and outputs (4)
- Remote emergency stop

Options

- Auxiliary output relays (2)

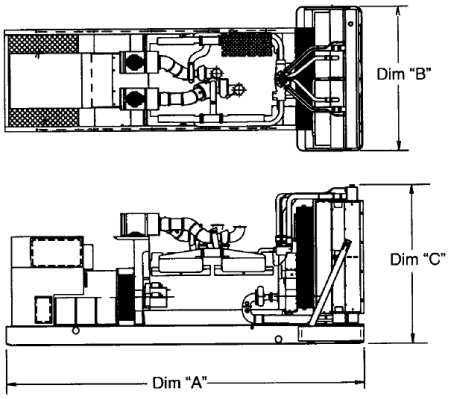
Ratings Definitions

Emergency Standby Power (ESP):
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-Time Running Power (LTP):
Applicable for supplying power to a constant electrical load for limited hours. Limited-Time Running Power (LTP) is in accordance with ISO 8528.

Prime Power (PRP):
Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base Load (Continuous) Power (COP):
Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.



This outline drawing is for reference only. See respective model data sheet for specific model outline drawing number.

Do not use for installation design

Model	Dim 'A' (mm) (in.)	Dim 'B' (mm) (in.)	Dim 'C' (mm) (in.)	Set Weight dry* kg (lbs)	Set Weight* wet kg (lbs)
DQGAA	5969 (235)	2007 (79)	2840 (112)	10989 (24220)	11493 (25330)
DQGAB	5969 (235)	2007 79)	2840 (112)	10989 (24220)	11493 (25330)

* Note: Weights represent a set with standard features. See outline drawings for weights of other configurations.

Codes and Standards

	This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.		The generator set is available listed to UL 2200, Stationary Engine Generator Assemblies for all 60 Hz low voltage models. The PowerCommand control is Listed to UL 508 – Category NITW7 for U.S and Canadian usage. Circuit breaker assemblies are UL 489 Listed for 100% continuous operation and also UL 869A Listed Service Equipment.
	The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.	**U.S EPA**	Engine certified to Stationary Emergency U.S. EPA New Source Performance Standards, 40 CFR 60 subpart IIII Tier 2 exhaust emission levels. U.S. applications must be applied per this EPA regulation.
	All low voltage models are CSA certified to product class 4215-01.	**International Building Code**	The generator set package set is available certified for seismic application in accordance with the following International Building Code: IBC2000, IBC2003, IBC2006 and IBC2009.

For more information contact your local Cummins distributor or visit power.cummins.com

Our energy working for you.™

S-1512 (07/20)

Alternator data sheet

Frame size: P734C

Characteristics

Weights:	Stator assembly:	3186 lb	1445 kg
	Rotor assembly:	2756 lb	1250 kg
	Complete assembly:	6654 lb	3018 kg
Maximum speed:		2250 rpm	
Excitation current:	Full load:	3.6 Amps	
	No load:	0.5 Amps	
Insulation system:	Class H throughout		

3 Ø Ratings (0.8 power factor)		**60 Hz Voltage** (winding no)						
(Based on specific temperature rise at 40° C ambient temperature)		220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
163° C rise ratings	kW			1284	1456	1556	1620	1620
	kVA			1605	1820	1945	2025	2025
150° C rise ratings	kW			1248	1416	1512	1576	1576
	kVA			1560	1770	1890	1970	1970
125° C rise ratings	kW			1200	1364	1452	1512	1512
	kVA			1500	1705	1815	1890	1890
105° C rise ratings	kW			1116	1272	1352	1408	1408
	kVA			1395	1590	1690	1760	1760
80° C rise ratings	kW			1032	1172	1252	1300	1300
	kVA			1290	1465	1565	1625	1625
Reactances (per unit ± 10%)		220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
(Based on full load at 125° C rise rating)								
Synchronous				4.06	3.86	3.67	3.21	2.96
Transient				0.25	0.23	0.22	0.19	0.21
Subtransient				0.18	0.17	0.16	0.14	0.14
Negative sequence				0.26	0.25	0.23	0.20	0.16
Zero sequence				0.03	0.03	0.03	0.03	0.02
Motor starting		220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
Maximum kVA	(90% sustained voltage)			5521	5521	5521	5521	5521
Time constants (sec)		220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
Transient				0.135	0.135	0.135	0.135	0.135
Subtransient				0.010	0.010	0.010	0.010	0.010
Open circuit				2.230	2.230	2.230	2.230	2.230
DC				0.020	0.020	0.020	0.020	0.020
Windings (@ 20° C)		220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
Stator resistance	(Line to Line, Ohms)			0.00126	0.00126	0.00126	0.00126	0.00400
Rotor resistance	(Ohms)			1.85	1.85	1.85	1.85	1.85
Number of leads				6	6	6	6	6

Alternator data sheet

Frame size: P734C

Characteristics

Weights:	Stator assembly:	3186 lb	1445 kg
	Rotor assembly:	2756 lb	1250 kg
	Complete assembly:	6654 lb	3018 kg
Maximum speed:		2250 rpm	
Excitation current:	Full load:	3.6 Amps	
	No load:	0.5 Amps	
Insulation system:	Class H throughout		

3 Ø Ratings (0.8 power factor)		**50 Hz Voltage** (winding no)			
(Based on specific temperature rise at 40° C ambient temperature)		220/380 (312)	240/400 (312)	240/415 (312)	254/440 (312)
163° C rise ratings	kW	1292	1328	1328	1304
	kVA	1615	1660	1660	1630
150° C rise ratings	kW	1256	1292	1292	1272
	kVA	1570	1615	1615	1590
125° C rise ratings	kW	1204	1240	1240	1216
	kVA	1505	1550	1550	1520
105° C rise ratings	kW	1120	1156	1156	1132
	kVA	1400	1445	1445	1415
80° C rise ratings	kW	1036	1068	1068	1048
	kVA	1295	1335	1335	1310

Reactances (per unit ± 10%)	220/380 (312)	240/400 (312)	240/415 (312)	254/440 (312)
(Based on full load at 125° C rise rating)				
Synchronous	3.18	2.96	2.75	2.40
Transient	0.19	0.18	0.17	0.15
Subtransient	0.14	0.13	0.12	0.11
Negative sequence	0.20	0.19	0.18	0.15
Zero sequence	0.02	0.02	0.02	0.02

Motor starting	220/380 (312)	240/400 (312)	240/415 (312)	254/440 (312)
Maximum kVA (90% sustained voltage)	3688	3688	3688	3688

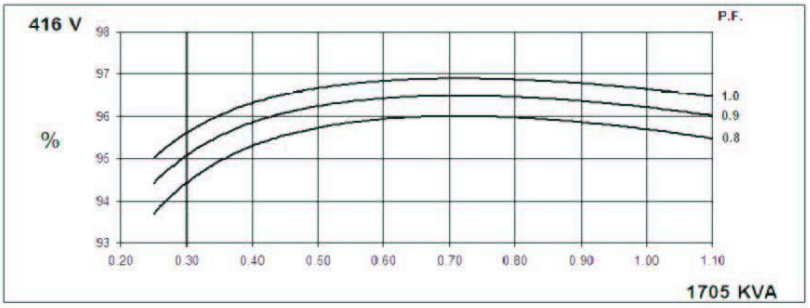
Time constants (sec)	220/380 (312)	240/400 (312)	240/415 (312)	254/440 (312)
Transient	0.135	0.135	0.135	0.135
Subtransient	0.010	0.010	0.010	0.010
Open circuit	2.230	2.230	2.230	2.230
DC	0.020	0.020	0.020	0.020

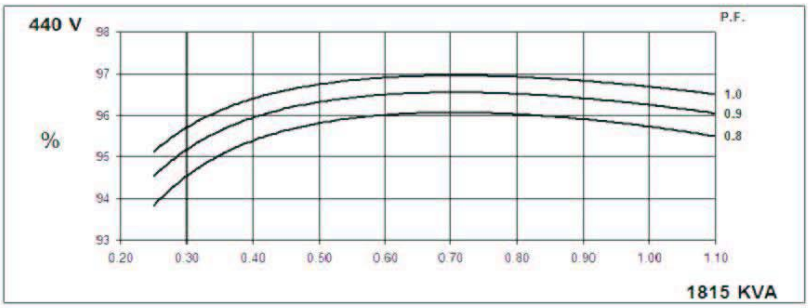
Windings (@ 20° C)		220/380 (312)	240/400 (312)	240/415 (312)	254/440 (312)
Stator resistance	(Line to Line, Ohms)	0.00126	0.00126	0.00126	0.00126
Rotor resistance	(Ohms)	1.85	1.85	1.85	1.85
Number of leads		6	6	6	6

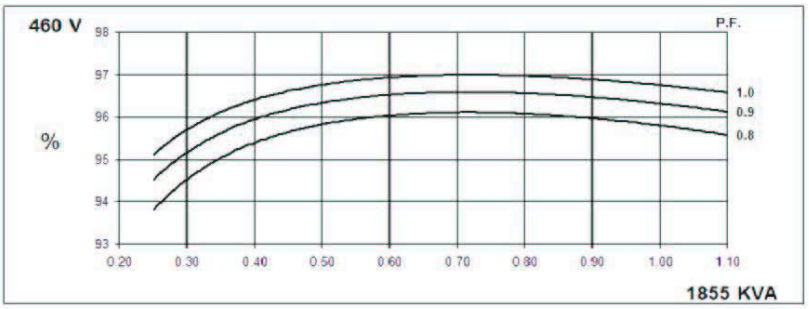
60 Hz

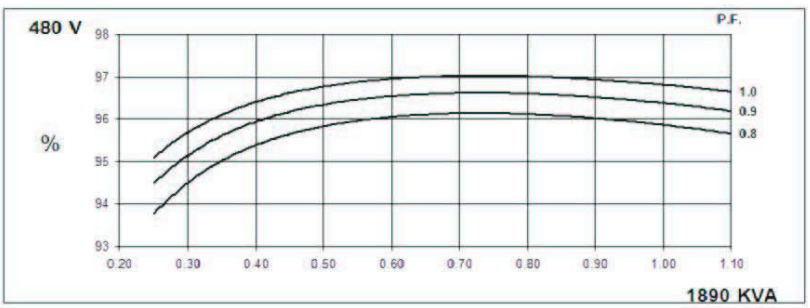
Winding 312

THREE PHASE EFFICIENCY CURVES





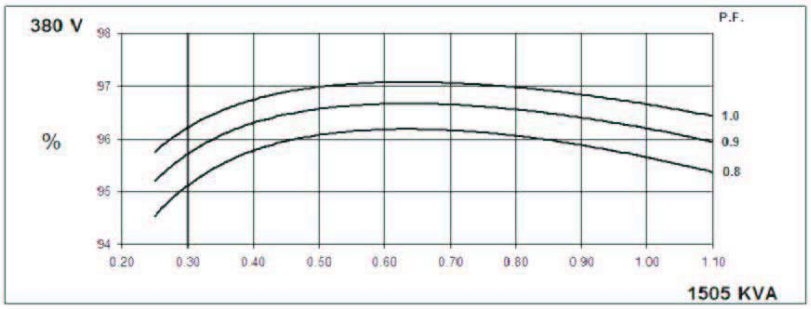


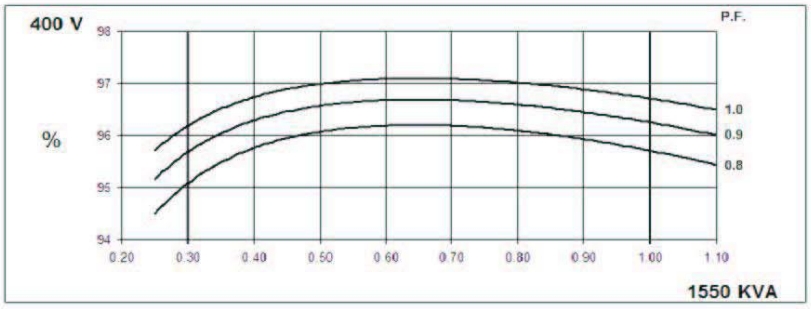


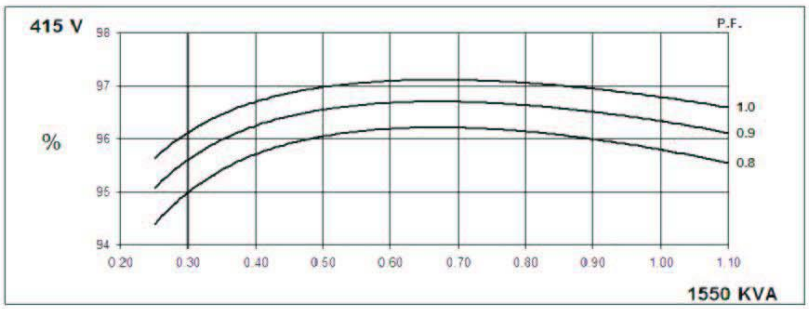
50 Hz

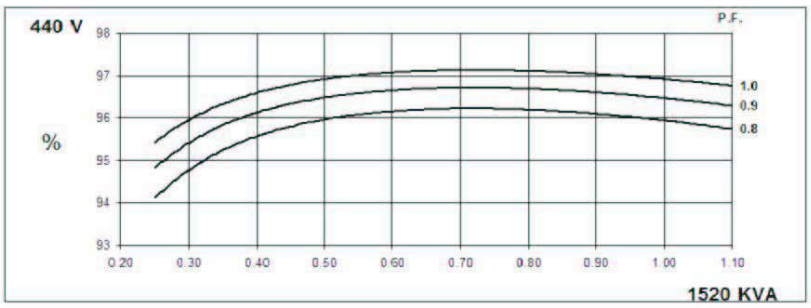
Winding 312

THREE PHASE EFFICIENCY CURVES



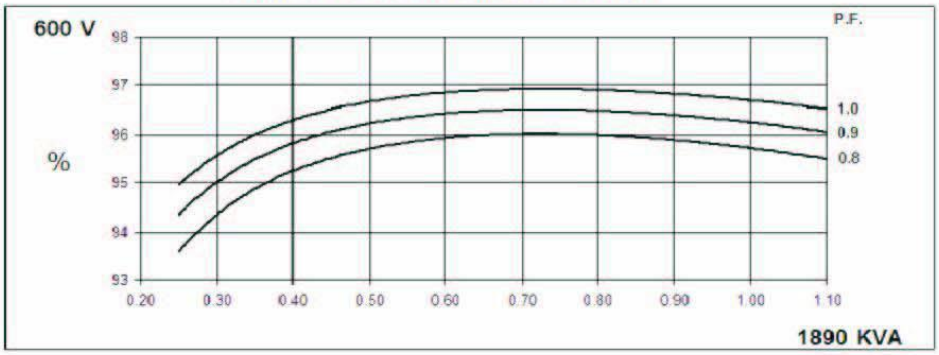






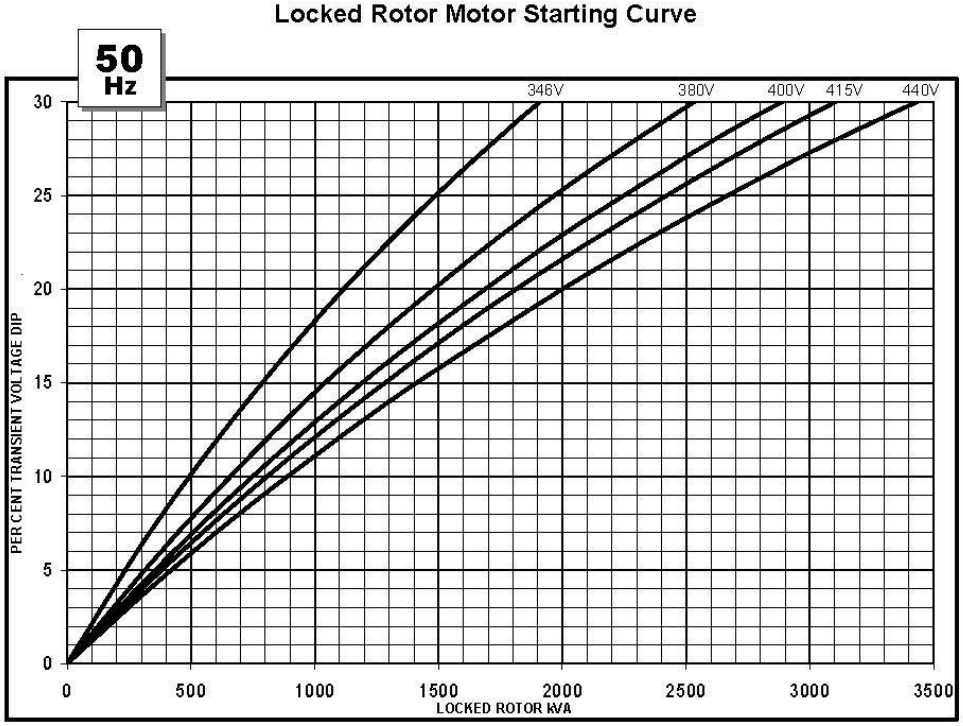
Wdg 7, 60Hz

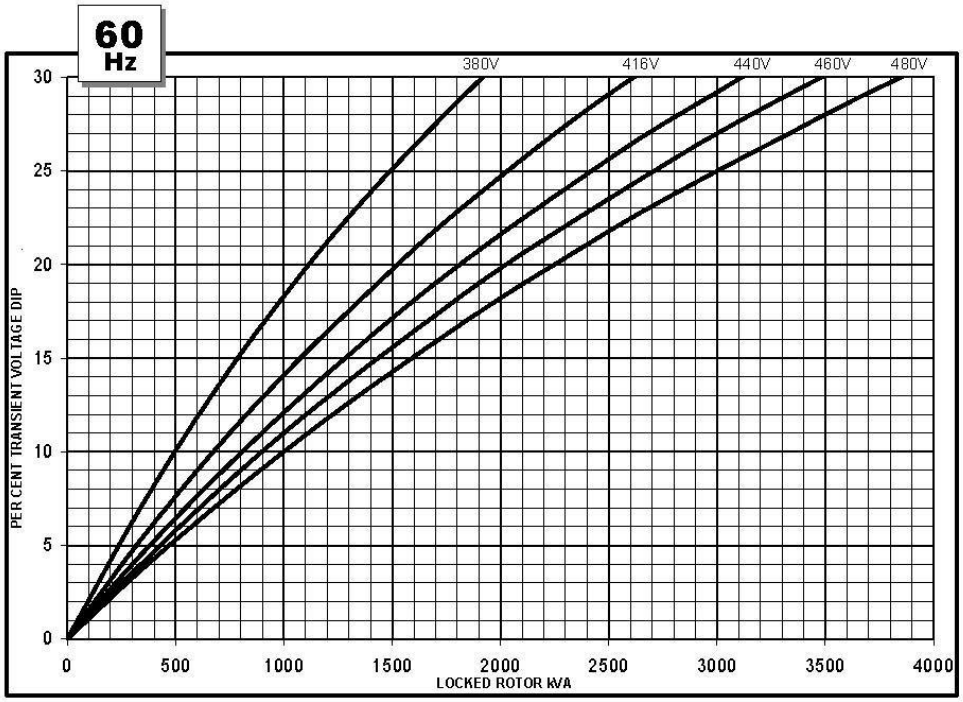
THREE PHASE EFFICIENCY CURVES



Winding 312

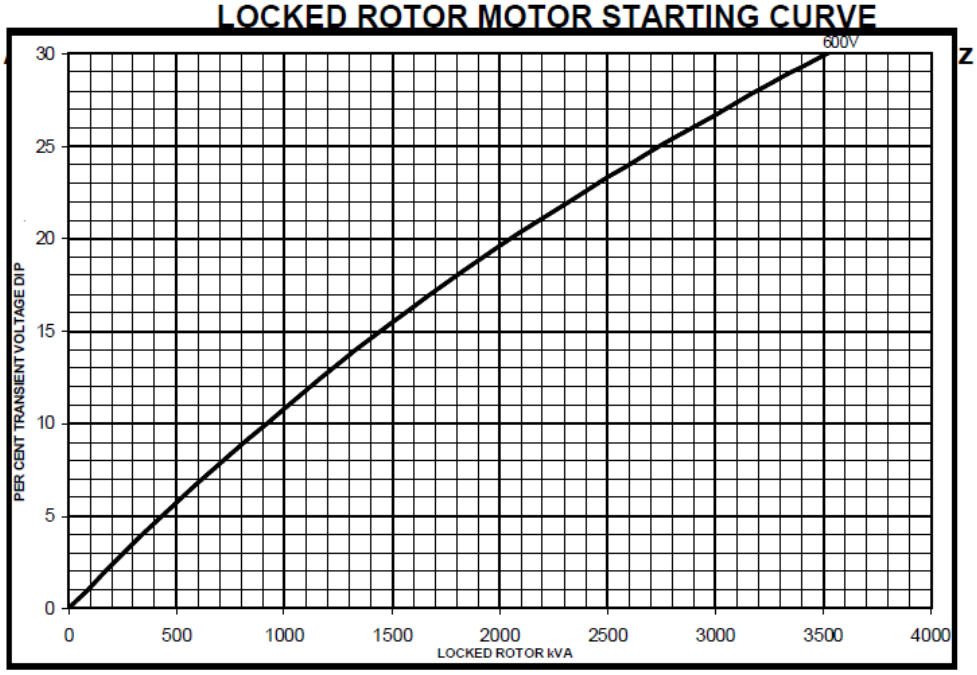
Locked Rotor Motor Starting Curve





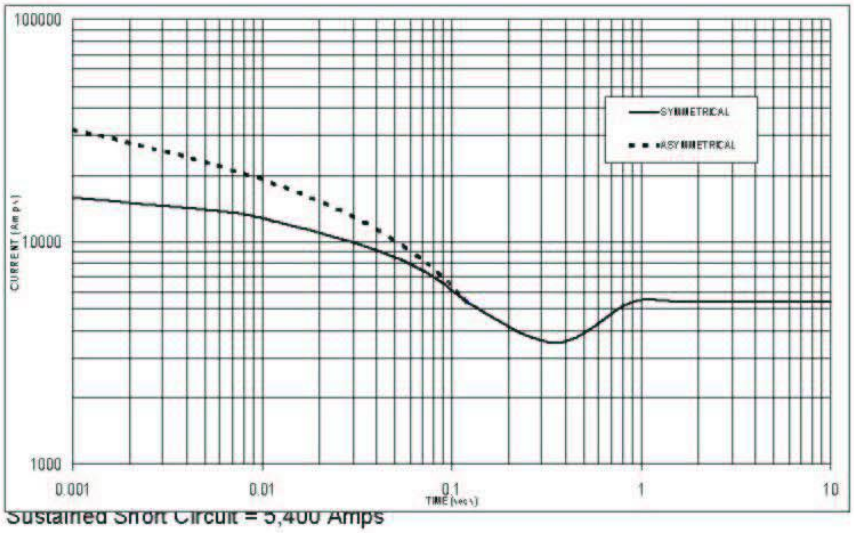
Winding 07

LOCKED ROTOR MOTOR STARTING CURVE



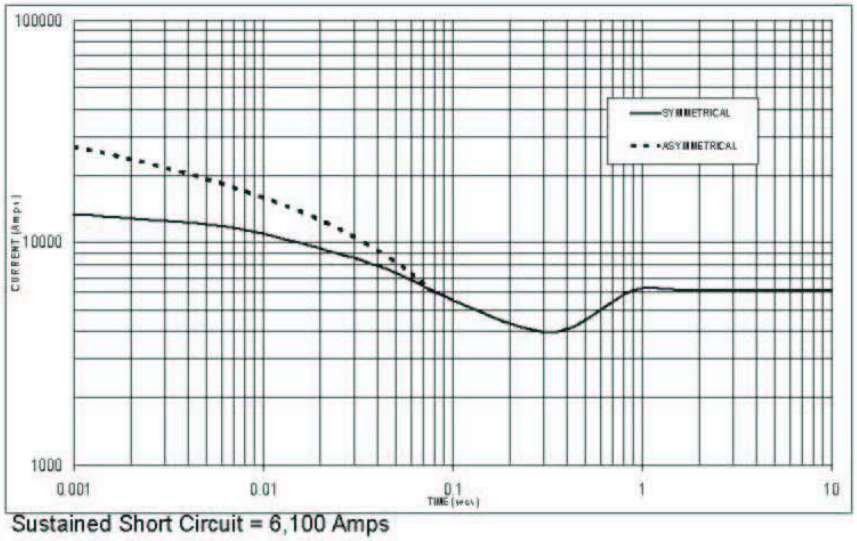
Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed
Based on star (wye) connection.

50 Hz



Sustained Short Circuit = 5,400 Amps

60 Hz



Sustained Short Circuit = 6,100 Amps

Note 1
The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380v	x 1.00	416v	x 1.00
400v	x 1.05	440v	x 1.06
415v	x 1.09	460v	x 1.10
440v	x 1.16	480v	x 1.15

The sustained current value is constant irrespective of voltage level

Note 2
The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

	3-phase	2-phase L-L	1-phase L-N
Instantaneous	x 1.00	x 0.87	x 1.30
Minimum	x 1.00	x 1.80	x 3.20
Sustained	x 1.00	x 1.50	x 2.50
Max. sustained duration	10 sec.	5 sec.	2 sec.

All other times are unchanged

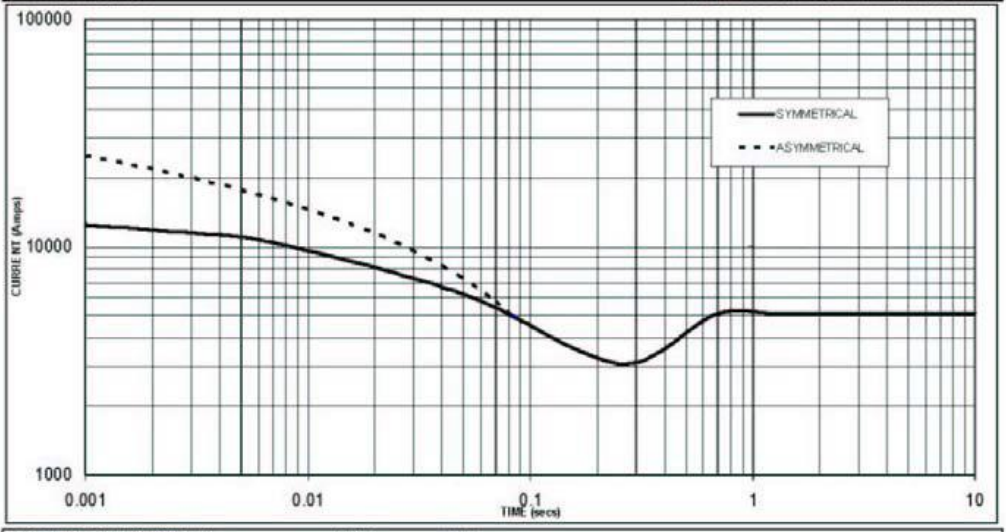
Note 3
Curves are drawn for Star (Wye) connected machines.

Alternator data sheet Frame size: P734C

THREE PHASE PHASE SHORT CIRCUIT DECREMENT CURVE

A.V.R TYPE **MX** WINDING **7** 4 POLE FREQ **60 Hz** **1800** Rev/Min

STAR CONNECTION NO LOAD EXCITATION AT RATED SPEED



SUSTAINED SHORT CIRCUIT = 5100 AMPS

NOTE 1

THE FOLLOWING MULTIPLICATION FACTORS SHOULD BE USED TO ADJUST THE VALUES FROM CURVES BETWEEN THE 0.001 SECONDS AND THE MINIMUM CURRENT POINT IN RESPECT OF NOMINAL OPERATING VOLTAGE

VOLTAGE	FACTOR
600 V	X 1.00

THE SUSTAINED CURRENT VALUE IS CONSTANT IRRESPECTIVE OF VOLTAGE LEVEL

NOTE 2

THE FOLLOWING MULTIPLICATION FACTORS SHOULD BE USED TO CONVERT THE VALUES CALCULATED IN ACCORDANCE WITH NOTE 1 TO THOSE APPLICABLE TO THE VARIOUS TYPES OF SHORT CIRCUIT

	3 PHASE	2 PHASE L-L	1 PHASE L-N
INSTANTANEOUS	X 1.0	X 0.87	X 1.3
MINIMUM	X 1.0	X 1.80	X 3.20
SUSTAINED	X 1.0	X 1.50	X 2.50
MAX SUSTAINED DURATION	10 SEC	5 SEC	2 SEC

ALL OTHER TIMES ARE UNCHANGED

Exhaust emission data sheet 1500DQGAB

60 Hz Diesel generator set

Engine information:

Model:	Cummins Inc. QSK50-G4 NR2	Bore:	6.25 in. (159 mm)
Type:	4 cycle, 60 °V, 16 cylinder diesel	Stroke:	6.25 in. (159 mm)
Aspiration:	Turbocharged and low temperature after-cooled	Displacement:	3067 cu. in. (50.2 liters)
Compression ratio:	15.0:1		
Emission control device:	Turbocharged and low temperature after-cooled		

Performance data	1/4 Standby	1/2 Standby	3/4 Standby	Full Standby	Full Prime
BHP @ 1800 RPM (60 Hz)	555	1110	1665	2220	1971
Fuel consumption (gal/hr)	33	57	82	108	96
Exhaust gas flow (CFM)	4755	7557	9751	11783	10838
Exhaust gas temperature (°F)	659	709	745	880	811
Exhaust emission data					
HC (Total unburned hydrocarbons)	0.32	0.19	0.11	0.07	0.08
NOx (Oxides of nitrogen as NO2)	3.5	3.93	4.38	5.38	5.1
CO (Carbon monoxide)	0.95	0.51	0.32	0.58	0.45
PM (Particular matter)	0.22	0.08	0.03	0.02	0.02
SO2 (Sulfur dioxide)	0.01	0.01	0.01	0.01	0.01
Smoke (Bosch)	0.63	0.33	0.14	0.12	0.12

All values are Grams per HP-Hour, Smoke is Bosch#

Test conditions

Data was recorded during steady-state rated engine speed (± 25 RPM) with full load (±2%). Pressures, temperatures, and emission rates were stabilized.

Fuel specification:	ASTM D975 No. 2-D diesel fuel with ULSD, and 40-48 cetane number.
Fuel temperature:	99 ±9 °F (at fuel pump inlet)
Intake air temperature:	77 ±9 °F
Barometric pressure:	29.6 ±1 in. Hg
Humidity:	NO_X measurement corrected to 75 grains H_2O/lb dry air
Reference standard:	ISO 8178

The NO_X, HC, CO and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

Power Generation

Sound Data

1500DQGAB 60Hz

Sound Pressure Level @ 7 meters, dB(A)

See Notes 1-8 listed below

Configuration		Measurement Location Number								Average
		1	2	3	4	5	6	7	8	
Standard - Unhoused	Infinite Exhaust	100.4	96.8	95.3	96.6	93.4	96.3	94.2	99.0	97.1

Sound Power Level, dB(A)

See Notes 2-6, 9, 10 listed below

Configuration		Octave Band Center Frequency (Hz)								Overall Sound Power Level
		63	125	250	500	1000	2000	4000	8000	
Standard - Unhoused	Infinite Exhaust	82.5	101.1	119.3	119.5	117.5	114.9	109.7	108.0	124.5

Exhaust Sound Power Level, dB(A)

Open Exhaust (No Muffler Rated Load)	Octave Band Center Frequency (Hz)								Sound Power Level
	63	125	250	500	1000	2000	4000	8000	
	94.6	118.5	123.4	128.1	126.6	128.6	126.9	125.7	135.1

Note:

1. Position 1 faces the engine front. The positions proceed around the generator set in a counter-clockwise direction in 45° increments. All positions are at 7m (23 ft) from the surface of the generator set and 1.2m (48") from floor level.
2. Sound levels are subject to instrumentation, measurement, installation and manufacturing variability.
3. Sound data with remote-cooled generator sets are based on rated loads without cooling fan noise.
4. Sound levels for aluminum enclosures are approximately 2 dB(A)s higher than listed sound levels for steel enclosures.
5. Sound data for generator set with infinite exhaust do not include exhaust noise.
6. Data is based on full rated load with standard radiator-cooling fan package
7. Sound Pressure Levels are measured per ANSI S1.13 and ANSI S12.18, as applicable.
8. Reference sound pressure is 20 µPa.
9. Sound Power Levels per ISO 3744 and ISO 8528-10, as applicable.
10. Reference power = 1 pw (10^{-12} W)
11. Exhaust Sound Pressure Levels are per ISO 6798, as applicable.

PROTOTYPE TEST SUPPORT (PTS)
60 HZ TEST SUMMARY

GENERATOR SET MODELS	REPRESENTATIVE PROTOTYPE
1250DQGAA	Model:1500DQGAB
1500DQGAB	Alternator: P734C
	Engine: QSK50-G4 NR2

The following summarizes prototype testing conducted on the designated representative prototype of the specified models. This testing is conducted to verify the complete generator set electrical and mechanical design integrity. Prototype testing is conducted only on generator sets not sold as new equipment.

Maximum Surge Power: 1580 kW

The generator set was evaluated to determine the stated maximum surge power.

Torsional Analysis and Testing:

The generator set was tested to verify that the design is not subjected to harmful torsional stresses. A spectrum analysis of the transducer output was conducted over the speed range of 1200 to 2000 RPM.

Cooling System: 40 °C Ambient
0.5 in. H2O restriction

The cooling system was tested to determine ambient temperature and static restriction capabilities. The test was performed at full rated load in elevated ambient temperature under stated static restriction conditions.

Electrical and Mechanical Strength:

The generator set was tested to several single phase and three phase faults to verify that the generator can safely withstand the forces associated with short circuit conditions. The generator set was capable of producing full rated output at the conclusion of the testing.

Steady State Performance:

The generator set was tested to verify steady state operating performance was within the specified maximum limits.

Voltage Regulation:	±0.50%
Random Voltage Variation:	±0.50%
Frequency Regulation:	Isochronous
Random Frequency Variation:	±0.25%

Transient Performance:

The generator set was tested with the standard alternator to verify single step loading capability as required by NFPA 110. Voltage and frequency response on load addition or rejection were evaluated. The following results were recorded:

Full Load Acceptance:		
Voltage Dip:	40.4	%
Recovery Time:	4.2	Second
Frequency Dip:	7.5	%
Recovery Time:	5.6	Second
Full Load Rejection:		
Voltage Rise:	26.4	%
Recovery Time:	2.8	Second
Frequency Rise:	3.5	%
Recovery Time:	1.3	Second

Harmonic Analysis:

(per MIL-STD-705B, Method 601.4)

	Line to Line		Line to Neutral	
Harmonic	No Load	Full Load	No Load	Full Load
3	0.18	0.01	0.13	0.08
5	0.2	2.3	0.13	2.3
7	0.52	1.46	0.48	0.74
9	0.08	0.03	0.03	0.07
11	0.65	0.49	0.64	0.46
13	0.21	0.28	0.19	0.31
15	0.05	0.05	0.03	0.1

Generator set data sheet

Model:	DQGAB
Frequency:	60 Hz
Fuel type:	Diesel
KW rating:	1500 standby
	1350 prime
Emissions level:	EPA NSPS Stationary Emergency Tier 2

Exhaust emission data sheet:	EDS-1059
Exhaust emission compliance sheet:	EPA-1093
Sound performance data sheet:	MSP-1034
Cooling performance data sheet:	MCP-152
Prototype test summary data sheet:	PTS-265
Standard set-mounted radiator cooling outline:	0500-4357
Optional remote radiator cooling outline:	0500-4309

Fuel consumption

	Standby				Prime			
	kW (kVA)				kW (kVA)			
Ratings	1500 (1875)				1350 (1688)			
Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
US gph	35.4	58.2	81	103.8	33.1	53.6	74.2	94.7
L/hr	133.9	220.3	306.6	393	125.3	203	208.7	358.4

Engine

	Standby rating	Prime rating
Engine manufacturer	Cummins Inc.	
Engine model	QSK50-G4 NR2	
Configuration	Cast iron, V 16 cylinder	
Aspiration	Turbocharged and low temperature aftercooled	
Gross engine power output, kWm (bhp)	1656 (2220)	1470 (1971)
BMEP at set rated load, kPa (psi)	2192 (318)	1957 (284)
Bore, mm (in)	159 (6.25)	
Stroke, mm (in)	159 (6.25)	
Rated speed, rpm	1800	
Piston speed, m/s (ft/min)	9.5 (1875)	
Compression ratio	15:1	
Lube oil capacity, L (qt)	235 (248)	
Overspeed limit, rpm	2100 ±50	
Regenerative power, kW	168	

Maximum fuel flow, L/hr (US gph)	912 (241)
Maximum fuel inlet restriction, kPa (in Hg)	16.9 (5)
Maximum fuel inlet temperature, °C (°F)	71 (160)

Air

	Standby rating	Prime rating
Combustion air, m^3/min (scfm)	139 (4895)	133 (4700)
Maximum air cleaner restriction, kPa (in H_2O)	3.7 (15)	
Alternator cooling air, m^3/min (cfm)	207 (7300)	

Exhaust

Exhaust flow at set rated load, m^3/min (cfm)	342 (12065)	312 (11000)
Exhaust temperature, °C (°F)	491 (915)	446 (835)
Maximum back pressure, kPa (in H_2O)	6.78 (27)	

Standard set-mounted radiator cooling

Ambient design, °C (°F)	40 (104)	
Fan load, kW_m (HP)	45 (60)	
Coolant capacity (with radiator), L (US gal)	541 (143)	
Cooling system air flow, m^3/min (scfm)	1705 (60150)	
Total heat rejection, MJ/min (Btu/min)	72.3 (68580)	64.8 (61510)
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)	
Maximum fuel return line restriction kPa (in Hg)	34 (10)	

Optional remote radiator cooling[1]

Set coolant capacity, L (US gal)		
Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)	1893 (500)	
Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min)	537 (142)	
Heat rejected, jacket water circuit, MJ/min (Btu/min)	35.44 (33610)	32.11 (30455)
Heat rejected, aftercooler circuit, MJ/min (Btu/min)	26.93 (25545)	23.96 (22725)
Heat rejected, fuel circuit, MJ/min (Btu/min)		
Total heat radiated to room, MJ/min (Btu/min)	13.1 (12420)	11.9 (11275)
Maximum friction head, jacket water circuit, kPa (psi)	67 (10)	
Maximum friction head, aftercooler circuit, kPa (psi)	48 (7)	
Maximum static head, jacket water circuit, m (ft)	18.3 (60)	
Maximum static head, aftercooler circuit, m (ft)	18.3 (60)	
Maximum jacket water outlet temp, °C (°F)	104 (220)	100 (212)
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)	49 (120)	
Maximum aftercooler inlet temp, °C (°F)	71 (160)	66 (150)
Maximum fuel flow, L/hr (US gph)	469 (124)	
Maximum fuel return line restriction, kPa (in Hg)	34 (10)	

Weights[2]

Unit dry weight kgs (lbs)	12700 (28000)
Unit wet weight kgs (lbs)	13270 (29260)

Notes:

[1] For non-standard remote installations contact your local Cummins Power Generation representative.
[2] Weights represent a set with standard features. See outline drawing for weights of other configurations.

Derating factors

Standby	Full rated power available up to 1134.0m (3719.6 ft) elevation at ambient temperatures up to 40 °C (104 °F). Full rated power available up to 702.5m (2304.2 ft) elevation at ambient temperatures up to 50 °C (120 °F). Above these conditions derate by 6.6% per 305m (1000 ft) and derate by an additional 10.3% per 10 °C (18 °F).
Prime	Full rated power available up to 1334.9m (4378.6 ft) elevation at ambient temperatures up to 40 °C (104 °F). Above these conditions derate by 5.8% per 305m (1000 ft) and derate by an additional 14.0% per 10 °C (18 °F).

Ratings definitions

Emergency standby power (ESP):	Limited-time running power (LTP):	Prime power (PRP):	Base load (continuous) power (COP):
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

Alternator data

Voltage	Connection[1]	Temp rise degrees C	Duty[2]	Single phase factor[3]	Max surge kVA[4]	Winding No.	Alternator data sheet	Feature Code
380	Wye, 3-phase	125	P		5743		ADS-332	B596-2
380	Wye, 3-phase	150/105	S/P		6716		ADS-333	B595-2
380	Wye, 3-phase	80	P		6716		ADS-333	B687-2
380	Wye, 3-phase	105/80	S/P		7361		ADS-334	B599-2
380	Wye, 3-phase	80	S		7695		ADS-335	B660-2
440	Wye, 3-phase	125	P		4602		ADS-330	B692-2
440	Wye, 3-phase	150/125	S/P		5521		ADS-331	B691-2
440	Wye, 3-phase	125/105	S/P		5743		ADS-332	B663-2
440	Wye, 3-phase	80	S		6716		ADS-333	B688-2
440	Wye, 3-phase	80	P		7695		ADS-331	B689-2
480	Wye, 3-phase	105	P		4602		ADS-330	B693-2
480	Wye, 3-phase	125/105	S/P		5521		ADS-331	B276-2
480	Wye, 3-phase	80	P		5521		ADS-331	B694-2
480	Wye, 3-phase	105/80	S/P		5743		ADS-332	B600-2
480	Wye, 3-phase	80	S		6716		ADS-333	B601-2
600	Wye, 3-phase	105	P		4602		ADS-330	B581-2
600	Wye, 3-phase	125/105	S/P		5521		ADS-331	B602-2
600	Wye, 3-phase	80	P		5521		ADS-331	B695-2
600	Wye, 3-phase	105/80	S/P		5743		ADS-332	B603-2
600	Wye, 3-phase	80	S		6716		ADS-333	B604-2
4160	Wye, 3-phase	105	P		6204		ADS-322	B312-2
4160	Wye, 3-phase	105/80	S/P		7005		ADS-323	B313-2

Notes:

[1] Limited single phase capability is available from some three phase rated configurations. To obtain single phase rating, multipy the three phase kW rating by the Single Phase Factor[3]. All single phase ratings are at unity power factor.

[2] Standby (S), Prime (P) and Continuous ratings (C).

[3] Factor for the *Single Phase Output from Three Phase Alternator* formula listed below.

[4] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Formulas for calculating full load currents:

Three phase output	Single phase output
$\frac{kW \times 1000}{Voltage \times 1.73 \times 0.8}$	$\frac{kW \times SinglePhaseFactor \times 1000}{Voltage}$

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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Power Generation

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Power Generation

Recommended Generator Report - 1500DQGAB*

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 1200.0	**Max. Step kW**	: 1200.0 In Step 1	**Cumulative Step kW**	: 1200.0
Running kVA	: 1500.0	**Max. Step kVA**	: 1500.0 In Step 1	**Cumulative Step kVA**	: 1500.0
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 0.0	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 1200.0			**Pct Rated Capacity**	: 80.0

Generator Set Configuration

Alternator	: P734D	**Engine**	: QSK50-G4 NR2
BCode	: B603	**Fuel**	: Diesel
Excitation	: PMG	**Displacement, cu in. (Litre)**	: 3069.0(50.3)
Voltage Range	: LV 600	**Cylinders**	: 16
Number of Leads	: 6	**Altitude Knee, ft(m)**	: 3569(1088)
Reconnectable	: Yes	**Altitude Slope, % per 1000ft(304.8m)**	: 7
Full Single Phase Output	: No	**Temperature Knee, °F(°C)**	: 104(40)
Increased Motor Starting	: No	**Temperature Slope, % per 18°F(10.0°C)**	: 14
Extended Stack	: No	**Emissions**	: EPA Tier 2
		Cooling Package	: high ambient

Set Performance

Running At	: 80.0% Rated Capacity
Max. Step Voltage Dip, %	: 33
Max. Step Frequency Dip, %	: 7
Peak Voltage Dip, %	:
Peak Frequency Dip, %	:
Site Rated Standby kW/kVA	: 1500 / 1875
Site Rated Max. SkW	: 1530
Max. SkVA	: 5473
Temp Rise at Full Load, °C	: 105
Voltage Distortion	:
Site Rated Max Step kW Limit	:

Load Requirements

Max. Allowed Step Voltage Dip	: 35 In Step 1
Max. Allowed Step Frequency Dip	: 10 In Step 1
Peak Voltage Dip Limit %	: 35.0
Peak Frequency Dip Limit %	: 10
Running kW	: 1200.0
Running kVA	: 1500.0
Effective Step kW	: 1037.9
Effective Step kVA	: 1500.0
Percent Non-Linear Load	: 0.0
Voltage Distortion Limit	:
Max Step kW	:

*Note: Higher temperature rise at full rated load.

*Note: All generator set power derates are based on open generator sets.

Loads Summary Report

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	:	60.0	**Generators Running in Parallel**	:	1
Duty	:	Standby	**Site Altitude, ft(m)**	:	361(152)
Voltage	:	347/600, Series Wye	**Site Temperature, °C**	:	25
Phase	:	3	**Max. Altr Temp Rise, °C**	:	125
Fuel	:	Diesel	**Project Voltage Distortion Limit, %**	:	
Emissions	:	No Preference			

Loads Summary List

***Note: Detailed Loads and Step Report available below**

Step No.	Load Name	Quantity	Running		Starting		Peak		Dip Limits, %		VTHD% Limit
			kW	kVA	kW	kVA	kW	kVA	Vdip	Fdip	
Step01	User Defined Load 1	1	1200.0	1500.0	1200.0	1500.0	None	None	35.0	10.0	0.0
Step Summary			1200.0	1500.0	1200.0	1500.0	None	None	35.0	10.0	0.0

Project Summary	Running		Max Starting		Cumulative Step		Cumulative Peak		Project VTHD% Limit
	kW	kVA	kW	kVA	kW	kVA	kW	kVA	
	1200.0	1500.0	1200.0	1500.0	1200.0	1500.0	0.0	0.0	0.0

***Note: Detailed Loads and Step Report available below**

Power Generation

Loads and Steps Detail Report

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 1200.0	**Max. Step kW**	: 1200.0 In Step 1	**Cumulative Step kW**	: 1200.0
Running kVA	: 1500.0	**Max. Step kVA**	: 1500.0 In Step 1	**Cumulative Step kVA**	: 1500.0
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: None	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 1200.0				

Step1

Calculated Individual Generator Set Step Load Requirements

Running kW	: 1200.0	**Starting kW**	: 1200.0	**Cumulative Step kW**	: 1200.0
Running kVA	: 1500.0	**Starting kVA**	: 1500.0	**Cumulative Step kVA**	: 1500.0
Running Amps	: 1445.0	**Starting Non-linear kVA**	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 1200.0				
Voltage Distortion Limit for step	: 0				

User Defined Load 1 Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 1200.0	**Starting kW**	: 1200.0	**Peak kW**	: None
Running kVA	: 1500.0	**Starting kVA**	: 1500.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 1445.09	**Max. % Voltage Dip**	: 35.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 1200.0			**Voltage**	: 600

Power Generation

Steps and Dips Details Report

Project - Compliance 1)- UHN TWH OR Generators

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 1200.0	**Max. Step kW**	: 1200.0 In Step 1	**Cumulative Step kW**	: 1200.0
Running kVA	: 1500.0	**Max. Step kVA**	: 1500.0 In Step 1	**Cumulative Step kVA**	: 1500.0
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 0.0	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 1200.0				

Generator Set Configuration

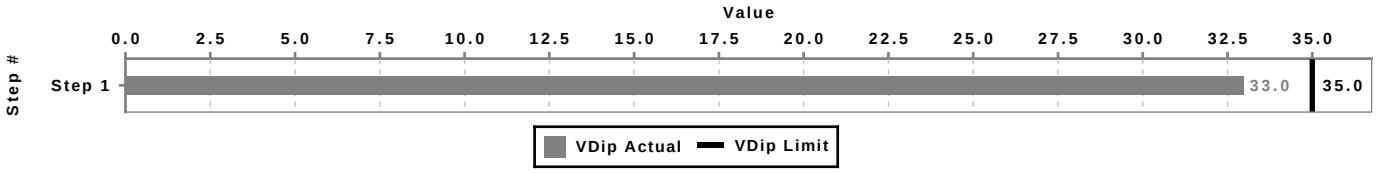
Model	: 1500DQGAB*	**Alternator**	: P734D
Engine Model	: QSK50-G4 NR2	**Excitation**	: PMG
Fuel	: Diesel		high ambient

Step Level Dips Summary

Step #	Voltage Dip Limit (%)	Expected Step Voltage Dip (%)	Voltage Recovery Time (s) **	Frequency Dip Limit (%)	Expected Frequency Dip (%)	Frequency recovery Time (s) **
1	35	33	3.1	10	7	3.9

Note: Please refer to the model Spec. sheet for bandwidths used to report recovery times. For products manufactured in the United Kingdom it may be assumed that recovery times are based on ISO8528-5 G2 class bandwidths. Voltage and frequency recovery times are estimates. Typically, allow five to ten seconds between application of load steps when designing your system.

**Please note that in some cases the voltage and frequency recovery time estimates are not shown in list. This is a result of "dummy" data points temporarily being used to fill data gaps in the GenSize database. Please disregard these blank results.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5.0
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12.5
15.0
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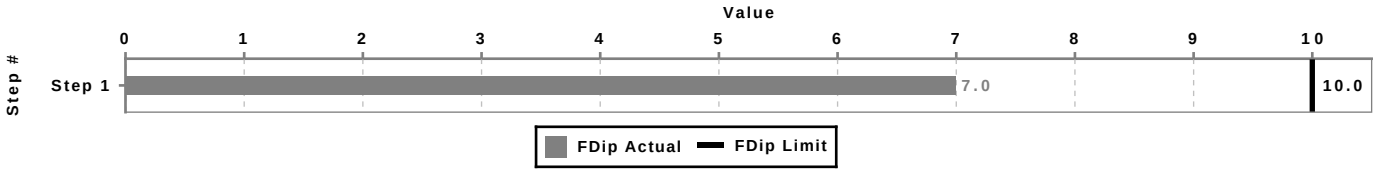
30.0
32.5
35.0
Step #
Step 1
33.0
35.0
VDip Actual
VDip Limit


Value
0
1
2
3
4
5
6
7
8
9
10
Step #
Step 1
7.0
10.0
FDip Actual
FDip Limit

Power Generation

Recommended Generator Report - 1500DQGAB*

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 925.0	**Max. Step kW**	: 800.0 In Step 2	**Cumulative Step kW**	: 925.0
Running kVA	: 1156.2	**Max. Step kVA**	: 1000.0 In Step 2	**Cumulative Step kVA**	: 1156.2
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 0.0	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 925.0			**Pct Rated Capacity**	: 61.7

Generator Set Configuration

Alternator	: P734D	**Engine**	: QSK50-G4 NR2
BCode	: B603	**Fuel**	: Diesel
Excitation	: PMG	**Displacement, cu in. (Litre)**	: 3069.0(50.3)
Voltage Range	: LV 600	**Cylinders**	: 16
Number of Leads	: 6	**Altitude Knee, ft(m)**	: 3569(1088)
Reconnectable	: Yes	**Altitude Slope, % per 1000ft(304.8m)**	: 7
Full Single Phase Output	: No	**Temperature Knee, °F(°C)**	: 104(40)
Increased Motor Starting	: No	**Temperature Slope, % per 18°F(10.0°C)**	: 14
Extended Stack	: No	**Emissions**	: EPA Tier 2
		Cooling Package	: high ambient

Set Performance

Running At	: 61.7% Rated Capacity
Max. Step Voltage Dip, %	: 20
Max. Step Frequency Dip, %	: 5
Peak Voltage Dip, %	:
Peak Frequency Dip, %	:
Site Rated Standby kW/kVA	: 1500 / 1875
Site Rated Max. SkW	: 1530
Max. SkVA	: 5473
Temp Rise at Full Load, °C	: 105
Voltage Distortion	:
Site Rated Max Step kW Limit	:

Load Requirements

Max. Allowed Step Voltage Dip	: 35 In Step 2
Max. Allowed Step Frequency Dip	: 10 In Step 2
Peak Voltage Dip Limit %	: 35.0
Peak Frequency Dip Limit %	: 10
Running kW	: 925.0
Running kVA	: 1156.2
Effective Step kW	: 879.1
Effective Step kVA	: 1156.2
Percent Non-Linear Load	: 0.0
Voltage Distortion Limit	:
Max Step kW	:

*Note: Higher temperature rise at full rated load.

*Note: All generator set power derates are based on open generator sets.

Loads Summary Report

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	:	60.0	**Generators Running in Parallel**	:	1
Duty	:	Standby	**Site Altitude, ft(m)**	:	361(152)
Voltage	:	347/600, Series Wye	**Site Temperature, °C**	:	25
Phase	:	3	**Max. Altr Temp Rise, °C**	:	125
Fuel	:	Diesel	**Project Voltage Distortion Limit, %**	:	
Emissions	:	No Preference			

Loads Summary List

***Note: Detailed Loads and Step Report available below**

Step No.	Load Name	Quantity	Running		Starting		Peak		Dip Limits, %		VTHD% Limit
			kW	kVA	kW	kVA	kW	kVA	Vdip	Fdip	
Step01	User Defined Load 1	1	125.0	156.25	125.0	156.25	None	None	35.0	10.0	0.0
Step Summary			125.0	156.0	125.0	156.0	None	None	35.0	10.0	0.0
Step02	User Defined Load 2	1	800.0	1000.0	800.0	1000.0	None	None	35.0	10.0	0.0
Step Summary			800.0	1000.0	800.0	1000.0	None	None	35.0	10.0	0.0

Project Summary	Running		Max Starting		Cumulative Step		Cumulative Peak		Project VTHD% Limit
	kW	kVA	kW	kVA	kW	kVA	kW	kVA	
	925.0	1156.2	800.0	1000.0	925.0	1156.2	0.0	0.0	0.0

***Note: Detailed Loads and Step Report available below**

Power Generation

Loads and Steps Detail Report

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 925.0	**Max. Step kW**	: 800.0 In Step 2	**Cumulative Step kW**	: 925.0
Running kVA	: 1156.2	**Max. Step kVA**	: 1000.0 In Step 2	**Cumulative Step kVA**	: 1156.2
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: None	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 925.0				

Step1

Calculated Individual Generator Set Step Load Requirements

Running kW	: 125.0	**Starting kW**	: 125.0	**Cumulative Step kW**	: 125.0
Running kVA	: 156.0	**Starting kVA**	: 156.0	**Cumulative Step kVA**	: 156.0
Running Amps	: 151.0	**Starting Non-linear kVA**	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 125.0				
Voltage Distortion Limit for step	: 0				

User Defined Load 1 Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 125.0	**Starting kW**	: 125.0	**Peak kW**	: None
Running kVA	: 156.25	**Starting kVA**	: 156.25	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 150.53	**Max. % Voltage Dip**	: 35.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 125.0			**Voltage**	: 600

Step2

Calculated Individual Generator Set Step Load Requirements

Running kW	: 800.0	**Starting kW**	: 800.0	**Cumulative Step kW**	: 925.0
Running kVA	: 1000.0	**Starting kVA**	: 1000.0	**Cumulative Step kVA**	: 1156.0
Running Amps	: 963.0	**Starting Non-linear kVA**	: 0.0		
Running Non-linear kVA	: 0.0				

Alternator kW	:	800.0
Voltage Distortion Limit for step	:	0

User Defined Load 2 Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 800.0	**Starting kW**	: 800.0	**Peak kW**	: None
Running kVA	: 1000.0	**Starting kVA**	: 1000.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 963.39	**Max. % Voltage Dip**	: 35.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 800.0			**Voltage**	: 600

Power Generation

Steps and Dips Details Report

Project - Compliance 1)- UHN TWH OR Generators

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 925.0	**Max. Step kW**	: 800.0 In Step 2	**Cumulative Step kW**	: 925.0
Running kVA	: 1156.2	**Max. Step kVA**	: 1000.0 In Step 2	**Cumulative Step kVA**	: 1156.2
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 0.0	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 925.0				

Generator Set Configuration

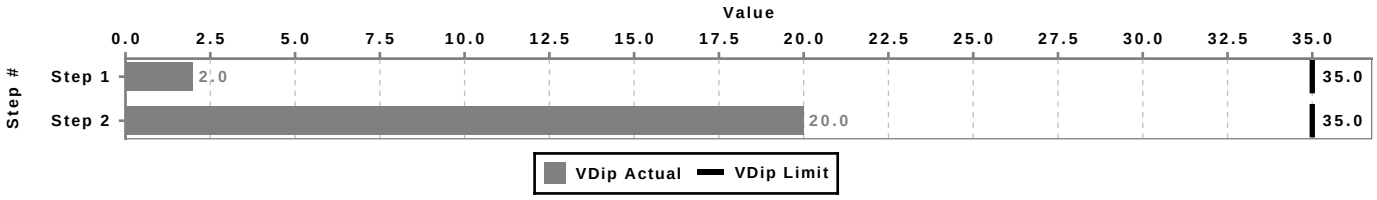
Model	: 1500DQGAB*	**Alternator**	: P734D
Engine Model	: QSK50-G4 NR2	**Excitation**	: PMG
Fuel	: Diesel		high ambient

Step Level Dips Summary

Step #	Voltage Dip Limit (%)	Expected Step Voltage Dip (%)	Voltage Recovery Time (s) **	Frequency Dip Limit (%)	Expected Frequency Dip (%)	Frequency recovery Time (s) **
1	35	2	0.2	10	1	0.4
2	35	20	1.9	10	5	2.7

Note: Please refer to the model Spec. sheet for bandwidths used to report recovery times. For products manufactured in the United Kingdom it may be assumed that recovery times are based on ISO8528-5 G2 class bandwidths. Voltage and frequency recovery times are estimates. Typically, allow five to ten seconds between application of load steps when designing your system.

**Please note that in some cases the voltage and frequency recovery time estimates are not shown in list. This is a result of "dummy" data points temporarily being used to fill data gaps in the GenSize database. Please disregard these blank results.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25.0
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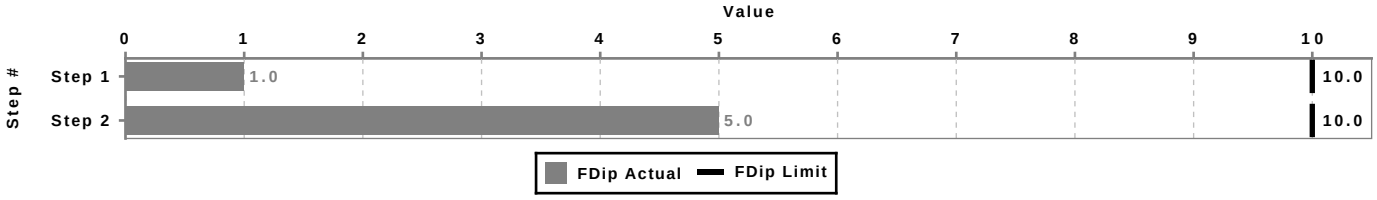
30.0
32.5
35.0
Step #
Step 1
Step 2
2.0
20.0
35.0
35.0
VDip Actual
VDip Limit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2
3
4
5
6
7
8
9
10
Step #
Step 1
Step 2
1.0
5.0
10.0
10.0
FDip Actual
FDip Limit

Power Generation

Recommended Generator Report - 1500DQGAB*

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 925.0	**Max. Step kW**	: 725.0 In Step 2	**Cumulative Step kW**	: 925.0
Running kVA	: 1156.2	**Max. Step kVA**	: 906.2 In Step 2	**Cumulative Step kVA**	: 1156.2
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 0.0	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 925.0			**Pct Rated Capacity**	: 61.7

Generator Set Configuration

Alternator	: P734D	**Engine**	: QSK50-G4 NR2
BCode	: B603	**Fuel**	: Diesel
Excitation	: PMG	**Displacement, cu in. (Litre)**	: 3069.0(50.3)
Voltage Range	: LV 600	**Cylinders**	: 16
Number of Leads	: 6	**Altitude Knee, ft(m)**	: 3569(1088)
Reconnectable	: Yes	**Altitude Slope, % per 1000ft(304.8m)**	: 7
Full Single Phase Output	: No	**Temperature Knee, °F(°C)**	: 104(40)
Increased Motor Starting	: No	**Temperature Slope, % per 18°F(10.0°C)**	: 14
Extended Stack	: No	**Emissions**	: EPA Tier 2
		Cooling Package	: high ambient

Set Performance

Running At	: 61.7% Rated Capacity
Max. Step Voltage Dip, %	: 18
Max. Step Frequency Dip, %	: 4
Peak Voltage Dip, %	:
Peak Frequency Dip, %	:
Site Rated Standby kW/kVA	: 1500 / 1875
Site Rated Max. SkW	: 1530
Max. SkVA	: 5473
Temp Rise at Full Load, °C	: 105
Voltage Distortion	:
Site Rated Max Step kW Limit	:

Load Requirements

Max. Allowed Step Voltage Dip	: 35 In Step 2
Max. Allowed Step Frequency Dip	: 10 In Step 2
Peak Voltage Dip Limit %	: 35.0
Peak Frequency Dip Limit %	: 10
Running kW	: 925.0
Running kVA	: 1156.2
Effective Step kW	: 879.1
Effective Step kVA	: 1156.2
Percent Non-Linear Load	: 0.0
Voltage Distortion Limit	:
Max Step kW	:

*Note: Higher temperature rise at full rated load.

*Note: All generator set power derates are based on open generator sets.

Power Generation

Loads Summary Report

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	:	60.0	**Generators Running in Parallel**	:	1
Duty	:	Standby	**Site Altitude, ft(m)**	:	361(152)
Voltage	:	347/600, Series Wye	**Site Temperature, °C**	:	25
Phase	:	3	**Max. Altr Temp Rise, °C**	:	125
Fuel	:	Diesel	**Project Voltage Distortion Limit, %**	:	
Emissions	:	No Preference			

Loads Summary List

***Note: Detailed Loads and Step Report available below**

Step No.	Load Name	Quantity	Running		Starting		Peak		Dip Limits, %		VTHD% Limit
			kW	kVA	kW	kVA	kW	kVA	Vdip	Fdip	
Step01	User Defined Load 1	1	200.0	250.0	200.0	250.0	None	None	35.0	10.0	0.0
Step Summary			200.0	250.0	200.0	250.0	None	None	35.0	10.0	0.0
Step02	User Defined Load 2	1	725.0	906.25	725.0	906.25	None	None	35.0	10.0	0.0
Step Summary			725.0	906.0	725.0	906.0	None	None	35.0	10.0	0.0

Project Summary	Running		Max Starting		Cumulative Step		Cumulative Peak		Project VTHD% Limit
	kW	kVA	kW	kVA	kW	kVA	kW	kVA	
	925.0	1156.2	725.0	906.2	925.0	1156.2	0.0	0.0	0.0

***Note: Detailed Loads and Step Report available below**

Power Generation

Loads and Steps Detail Report

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 925.0	**Max. Step kW**	: 725.0 In Step 2	**Cumulative Step kW**	: 925.0
Running kVA	: 1156.2	**Max. Step kVA**	: 906.2 In Step 2	**Cumulative Step kVA**	: 1156.2
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: None	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 925.0				

Step1

Calculated Individual Generator Set Step Load Requirements

Running kW	: 200.0	**Starting kW**	: 200.0	**Cumulative Step kW**	: 200.0
Running kVA	: 250.0	**Starting kVA**	: 250.0	**Cumulative Step kVA**	: 250.0
Running Amps	: 241.0	**Starting Non-linear kVA**	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 200.0				
Voltage Distortion Limit for step	: 0				

User Defined Load 1 Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 200.0	**Starting kW**	: 200.0	**Peak kW**	: None
Running kVA	: 250.0	**Starting kVA**	: 250.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 240.85	**Max. % Voltage Dip**	: 35.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 200.0			**Voltage**	: 600

Step2

Calculated Individual Generator Set Step Load Requirements

Running kW	: 725.0	**Starting kW**	: 725.0	**Cumulative Step kW**	: 925.0
Running kVA	: 906.0	**Starting kVA**	: 906.0	**Cumulative Step kVA**	: 1156.0
Running Amps	: 873.0	**Starting Non-linear kVA**	: 0.0		
Running Non-linear kVA	: 0.0				

Alternator kW	: 725.0		
Voltage Distortion Limit for step	: 0		

User Defined Load 2 Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 725.0	**Starting kW**	: 725.0	**Peak kW**	: None
Running kVA	: 906.25	**Starting kVA**	: 906.25	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 873.07	**Max. % Voltage Dip**	: 35.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 725.0			**Voltage**	: 600

Power Generation

Steps and Dips Details Report

Project - Compliance 1)- UHN TWH OR Generators

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 925.0	**Max. Step kW**	: 725.0 In Step 2	**Cumulative Step kW**	: 925.0
Running kVA	: 1156.2	**Max. Step kVA**	: 906.2 In Step 2	**Cumulative Step kVA**	: 1156.2
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 0.0	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 925.0				

Generator Set Configuration

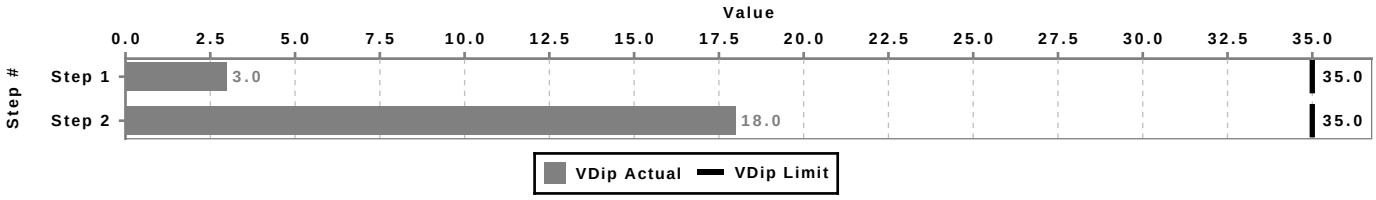
Model	: 1500DQGAB*	**Alternator**	: P734D
Engine Model	: QSK50-G4 NR2	**Excitation**	: PMG
Fuel	: Diesel		high ambient

Step Level Dips Summary

Step #	Voltage Dip Limit (%)	Expected Step Voltage Dip (%)	Voltage Recovery Time (s) **	Frequency Dip Limit (%)	Expected Frequency Dip (%)	Frequency recovery Time (s) **
1	35	3	0.3	10	2	0.7
2	35	18	1.6	10	4	2.3

Note: Please refer to the model Spec. sheet for bandwidths used to report recovery times. For products manufactured in the United Kingdom it may be assumed that recovery times are based on ISO8528-5 G2 class bandwidths. Voltage and frequency recovery times are estimates. Typically, allow five to ten seconds between application of load steps when designing your system.

**Please note that in some cases the voltage and frequency recovery time estimates are not shown in list. This is a result of "dummy" data points temporarily being used to fill data gaps in the GenSize database. Please disregard these blank results.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7.5
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12.5
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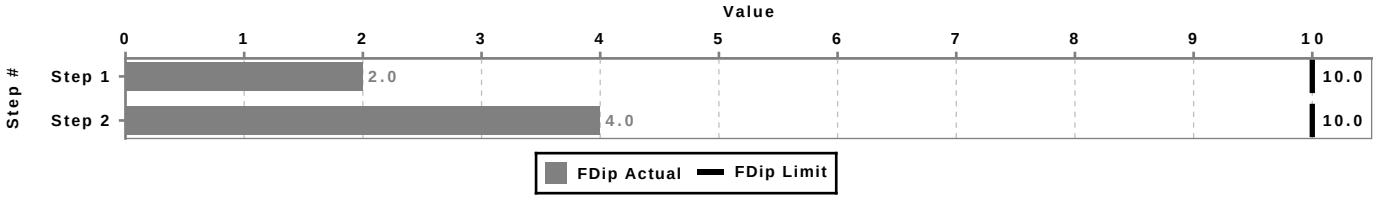
17.5
20.0
22.5
25.0
27.5
30.0
32.5
35.0
Step #
Step 1
Step 2
3.0
18.0
35.0
35.0
VDip Actual
VDip Limit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2
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4
5
6
7
8
9
10
Step #
Step 1
Step 2
2.0
4.0
10.0
10.0
FDip Actual
FDip Limit

Power Generation

Recommended Generator Report - 1500DQGAB*

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 1200.0	**Max. Step kW**	: 300.0 In Step 1	**Cumulative Step kW**	: 1200.0
Running kVA	: 1500.0	**Max. Step kVA**	: 375.0 In Step 1	**Cumulative Step kVA**	: 1500.0
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 0.0	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 1200.0			**Pct Rated Capacity**	: 80.0

Generator Set Configuration

Alternator	: P734D	**Engine**	: QSK50-G4 NR2
BCode	: B603	**Fuel**	: Diesel
Excitation	: PMG	**Displacement, cu in. (Litre)**	: 3069.0(50.3)
Voltage Range	: LV 600	**Cylinders**	: 16
Number of Leads	: 6	**Altitude Knee, ft(m)**	: 3569(1088)
Reconnectable	: Yes	**Altitude Slope, % per 1000ft(304.8m)**	: 7
Full Single Phase Output	: No	**Temperature Knee, °F(°C)**	: 104(40)
Increased Motor Starting	: No	**Temperature Slope, % per 18°F(10.0°C)**	: 14
Extended Stack	: No	**Emissions**	: EPA Tier 2
		Cooling Package	: high ambient

Set Performance

Running At	: 80.0% Rated Capacity
Max. Step Voltage Dip, %	: 5
Max. Step Frequency Dip, %	: 2
Peak Voltage Dip, %	:
Peak Frequency Dip, %	:
Site Rated Standby kW/kVA	: 1500 / 1875
Site Rated Max. SkW	: 1530
Max. SkVA	: 5473
Temp Rise at Full Load, °C	: 105
Voltage Distortion	:
Site Rated Max Step kW Limit	:

Load Requirements

Max. Allowed Step Voltage Dip	: 35 In Step 1
Max. Allowed Step Frequency Dip	: 10 In Step 1
Peak Voltage Dip Limit %	: 35.0
Peak Frequency Dip Limit %	: 10
Running kW	: 1200.0
Running kVA	: 1500.0
Effective Step kW	: 1037.9
Effective Step kVA	: 1500.0
Percent Non-Linear Load	: 0.0
Voltage Distortion Limit	:
Max Step kW	:

*Note: Higher temperature rise at full rated load.

*Note: All generator set power derates are based on open generator sets.

Loads Summary Report

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Loads Summary List

***Note: Detailed Loads and Step Report available below**

Step No.	Load Name	Quantity	Running		Starting		Peak		Dip Limits, %		VTHD% Limit
			kW	kVA	kW	kVA	kW	kVA	Vdip	Fdip	
Step01	User Defined Load 1	1	300.0	375.0	300.0	375.0	None	None	35.0	10.0	0.0
Step Summary			300.0	375.0	300.0	375.0	None	None	35.0	10.0	0.0
Step02	User Defined Load 2	1	300.0	375.0	300.0	375.0	None	None	35.0	10.0	0.0
Step Summary			300.0	375.0	300.0	375.0	None	None	35.0	10.0	0.0
Step03	User Defined Load 3	1	300.0	375.0	300.0	375.0	None	None	35.0	10.0	0.0
Step Summary			300.0	375.0	300.0	375.0	None	None	35.0	10.0	0.0
Step04	User Defined Load 4	1	300.0	375.0	300.0	375.0	None	None	35.0	10.0	0.0
Step Summary			300.0	375.0	300.0	375.0	None	None	35.0	10.0	0.0

Project Summary	Running		Max Starting		Cumulative Step		Cumulative Peak		Project VTHD% Limit
	kW	kVA	kW	kVA	kW	kVA	kW	kVA	
	1200.0	1500.0	300.0	375.0	1200.0	1500.0	0.0	0.0	0.0

***Note: Detailed Loads and Step Report available below**

Power Generation

Loads and Steps Detail Report

Project - Compliance 1)- UHN TWH OR Generators

Comments -

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 1200.0	**Max. Step kW**	: 300.0 In Step 1	**Cumulative Step kW**	: 1200.0
Running kVA	: 1500.0	**Max. Step kVA**	: 375.0 In Step 1	**Cumulative Step kVA**	: 1500.0
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: None	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 1200.0				

Step1

Calculated Individual Generator Set Step Load Requirements

Running kW	: 300.0	**Starting kW**	: 300.0	**Cumulative Step kW**	: 300.0
Running kVA	: 375.0	**Starting kVA**	: 375.0	**Cumulative Step kVA**	: 375.0
Running Amps	: 361.0	**Starting Non-linear kVA**	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 300.0				
Voltage Distortion Limit for step	: 0				

User Defined Load 1 Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 300.0	**Starting kW**	: 300.0	**Peak kW**	: None
Running kVA	: 375.0	**Starting kVA**	: 375.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 361.27	**Max. % Voltage Dip**	: 35.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 300.0			**Voltage**	: 600

Step2

Calculated Individual Generator Set Step Load Requirements

Running kW	: 300.0	**Starting kW**	: 300.0	**Cumulative Step kW**	: 600.0
Running kVA	: 375.0	**Starting kVA**	: 375.0	**Cumulative Step kVA**	: 750.0
Running Amps	: 361.0	**Starting Non-linear kVA**	: 0.0		
Running Non-linear kVA	: 0.0				

Alternator kW	: 300.0				
Voltage Distortion Limit for step	: 0				

User Defined Load 2 Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 300.0	**Starting kW**	: 300.0	**Peak kW**	: None
Running kVA	: 375.0	**Starting kVA**	: 375.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 361.27	**Max. % Voltage Dip**	: 35.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 300.0			**Voltage**	: 600

Step3

Calculated Individual Generator Set Step Load Requirements

Running kW	: 300.0	**Starting kW**	: 300.0	**Cumulative Step kW**	: 900.0
Running kVA	: 375.0	**Starting kVA**	: 375.0	**Cumulative Step kVA**	: 1125.0
Running Amps	: 361.0	**Starting Non-linear kVA**	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 300.0				
Voltage Distortion Limit for step	: 0				

User Defined Load 3 Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 300.0	**Starting kW**	: 300.0	**Peak kW**	: None
Running kVA	: 375.0	**Starting kVA**	: 375.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 361.27	**Max. % Voltage Dip**	: 35.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 300.0			**Voltage**	: 600

Step4

Calculated Individual Generator Set Step Load Requirements

Running kW	: 300.0	**Starting kW**	: 300.0	**Cumulative Step kW**	: 1200.0
Running kVA	: 375.0	**Starting kVA**	: 375.0	**Cumulative Step kVA**	: 1500.0
Running Amps	: 361.0	**Starting Non-linear kVA**	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 300.0				
Voltage Distortion Limit for step	: 0				

User Defined Load 4 Three Phase Quantity : 1 In this Step

Category : User Defined

Running kW	: 300.0	**Starting kW**	: 300.0	**Peak kW**	: None
Running kVA	: 375.0	**Starting kVA**	: 375.0	**Peak kVA**	: None
Running PF	: 0.8	**Starting PF**	: 0.8	**Cyclic**	: No
Running Amps	: 361.27	**Max. % Voltage Dip**	: 35.0	**Max. % Frequency Dip**	: 10.0
Alternator kW	: 300.0			**Voltage**	: 600

Power Generation

Steps and Dips Details Report

Project - Compliance 1)- UHN TWH OR Generators

Project Requirements

Frequency, Hz	: 60.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(152)
Voltage	: 347/600, Series Wye	**Site Temperature, °C**	: 25
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 1200.0	**Max. Step kW**	: 300.0 In Step 1	**Cumulative Step kW**	: 1200.0
Running kVA	: 1500.0	**Max. Step kVA**	: 375.0 In Step 1	**Cumulative Step kVA**	: 1500.0
Running PF	: 0.8	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 0.0	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 1200.0				

Generator Set Configuration

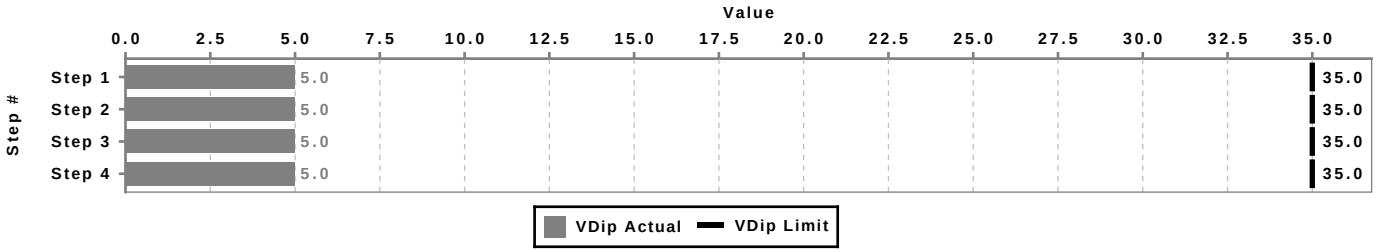
Model	: 1500DQGAB*	**Alternator**	: P734D
Engine Model	: QSK50-G4 NR2	**Excitation**	: PMG
Fuel	: Diesel		high ambient

Step Level Dips Summary

Step #	Voltage Dip Limit (%)	Expected Step Voltage Dip (%)	Voltage Recovery Time (s) **	Frequency Dip Limit (%)	Expected Frequency Dip (%)	Frequency recovery Time (s) **
1	35	5	0.5	10	2	1.0
2	35	5	0.5	10	2	1.0
3	35	5	0.5	10	2	1.0
4	35	5	0.5	10	2	1.0

Note: Please refer to the model Spec. sheet for bandwidths used to report recovery times. For products manufactured in the United Kingdom it may be assumed that recovery times are based on ISO8528-5 G2 class bandwidths. Voltage and frequency recovery times are estimates. Typically, allow five to ten seconds between application of load steps when designing your system.

**Please note that in some cases the voltage and frequency recovery time estimates are not shown in list. This is a result of "dummy" data points temporarily being used to fill data gaps in the GenSize database. Please disregard these blank results.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5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0
32.5
35.0
Step #
Step 1
Step 2
Step 3
Step 4
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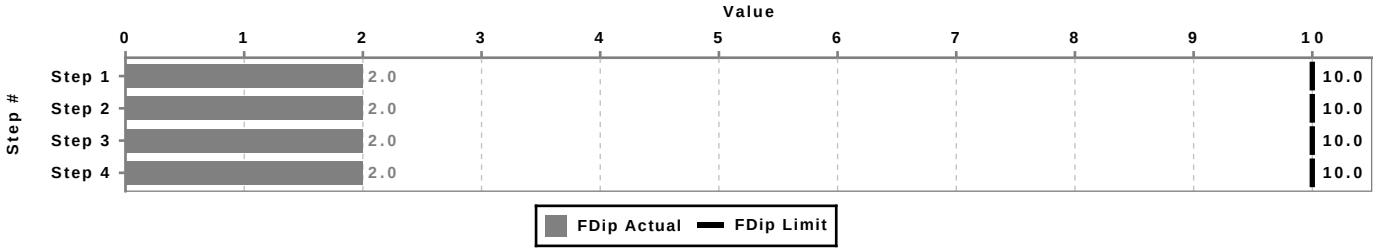
5.0
5.0
5.0
35.0
35.0
35.0
35.0
VDip Actual
VDip Limit


Value
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1
2
3
4
5
6
7
8
9
10
Step #
Step 1
Step 2
Step 3
Step 4
2.0
2.0
2.0
2.0
10.0
10.0
10.0
10.0
FDip Actual
FDip Limit

Appendix D3: Combustion Spreadsheet for Generator MP_GenExh1, MP_GenExh2

RWDI# 1803937

RWDI Project Name:	University Health Network - Toronto Western Hospital
RWDI Project Number:	1803937
RWDI Source ID:	MP_GenExh1, MP_GenExh2
Manufacturer:	Caterpillar 3508 TA
Engine Model:	

Parameter	Units	Value
Engine Fuel		Diesel
Fuel Heating Value	(Btu/gal)	
Stroke Cycle		
Engine Loading	(%)	
Burn Style		
NOx Controlled?		No

Rating	Units	Value
Electrical Power Output (kW)	(kW)	880
Generator Transfer Efficiency	(%)	90
Engine Combustion Efficiency	(%)	
Calculated Engine Output	(hp)	1310
	(kW)	978
	(hp)	1310
Calculated Engine Input	(hp)	

Manufacturer Emissions Data	Units	Factor
Oxides of Sulphur (SOx)	(g/hp-hr)	
Oxides of Nitrogen (NO_x)	(g/hp-hr)	
Carbon Monoxide (CO)	(g/hp-hr)	
PM	(g/hp-hr)	
Source:		

Fuel Sulphur Information	Units	Value
Natural Gas Sulphur Content	(%)	
Fuel Oil Sulphur Content	(%)	

Exhaust Temperature	Units	Value
Exhaust Temperature (°C)	(°C)	482
Calculated Exit Temperature	(K)	755
Exhaust Flow Rate	cfm	6271
	m³/s	2.96

Emission Factors	Emission Factor		Data Quality	Source of Emission Factor	Emission Rate	
	Value	Units			Value	Units
Oxides of Nitrogen (NOx)	0.024	(lb/hp-hr)	B	AP 42 (10/1996) Ch 3.4, Tables 3.4-1	3.96E+00	g/s

Sample Calculation for Nitrogen Oxides:

$$\frac{1310\ \text{hp} \quad 0.024\ \text{lb} \quad 1\ \text{h} \quad 453.5924\ \text{g}}{1\ \text{hp-hr} \quad 3600\ \text{s} \quad \text{lb}} = 3.96\text{E+00 g/s}$$

Appendix D4: Combustion Spreadsheet for Generator KDC_GEN1101Exh, KDC_GEN1102Exh

RWDI# 1803937

RWDI Project Name:	University Health Network - Toronto Western Hospital
RWDI Project Number:	1803937
RWDI Source ID:	KDC_GEN1101Exh, KDC_GEN1102Exh
Manufacturer:	Kohler
Engine Model:	Mitsubishi S16R-Y2PTAW-1

Parameter	Units	Value
Engine Fuel		Diesel
Fuel Heating Value	(Btu/gal)	
Stroke Cycle		
Engine Loading	(%)	
Burn Style		
NOx Controlled?		No

Rating	Units	Value
Electrical Power Output (kW)	(kW)	1250
Generator Transfer Efficiency	(%)	90
Engine Combustion Efficiency	(%)	
Calculated Engine Output	(hp)	1861
	(kW)	1389
	(hp)	1861
Calculated Engine Input	(hp)	

Manufacturer Emissions Data	Units	Factor
Oxides of Sulphur (SOx)	(g/hp-hr)	
Oxides of Nitrogen (NO_x)	(g/kW-hr)	6.4
Carbon Monoxide (CO)	(g/hp-hr)	
PM	(g/hp-hr)	
Source:	Tier 2 EPA-Certified for Stationary Emergency Applications	

Fuel Sulphur Information	Units	Value
Natural Gas Sulphur Content	(%)	
Fuel Oil Sulphur Content	(%)	

Exhaust Temperature	Units	Value
Exhaust Temperature (°C)	(°C)	505
Calculated Exit Temperature	(K)	778
Exhaust Flow Rate	cfm	15,642
	m^3/s	7.38

Emission Factors	Emission Factor		Data Quality	Source of Emission Factor	Emission Rate	
	Value	Units			Value	Units
Oxides of Nitrogen (NOx)	6.4	(g/kW-hr)	C	Tier 2 EPA-Certified for Stationary Emergency Applications	2.47E+00	g/s

Sample Calculation for Nitrogen Oxides:

$$\frac{1389\ \text{kW}}{} \times \frac{6.4\ \text{g}}{1\ \text{kW-hr}} \times \frac{1\ \text{h}}{3600\ \text{s}} = 2.47\text{E+00 g/s}$$

Model: 1600REOZMB

KOHLER POWER SYSTEMS

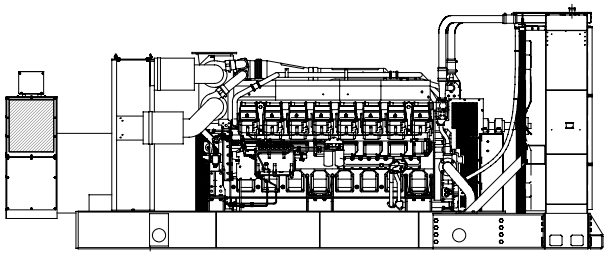
380–4160 V **Diesel**

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

Tier 2 EPA-Certified for Stationary Emergency Applications

Ratings Range

		60 Hz
Standby:	**kW**	1160–1600
	kVA	1450–2000
Prime:	**kW**	1050–1450
	kVA	1313–1813



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- The generator set complies with ISO 8528-5, Class G3, requirements for transient performance.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
  - The pilot-excited, permanent magnet (PM) alternator provides superior short-circuit capability.
  - Additional alternator voltages are available including 12.47 kV, 13.2 kV, and 13.8 kV medium voltages. Contact your local distributor for more detailed information.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - The low coolant level shutdown prevents overheating (standard on radiator models only).
  - The generator set is direct-mounted to the skid.
  - An electronic, isochronous governor delivers precise frequency regulation.

Generator Set Ratings

				150°C Rise Standby Rating		130°C Rise Standby Rating		125°C Rise Prime Rating		105°C Rise Prime Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
7M4050	220/380	3	60	1160/1450	2203	1160/1450	2203	1050/1313	1994	1050/1313	1994
	240/416	3	60	1410/1763	2446	1370/1713	2377	1340/1675	2325	1270/1588	2203
	277/480	3	60	1520/1900	2285	1500/1875	2255	1450/1813	2180	1430/1788	2150
7M4052	220/380	3	60	1480/1850	2811	1480/1850	2811	1340/1675	2545	1340/1675	2545
	240/416	3	60	1600/2000	2776	1600/2000	2776	1450/1813	2515	1450/1813	2515
	277/480	3	60	1600/2000	2406	1600/2000	2406	1450/1813	2180	1450/1813	2180
7M4054	220/380	3	60	1590/1988	3020	1590/1988	3020	1450/1813	2754	1450/1813	2754
	240/416	3	60	1600/2000	2776	1600/2000	2776	1450/1813	2515	1450/1813	2515
	277/480	3	60	1600/2000	2406	1600/2000	2406	1450/1813	2180	1450/1813	2180
7M4174	220/380	3	60	1600/2000	3039	1600/2000	3039	1450/1813	2754	1450/1813	2754
7M4176	220/380	3	60	1600/2000	3039	1600/2000	3039	1450/1813	2754	1450/1813	2754
7M4290	347/600	3	60	1600/2000	1925	1600/2000	1925	1450/1813	1744	1450/1813	1744
7M4368	2400/4160	3	60	1600/2000	278	1600/2000	278	1450/1813	252	1450/1813	252
7M4370	2400/4160	3	60	1600/2000	278	1600/2000	278	1450/1813	252	1450/1813	252

RATINGS: All three-phase units are rated at 0.8 power factor. *Standby Ratings:* The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. *Prime Power Ratings:* At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528-1 and ISO-3046-1. For limited running time and continuous ratings, consult the factory. Obtain technical information bulletin (TIB-101) for ratings guidelines, complete ratings definitions, and site condition derates. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

Alternator Specifications

Specifications		Alternator
Type		4-Pole, Rotating-Field
Exciter type		Brushless, Permanent-Magnet Pilot Exciter
Voltage regulator		Solid State, Volts/Hz
Insulation:		NEMA MG1
Material		Class H, Synthetic, Nonhygroscopic
Temperature rise		130°C, 150°C Standby
Bearing: quantity, type		1, Sealed
Coupling		Flexible Disc
Amortisseur windings		Full
Rotor balancing		125%
Voltage regulation, no-load to full-load (with <0.5% drift due to temp. variation)		3-Phase Sensing, ±0.25%
One-step load acceptance at 60 Hz		100% of Rating
Unbalanced load capability		100% of Rated Standby Current
Peak motor starting kVA:		(35% dip for voltages below)
480 V	7M4050 (4 bus bar)	4500
480 V	7M4052 (4 bus bar)	5500
480 V	7M4054 (4 bus bar)	7000
380 V	7M4174 (4 bus bar)	4200
380 V	7M4176 (4 bus bar)	5400
600 V	7M4290 (4 bus bar)	5700
4160 V	7M4368 (6 lead)	4900
4160 V	7M4370 (6 lead)	5500

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from two-thirds pitch windings and skewed stator.
- Digital solid-state, volts-per-hertz voltage regulator with ±0.25% no-load to full-load regulation.
- Brushless alternator with brushless pilot exciter for excellent load response.

Application Data

Engine

Engine Specifications	
Manufacturer	Mitsubishi
Engine model	S16R-Y2PTAW-1
Engine type	4-Cycle, Turbocharged
Cylinder arrangement	16 V
Displacement, L (cu. in.)	65.4 (3989)
Bore and stroke, mm (in.)	170 x 180 (6.69 x 7.09)
Compression ratio	14.5:1
Piston speed, m/min. (ft./min.)	648 (2126)
Main bearings: quantity, type	—
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	1750 (2346)
Cylinder head material	Cast Iron
Crankshaft material	Forged Steel
Governor type	Electronic
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System	
Exhaust manifold type	Dry
Exhaust flow at rated kW, m^3/min. (cfm)	443 (15642)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	505 (940)
Maximum allowable back pressure, kPa (in. Hg)	5.9 (1.7)
Exhaust outlet size at engine hookup, mm (in.)	See ADV drawing

Engine Electrical

Engine Electrical System	
Battery charging alternator:	
Ground (negative/positive)	Negative
Volts (DC)	24
Ampere rating	30
Starter motor rated voltage (DC)	Dual, 24
Battery, recommended cold cranking amps (CCA):	
Quantity, CCA rating each	Four, 1150
Battery voltage (DC)	12

Fuel

Fuel System	
Fuel supply line, min. ID, mm (in.)	19 (0.75)
Fuel return line, min. ID, mm (in.)	19 (0.75)
Max. fuel flow, Lph (gph)	560 (148)
Max. fuel pump restriction, kPa (in. Hg)	10 (3.0)
Fuel filter: quantity, type	4, Secondary
Recommended fuel	#2 Diesel

Lubrication

Lubricating System	
Type	Full Pressure
Oil pan capacity, L (qt.)	200 (211)
Oil pan capacity with filter, L (qt.)	230 (243)
Oil filter: quantity, type	4, Cartridge
Oil cooler	Water-Cooled

Application Data

Cooling

Radiator System	
Ambient temperature, °C (°F)*	40 (104)
Engine water capacity, L (gal.)	170 (44.9)
Radiator system capacity, including engine, L (gal.)	367 (96.9)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	920 (243)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	635 (36167)
Heat rejected to charge cooler water at rated kW, dry exhaust, kW (Btu/min.)	635 (36167)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	2057 (81)
Fan kWm (HP)	81 (109)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)

High Ambient Radiator System	
Ambient temperature, °C (°F)*	50 (122)
Engine water capacity, L (gal.)	170 (44.9)
Radiator system capacity, including engine, L (gal.)	386 (102)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	920 (243)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	635 (36167)
Heat rejected to charge cooler water at rated kW, dry exhaust, kW (Btu/min.)	635 (36167)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	2057 (81)
Fan kWm (HP)	81 (109)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)

* Enclosure with enclosed silencer reduces ambient temperature capability by 5°C (9°F).

Remote Radiator System†	
Exhaust manifold type	Dry
Connection sizes:	
Jacket water engine inlet, mm (in.)	95 (3.75)
Jacket water engine outlet, mm (in.)	95 (3.75)
Intercooler water engine inlet, mm (in.)	83 (3.25)
Intercooler water engine outlet, mm (in.)	83 (3.25)
Static head allowable above engine, kPa (ft. H_2O)	98 (32.8)

† Contact your local distributor for cooling system options and specifications based on your specific requirements.

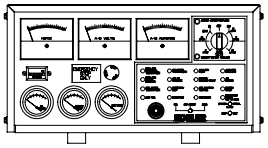
Operation Requirements

Air Requirements	
Radiator-cooled cooling air, m^3/min. (scfm)‡	2061 (72800)
High ambient radiator-cooled cooling air, m^3/min. (scfm)‡	1894 (66900)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise, m^3/min. (scfm)‡	818 (28900)
Combustion air, m^3/min. (cfm)	168 (5932)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	146 (8346)
Alternator, kW (Btu/min.)	82 (4663)

‡ Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

Fuel Consumption	
Diesel, Lph (gph) at % load	**Standby Rating**
100%	487 (128.6)
75%	356 (93.9)
50%	241 (63.8)
25%	133 (35.2)
Diesel, Lph (gph) at % load	**Prime Rating**
100%	436 (115.1)
75%	324 (85.5)
50%	219 (57.8)
25%	126 (33.3)

Controllers

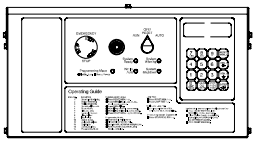


Decision-Maker® 3+ Controller

Provides system control and monitoring capabilities.

- Analog display using AC meters, engine gauges, and voltage selector switch.
- 16-light status, warning, and shutdown fault annunciation.
- Alarm horn, emergency stop switch, and hour meter features.
- Remote annunciation options.
- Remote start and prime power options.

Refer to G6-30 for additional controller features and accessories.

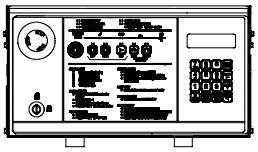


Decision-Maker® 550 Controller

Provides advanced control, system monitoring, and system diagnostics with remote monitoring capabilities.

- Digital display and keypad provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Controller supports Modbus® protocol
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-46 for additional controller features and accessories.



Decision-Maker® 6000 Paralleling Controller

Provides advanced control, system monitoring, and system diagnostics with remote monitoring capabilities for paralleling multiple generator sets.

- Paralleling capability with first-on logic, synchronizer, kW and kVAR load sharing, and protective relays
- Digital display and keypad provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Controller supports Modbus® protocol
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-107 for additional controller features and accessories.

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-457-4441, Fax 920-459-1646
For the nearest sales and service outlet in the
US and Canada, phone 1-800-544-2444
KohlerPower.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Additional Standard Features

- Alternator Protection
  (standard with Decision-Maker® 550 and 6000 controllers)
- Alternator Strip Heater (standard on 3300 volt and above)
- Oil Drain Extension
- Operation and Installation Literature
- Reactive Droop Compensation
  (standard with Decision-Maker® 550 and 6000 controllers)

Available Options

Approvals and Listings

- ❑ CSA Approval
- ❑ IBC Seismic Certification
- ❑ Rated Power Factor Testing
- ❑ UL 2200 Listing

Enclosed Unit

- ❑ Sound Enclosure/Fuel Tank Package
- ❑ Weather Enclosure/Fuel Tank Package

Open Unit

- ❑ Exhaust Silencer, Hospital (kit: PA-361626)
- ❑ Exhaust Silencer, Critical (kit: PA-361625)
- ❑ Flexible Exhaust Connector, Stainless Steel

Fuel System

- ❑ Flexible Fuel Lines
- ❑ Fuel Pressure Gauge
- ❑ Fuel/Water Separator

Controller

- ❑ Common Failure Relay
- ❑ Communication Products and PC Software
  (Decision-Maker® 550 and 6000 controllers)
- ❑ Customer Connection
  (Decision-Maker® 3+ and 550 controllers)
- ❑ Dry Contact (isolated alarm)
- ❑ Prime Power Switch
  (Decision-Maker® 550 and 6000 controllers)
- ❑ Remote Audiovisual Alarm Panel
- ❑ Remote Emergency Stop
- ❑ Remote Mounting Cable
  (Decision-Maker® 3+ and 550 controllers)
- ❑ Remote Serial Annunciator Panel
- ❑ Run Relay

Cooling System

- ❑ Block Heater;
  Recommended for Ambient Temperatures Below 20°C (68°F)
- ❑ High Ambient Radiator
- ❑ Remote Radiator Cooling Setup

Electrical System

- ❑ Alternator Strip Heater (available up to 600 volt)
- ❑ Battery
- ❑ Battery Charger, Equalize/Float Type
- ❑ Battery Heater
- ❑ Battery Rack and Cables
- ❑ Line Circuit Breaker (NEMA type 1 enclosure)
- ❑ Line Circuit Breaker with Shunt Trip (NEMA type 1 enclosure)
- ❑ Safeguard Breaker (Decision-Maker® 3+ controller only)

Paralleling System

- ❑ Decision-Maker® Paralleling System (DPS)
  (Decision-Maker® 6000 controller only)
- ❑ Reactive Droop Compensator
  (Decision-Maker® 3+ controller only)
- ❑ Remote Voltage Adjustment Control
- ❑ Voltage Regulator Relocation (Decision-Maker® 3+ controller only)

Miscellaneous

- ❑ Air Cleaner, Heavy Duty
- ❑ Air Cleaner Restriction Indicator
- ❑ Crankcase Emissions Canister
- ❑ Engine Fluids
- ❑ Oil Temperature Gauge
- ❑ Integral Vibration Isolation Mounting
- ❑ Solid Mounting/Spring Isolators

Literature

- ❑ General Maintenance
- ❑ NFPA 110
- ❑ Overhaul
- ❑ Production

Warranty

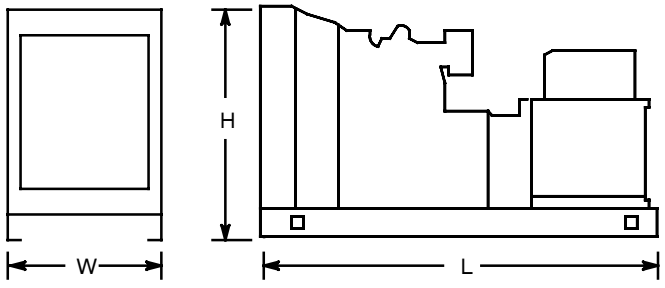
- ❑ 2-Year Basic
- ❑ 2-Year Prime
- ❑ 5-Year Basic
- ❑ 5-Year Comprehensive
- ❑ 10-Year Major Components

Other Options

- ❑ _____
- ❑ _____
- ❑ _____

Dimensions and Weights

Overall Size, L x W x H, max., mm (in.):	6405 x 2232 x 2586 (252.1 x 87.9 x 101.8)
Weight (radiator model), wet, max., kg (lb.):	14334 (31600)



Note: This drawing is provided for reference only and should not be used for planning the installation. Contact your local distributor for more detailed information.

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APPENDIX E

Ethylene Oxide Sterilization System Emissions Calculations

Appendix E: Ethylene Oxide Sterilization System Exhaust

RWDI# 1803937

University Health Network - Toronto Western Hospital

The facility operates a 100% Ethylene Oxide Sterilizer/Aerator system. This system uses 100-gram ethylene oxide single dose gas cartridges. The system is preprogrammed with default sterilize/aerate cycles. The shortest (worst-case) cycle operates over 13 hours (1-hour sterilize time, 12-hour aeration time). Therefore, the maximum amount of ethylene oxide that the facility can use in a 24-hour period is approximately 200 grams.

The system is attached to an Ethylene Oxide Disposer. The disposer converts ethylene oxide gas in the exhaust from the sterilizer/aerator to carbon dioxide and water vapour through a catalytic reaction. The disposer operates at 99.9% removal efficiency.

Grams of ethylene oxide used in a 24-hour period	200
Removal efficiency	99.9%

$$ER = \frac{200\ g}{24\ hr} \times (100\% - 99.9\%) \times \frac{1\ hr}{3600\ sec}$$

ER = 5.56E-05 g/s

APPENDIX F

Laboratory Fume Hoods Emissions Calculations

Appendix F: Chemical Properties & Emission Calculation Table

RWDI# 1803937

University Health Network - Toronto Western Hospital

Fume Hood Parameters

Room Pressure:	101,325	Pa (do not change)
Room Temperature:	25	°C (do not change)
	298	K
Face Velocity:	100	fpm (100 fpm default, change with caution)
	0.51	m/s
Table Area:	8.75	ft² (8.75 ft² default, change with caution)
	0.81	m²
Exhaust Flow Rate:	1,000	cfm (1 000 cfm default, change with caution)
	0.47	m³/s
Reynolds Number:	30,480	
Chilton-Colburn j-Factor:	0.0047837	

Gas Cylinder Parameters

Gas Flow Rate:	4.0	l/min

Model Parameters

Schedule to O. Reg 419/05:	3	
Modelled Emission Rate:	1.0	g/s
Maximum Concentration:	1,728	µg/m³ (enter 30-minute maximum for O. Reg. 346 Modelling, 1-hour for ASHRAE, SCREEN3 or AERMOD)
	1,728	µg/m³
Dilution	1226	

Restricted Chemicals

Total Restricted:	47
Fraction Restricted:	24%

Notes:

[1] Chemicals in liquid form at room temperature (25 C) are identified with a numeric value; gases are noted as "gas".

[2] Gas densities determined using ideal gas law and reference conditions of: 298 deg K, 101325 Pa.

[3] Vapour pressures are referenced to room temperature (20-25 deg Celsius) unless otherwise noted. Vapour pressures for gases are not applicable.

[4] Partial Pressure Above Interface based on Raoult's Law or, where possible, tablulated data in Perry's Chemical Engineers' Handbook. Partial Pressure Above Interface for gases are not applicable.

			CHEMICAL PROPERTIES									EMISSION SUMMARY		MODELLED CONCENTRATIONS			
Col 1 Index Number (CAS Number + Solution Strength)	Col 2 CAS No.	Col 3 Chemical Name	Col 4 Chemical Formula	Col 5 Pure Component Vapour Pressure [3] (Pa)	Col 6 Solution Strength S (mass frac.)	Col 7 Molecular Weight MW (g/mol)	Col 8 Density [2] r (g/mL)	Col 9 Partial Pressure P [3]	Col 10 Concentration at Air/Liquid Interface ρ_i (g/m³)	Col 11 Diffusivity in Air D_{AB} (cm²/s)	Col 12 Mass Transfer Coefficient (m/s)	Col 13 Mass Emission Rate q (g/s)	Col 14 In-Stack Concentration (µg/m³)	Col 15 24 Hour C_{POI} (µg/m³)	Col 15 1 Hour C_{POI} (µg/m³)	Col 15 0.5 Hour C_{POI} (µg/m³)	Col 15 0.17 Hour C_{POI} (µg/m³)
75070-100%	75-07-0	Acetaldehyde	C2H4O	120,000	1.00	44.052	0.7834	120,000	2.13E+03	0.124	0.0020	3.46E+00	7.3E+06	2.49E+02	5.98E+03	7.17E+03	9.86E+03
64197-100%	64-19-7	Acetic Acid	C2H4O2	2,070	1.00	60.052	1.0446	2,070	5.01E+01	0.113	0.0019	7.65E-02	1.6E+05	5.50E+00	1.32E+02	1.59E+02	2.18E+02
67641-100%	67-64-1	Acetone	C3H6O	30,800	1.00	58.079	0.7845	30,800	7.22E+02	0.124	0.0020	1.17E+00	2.5E+06	8.43E+01	2.02E+03	2.43E+03	3.34E+03
75058-100%	75-05-8	Acetonitrile	C2H3N	11,900	1.00	41.052	0.7857	11,900	1.97E+02	0.128	0.0020	3.26E-01	6.9E+05	2.35E+01	5.64E+02	6.77E+02	9.31E+02
98862-100%	98-86-2	Acetophenone	C8H8O	49	1.00	120.149	1.0281	49	2.38E+00	0.065	0.0013	2.51E-03	5.3E+03	1.81E-01	4.34E+00	5.20E+00	7.16E+00
74862-Gas	74-86-2	Acetylene	C2H2	Gas	Gas	26.037	0.0011	--	--	--	--	7.10E-02	1.5E+05	5.11E+00	1.23E+02	1.47E+02	2.02E+02
107028-100%	107-02-8	Acrolein	C3H4O	36,200	1.00	56.063	0.840	36,200	8.19E+02	0.105	0.0018	1.19E+00	2.5E+06	8.56E+01	2.05E+03	2.46E+03	3.39E+03
107131-100%	107-13-1	Acrylonitrile	C3H3N	14,100	1.00	56.063	0.8007	14,100	3.19E+02	0.122	0.0020	5.12E-01	1.1E+06	3.68E+01	8.84E+02	1.06E+03	1.46E+03
106923-100%	106-92-3	Allyl Glycidyl Ether	C6H10O2	625	1.00	114.142	0.9698	625	2.88E+01	0.067	0.0013	3.10E-02	6.6E+04	2.23E+00	5.35E+01	6.42E+01	8.83E+01
7664417-Gas	7664-41-7	Ammonia	NH3	Gas	Gas	17.031	0.0007	--	--	--	--	4.64E-02	9.8E+04	3.34E+00	8.02E+01	9.62E+01	1.32E+02
12125029-100%	12125-02-9	Ammonium Chloride	NH4Cl	133	1.00	53.492	1.5190	133	2.87E+00	0.146	0.0022	5.19E-03	1.1E+04	3.73E-01	8.96E+00	1.07E+01	1.48E+01
7784421-Gas	7784-42-1	Arsine	AsH3	Gas	Gas	77.946	0.0032	--	--	--	--	2.12E-01	4.5E+05	1.53E+01	3.67E+02	4.40E+02	6.06E+02
95169-100%	95-16-9	Benzothiazole	C7H5NS	4,518	1.00	135.187	1.2460	4,518	2.46E+02	0.062	0.0013	2.51E-01	5.3E+05	1.81E+01	4.34E+02	5.21E+02	7.16E+02
98884-100%	98-88-4	Benzoyl Chloride	C7H5ClO	84	1.00	140.567	1.2120	84	4.76E+00	0.058	0.0012	4.65E-03	9.9E+03	3.35E-01	8.04E+00	9.64E+00	1.33E+01
100516-100%	100-51-6	Benzyl Alcohol	C7H8O	15	1.00	108.138	1.0419	15	6.54E-01	0.073	0.0014	7.46E-04	1.6E+03	5.37E-02	1.29E+00	1.55E+00	2.13E+00
92524-100%	92-52-4	Biphenyl, 1,1-	C12H10	1	1.00	154.207	1.04	1	7.38E-02	0.047	0.0010	6.28E-05	1.3E+02	4.52E-03	1.08E-01	1.30E-01	1.79E-01
10294334-100%	10294-33-4	Boron Tribromide	BBr3	5,316	1.00	250.523	2.6	5,316	5.37E+02	0.034	0.0008	3.70E-01	7.8E+05	2.67E+01	6.40E+02	7.68E+02	1.06E+03
10294345-Gas	10294-34-5	Boron Trichloride	BCl3	Gas	Gas	117.169	0.0048	--	--	--	--	3.19E-01	6.8E+05	2.30E+01	5.52E+02	6.62E+02	9.10E+02
7726956-100%	7726-95-6	Bromine	Br2	28,200	1.00	159.808	3.1028	28,200	1.82E+03	0.071	0.0014	2.03E+00	4.3E+06	1.46E+02	3.51E+03	4.21E+03	5.79E+03
75252-100%	75-25-2	Bromoform	CHBr3	1,000	1.00	252.731	2.8788	1,000	1.02E+02	0.036	0.0009	7.21E-02	1.5E+05	5.19E+00	1.25E+02	1.50E+02	2.06E+02
71363-100%	71-36-3	Butanol, n-	C4H10O	860	1.00	74.121	0.8095	860	2.57E+01	0.090	0.0016	3.37E-02	7.1E+04	2.43E+00	5.82E+01	6.99E+01	9.61E+01
5131668-100%	5131-66-8	Butoxy-2-Propanol, 1-	C7H16O2	113	1.00	132.201	0.8820	113	6.02E+00	0.054	0.0012	5.64E-03	1.2E+04	4.06E-01	9.75E+00	1.17E+01	1.61E+01
123864-100%	123-86-4	Butyl Acetate, n-	C6H12O2	1,660	1.00	116.158	0.8825	1,660	7.78E+01	0.063	0.0013	8.05E-02	1.7E+05	5.79E+00	1.39E+02	1.67E+02	2.29E+02
141322-100%	141-32-2	Butyl Acrylate, n-	C7H12O2	731	1.00	128.169	0.8898	731	3.78E+01	0.057	0.0012	3.64E-02	7.7E+04	2.62E+00	6.29E+01	7.55E+01	1.04E+02
75150-100%	75-15-0	Carbon Disulphide	CS2	48,200	1.00	76.141	1.2632	48,200	1.48E+03	0.106	0.0018	2.17E+00	4.6E+06	1.56E+02	3.75E+03	4.50E+03	6.18E+03
56235-100%	56-23-5	Carbon Tetrachloride	CCl4	15,200	1.00	153.823	1.5940	15,200	9.43E+02	0.057	0.0012	9.13E-01	1.9E+06	6.57E+01	1.58E+03	1.89E+03	2.60E+03
7782505-Gas	7782-50-5	Chlorine	Cl2	Gas	Gas	70.905	0.0029	--	--	--	--	1.93E-01	4.1E+05	1.39E+01	3.34E+02	4.01E+02	5.51E+02
10049044-Gas	10049-04-4	Chlorine Dioxide	ClO2	Gas	Gas	67.452	0.0028	--	--	--	--	1.84E-01	3.9E+05	1.32E+01	3.18E+02	3.81E+02	5.24E+02
108907-100%	108-90-7	Chlorobenzene	C6H5Cl	1,600	1.00	112.557	1.1058	1,600	7.27E+01	0.072	0.0014	8.21E-02	1.7E+05	5.91E+00	1.42E+02	1.70E+02	2.34E+02
75456-Gas	75-45-6	Chlorodifluoromethane	CHClF2	Gas	Gas	86.469	0.0035	--	--	--	--	2.36E-01	5.0E+05	1.70E+01	4.07E+02	4.89E+02	6.72E+02
75003-Gas	75-00-3	Chloroethane	C2H5Cl	Gas	Gas	64.514	0.0026	--	--	--	--	1.76E-01	3.7E+05	1.27E+01	3.04E+02	3.64E+02	5.01E+02
67663-100%	67-66-3	Chloroform	CHCl3	26,200	1.00	119.378	1.4788	26,200	1.26E+03	0.077	0.0015	1.49E+00	3.2E+06	1.07E+02	2.57E+03	3.09E+03	4.24E+03
1319773-100%	1319-77-3	Cresol (o, m, & p-Isomers)	C7H8O	26	1.00	108.138	1.0284	26	1.12E+00	0.073	0.0014	1.27E-03	2.7E+03	9.16E-02	2.20E+00	2.64E+00	3.63E+00
506774-Gas	506-77-4	Cyanogen Chloride	CClN	Gas	Gas	61.471	0.0025	--	--	--	--	1.68E-01	3.5E+05	1.21E+01	2.89E+02	3.47E+02	4.78E+02
110827-100%	110-82-7	Cyclohexane	C6H12	13,000	1.00	84.159	0.7739	13,000	4.41E+02	0.0839	0.0015	5.52E-01	1.2E+06	3.97E+01	9.53E+02	1.14E+03	1.57E+03
872059-100%	872-05-9	Decene, 1-	C10H20	210	1.00	140.266	0.7408	210	1.19E+01	0.046	0.0010	1.00E-02	2.1E+04	7.21E-01	1.73E+01	2.08E+01	2.85E+01
117817-100%	117-81-7	Di(2-Ethylhexyl) Phthalate	C24H38O4	0.00001	1.00	390.562	0.9732	0	1.51E-06	0.017	0.0005	6.60E-10	1.4E-03	4.75E-08	1.14E-06	1.37E-06	1.88E-06
123422-100%	123-42-2	Diacetone Alcohol	C6H12O2	224	1.00	116.158	0.9387	224	1.05E+01	0.065	0.0013	1.11E-02	2.3E+04	7.96E-01	1.91E+01	2.29E+01	3.15E+01
333415-100%	333-41-5	Diazinon	C12H21N2O3PS	0.01	1.00	304.345	1.1088	0.012	1.47E-03	0.021	0.0006	7.31E-07	1.5E+00	5.26E-05	1.26E-03	1.51E-03	2.08E-03
19287457-Gas	19287-45-7	Diborane	B2H6	Gas	Gas	27.670	0.0011	--	--	--	--	7.54E-02	1.6E+05	5.43E+00	1.30E+02	1.56E+02	2.15E+02
84742-100%	84-74-2	Dibutyl Phthalate	C16H22O4	0.003	1.00	278.344	1.0465	0.0027	3.00E-04	0.021	0.0006	1.51E-07	3.2E-01	1.09E-05	2.61E-04	3.13E-04	4.30E-04
76142-Gas	76-14-2	Dichloro-1,1,2,2,-Tetrafluoroethane, 1,2	C2Cl2F4	Gas	Gas	170.921	0.0070	--	--	--	--	4.66E-01	9.9E+05	3.35E+01	8.05E+02	9.66E+02	1.33E+03
95501-100%	95-50-1	Dichlorobenzene, o- (1,2-)	C6H4Cl2	180	1.00	147.002	1.3059	180	1.07E+01	0.069	0.0013	1.17E-02	2.5E+04	8.43E-01	2.02E+01	2.43E+01	3.34E+01
106467-100%	106-46-7	Dichlorobenzene, p- (1,4-)	C6H4Cl	231	1.00	147.002	1.2475	231	1.37E+01	0.069	0.0013	1.50E-02	3.2E+04	1.08E+00	2.60E+01	3.12E+01	4.29E+01
75343-100%	75-34-3	Dichloroethane, 1,1-	C2H4Cl2	30,500	1.00	98.959	1.1757	30,500	1.22E+03	0.0914	0.0016	1.61E+00	3.4E+06	1.16E+02	2.78E+03	3.34E+03	4.59E+03
156-59-2-100%	156-59-2	Dichloroethylene, Cis-1,2-	C2H2Cl2	26,800	1.00	96.943	1.2837	26,800	1.05E+03	0.0935	0.0017	1.41E+00	3.0E+06	1.01E+02	2.43E+03	2.92E+03	4.01E+03
540590-100%	540-59-0	Dichloroethylene, Sym-1,2-	C2H2Cl2	44,200	1.00	96.943	1.2565	44,200	1.73E+03	0.0935	0.0017	2.32E+00	4.9E+06	1.67E+02	4.01E+03	4.82E+03	6.62E+03
156605-100%	156-60-5	Dichloroethylene, Trans-1,2-	C2H2Cl2	44,200	1.00	96.943	1.2565	44,200	1.73E+03	0.0935	0.0017	2.32E+00	4.9E+06	1.67E+02	4.01E+03	4.82E+03	6.62E+03
84662-100%	84-66-2	Diethyl Phthalate	C12H14O4	2	1.00	222.237	1.2320	2	1.79E-01	0.0542	0.0011	1.68E-04	3.5E+02	1.21E-02	2.89E-01	3.47E-01	4.78E-01
111900-100%	111-90-0	Diethylene Glycol Monoethyl Ether	C6H14O3	17	1.00	134.173	0.9885	17	9.20E-01	0.056	0.0012	8.81E-04	1.9E+03	6.34E-02	1.52E+00	1.83E+00	2.51E+00
111773-100%	111-77-3	Diethylene Glycol Monomethyl Ether	C5H12O3	24	1.00	120.147	1.035	24	1.16E+00	0.065	0.0013	1.23E-03	2.6E+03	8.87E-02	2.13E+00	2.55E+00	3.51E+00
75718-Gas	75-71-8	Difluorodichloromethane	CCl2F2	Gas	Gas	120.914	0.0049	--	--	--	--	3.30E-01	7.0E+05	2.37E+01	5.69E+02	6.83E+02	9.39E+02
108838-100%	108-83-8	Diisobutyl Ketone	C9H18O	230	1.00	142.238	0.8062	230	1.32E+01	0.047	0.0011	1.13E-02	2.4E+04	8.11E-01	1.95E+01	2.34E+01	3.21E+01
127195-100%	127-19-5	Dimethyl Acetamide, n-	C4H9NO	75	1.00	87.120	0.9372	75	2.64E+00	0.085	0.0015	3.31E-03	7.0E+03	2.38E-01	5.72E+00	6.87E+00	9.44E+00
624920-100%	624-92-0	Dimethyl Disulphide	C2H6S2	3,820	1.00	94.199	1.0625	3,820	1.45E+02	0.084	0.0015	1.81E-01	3.8E+05	1.30E+01	3.13E+02	3.75E+02	5.16E+02
131113-100%	131-11-3	Dimethyl Phthalate	C10H10O4	1	1.00	194.184	1.1905	1	7.83E-02	0.0568	0.0012	7.55E-05	1.6E+02	5.44E-03	1.30E-01	1.57E-01	2.15E-01
67685-100%	67-68-5	Dimethyl Sulfoxide	C2H6OS	84	1.00	78.133	1.1010	84	2.65E+00	0.099	0.0017	3.69E-03	7.8E+03	2.65E-01	6.37E+00	7.64E+00	1.05E+01
75183-100%	75-18-3	Dimethyl Sulphide	C2H6S	64,400	1.00	62.134	0.8483	64,400	1.61E+03	0.104	0.0018	2.33E+00	4.9E+06	1.68E+02	4.03E+03	4.84E+03	6.66E+03
109557-100%	109-55-7	Dimethyl-1,3-Diaminopropane, n-	C5H14N2	664	1.00	102.178	0.827	664	2.74E+01	0.070	0.0014	3.03E-02	6.4E+04	2.18E+00	5.23E+01	6.27E+01	8.62E+01
646060-100%	646-06-0	Dioxolane, 1,3-	C3H6O2	14,600	1.00	74.079	1.060	14,600	4.36E+02	0.101	0.0017	6.17E-01	1.3E+06	4.44E+01	1.07E+03	1.28E+03	1.76E+03
110805-100%	110-80-5	Ethoxyethanol, 2-	C4H10O2	710	1.00	90.121	0.9253	710	2.58E+01	0.082	0.0015	3.17E-02	6.7E+04	2.28E+00	5.48E+01	6.58E+01	9.04E+01
111159-100%	111-15-9	Ethoxyethyl Acetate, 2-	C6H12O3	240	1.00	132.157	0.9740	240	1.28E+01	0.057	0.0012	1.24E-02	2.6E+04	8.89E-01	2.13E+01	2.56E+01	3.52E+01
141786-100%	141-78-6	Ethyl Acetate	C4H8O2	12,600	1.00	88.106	0.9003	12,600	4.48E+02	0.0732	0.0014	5.11E-01	1.1E+06	3.68E+01	8.83E+02	1.06E+03	1.46E+03
140885-100%	140-88-5	Ethyl Acrylate	C5H8O2	5,140	1.00	100.117	0.9234	5,140	2.08E+02	0.077	0.0015	2.45E-01	5.2E+05	1.76E+01	4.23E+02	5.08E+02	6.99E+02
64175-100%	64-17-5	Ethyl Alcohol	C2H6O	7,870	1.00	46.068	0.7893	7,870	1.46E+02	0.123	0.0020	2.36E-01	5.0E+05	1.70E+01	4.08E+02	4.89E+02	6.73E+02
100414-100%	100-41-4	Ethyl Benzene	C8H10	1,280	1.00	106.165	0.8626	1,280	5.48E+01	0.075	0.0014	6.36E-02	1.3E+05	4.58E+00	1.10E+02	1.32E+02	1.81E+02
60297-100%	60-29-7	Ethyl Ether	C4H10O	71,700	1.00	74.121	0.7138	71,700	2.14E+03	0.074	0.0014	2.46E+00	5.2E+06	1.77E+02	4.26E+03	5.11E+03	7.03E+03
104767-100%	104-76-7	Ethyl Hexanol, 2-	C8H18O	19	1.00	130.228	0.8319	19	9.98E-01	0.054	0.0011	9.30E-04	2.0E+03	6.70E-02	1.61E+00	1.93E+00	2.65E+00
763699-100%	763-69-9	Ethyl-3-Ethoxypropionate	C7H14O3	146	1.00	146.184	0.9490	146	8.62E+00	0.049	0.0011	7.54E-03	1.6E+04	5.43E-01	1.30E+01	1.56E+01	2.15E+01
106934-100%	106-93-4	Ethylene Dibromide	C2H4Br2	1,488	1.00	187.861	2.1683	1,488	1.13E+02	0.043	0.0010	9.04E-02	1.9E+05	6.50E+00	1.56E+02	1.87E+02	2.58E+02
107062-100%	107-06-2	Ethylene Dichloride	C2H4Cl2	10,600	1.00	98.959	1.2454	10,600	4.23E+02	0.104	0.0018	6.10E-01	1.3E+06	4.39E+01	1.05E+03	1.27E+03	1.74E+03
111762-100%	111-76-2	Ethylene glycol butyl ether Butyl cellosolve	C6H14O2	150	1.00	118.174	0.9015	150	7.15E+00	0.063	0.0013	7.36E-03	1.6E+04	5.30E-01	1.27E+01	1.52E+01	2.10E+01
628966-100%	628-96-6	Ethylene Glycol Dinitrate	C2H4N2O6	9	1.00	152.062	1.4918	9	5.52E-01	0.057	0.0012	5.31E-04	1.1E+03	3.82E-02	9.17E-01	1.10E+00	1.51E+00
112072-100%	112-07-2	Ethylene Glycol Monobutyl Ether Acetate	C8H16O3	50	1.00	160.211	0.94	50	3.22E+00	0.042	0.0010	2.54E-03	5.4E+03	1.83E-01	4.39E+00	5.27E+00	7.25E+00
75218-Gas	75-21-8	Ethylene Oxide	C2H4O	Gas	Gas	44.052	0.0018	--	--	--	--	1.20E-01	2.5E+05	8.64E+00	2.07E+02	2.49E+02	3.42E+02
50000-37%	50-00-0	Formaldehyde Solution (37 %)	CH2O	Solution	0.37	30.026	1.113	173	2.10E+00	0.178	0.0025	4.33E-03	9.2E+03	3.11E-01	7.47E+00	8.97E+00	1.23E+01
64186-100%	64-18-6	Formic Acid	CH2O2	5,750	1.00	46.026	1.220	5,750	1.07E+02	0.079	0.0015	1.28E-01	2.7E+05	9.23E+00	2.22E+02	2.66E+02	3.66E+02
98011-100%	98-01-1	Furfural	C5H4O2	290	1.00	96.085	1.1594	290	1.12E+01	0.0872	0.0016	1.44E-02	3.1E+04	1.04E+00	2.49E+01	2.99E+01	4.11E+01
98000-100%	98-00-0	Furfuryl Alcohol	C5H6O2	97	1.00	98.101	1.1296	97	3.84E+00	0.083	0.0015	4.76E-03	1.0E+04	3.43E-01	8.22E+00	9.87E+00	1.36E+01
111308-100%	111-30-8	Glutaraldehyde (100 %)	C5H8O2	80	1.00	100.117	1.06	80	3.22E+00	0.079	0.0015	3.87E-03	8.2E+03	2.79E-01	6.69E+00	8.03E+00	1.10E+01
111308-50%	111-30-8	Glutaraldehyde (50 %)	C5H8O2	80	0.50	100.117	1.06	12	4.91E-01	0.079	0.0015	5.90E-04	1.3E+03	4.25E-02	1.02E+00	1.22E+00	1.68E+00
142825-100%	142-82-5	Heptane, n-	C7H16	6,090	1.00	100.202	0.6795	6,090	2.46E+02	0.065	0.0013	2.59E-01	5.5E+05	1.87E+01	4.48E+02	5.38E+02	7.39E+02
77474-100%	77-47-4	Hexachlorocyclopentadiene	C5Cl6	11	1.00	272.772	1.7019	11	1.17E+00	0.0561	0.0012	1.12E-03	2.4E+03	8.05E-02	1.93E+00	2.32E+00	3.19E+00
999973-100%	999-97-3	Hexamethyldisilazane	C6H19NSi2	2,658	1.00	161.393	0.774	2,658	1.73E+02	0.038	0.0009	1.27E-01	2.7E+05	9.17E+00	2.20E+02	2.64E+02	3.63E+02
4035896-100%	4035-89-6	Hexamethylene Diisocyanate (HDI) Biuret (HDI-Bt)	C23H38N6O5	0.01	1.00	479.000	1.1140	0.010	1.93E-03	0.017	0.0005	8.17E-07	1.7E+00	5.88E-05	1.41E-03	1.69E-03	2.33E-03
3779633-100%	3779-63-3	Hexamethylene Diisocyanate (HDI) Isocyanurate	C24H36N6O6	0.0000007	1.00	504.585	1.1200	0.00000069	1.41E-07	0.016	0.0005	5.87E-11	1.2E-04	4.22E-09	1.01E-07	1.22E-07	1.67E-07
822060-100%	822-06-0	Hexamethylene Diisocyanate (HDI) Monomer	C8H12N2O2	66	1.00	168.193	1.0528	66	4.51E+00	0.040	0.0009	3.46E-03	7.3E+03	2.49E-01	5.98E+00	7.18E+00	9.88E+00
28182812-100%	28182-81-2	Hexamethylene Diisocyanate (HDI) Polyisocyanate	C24H36N6O6	0.01	1.00	486.400	1.1200	0.010	1.96E-03	0.016	0.0005	8.26E-07	1.8E+00	5.95E-05	1.43E-03	1.71E-03	2.36E-03
110543-100%	110-54-3	Hexane, n-	C6H14	20,200	1.00	86.175	0.6606	20,200	7.02E+02	0.2	0.0027	1.57E+00	3.3E+06	1.13E+02	2.71E+03	3.25E+03	4.47E+03
107415-100%	107-41-5	Hexylene Glycol	C6H14O2	10	1.00	118.174	0.923	10	4.77E-01	0.063	0.0013	4.94E-04	1.0E+03	3.56E-02	8.53E-01	1.02E+00	1.41E+00
10035106-50%	10035-10-6	Hydrobromic Acid (50%)	HBr	Solution	0.50	80.912	1.5170	49	1.61E+00	0.110	0.0018	2.40E-03	5.1E+03	1.73E-01	4.14E+00	4.97E+00	6.83E+00
7647010-10%	7647-01-0	Hydrochloric Acid (10%)	HCl	Solution	0.10	36.461	1.05	0.89	1.31E-02	0.162	0.0024	2.54E-05	5.4E+01	1.83E-03	4.39E-02	5.27E-02	7.24E-02
7647010-20%	7647-01-0	Hydrochloric Acid (20 %)	HCl	Solution	0.20	36.461	1.10	43	6.26E-01	0.165	0.0024	1.23E-03	2.6E+03	8.84E-02	2.12E+00	2.55E+00	3.50E+00
7647010-30%	7647-01-0	Hydrochloric Acid (30 %)	HCl	Solution	0.30	36.461	1.15	2,007	2.95E+01	0.168	0.0024	5.86E-02	1.2E+05	4.22E+00	1.01E+02	1.21E+02	1.67E+02
7647010-35%	7647-01-0	Hydrochloric Acid (35 %)	HCl	Solution	0.35	36.461	1.1800	10,366	1.52E+02	0.170	0.0025	3.05E-01	6.5E+05	2.19E+01	5.26E+02	6.32E+02	8.68E+02
7647010-40%	7647-01-0	Hydrochloric Acid (40 %)	HCl	Solution	0.40	36.461	1.20	68,441	1.01E+03	0.171	0.0025	2.02E+00	4.3E+06	1.45E+02	3.49E+03	4.19E+03	5.76E+03
7664393-30%	7664-39-3	Hydrofluoric Acid (30%)	HF	Solution	0.30	20.006	1.10	199	1.61E+00	0.243	0.0031	4.09E-03	8.7E+03	2.94E-01	7.07E+00	8.48E+00	1.17E+01
7664393-40%	7664-39-3	Hydrofluoric Acid (40%)	HF	Solution	0.40	20.006	1.13	1,196	9.65E+00	0.246	0.0031	2.47E-02	5.2E+04	1.78E+00	4.27E+01	5.12E+01	7.04E+01
7664393-50%	7664-39-3	Hydrofluoric Acid (50%)	HF	Solution	0.50	20.006	1.17	4,386	3.54E+01	0.248	0.0032	9.12E-02	1.9E+05	6.57E+00	1.58E+02	1.89E+02	2.60E+02
7664393-60%	7664-39-3	Hydrofluoric Acid (60%)	HF	Solution	0.60	20.006	1.20	11,961	9.65E+01	0.251	0.0032	2.50E-01	5.3E+05	1.80E+01	4.32E+02	5.19E+02	7.14E+02
10035106-Gas	10035-10-6	Hydrogen Bromide	HBr	Gas	Gas	80.912	0.0033	--	--	--	--	2.20E-01	4.7E+05	1.59E+01	3.81E+02	4.57E+02	6.29E+02

	O. REG. 419/05 LIMITS												COMPARISON TO O. REG. 419/05 LIMITS				STATUS	USAGE RESTRICTION	
Col 1 Index Number (CAS Number + Solution Strength)	Col 16 24 Hour O.Reg. 419/05 Limit (µg/m³)	Col 16 1 Hour O.Reg. 419/05 Limit (µg/m³)	Col 16 0.5 Hour O.Reg. 419/05 Limit (µg/m³)	Col 16 0.17 Hour O.Reg. 419/05 Limit (µg/m³)	Col 17 24 Hour O.Reg. 419/05 Limiting Effect	Col 17 1 Hour O.Reg. 419/05 Limiting Effect	Col 17 0.5 Hour O.Reg. 419/05 Limiting Effect	Col 17 0.17 Hour O.Reg. 419/05 Limiting Effect	Col 18 24 Hour O.Reg. 419/05 Status	Col 18 1 Hour O.Reg. 419/05 Status	Col 18 0.5 Hour O.Reg. 419/05 Status	Col 18 0.17 Hour O.Reg. 419/05 Status	Col 19 24 Hour Percentage of Limit Guideline (%)	Col 19 1 Hour Percentage of Limit Guideline (%)	Col 19 0.5 Hour Percentage of Limit Guideline (%)	Col 19 0.17 Hour Percentage of Limit Guideline (%)	Col 20 Usage Restriction Required (Yes/No)	Col 21 Maximum Mass-Based Chemical Usage (g/hour)	Col 22 Maximum Volume-Based Chemical Usage @25°C (mL/hour)
75070-100%	500	--	500	--	Health	--	Health	--	3	--	3	--	50%	--	1434%	--	Yes	868	1108
64197-100%	2500	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
67641-100%	11880	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
75058-100%	70	--	--	--	Health	--	--	--	3	--	--	--	34%	--	--	--	No	--	--
98862-100%	--	1167	--	850	--	Health	--	Odour	--	Guideline	--	Guideline	--	<1%	--	<1%	No	--	--
74862-Gas	56000	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
107028-100%	0.4	4.5	--	--	Health	Health	--	--	3	3	--	--	21391%	45635%	--	--	Yes	9	11
107131-100%	0.6	--	--	--	Health	--	--	--	3	--	--	--	6139%	--	--	--	Yes	30	37
106923-100%	60	--	--	--	Health	--	--	--	Guideline	--	--	--	4%	--	--	--	No	--	--
7664417-Gas	100	--	--	--	Health	--	--	--	3	--	--	--	3%	--	--	--	No	--	--
12125029-100%	120	--	--	--	Particulate	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
7784421-Gas	5	--	10	--	Health	--	Health	--	3	--	3	--	306%	--	4404%	--	Yes	17	5450
95169-100%	70	--	--	--	Health	--	--	--	Guideline	--	--	--	26%	--	--	--	No	--	--
98884-100%	125	--	--	--	Corrosion and Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
100516-100%	880	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
92524-100%	--	60	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	No	--	--
10294334-100%	35	--	--	--	Corrosion	--	--	--	3	--	--	--	76%	--	--	--	No	--	--
10294345-Gas	35	--	--	--	Corrosion	--	--	--	3	--	--	--	66%	--	--	--	No	--	--
7726956-100%	20	--	--	--	Health	--	--	--	3	--	--	--	731%	--	--	--	Yes	1000	322
75252-100%	55	--	--	--	Health	--	--	--	Guideline	--	--	--	9%	--	--	--	No	--	--
71363-100%	920	--	--	2100	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	5%	No	--	--
5131668-100%	3300	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
123864-100%	--	15000	--	1000	--	Health	--	Odour	--	Guideline	--	Guideline	--	<1%	--	23%	No	--	--
141322-100%	120	--	--	--	Particulate	--	--	--	Guideline	--	--	--	2%	--	--	--	No	--	--
75150-100%	330	--	--	--	Odour	--	--	--	Guideline	--	--	--	47%	--	--	--	No	--	--
56235-100%	2.4	--	--	--	Health	--	--	--	3	--	--	--	2738%	--	--	--	Yes	120	75
7782505-Gas	10	--	--	230	Health	--	--	Odour	3	--	--	Guideline	139%	--	--	239%	Yes	290	100213
10049044-Gas	2	--	--	--	Health	--	--	--	3	--	--	--	662%	--	--	--	Yes	100	36275
108907-100%	--	3500	--	4500	--	Health	--	Odour	--	Guideline	--	Guideline	--	4%	--	5%	No	--	--
75456-Gas	350000	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
75003-Gas	5600	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
67663-100%	1	--	--	--	Health	--	--	--	3	--	--	--	10716%	--	--	--	Yes	50	34
1319773-100%	75	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
506774-Gas	12	--	--	--	Health	--	--	--	Guideline	--	--	--	100%	--	--	--	Yes	600	238825
110827-100%	6100	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
872059-100%	60000	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
117817-100%	50	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
123422-100%	--	--	--	1350	--	--	--	Odour	--	--	--	Guideline	--	--	--	2%	No	--	--
333415-100%	3	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
19287457-Gas	10	--	--	--	Health	--	--	--	3	--	--	--	54%	--	--	--	No	--	--
84742-100%	50	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
76142-Gas	700000	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
95501-100%	--	30500	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	No	--	--
106467-100%	95	--	--	--	Health	--	--	--	3	--	--	--	1%	--	--	--	No	--	--
75343-100%	165	--	--	--	Health	--	--	--	3	--	--	--	70%	--	--	--	No	--	--
156-59-2-100%	105	--	--	--	Health	--	--	--	Guideline	--	--	--	97%	--	--	--	No	--	--
540590-100%	105	--	--	--	Health	--	--	--	Guideline	--	--	--	159%	--	--	--	Yes	5251	4179
156605-100%	105	--	--	--	Health	--	--	--	Guideline	--	--	--	159%	--	--	--	Yes	5251	4179
84662-100%	125	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
111900-100%	--	--	--	1100	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	No	--	--
111773-100%	1200	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
75718-Gas	500000	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
108838-100%	3500	--	--	649	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	5%	No	--	--
127195-100%	300	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
624920-100%	--	--	--	56	--	--	--	Odour	--	--	--	Guideline	--	--	--	922%	Yes	71	67
131113-100%	125	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
67685-100%	2100	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
75183-100%	--	--	--	30	--	--	--	Odour	--	--	--	Guideline	--	--	--	22186%	Yes	38	45
109557-100%	20	--	--	--	Health	--	--	--	Guideline	--	--	--	11%	--	--	--	No	--	--
646060-100%	10	--	--	--	Health	--	--	--	Guideline	--	--	--	444%	--	--	--	Yes	500	472
110805-100%	380	--	--	1100	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	8%	No	--	--
111159-100%	540	--	--	300	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	12%	No	--	--
141786-100%	--	19000	--	--	--	Odour	--	--	--	Guideline	--	--	--	5%	--	--	No	--	--
140885-100%	--	4.5	--	--	--	Odour	--	--	--	Guideline	--	--	--	9410%	--	--	Yes	9	10
64175-100%	--	19000	--	--	--	Odour	--	--	--	Guideline	--	--	--	2%	--	--	No	--	--
100414-100%	1000	--	--	1900	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	10%	No	--	--
60297-100%	8000	--	--	950	Health	--	--	Odour	3	--	--	Guideline	2%	--	--	740%	Yes	1200	1681
104767-100%	--	600	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	No	--	--
763699-100%	--	--	--	200	--	--	--	Odour	--	--	--	Guideline	--	--	--	11%	No	--	--
106934-100%	3	--	--	--	Health	--	--	--	Guideline	--	--	--	217%	--	--	--	Yes	150	69
107062-100%	2	--	--	--	Health	--	--	--	3	--	--	--	2197%	--	--	--	Yes	100	80
111762-100%	2400	--	--	500	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	4%	No	--	--
628966-100%	3	--	--	--	Health	--	--	--	Guideline	--	--	--	1%	--	--	--	No	--	--
112072-100%	3250	--	--	700	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	1%	No	--	--
75218-Gas	0.2	--	--	--	Health	--	--	--	3	--	--	--	4321%	--	--	--	Yes	10	5554
50000-37%	65	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
64186-100%	500	--	--	--	Health	--	--	--	3	--	--	--	2%	--	--	--	No	--	--
98011-100%	--	1000	--	--	--	Odour	--	--	--	Guideline	--	--	--	2%	--	--	No	--	--
98000-100%	1000	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
111308-100%	14	--	--	35	Health	--	--	Health	Guideline	--	--	Guideline	2%	--	--	32%	No	--	--
111308-50%	14	--	--	35	Health	--	--	Health	Guideline	--	--	Guideline	<1%	--	--	5%	No	--	--
142825-100%	11000	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
77474-100%	2	--	--	--	Health	--	--	--	Guideline	--	--	--	4%	--	--	--	No	--	--
999973-100%	2	--	--	--	Health	--	--	--	Guideline	--	--	--	459%	--	--	--	Yes	100	129
4035896-100%	3	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
3779633-100%	3	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
822060-100%	0.03	--	--	--	Health	--	--	--	3	--	--	--	831%	--	--	--	Yes	1.50	1
28182812-100%	3	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
110543-100%	2500	--	--	--	Health	--	--	--	3	--	--	--	5%	--	--	--	No	--	--
107415-100%	--	12000	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	No	--	--
10035106-50%	--	668	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	No	--	--
7647010-10%	20	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
7647010-20%	20	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
7647010-30%	20	--	--	--	Health	--	--	--	3	--	--	--	21%	--	--	--	No	--	--
7647010-35%	20	--	--	--	Health	--	--	--	3	--	--	--	110%	--	--	--	Yes	1000	2422
7647010-40%	20	--	--	--	Health	--	--	--	3	--	--	--	727%	--	--	--	Yes	1000	2084
7664393-30%	0.86	--	--	--	Vegetation	--	--	--	3	--	--	--	34%	--	--	--	No	--	--
7664393-40%	0.86	--	--	--	Vegetation	--	--	--	3	--	--	--	207%	--	--	--	Yes	43	95
7664393-50%	0.86	--	--	--	Vegetation	--	--	--	3	--	--	--	764%	--	--	--	Yes	43	74
7664393-60%	0.86	--	--	--	Vegetation	--	--	--	3	--	--	--	2095%	--	--	--	Yes	43	60
10035106-Gas	--	668	--	--	--	Health	--	--	--	Guideline	--	--	--	57%	--	--	No	--	--

			CHEMICAL PROPERTIES									EMISSION SUMMARY		MODELLED CONCENTRATIONS			
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12	Col 13	Col 14	Col 15			
Index Number (CAS Number + Solution Strength)	CAS No.	Chemical Name	Chemical Formula	Pure Component Vapour Pressure [3] (Pa)	Solution Strength S (mass frac.)	Molecular Weight MW (g/mol)	Density [2] r (g/mL)	Partial Pressure P [3]	Concentration at Air/Liquid Interface ρ_i (g/m^3)	Diffusivity in Air D_{AB} (cm²/s)	Mass Transfer Coefficient (m/s)	Mass Emission Rate q (g/s)	In-Stack Concentration (μg/m^3)	24 Hour C_{POI} (μg/m^3)	1 Hour C_{POI} (μg/m^3)	0.5 Hour C_{POI} (μg/m^3)	0.17 Hour C_{POI} (μg/m^3)
7647010-Gas	7647-01-0	Hydrogen Chloride	HCl	Gas	Gas	36.461	0.0015	--	--	--	--	9.94E-02	2.1E+05	7.15E+00	1.72E+02	2.06E+02	2.83E+02
74908-100%	74-90-8	Hydrogen Cyanide	HCN	98,800	1.00	27.026	0.6876	98,800	1.08E+03	0.197	0.0027	2.38E+00	5.0E+06	1.71E+02	4.11E+03	4.93E+03	6.78E+03
7664393-Gas	7664-39-3	Hydrogen Fluoride	HF	Gas	Gas	20.006	0.0008	--	--	--	--	5.45E-02	1.2E+05	3.92E+00	9.42E+01	1.13E+02	1.55E+02
7722841-35%	7722-84-1	Hydrogen Peroxide (35 %)	H2O2	260	0.35	34.015	1.1300	58	7.92E-01	0.174	0.0025	1.61E-03	3.4E+03	1.16E-01	2.78E+00	3.34E+00	4.59E+00
7722841-50%	7722-84-1	Hydrogen Peroxide (50 %)	H2O2	260	0.50	34.015	1.2000	90	1.24E+00	0.178	0.0025	2.55E-03	5.4E+03	1.84E-01	4.41E+00	5.29E+00	7.28E+00
7722841-70%	7722-84-1	Hydrogen Peroxide (70 %)	H2O2	260	0.70	34.015	1.2900	144	1.97E+00	0.183	0.0026	4.15E-03	8.8E+03	2.99E-01	7.17E+00	8.60E+00	1.18E+01
7722841-90%	7722-84-1	Hydrogen Peroxide (90 %)	H2O2	260	0.90	34.015	1.3900	215	2.95E+00	0.188	0.0026	6.32E-03	1.3E+04	4.55E-01	1.09E+01	1.31E+01	1.80E+01
7783064-Gas	7783-06-4	Hydrogen Sulphide	S2S	Gas	Gas	34.082	0.0014	--	--	--	--	9.29E-02	2.0E+05	6.69E+00	1.60E+02	1.93E+02	2.65E+02
78831-100%	78-83-1	Isobutanol	C4H10O	1,390	1.00	74.121	0.8018	1,390	4.16E+01	0.090	0.0016	5.43E-02	1.2E+05	3.91E+00	9.38E+01	1.13E+02	1.55E+02
110190-100%	110-19-0	Isobutyl Acetate	C6H12O2	2,390	1.00	116.158	0.8712	2,390	1.12E+02	0.063	0.0013	1.15E-01	2.4E+05	8.31E+00	1.99E+02	2.39E+02	3.29E+02
108214-100%	108-21-4	Isopropyl Acetate	C5H10O2	7,880	1.00	102.132	0.8718	7,880	3.25E+02	0.071	0.0014	3.64E-01	7.7E+05	2.62E+01	6.29E+02	7.55E+02	1.04E+03
67630-100%	67-63-0	Isopropyl Alcohol	C3H8O	6,020	1.00	60.095	0.7809	6,020	1.46E+02	0.103	0.0018	2.09E-01	4.4E+05	1.51E+01	3.62E+02	4.34E+02	5.97E+02
98828-100%	98-82-8	Isopropyl Benzene	C9H12	610	1.00	120.191	0.8640	610	2.96E+01	0.060	0.0012	2.97E-02	6.3E+04	2.14E+00	5.13E+01	6.15E+01	8.46E+01
108203-100%	108-20-3	Isopropyl Ether	C6H14O	19,900	1.00	102.174	0.7192	19,900	8.20E+02	0.065	0.0013	8.69E-01	1.8E+06	6.25E+01	1.50E+03	1.80E+03	2.48E+03
121755-100%	121-75-5	Malathion	C10H19O6PS2	0.02	1.00	330.358	1.2076	0.024	3.15E-03	0.021	0.0006	1.56E-06	3.3E+00	1.13E-04	2.70E-03	3.24E-03	4.46E-03
7439976-100%	7439-97-6	Mercury (Hg)	Hg	0.3	1.00	200.59	13.5336	0.27	2.15E-02	0.071	0.0014	2.42E-05	5.1E+01	1.74E-03	4.18E-02	5.01E-02	6.89E-02
79414-100%	79-41-4	Methacrylic Acid	C4H6O2	120	1.00	86.090	1.0153	120	4.17E+00	0.088	0.0016	5.39E-03	1.1E+04	3.88E-01	9.32E+00	1.12E+01	1.54E+01
101688-100%	101-68-8	Methane Diphenyl Diisocyanate (MDI)	C15H10N2O2	0.0006	1.00	250.252	1.197	0.00061	6.17E-05	0.024	0.0007	3.37E-08	7.1E-02	2.42E-06	5.81E-05	6.98E-05	9.59E-05
67561-100%	67-56-1	Methanol	CH4O	16,900	1.00	32.042	0.7914	16,900	2.18E+02	0.15	0.0023	4.02E-01	8.5E+05	2.90E+01	6.95E+02	8.34E+02	1.15E+03
96333-100%	96-33-3	Methyl Acrylate	C4H6O2	11,000	1.00	86.090	0.9535	11,000	3.82E+02	0.086	0.0016	4.85E-01	1.0E+06	3.49E+01	8.39E+02	1.01E+03	1.38E+03
74839-Gas	74-83-9	Methyl Bromide	CH3Br	Gas	Gas	94.939	0.0039	--	--	--	--	2.59E-01	5.5E+05	1.86E+01	4.47E+02	5.36E+02	7.38E+02
74873-Gas	74-87-3	Methyl Chloride	CH3Cl	Gas	Gas	50.488	0.0021	--	--	--	--	1.38E-01	2.9E+05	9.90E+00	2.38E+02	2.85E+02	3.92E+02
71556-100%	71-55-6	Methyl Chloroform	C2H3Cl3	16,500	1.00	133.404	1.3390	16,500	8.88E+02	0.078	0.0015	1.06E+00	2.2E+06	7.61E+01	1.83E+03	2.19E+03	3.01E+03
78933-100%	78-93-3	Methyl Ethyl Ketone	C4H8O	12,600	1.00	72.108	0.7999	12,600	3.67E+02	0.0808	0.0015	4.47E-01	9.5E+05	3.22E+01	7.72E+02	9.26E+02	1.27E+03
108101-100%	108-10-1	Methyl Isobutyl Ketone	C6H12O	2,640	1.00	100.158	0.7965	2,640	1.07E+02	0.075	0.0014	1.24E-01	2.6E+05	8.91E+00	2.14E+02	2.57E+02	3.53E+02
624839-100%	624-83-9	Methyl Isocyanate	C2H3NO	57,700	1.00	57.051	0.9230	57,700	1.33E+03	0.115	0.0019	2.05E+00	4.3E+06	1.47E+02	3.53E+03	4.24E+03	5.83E+03
74931-Gas	74-93-1	Methyl Mercaptan	CH4S	Gas	Gas	48.103	0.0020	--	--	--	--	1.31E-01	2.8E+05	9.44E+00	2.26E+02	2.72E+02	3.74E+02
80626-100%	80-62-6	Methyl Methacrylate	C5H8O2	5,100	1.00	100.117	0.9377	5,100	2.06E+02	0.077	0.0015	2.43E-01	5.2E+05	1.75E+01	4.20E+02	5.04E+02	6.93E+02
119368-100%	119-36-8	Methyl Salicylate	C8H8O3	15	1.00	152.148	1.181	15	9.21E-01	0.051	0.0011	8.25E-04	1.7E+03	5.94E-02	1.43E+00	1.71E+00	2.35E+00
1634044-100%	1634-04-4	Methyl Tert-Butyl Ether	C5H12O	33,600	1.00	88.148	0.7353	33,600	1.19E+03	0.075	0.0014	1.39E+00	2.9E+06	1.00E+02	2.40E+03	2.88E+03	3.96E+03
110123-100%	110-12-3	Methyl-2-Hexanone, 5-	C7H14O	691	1.00	114.185	0.888	691	3.18E+01	0.064	0.0013	3.34E-02	7.1E+04	2.40E+00	5.77E+01	6.92E+01	9.52E+01
109875-100%	109-87-5	Methylal	C3H8O2	53,100	1.00	76.095	0.8593	53,100	1.63E+03	0.091	0.0016	2.14E+00	4.5E+06	1.54E+02	3.70E+03	4.45E+03	6.11E+03
12108133-100%	12108-13-3	Methylcyclopentadienyl Manganese Tricarbonyl	C9H7MnO3	6	1.00	218.09	1.3942	6	5.50E-01	0.028	0.0007	3.30E-04	7.0E+02	2.37E-02	5.69E-01	6.83E-01	9.39E-01
75092-100%	75-09-2	Methylene Chloride	CH2Cl2	58,200	1.00	84.933	1.3266	58,200	1.99E+03	0.101	0.0017	2.82E+00	6.0E+06	2.03E+02	4.87E+03	5.85E+03	8.04E+03
75116-100%	75-11-6	Methylene Iodide	CH2I2	172	1.00	267.836	3.3211	172	1.86E+01	0.037	0.0009	1.34E-02	2.8E+04	9.68E-01	2.32E+01	2.79E+01	3.83E+01
74895-40%	74-89-5	Monomethyl Amine (40%)	CH5N	64,321	0.40	31.058	0.6560	17,933	2.25E+02	0.150	0.0023	4.14E-01	8.8E+05	2.98E+01	7.15E+02	8.58E+02	1.18E+03
8030306-100%	8030-30-6	Naphtha (Mineral Spirits)		664	1.00	110.000	0.76	664	2.95E+01	0.062	0.0013	3.03E-02	6.4E+04	2.18E+00	5.23E+01	6.28E+01	8.63E+01
91203-100%	91-20-3	Naphthalene	C10H8	11	1.00	128.171	1.0253	11	5.84E-01	0.059	0.0012	5.77E-04	1.2E+03	4.16E-02	9.98E-01	1.20E+00	1.65E+00
90153-100%	90-15-3	Naphthol, 1-	C10H8O	133	1.00	144.170	1.0989	133	7.73E+00	0.054	0.0011	7.16E-03	1.5E+04	5.15E-01	1.24E+01	1.48E+01	2.04E+01
13463393-100%	13463-39-3	Nickel Carbonyl	C4NiO4	53,158	1.00	170.734	1.31	53,158	3.66E+03	0.043	0.0010	2.94E+00	6.2E+06	2.12E+02	5.09E+03	6.11E+03	8.40E+03
7697372-70%	7697-37-2	Nitric Acid (70 %)	NHNO3	Solution	0.70	63.013	1.4134	545	1.39E+01	0.127	0.0020	2.29E-02	4.8E+04	1.65E+00	3.95E+01	4.74E+01	6.52E+01
55630-100%	55-63-0	Nitroglycerin	C3H5N3O9	0.05	1.00	227.087	1.5931	0.050	4.58E-03	0.029	0.0008	2.82E-06	6.0E+00	2.03E-04	4.87E-03	5.85E-03	8.04E-03
10024972-Gas	10024-97-2	Nitrous Oxide	N2O	Gas	Gas	44.012	0.0018	--	--	--	--	1.20E-01	2.5E+05	8.63E+00	2.07E+02	2.49E+02	3.42E+02
111659-100%	111-65-9	Octane	C8H18	1,860	1.00	114.229	0.6986	1,860	8.57E+01	0.058	0.0012	8.36E-02	1.8E+05	6.02E+00	1.44E+02	1.73E+02	2.38E+02
112801-100%	112-80-1	Oleic Acid	C18H34O2	0.001	1.00	282.462	0.8935	0.0010	1.14E-04	0.020	0.0006	5.42E-08	1.1E-01	3.90E-06	9.37E-05	1.12E-04	1.55E-04
144627-100%	144-62-7	Oxalic Acid	C2H2O4	0.1	1.00	90.035	1.900	0.13	4.83E-03	0.110	0.0018	7.25E-06	1.5E+01	5.22E-04	1.25E-02	1.50E-02	2.07E-02
90438792-100%	90438-79-2	Oxo-Heptyl Acetate		66	1.00	158.000	0.8700	66	4.24E+00	0.042	0.0010	3.32E-03	7.0E+03	2.39E-01	5.73E+00	6.88E+00	9.46E+00
88230357-100%	88230-35-7	Oxo-Hexyl Acetate		186	1.00	144.000	0.8700	186	1.08E+01	0.048	0.0011	9.34E-03	2.0E+04	6.72E-01	1.61E+01	1.94E+01	2.66E+01
10028156-Gas	10028-15-6	Ozone	O3	Gas	Gas	47.998	0.0020	--	--	--	--	1.31E-01	2.8E+05	9.42E+00	2.26E+02	2.71E+02	3.73E+02
19624227-100%	19624-22-7	Pentaborane	B5H9	22,725	1.00	63.121	0.6100	22,725	5.79E+02	0.090	0.0016	7.56E-01	1.6E+06	5.44E+01	1.31E+03	1.57E+03	2.15E+03
87865-100%	87-86-5	Pentachlorophenol	C6HCl5O	0.01	1.00	266.336	1.9780	0.015	1.57E-03	0.056	0.0012	1.50E-06	3.2E+00	1.08E-04	2.59E-03	3.11E-03	4.28E-03
127184-100%	127-18-4	Perchloroethylene	C2Cl4	2,420	1.00	165.833	1.6230	2,420	1.62E+02	0.072	0.0014	1.83E-01	3.9E+05	1.32E+01	3.16E+02	3.79E+02	5.21E+02
108952-100%	108-95-2	Phenol	C6H6O	55	1.00	94.111	1.0545	55	2.09E+00	0.082	0.0015	2.57E-03	5.4E+03	1.85E-01	4.44E+00	5.33E+00	7.33E+00
75445-Gas	75-44-5	Phosgene	CCl2O	Gas	Gas	98.916	0.0040	--	--	--	--	2.70E-01	5.7E+05	1.94E+01	4.66E+02	5.59E+02	7.68E+02
7803512-Gas	7803-51-2	Phosphine	H3P	Gas	Gas	33.998	0.0014	--	--	--	--	9.26E-02	2.0E+05	6.67E+00	1.60E+02	1.92E+02	2.64E+02
7664382-75%	7664-38-2	Phosphoric Acid (75 %)	H3PO4	4	0.75	97.995	1.5730	1	5.32E-02	0.095	0.0017	7.24E-05	1.5E+02	5.21E-03	1.25E-01	1.50E-01	2.06E-01
7664382-85%	7664-38-2	Phosphoric Acid (85 %)	H3PO4	4	0.85	97.995	1.6850	2	8.04E-02	0.098	0.0017	1.12E-04	2.4E+02	8.03E-03	1.93E-01	2.31E-01	3.18E-01
10025873-100%	10025-87-3	Phosphorus Oxychloride	POCl3	4,970	1.00	153.331	1.645	4,970	3.07E+02	0.058	0.0012	3.01E-01	6.4E+05	2.17E+01	5.20E+02	6.25E+02	8.59E+02
9016879-100%	9016-87-9	Polymeric Methane Diphenyl Diisocyanate (PMDI)		0.0003	1.00	250.260	1.2000	0.00031	3.09E-05	0.024	0.0007	1.68E-08	3.6E-02	1.21E-06	2.91E-05	3.49E-05	4.80E-05
123386-100%	123-38-6	Propionaldehyde	C3H6O	42,200	1.00	58.079	0.8657	42,200	9.89E+02	0.102	0.0018	1.41E+00	3.0E+06	1.01E+02	2.43E+03	2.92E+03	4.01E+03
79094-100%	79-09-4	Propionic Acid	C3H6O2	553	1.00	74.079	0.9882	553	1.65E+01	0.098	0.0017	2.29E-02	4.9E+04	1.65E+00	3.96E+01	4.75E+01	6.54E+01
109604-100%	109-60-4	Propyl Acetate, n-	C5H10O2	4,490	1.00	102.132	0.8878	4,490	1.85E+02	0.072	0.0014	2.09E-01	4.4E+05	1.50E+01	3.61E+02	4.33E+02	5.95E+02
71238-100%	71-23-8	Propyl Alcohol, n-	C3H8O	2,760	1.00	60.095	0.7997	2,760	6.69E+01	0.098	0.0017	9.28E-02	2.0E+05	6.68E+00	1.60E+02	1.92E+02	2.64E+02
115071-Gas	115-07-1	Propylene	C3H6	Gas	Gas	42.080	0.0017	--	--	1.098	--	1.15E-01	2.4E+05	8.26E+00	1.98E+02	2.38E+02	3.27E+02
78875-100%	78-87-5	Propylene Dichloride	C3H6Cl2	6,620	1.00	112.986	1.1560	6,620	3.02E+02	0.0782	0.0015	3.60E-01	7.6E+05	2.59E+01	6.22E+02	7.46E+02	1.03E+03
57556-100%	57-55-6	Propylene Glycol	C3H8O2	20	1.00	76.095	1.0361	20	6.14E-01	0.093	0.0016	8.22E-04	1.7E+03	5.92E-02	1.42E+00	1.70E+00	2.34E+00
107982-100%	107-98-2	Propylene Glycol 1-Methyl Ether	C4H10O2	1,568	1.00	90.121	0.9620	1,568	5.70E+01	0.083	0.0015	7.08E-02	1.5E+05	5.10E+00	1.22E+02	1.47E+02	2.02E+02
108656-100%	108-65-6	Propylene Glycol-1-Methyl Ether-2-Acetate	C6H12O3	492	1.00	132.157	0.9570	492	2.62E+01	0.056	0.0012	2.52E-02	5.3E+04	1.81E+00	4.35E+01	5.22E+01	7.18E+01
75569-100%	75-56-9	Propylene Oxide	C3H6O	71,700	1.00	58.079	0.859	71,700	1.68E+03	0.104	0.0018	2.42E+00	5.1E+06	1.74E+02	4.19E+03	5.02E+03	6.91E+03
110861-100%	110-86-1	Pyridine	C5H5N	2,760	1.00	79.101	0.9819	2,760	8.81E+01	0.091	0.0016	1.16E-01	2.5E+05	8.37E+00	2.01E+02	2.41E+02	3.31E+02
7803625-Gas	7803-62-5	Silane	H4Si	Gas	Gas	32.118	0.0013	--	--	--	--	8.75E-02	1.9E+05	6.30E+00	1.51E+02	1.81E+02	2.50E+02
8052413-100%	8052-41-3	Stoddard Solvent		598	1.00	144.000	0.78	598	3.47E+01	0.046	0.0010	2.90E-02	6.1E+04	2.09E+00	5.01E+01	6.02E+01	8.27E+01
100425-100%	100-42-5	Styrene, Monomer	C8H8	810	1.00	104.150	0.9016	810	3.40E+01	0.071	0.0014	3.81E-02	8.1E+04	2.74E+00	6.58E+01	7.89E+01	1.09E+02
2551624-Gas	2551-62-4	Sulphur Hexafluoride	SF6	Gas	Gas	146.050	0.0060	--	--	--	--	3.98E-01	8.4E+05	2.87E+01	6.88E+02	8.25E+02	1.13E+03
7664939-100%	7664-93-9	Sulphuric Acid (100 %)	H2SO4	solution	1.00	98.080	1.8390	4.79E-03	1.89E-04	0.102	0.0017	2.69E-07	5.7E-01	1.94E-05	4.65E-04	5.57E-04	7.66E-04
7664939-78%	7664-93-9	Sulphuric Acid (78 %)	H2SO4	solution	0.78	98.080	1.7060	4.93E-05	1.95E-06	0.098	0.0017	2.71E-09	5.7E-03	1.95E-07	4.69E-06	5.62E-06	7.73E-06
7664939-93%	7664-93-9	Sulphuric Acid (93 %)	H2SO4	solution	0.93	98.080	1.8350	2.08E-03	8.23E-05	0.101	0.0017	1.17E-07	2.5E-01	8.40E-06	2.02E-04	2.42E-04	3.33E-04
7664939-98%	7664-93-9	Sulphuric Acid (98 %)	H2SO4	solution	0.98	98.080	1.8440	3.94E-03	1.56E-04	0.102	0.0017	2.21E-07	4.7E-01	1.59E-05	3.83E-04	4.59E-04	6.31E-04
109999-100%	109-99-9	Tetrahydrofuran	C4H8O	21,600	1.00	72.106	0.8892	21,600	6.28E+02	0.098	0.0017	8.71E-01	1.8E+06	6.27E+01	1.51E+03	1.81E+03	2.48E+03
108883-100%	108-88-3	Toluene	C7H8	3,790	1.00	92.139	0.8668	3,790	1.41E+02	0.087	0.0016	1.80E-01	3.8E+05	1.30E+01	3.12E+02	3.74E+02	5.14E+02
584849-100%	584-84-9	Toluene Di-Isocyanate, 2,4-	C9H6N2O2	3	1.00	174.156	1.2244	3	2.11E-01	0.061	0.0012	2.13E-04	4.5E+02	1.53E-02	3.68E-01	4.42E-01	6.07E-01
26471625-100%	26471-62-5	Toluene Di-Isocyanate, 2,4- and 2,6- (Mixed Isomers)	C9H6N2O2	3	1.00	174.156	1.2244	3	2.11E-01	0.040	0.0009	1.61E-04	3.4E+02	1.16E-02	2.79E-01	3.35E-01	4.60E-01
76131-100%	76-13-1	Trichloro-1,2,2-Trifluoroethane, 1,2,2-	C2Cl3F3	44,800	1.00	187.375	1.5635	44,800	3.39E+03	0.078	0.0015	4.03E+00	8.5E+06	2.90E+02	6.97E+03	8.36E+03	1.15E+04
120821-100%	120-82-1	Trichlorobenzene, 1,2,4-	C6H3Cl3	57	1.00	181.447	1.459	57	4.17E+00	0.0676	0.0013	4.52E-03	9.6E+03	3.25E-01	7.80E+00	9.36E+00	1.29E+01
79016-100%	79-01-6	Trichloroethylene (TCE)	C2HCl3	9,910	1.00	131.388	1.4642	9,910	5.25E+02	0.079	0.0015	6.31E-01	1.3E+06	4.54E+01	1.09E+03	1.31E+03	1.80E+03
75694-Gas	75-69-4	Trichlorofluoromethane	CCl3F	Gas	Gas	137.368	1.4879	--	--	--	--	9.92E+01	2.1E+08	7.14E+03	1.71E+05	2.06E+05	2.83E+05
76051-100%	76-05-1	Trifluoroacetic Acid	C2HF3O2	15,100	1.00	114.023	1.5351	15,100	6.95E+02	0.082	0.0015	8.55E-01	1.8E+06	6.15E+01	1.48E+03	1.77E+03	2.44E+03
75503-40%	75-50-3	Trimethylamine (40 %)	C3H9N	45,982	0.40	59.110	0.627	7,763	1.85E+02	0.095	0.0017	2.52E-01	5.3E+05	1.81E+01	4.35E+02	5.21E+02	7.17E+02
526738-100%	526-73-8	Trimethylbenzene, 1,2,3- (individual isomer or Trimethylbenzene mixture)	C9H12	200	1.00	120.191	0.8944	200	9.70E+00	0.061	0.0012	9.83E-03	2.1E+04	7.08E-01	1.70E+01	2.04E+01	2.80E+01
95636-100%	95-63-6	Trimethylbenzene, 1,2,4- (individual isomer or Trimethylbenzene mixture)	C9H12	300	1.00	120.191	0.8758	300	1.45E+01	0.061	0.0012	1.47E-02	3.1E+04	1.05E+00	2.53E+01	3.04E+01	4.18E+01
108678-100%	108-67-8	Trimethylbenzene, 1,3,5- (individual isomer or Trimethylbenzene mixture)	C9H12	330	1.00	120.191	0.8615	330	1.60E+01	0.060	0.0012	1.60E-02	3.4E+04	1.15E+00	2.77E+01	3.32E+01	4.57E+01
75014-Gas	75-01-4	Vinyl Chloride	C2H3Cl3	Gas	Gas	62.498	0.0026	--	--	--	--	1.70E-01	3.6E+05	1.23E+01	2.94E+02	3.53E+02	4.86E+02
75354-100%	75-35-4	Vinylidene Chloride	C2H2Cl2	80,000	1.00	96.943	1.213	80,000	3.13E+03	0.09	0.0016	4.10E+00	8.7E+06	2.95E+02	7.08E+03	8.50E+03	1.17E+04
1330207-100%	1330-20-7	Xylene (o,m, p-Isomers)	C8H10	1,067	1.00	106.165	0.8655	1,067	4.57E+01	0.069	0.0013	4.99E-02	1.1E+05	3.59E+00	8.62E+01	1.03E+02	1.42E+02

	O. REG. 419/05 LIMITS												COMPARISON TO O. REG. 419/05 LIMITS				STATUS	USAGE RESTRICTION	
Col 1	Col 16				Col 17				Col 18				Col 19				Col 20	Col 21	Col 22
Index Number (CAS Number + Solution Strength)	24 Hour O.Reg. 419/05 Limit (μg/m^3)	1 Hour O.Reg. 419/05 Limit (μg/m^3)	0.5 Hour O.Reg. 419/05 Limit (μg/m^3)	0.17 Hour O.Reg. 419/05 Limit (μg/m^3)	24 Hour O.Reg. 419/05 Limiting Effect	1 Hour O.Reg. 419/05 Limiting Effect	0.5 Hour O.Reg. 419/05 Limiting Effect	0.17 Hour O.Reg. 419/05 Limiting Effect	24 Hour O.Reg. 419/05 Status	1 Hour O.Reg. 419/05 Status	0.5 Hour O.Reg. 419/05 Status	0.17 Hour O.Reg. 419/05 Status	24 Hour Percentage of Limit Guideline (%)	1 Hour Percentage of Limit Guideline (%)	0.5 Hour Percentage of Limit Guideline (%)	0.17 Hour Percentage of Limit Guideline (%)	Usage Restriction Required (Yes/No)	Maximum Mass-Based Chemical Usage (g/hour)	Maximum Volume-Based Chemical Usage @25ºC (mL/hour)
7647010-Gas	20	--	--	--	Health	--	--	--	3	--	--	--	36%	--	--	--	No	--	--
74908-100%	8	--	--	--	Health	--	--	--	3	--	--	--	2141%	--	--	--	Yes	400	582
7664393-Gas	0.86	--	--	--	Vegetation	--	--	--	3	--	--	--	456%	--	--	--	Yes	43	52590
7722841-35%	30	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
7722841-50%	30	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
7722841-70%	30	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
7722841-90%	30	--	--	--	Health	--	--	--	Guideline	--	--	--	2%	--	--	--	No	--	--
7783064-Gas	7	--	--	13	Health	--	--	Odour	3	--	--	3	96%	--	--	2037%	Yes	16	11784
78831-100%	4600	--	--	2340	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	7%	No	--	--
110190-100%	--	--	--	1660	--	--	--	Odour	--	--	--	Guideline	--	--	--	20%	No	--	--
108214-100%	--	--	--	2000	--	--	--	Odour	--	--	--	Guideline	--	--	--	52%	No	--	--
67630-100%	7300	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
98828-100%	400	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
108203-100%	110000	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
121755-100%	120	--	--	--	Particulate	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
7439976-100%	2	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
79414-100%	2000	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
101688-100%	0.7	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
67561-100%	4000	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
96333-100%	--	4	--	--	--	Odour	--	--	--	Guideline	--	--	--	20970%	--	--	Yes	8	9
74839-Gas	1350	--	--	--	Health	--	--	--	Guideline	--	--	--	1%	--	--	--	No	--	--
74873-Gas	320	--	--	--	Heatlh	--	--	--	3	--	--	--	3%	--	--	--	No	--	--
71556-100%	115000	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
78933-100%	1000	--	--	--	Health	--	--	--	3	--	--	--	3%	--	--	--	No	--	--
108101-100%	1200	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
624839-100%	1	--	--	--	Health	--	--	--	3	--	--	--	14724%	--	--	--	Yes	50	54
74931-Gas	--	--	--	13	--	--	--	Odour	--	--	--	3	--	--	--	2875%	Yes	16	8349
80626-100%	860	--	--	--	Odour	--	--	--	Guideline	--	--	--	2%	--	--	--	No	--	--
119368-100%	100	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
1634044-100%	7000	--	--	--	Health	--	--	--	Guideline	--	--	--	1%	--	--	--	No	--	--
110123-100%	--	--	--	630	--	--	--	Odour	--	--	--	Guideline	--	--	--	15%	No	--	--
109875-100%	6200	--	--	--	Health	--	--	--	Guideline	--	--	--	2%	--	--	--	No	--	--
12108133-100%	10	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
75092-100%	220	--	--	--	Health	--	--	--	3	--	--	--	92%	--	--	--	No	--	--
75116-100%	65	--	--	--	Health	--	--	--	Guideline	--	--	--	1%	--	--	--	No	--	--
74895-40%	25	--	--	--	Odour	--	--	--	Guideline	--	--	--	119%	--	--	--	Yes	1250	4764
8030306-100%	2600	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
91203-100%	22.5	--	--	50	Health	--	--	Odour	Guideline	--	--	Guideline	<1%	--	--	3%	No	--	--
90153-100%	100	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
13463393-100%	0.5	--	--	--	Health	--	--	--	3	--	--	--	42400%	--	--	--	Yes	25	19
7697372-70%	35	--	--	--	Corrosion	--	--	--	3	--	--	--	5%	--	--	--	No	--	--
55630-100%	3	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
10024972-Gas	9000	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
111659-100%	--	--	--	61800	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	No	--	--
112801-100%	--	5	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	No	--	--
144627-100%	25	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
90438792-100%	85	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
88230357-100%	85	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
10028156-Gas	--	165	--	--	--	Health	--	--	--	3	--	--	--	137%	--	--	Yes	344	175234
19624227-100%	1	--	--	--	Health	--	--	--	3	--	--	--	5442%	--	--	--	Yes	50	82
87865-100%	20	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
127184-100%	360	--	--	--	Health	--	--	--	3	--	--	--	4%	--	--	--	No	--	--
108952-100%	30	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
75445-Gas	45	--	--	--	Health	--	--	--	3	--	--	--	43%	--	--	--	No	--	--
7803512-Gas	10	--	--	--	Health	--	--	--	Guideline	--	--	--	67%	--	--	--	No	--	--
7664382-75%	7	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
7664382-85%	7	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
10025873-100%	12	--	--	--	Health	--	--	--	Guideline	--	--	--	181%	--	--	--	Yes	600	365
9016879-100%	0.7	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
123386-100%	--	--	--	10	--	--	--	Odour	--	--	--	Guideline	--	--	--	40137%	Yes	13	15
79094-100%	--	100	--	--	--	Odour	--	--	--	Guideline	--	--	--	40%	--	--	No	--	--
109604-100%	6600	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
71238-100%	16000	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
115071-Gas	4000	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
78875-100%	2400	--	--	--	Odour	--	--	--	Guideline	--	--	--	1%	--	--	--	No	--	--
57556-100%	120	--	--	--	Particulate	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
107982-100%	--	--	--	121000	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	No	--	--
108656-100%	5000	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
75569-100%	1.5	--	--	--	Health	--	--	--	3	--	--	--	11630%	--	--	--	Yes	75	87
110861-100%	150	--	--	80	Health	--	--	Odour	Guideline	--	--	Guideline	6%	--	--	414%	Yes	101	103
7803625-Gas	150	--	--	--	Health	--	--	--	Guideline	--	--	--	4%	--	--	--	No	--	--
8052413-100%	2600	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
100425-100%	400	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
2551624-Gas	600000	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
7664939-100%	5	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
7664939-78%	5	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
7664939-93%	5	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
7664939-98%	5	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
109999-100%	93000	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
108883-100%	2000	--	--	--	Odour	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
584849-100%	0.2	--	--	--	Health	--	--	--	3	--	--	--	8%	--	--	--	No	--	--
26471625-100%	0.2	--	--	--	Health	--	--	--	3	--	--	--	6%	--	--	--	No	--	--
76131-100%	800000	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
120821-100%	400	--	--	--	Health	--	--	--	Guideline	--	--	--	<1%	--	--	--	No	--	--
79016-100%	12	--	--	--	Health	--	--	--	3	--	--	--	378%	--	--	--	Yes	600	410
75694-Gas	6000	--	--	--	Health	--	--	--	Guideline	--	--	--	119%	--	--	--	Yes	300049	201659
76051-100%	15	--	--	--	Health	--	--	--	Guideline	--	--	--	410%	--	--	--	Yes	750	489
75503-40%	--	0.5	--	--	--	Odour	--	--	--	Guideline	--	--	--	86913%	--	--	Yes	1	4
526738-100%	220	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
95636-100%	220	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
108678-100%	220	--	--	--	Health	--	--	--	3	--	--	--	<1%	--	--	--	No	--	--
75014-Gas	1	--	--	--	Health	--	--	--	3	--	--	--	1226%	--	--	--	Yes	50	19575
75354-100%	10	--	--	--	Health	--	--	--	3	--	--	--	2950%	--	--	--	Yes	500	412
1330207-100%	730	--	--	3000	Health	--	--	Odour	3	--	--	Guideline	<1%	--	--	5%	No	--	--

APPENDIX G

NO_X Monitoring

MEMORANDUM

DATE:	2020-09-29	**RWDI Reference No.:** 1803937
TO:	Mohamed Kamel H.H. Angus & Associates Ltd.	**EMAIL:** mohamed.kamel@hhangus.com
FROM:	Alain Carriere	**EMAIL:** alain.carriere@rwdi.com
RE:	**NOx Monitoring in Air Handling Units: Summary of NOx monitoring data Toronto Western Hospital RWDI #1803937**	

Dear Mohamed,

The current memo documents the monitoring of total oxides of nitrogen (NOx) in air handling units which could be potentially re-entraining combustion exhausts from emergency generators during routine weekly testing. RWDI is completing work for UHN to update the environmental permit (EASR) for the TWH hospital facility. This memo is a summary of the NOx spot measurements within the plenum of the appropriate air intakes taken during each weekly generator testing activity. The purpose of the monitoring program was not to establish the actual levels of NOx (which were expected to be low, and likely below the instrument detection limit), but to confirm that elevated levels are not present in the air intakes during generator testing. This brief memo includes the monitoring program results, methodology and overall conclusions.

Numerical modelling of potential air contaminant levels (for NOx) had indicated predicted levels above "point-of-impingement" (POI) guideline limits established by the Ministry of the Environment, Conservation and Parks (MECP). The POI guideline limit for NOx in this case is 500 µg/m^3 (0.5-hour averaging period), which applies to testing of standby power systems. In RWDI's experience, however, the model available for generating these predictions (ASHRAE), has significant limitations in modelling the complex environments typical of a multi-building hospital with complex geometry. It was suspected that the model was overpredicting actual NOx levels at air intakes during generator testing, and the monitoring program was therefore developed to investigate whether high NOx levels were actually impacting air intakes during these tests.

The objectives of the NOx monitoring program were:

- To confirm or revise the initial numerical modeling assessment of potential air quality levels, wherein elevated NOx concentrations were predicted to be re-entrained into certain air intakes servicing patient areas within the hospital;
- To evaluate which intake(s) would be affected by generator testing, dependent on the prevailing wind direction and;
- To collect approximately a dozen representative spot measurements of NOx levels at intakes during generator testing over the course of a three-month monitoring program.

NOx Monitoring

RWDI completed NOx measurements at the air handling locations that could be potentially impacted by the routine testing of Main Pavilion and KDT generators. One (1) hour of monitoring data was collected during the weekly generator test activity. The air intakes to be measured were chosen depending on which generator was tested and the wind direction for that time period. The weather station located at Toronto Island was chosen to assess the prevailing wind conditions before choosing the monitoring location (air handling unit). Based on Table 1, wind directions were confirmed by RWDI personnel upon arrival at TWH and appropriate air intake was chosen. Figure 1 depicts the generator exhaust locations.

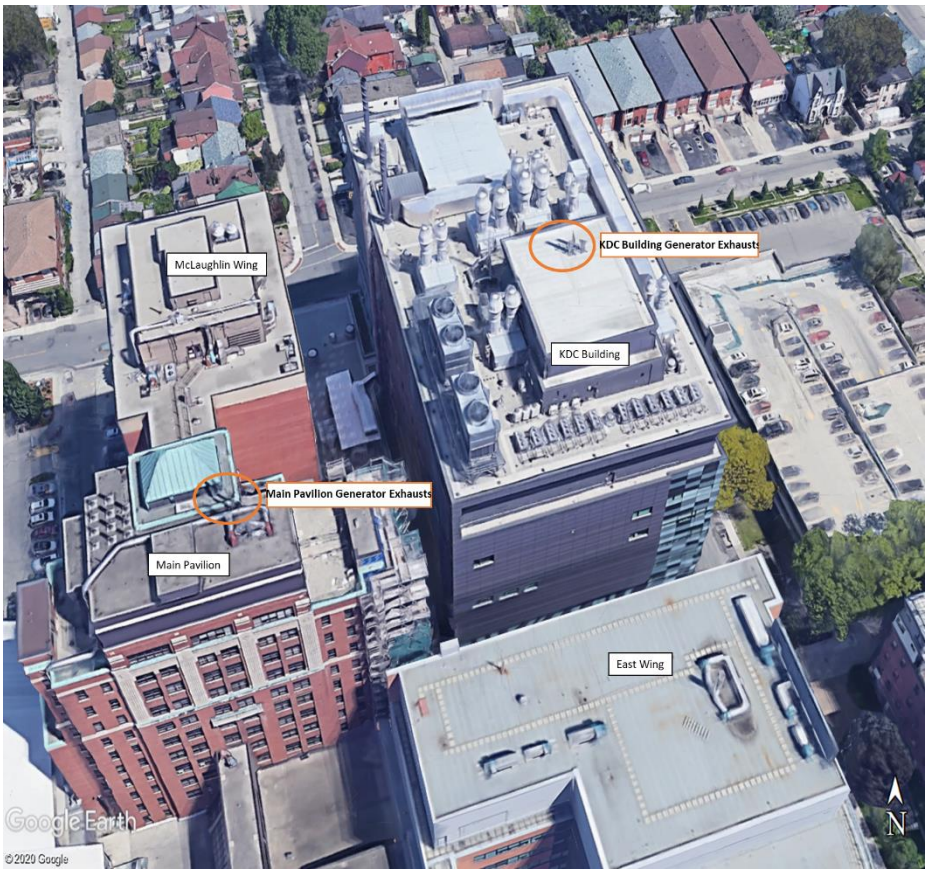
Table 1: Summary of Affected Air Intakes and Wind Directions of Concern

Operating Scenario	Affected Air Intakes	Wind Directions of Concern
Main Pavilion Generator Testing	Main Pavilion AHU 1	S
	KDC Air Intake	W, SW
KDC Building Generator Testing	Main Pavilion AHU 1	E, NE
	KDC Air Intake	E
	McLaughlin Wing Air Intake	E, SE

Notes: Emergency generators are tested at 100% load. Only one emergency generator is operated at a time.

The goal of this monitoring program was not to establish the actual levels of NOx (which were expected to be low, and likely below the limit of detections of the ECOM-D analyzer), but to confirm that elevated levels were not present in the air intakes during the generator testing.

Figure 2: Generator Exhaust Locations



A hand-held ECOM-D analyzer was chosen to conduct the NOx measurements. The process involved inserting the probe into the plenum of the chosen air intake through the available test ports. A pre and post monitoring car exhaust check was performed to verify and validate the instrument response and drift to combustion gases from a normal gasoline engine.

A total of 12 testing activities (12- 1*hour NOx measurements) were conducted.

Overall, at the completion of the monitoring program, observed average NOx results were zero (O) ppm for 11 of the 12 measurements taken during the test period. On June 6th, during testing of the KDT unit, occasional 1ppm NOx readings were observed in the ECOM. Average data for the run duration was around 0.40 ppm (752µg/m^3).

Results of the monitoring program have been summarized in Table 2.

These results provide evidence to support RWDI's suspicion that the modeling results were overpredicting NOx levels at the air intakes.

Table 2: Summary of NOx monitoring program

Date	Measurement Time	Generator	Air Intake	Prevailing Wind Condition	Average NOx concentration (ppmvd)[1]
Thursday, May 28, 2020	5-6am	Main Pavilion	Main Pavilion AHU	E-SE	0
Wednesday, June 3, 2020	8:25-9:25am	KDT	Mclaughlin Wing Air Intake	S-SE	0.40
Thursday, June 11, 2020	5-6am	Main Pavilion	KDT Air Intake	S-SW	0
Thursday, June 25, 2020	5-6am	Main Pavilion	KDT Air Intake	SW	0
Thursday, July 2, 2020	4:45-5:45am	Main Pavilion	KDT Air Intake	N,NW	0
Thursday, July 16, 2020	4:45-5:45am	Main Pavilion	Main Pavilion AHU	E,NE	0
Thursday, July 23, 2020	4:45-5:45am	Main Pavilion	Main Pavilion AHU	N	0
Thursday, July 30, 2020	4:45-5:58am	Main Pavilion	KDT Air Intake	W	0
Thursday, August 13, 2020	4:45-5:45	Main Pavilion	Main Pavilion AHU	N	0
Thursday, August 28, 2020	4:45 - 5:45	Main Pavilion	Main Pavilion AHU	NE	0
Thursday, September 10, 2020	4:45-5:45	Main Pavilion	Main Pavilion AHU	E-NE	0
Friday, September 11, 2020	9:00-10:00	KDT	Mclaughlin Wing Air Intake	N-NW	0

Notes: [1] ppmvd= parts per millions volume dry.