34-0222

November 8, 2019

Matt Hoffman
Oregon Department of Environmental Quality
Northwest Region
2020 SW Fourth Ave Suite 400
Portland, OR 97201

Re: QTS Investment Properties Hillsboro, LLC
Cleaner Air Oregon Level 1 Risk Assessment
Hillsboro, Oregon

Dear Mr. Hoffman:

QTS Investment Properties Hillsboro, LLC ("QTS", "the facility") is submitting the attached revised Level 1 Risk Assessment (the assessment) for the Standard Air Contaminant Discharge Permit (ACDP) application as required by Cleaner Air Oregon (CAO). A revised Standard ACDP application and a revised Level 1 Risk Assessment Modeling Protocol are being submitted to the Oregon Department of Environmental Quality (ODEQ) simultaneously with this assessment.

The facility is located at 4950 NE Huffman Street, Hillsboro, Oregon, currently designated as in attainment or unclassifiable for all criteria pollutants. With this revised submittal, QTS is addressing all comments in the letter from ODEQ dated October 11, 2019 regarding the submittal on September 12, 2019 and is proposing the installation and operation of four (4) emergency generators (GN01 – GN04) instead of nine, to meet the actual demand of the first upcoming project. QTS will start the permitting process for the additional emergency generators once the timeline of the next project phase of the facility is known. This assessment follows the established guidance for a Level 1 Risk Assessment under OAR 340-245-0040(8). The following documentation is updated and included in this assessment:

- Appendix A: Level 1 Risk Assessment;
- Appendix B: Oregon DEQ Form AQ405; and,
- Appendix C: Engine Manufacturer Specifications and Supporting Information.

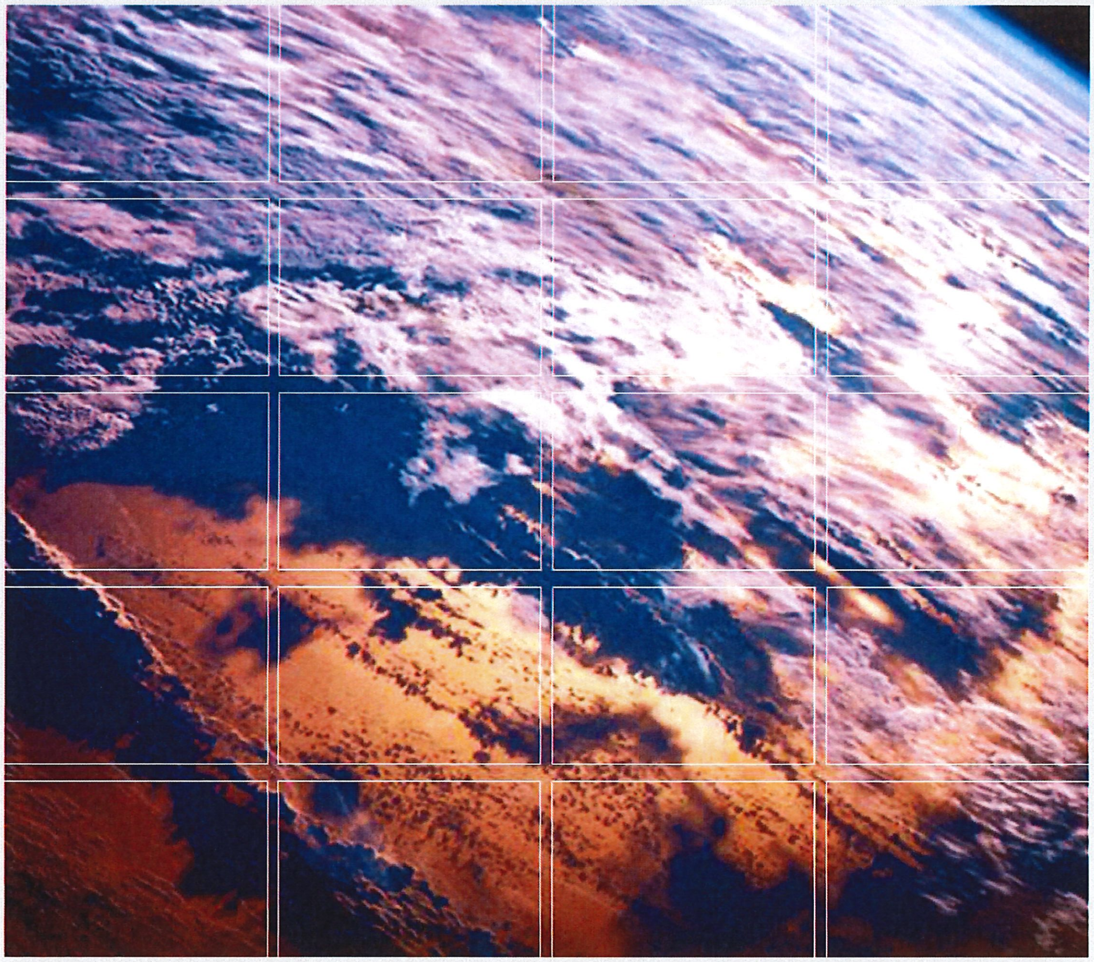
If you or your staff require any additional information regarding this request, please contact me at (678) 835-5215 or Tiffany Johnston of Environmental Resources Management (ERM) at (513) 830-9062.

Sincerely,

Laney Marinich

Laney Marinich,
Vice President – Property Development

cc: William Fowler, QTS
Tiffany Johnston, ERM



Level 1 Risk Assessment Revision 1

QTS Investment Properties Hillsboro, LLC

8 November 2019

Project No.: 0483509

The business of sustainability

ERM

Signature Page

8 November 2019

Level 1 Risk Assessment Revision 1

QTS Investment Properties Hillsboro, LLC

Tiffany A. Johnston
Partner-In-Charge

Environmental Resources Management, Inc.

9825 Kenwood Road, Suite 100

Cincinnati, Ohio 45242

513-830-9030

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1. INTRODUCTION

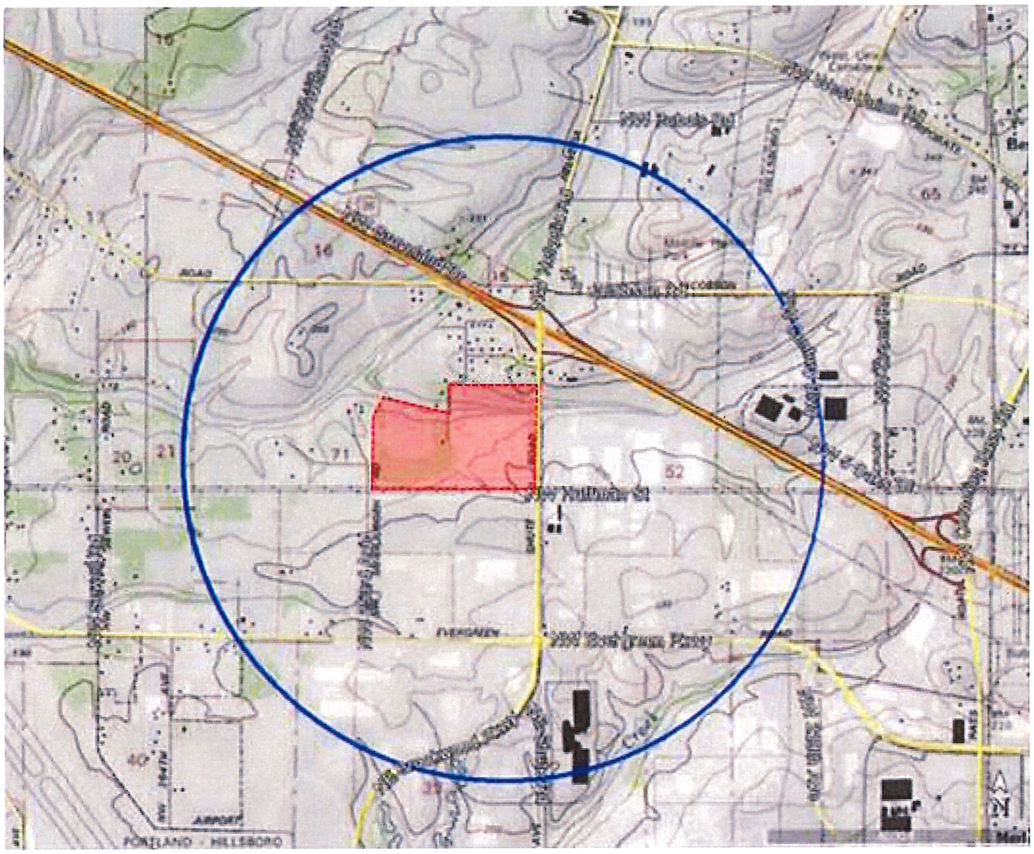
On behalf of QTS Investment Properties Hillsboro, LLC ("QTS", "the facility"), Environmental Resources Management, Inc. (ERM) submits this revised Level 1 Risk Assessment (assessment) for their Standard Air Contaminant Discharge Permit (ACDP) application (the permit application) as required by Cleaner Air Oregon (CAO). QTS received a letter from the Oregon Department of Environmental Quality (ODEQ), dated October 11, 2019, requesting additional information, corrections, and updates regarding the submittal on September 12, 2019. With this revised submittal, QTS is addressing all comments in the letter from ODEQ, and is proposing to the installation and operation of four emergency generators (GN01 – GN04) instead of nine to meet the actual demand of the first upcoming project. A revised permit application and a revised Level 1 Risk Assessment Modeling Protocol are being submitted to ODEQ simultaneously with this assessment.

QTS proposes to construct and operate four (4) diesel-fired emergency generators and their associated fuel storage tanks at a new data center located at 4950 NE Huffman Street, Hillsboro, Oregon, Washington County. QTS will maintain compliance with the Generic Plant Site Emission Limits (PSEL) for all criteria pollutants pursuant to OAR 340-200-0020(72). The new emergency generators will additionally be subject to New Source Performance Standards (NSPS), Subpart IIII. They will be equipped with a non-resettable hour meter and will not operate for greater than 100 hours per year for maintenance and testing purposes. The generators will comply with EPA Tier 2 emission standards, and the engines will comply with the fuel requirements of this subpart by using only 15 parts per million (ppm) or lower sulfur diesel fuel.

This assessment follows the established guidance for a Level 1 Risk Assessment under OAR 340-245-0040(8). The assessment contains a characterization of the proposed sources along with the emission rates to be assessed on both a short-term and long-term basis; the locations for residential, non-residential child, non-residential worker, and acute exposures; and the associated risks for residential cancer and non-cancer risk, non-residential child cancer and non-cancer risk, non-residential worker cancer and non-cancer risk, and acute non-cancer risk.

2. FACILITY DESCRIPTION

The facility is located at 4950 NE Huffman Street, Hillsboro, Oregon in Washington County. The proposed emergency generators (GN01 – GN04) are identical units with vertical stacks. The facility is surrounded by commercial development to the east, and residential development to the north, west and south. GN04 was used as the representative stack location for determining the distances to the respective risk receptors. An aerial view of the facility shown in Figure 2-1 shows the site location marked on a United States Geologic Survey (USGS) topographic map, with the surrounding 1.5 kilometers (km) indicated by the blue circle. Each emergency generator is conservatively estimated to be equipped with a stack of five (5) meters.



Site Boundary

1.5 km radius

Environmental Resources Management, Inc.
Quality Investment Properties Hillsboro, LLC
Hillsboro, OR
Site Location Map

DESIGN: BW	CHKD: LK	
DATE: [illegible]	SCALE:	REV.:
W.O.NO.:		

ERM

Figure 2-1: Site Location Map

2.1 Exposure Locations

The nearest exposure locations for *residential*, *non-residential child*, *non-residential worker* and *acute* were determined and used to reference the most conservative dispersion factors from OAR 340-245-8050, Table 5. Both the zoning of the area and the actual use of the surrounding area was used to make these selections. A zoning map indicating surrounding residential, commercial/industrial, and school/daycare zones are included in Figure 2-6. In a Level 1 Risk Assessment, the nearest exposure locations for each risk category will drive the Risk Assessment.

1. *Residential: any area zoned residential, or where satellite imagery or local knowledge indicates a home (e.g., a farmhouse on a parcel zoned for agriculture).*

   The surrounding residential area was physically surveyed prior to making the residential risk receptor determination. Abandoned residential structures located in agricultural zones closer to the facility were excluded. As shown in Figure 2-2, the closest residential location to the proposed emission units is 5840 NW Birch Ave, Hillsboro, OR 97124. Using OAR 340-245-8050 Table 5, the distance to this location is conservatively estimated to be 400 meters.

2. *Non-Residential Child: Any non-residential building where a child is expected to spend significant time during the day. This includes schools and daycares.*

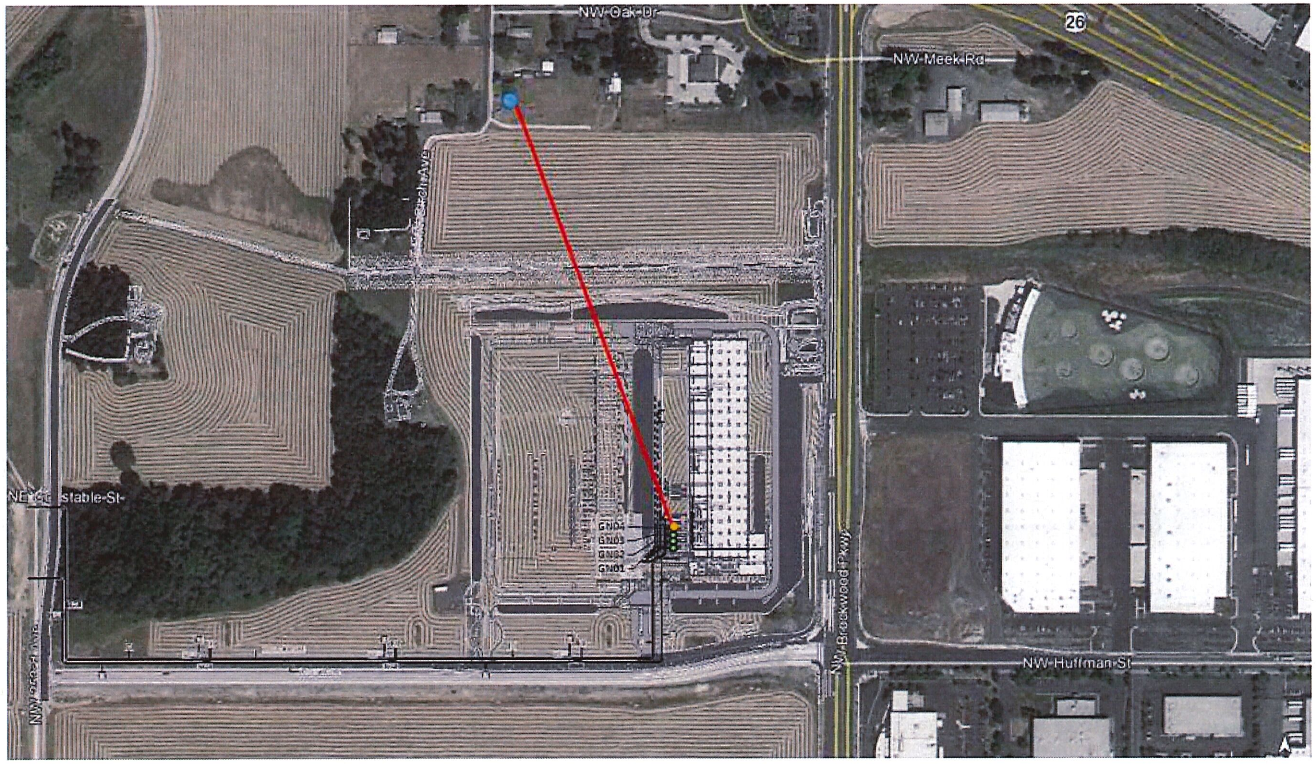
   As shown in Figure 2-3, the closest school or daycare, including all registered in-home daycares, is the Bright Start Learning Center, located at 5170 NE Five Oaks Dr, Hillsboro, OR 97124. Using OAR 340-245-8050 Table 5, the distance to this location is conservatively estimated to be 1,850 meters.

3. *Non-Residential Worker: Any area zoned industrial/commercial where the public is not expected to spend much time.*

   The closest area or facility zoned either industrial or commercial is the Topgolf located at 5505 NE Huffman St, Hillsboro, OR 97124, shown in Figure 2-4. Using OAR 340-245-8050 Table 5, the distance to this location is conservatively estimated to be 170 meters.

4. *Acute: Any area where people congregate for a few hours but exposure is not expected to occur each day. This includes parks, pools, golf courses, cemeteries, etc.*

   After a review of nearby potential areas of public congregation, Topgolf was found to be the closest such location. The location is listed above for Non-Residential Worker exposure location. Using OAR 340-245-8050 Table 5, the distance to this location is conservatively estimated to be 170 meters, as shown in Figure 2-5.



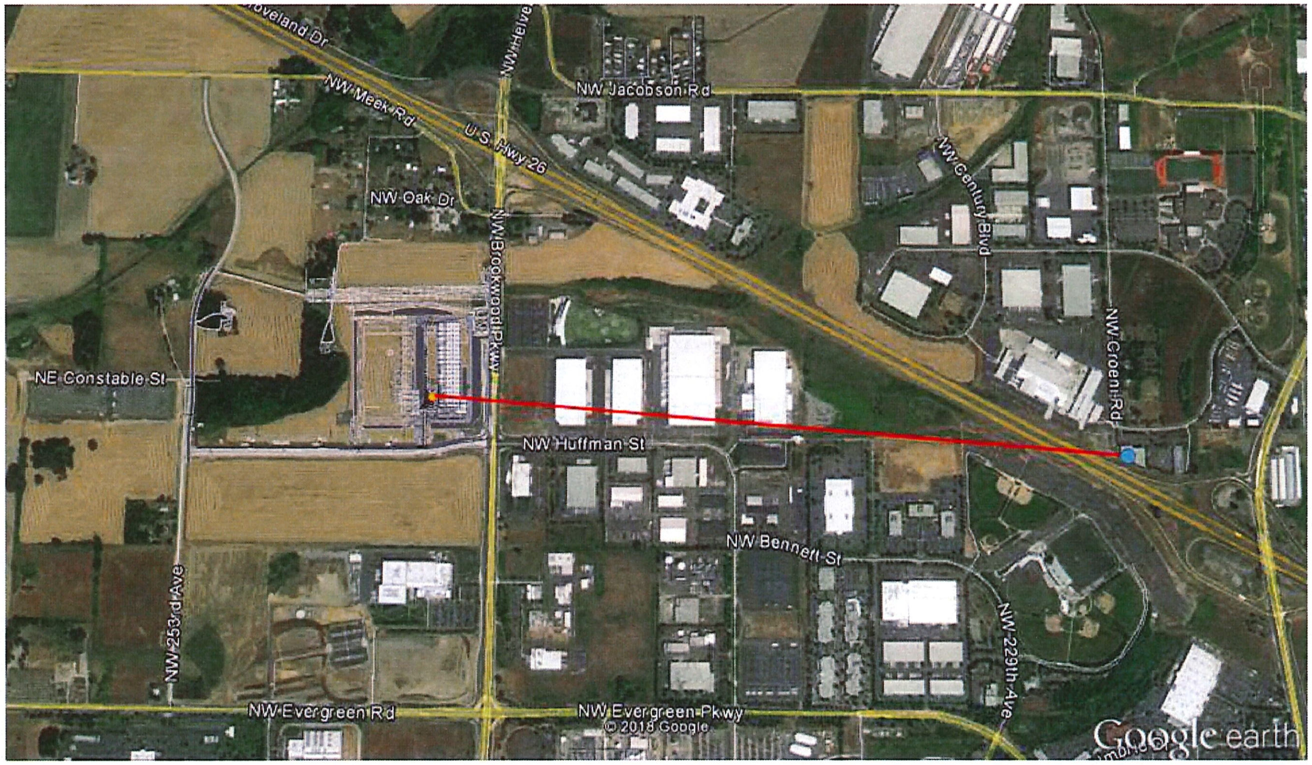
- Residential Risk Receptor - 5840 NW Birch Ave, Hillsboro, OR 97124
- GN04
- Exposure Location Distance (Conservatively estimated to be 400 meters)

Environmental Resources Management, Inc.
Quality Investment Properties Hillsboro, LLC
Hillsboro, OR
Exposure Location Distance Map
Residential

DESIGN: BW	CHKD.: LK	
DATE: 10/23/2019	SCALE:	REV.:
W.O.NO.:		

ERM

Figure 2-2: Residential Risk Receptor Location



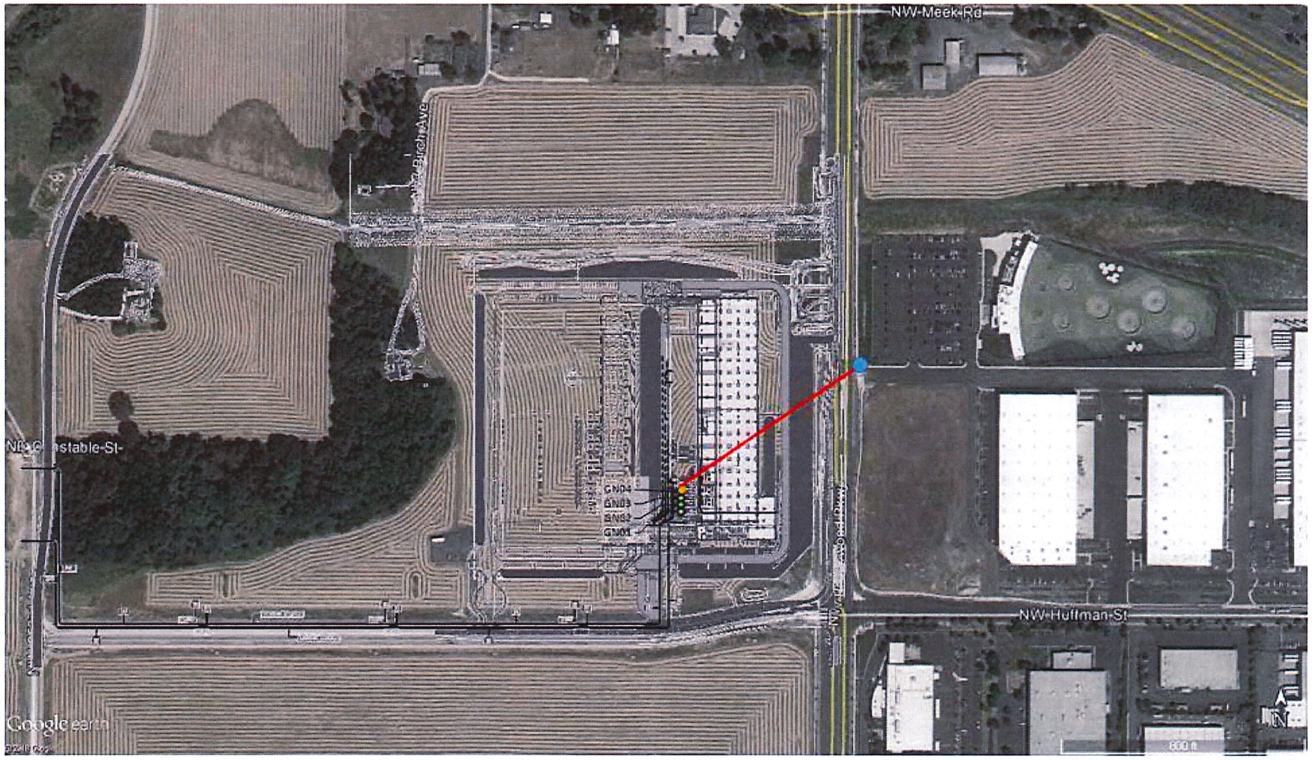
- Non-Residential Child Cancer Risk Receptor - 5170 NE Five Oaks Dr, Hillsboro, OR 97124
- GN04
- Exposure Location Distance (Conservatively estimated to be 1,850 meters)

Environmental Resources Management, Inc.
Quality Investment Properties Hillsboro, LLC
Hillsboro, OR
Exposure Location Distance Map
Non-residential Child

DESIGN: SW	CHKD.: LK	
DATE: 10/23/2019	SCALE:	REV.:
W.O.NO.:		

ERM

Figure 2-3: Non-Residential Child Cancer Risk Receptor Location



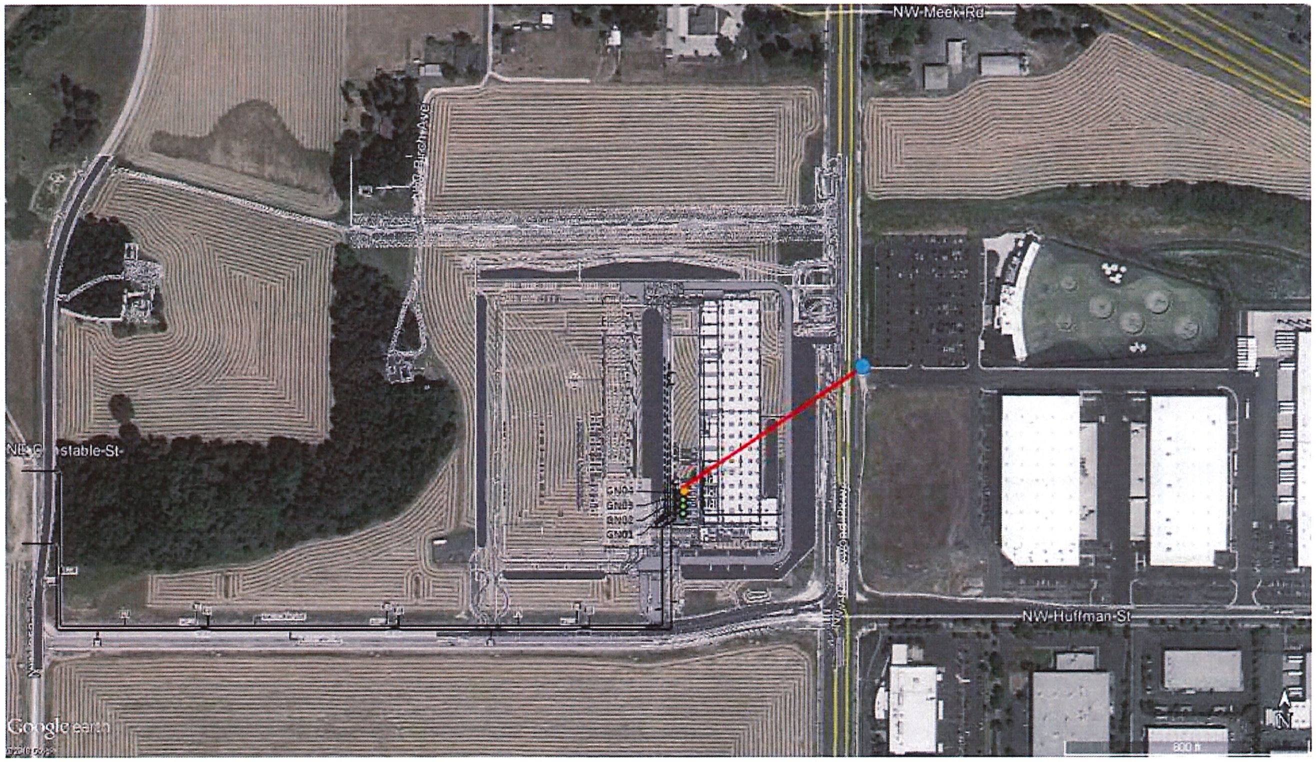
- Non-Residential Worker Risk Receptor - 5505 NE Huffman St, Hillsboro, OR 97124
- GN04
- Exposure Location Distance (Conservatively estimated to be 170 meters)

Environmental Resources Management, Inc.
Quality Investment Properties Hillsboro, LLC
Hillsboro, OR
Exposure Location Distance Map
Non-residential Worker

DESIGN: BW	CHKD.: LK	
DATE: 10/23/2019	SCALE:	REV.:
W.O.NO.:		

ERM

Figure 2-4: Non-Residential Worker Risk Receptor Location



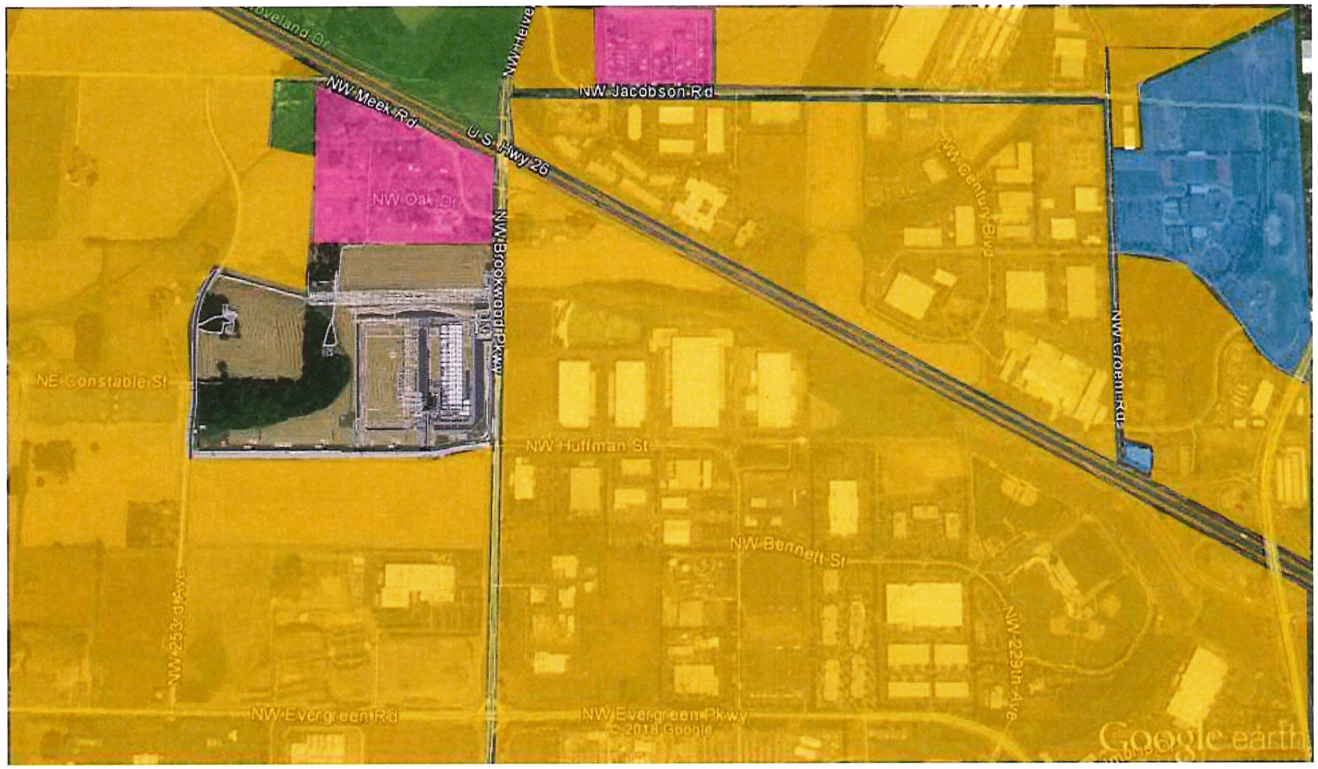
Acute Non-Cancer Risk Receptor - 5505 NE Huffman St, Hillsboro, OR 97124
GN04
Exposure Location Distance (Conservatively estimated to be 170 meters)

Environmental Resources Management, Inc.
Quality Investment Properties Hillsboro, LLC
Hillsboro, OR
Exposure Location Distance Map
Acute

DESIGN: BW	CHKD.: LK	
DATE: 10/23/2019	SCALE:	REV.:
W.O.NO.:		

ERM

Figure 2-5: Acute Non-Cancer Risk Receptor Location



Farmland
Residential
School/Daycare
Commercial/Industrial

Zoning map created based on Oregon Washington County Assessment and Taxation

Environmental Resources Management, Inc.
Quality Investment Properties Hillsboro, LLC
Hillsboro, OR
Zoning Map

DESIGN: YS	CHKD.: LK	
DATE: 10/23/2019	SCALE:	REV.:
W.O.NO.:		

ERM

Figure 2-6: Zoning Map

3. EMISSION RATES

The derivation of emission rates for toxic air contaminants for this assessment for the proposed emergency generators is based on the South Coast Air Quality Management District (SCAQMD) Supplemental Instructions of Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory, Table B-2. As specified by ODEQ, emission rates of diesel particulate matter (DPM) include condensable particulate matter (PM) represented by emission rates of hydrocarbons (HC), which are based on manufacturer specifications for MTU 16V4000G84S for standby operation. The toxic pollutant potential emissions were determined using the emission rates discussed in this section and fuel consumption rates from manufacturer specifications. These calculations also include a "black puff" emission factor to account for engine cold starts as described in Appendix A. The manufacturer specifications and SCAQMD documentation is included in Appendix C.

The corresponding risk based concentration (RBC) values for both cancer and non-cancer risks were then determined using the dispersion factors in conjunction with the emission rate of each toxic air pollutant and the respective RBCs as referenced in OAR 340-245-8040 Table 4. The acute RBC for the facility is based on a maximum of 20 aggregate operating hours from the generators operating at 100% load, or the maximum potential short-term operating scenario proposed for the site. This scenario is represented by one generator operating for 20 hours in this assessment. Four generators operating for five hours each, or any other equivalent combination of daily generator operation, can also represent this scenario.

The Risk Action Levels (RAL) for both cancer and non-cancer risks for all emergency generators are summarized in Table 3-1 below. The results from this revision indicate residential cancer RAL at 7.26, with the remaining cancer and non-cancer RAL all below 1. QTS understands and will follow all community engagement requirements for new facilities with an RAL above 5 and below 10. Pursuant OAR 340-245-0120, QTS will engage in any public meetings or public notice to ensure that consideration of environmental justice is appropriately emphasized.

Table 3-1: Cancer and Non-cancer Risk Action Levels

Risk Type	Facility-Wide RBC	Community Engagement Level
Residential Cancer RBC (Risk per Million)	7.26	5 - 10
Residential Non-cancer RBC (Hazard Index)	0.09	1
Child Cancer RBC (Risk per Million)	0.05	5 - 10
Child Non-cancer RBC (Hazard Index)	0.0025	1
Worker Cancer RBC (Risk per Million)	0.95	5 - 10
Worker Non-cancer RBC (Hazard Index)	0.05	1

APPENDIX A LEVEL 1 RISK ASSESSMENT

QTS Hillsboro Level 1 Risk Assessment

CAS Number	Chemical Name	Emission Factor[1] (lb/Mgal) (BAAQMD)	Fuel Usage[3] (gal/hour)	Annual Emission Rate (lb/year)	Excess Cancer Risk and Chronic Noncancer Risk[4]						Acute Noncancer Risk[5]	
					Residential Cancer RBC (Risk per Million)	Residential Non-Cancer RBC (Hazard Index)	Child Cancer RBC (Risk per Million)	Child Non-Cancer RBC (Risk per Million)	Worker Cancer RBC (Risk per Million)	Worker Non-Cancer RBC (Hazard Index)	24 Hr Average Emission Rate (lb/day)	Acute RBC
71-43-2	Benzene	0.1863		12.15	9.3E-03	4.0E-04	8.1E-05	2.1E-05	3.7E-03	4.3E-04	0.61	0.03
106-99-0	1,3-Butadiene	0.2174		14.17	0.043	7.1E-04	3.6E-04	3.5E-05	0.016	7.4E-04	0.71	1.5E-03
50-32-8	Benzo[a]pyrene (non-cancer only)	0.0000355		0.0023	-	1.2E-04	3.2E-05	5.8E-06	-	1.2E-04	1.2E-04	0.081
7440-43-9	Cadmium	0.0015		0.10	0.017	2.0E-03	1.5E-04	5.8E-05	6.7E-03	1.2E-03	4.9E-03	0.228
50-00-0	Formaldehyde	1.7261		112.54	0.066	1.3E-03	5.8E-04	6.2E-05	0.026	1.3E-03	5.63	0.161
18540-29-9	Hexavalent Chromium	0.0001		0.007	0.021	7.9E-06	2.8E-04	1.6E-07	3.0E-03	3.4E-06	3.3E-04	1.5E-03
7440-38-2	Arsenic	0.0016		0.10	0.43	0.061	1.8E-03	9.6E-04	0.077	0.020	5.2E-03	0.04
7439-92-1	Lead	0.0083		0.54	-	3.6E-04	-	1.8E-05	-	3.8E-04	0.03	0.253
7440-02-0	Nickel	0.0039		0.25	6.7E-03	1.8E-03	5.6E-05	9.0E-05	2.5E-03	1.9E-03	0.01	0.089
107-02-8	Acrolein	0.0339		2.21	-	6.3E-04	-	3.2E-05	-	6.8E-04	0.111	0.02
7664-41-7	Ammonia	0.8		52.16	-	1.0E-05	-	5.2E-07	-	1.1E-05	2.61	3.0E-03
1151	PAHs (excluding Naphthalene)	0.0362	163	2.36	5.49	-	0.03	-	0.36	-	0.118	-
91-20-3	Naphthalene	0.0197		1.28	4.4E-03	3.5E-05	3.7E-05	1.8E-06	1.7E-03	3.7E-05	0.064	4.5E-04
75-07-0	Acetaldehyde	0.7833		51.07	0.011	3.6E-05	9.4E-05	1.8E-06	4.3E-03	3.8E-05	2.55	7.6E-03
7440-50-8	Copper	0.0041		0.27	-	-	-	-	-	-	0.01	1.9E-04
100-41-4	Ethyl Benzene	0.0109		0.71	1.8E-04	2.7E-07	1.6E-06	1.4E-08	6.8E-05	3.0E-07	0.04	2.3E-06
110-54-3	Hexane	0.0269		1.75	-	2.5E-07	-	1.2E-08	-	2.6E-07	0.088	-
7647-01-0	Hydrogen Chloride	0.1863		12.15	-	6.1E-05	-	3.0E-06	-	6.3E-05	0.61	4.0E-04
7439-96-5	Manganese	0.0031		0.20	-	2.2E-04	-	1.1E-05	-	2.3E-04	0.01	0.047
7439-97-6	Mercury	0.002		0.13	-	1.7E-04	-	4.6E-06	-	9.5E-05	6.5E-03	0.02
7782-49-2	Selenium	0.0022		0.14	-	-	-	-	-	-	7.2E-03	5.0E-03
108-88-3	Toluene	0.1054		6.87	-	1.4E-07	-	6.9E-09	-	1.4E-07	0.344	6.4E-05
1330-20-7	Xylenes	0.0424		2.76	-	1.3E-06	-	6.3E-08	-	1.3E-06	0.138	2.2E-05
9901	Diesel Particulate Matter[2,3,11]	68.8	42	1,158	1.16	0.023	9.8E-03	1.2E-03	0.444	0.024	57.23	-
				Total:	7.26	0.09	0.05	2.5E-03	0.95	0.05	-	0.98
				Goal	<10	<1	<10	<1	<10	<1	-	<1

Manufacturer Specifications - MTU 16V4000G84S

Operating Load (%)	25%	50%	75%	100%
Power (kWm)	624	1,250	1,872	2,498
Fuel Consumption (gal/hr)	42	86	123	163
PM and HC Emissions (g/kWh)	2.08	0.92	0.64	0.38
PM and HC Emissions (lb/hr)	2.86	2.54	2.64	2.09

Stack Height, Distances and Corresponding Dispersion Factors

Stack Height (m)		5.0	Dispersion Factors
Distances (m)	Residential[9]	400.0	0.00010 ($\mu g/m^3$ / lbs/yr)
	Non-residential Child[8]	1850.0	0.00002 ($\mu g/m^3$ / lbs/yr)
	Non-residential Worker[7]	170.0	0.00046 ($\mu g/m^3$ / lbs/yr)
	Acute[6]	170.0	1.40 ($\mu g/m^3$ / lbs/day)

Parameters

Annual Operating Hours	100.0
No. of Generators	4
No. of Cold Start[10]	20
Black-puff Factors[10]	4.5

Acute Parameters

Hours/Day	20
No. Gens Operational	1

Notes

1. Emission factors are lb/Mgal per generator.
2. Diesel Particulate Matter Emission factor based on maximum PM + HC emission factor from MTU 16V4000G84S emission specifications which occurs at 25% operating load.
3. Fuel Usage at 100% operating load used for all pollutants except Diesel Particulate Matter, which uses fuel usage at 25% load to correspond with maximum PM+HC emission factor in lb/hr.
4. Excess Cancer Risk and Chronic Noncancer Risk based on operation of all generators at 100% operating load (except for DPM as noted above) for 100 hours per year.
5. Acute Noncancer Risk based on operation of four generator operating hours at 100% operating load, meaning operation of one generator for 20 hours per day, operation of four generators for five hours per day, or any scenario in between.
6. Acute dispersion factor based on an approximate distance of 170 meters from GN04 to the nearest exposure location, Topgolf, located at 5505 NE Huffman St, Hillsboro, OR 97124. A detailed map is included in Appendix B.
7. Non-residential worker dispersion factor based on an approximate distance of 170 meters from GN04 to the nearest industrial/commercial exposure location, Topgolf, located at 5505 NE Huffman St, Hillsboro, OR 97124. A detailed map is included in Appendix B.
8. Non-residential child dispersion factor based on an approximate distance of 1.85 kilometers from GN04 to the nearest daycare center, Bright Start Learning Center, located at 5170 NE Five Oaks Dr, Hillsboro, OR 97124. A detailed map is included in Appendix B.
9. Residential dispersion factor based on an approximate distance of 400 meters from GN04 to the nearest house, located at 5840 NW Birch Ave, Hillsboro, OR 97124. A detailed map is included in Appendix B.
10. Cold-start "black-puff" factor applies to the first 60 seconds of PM+HC emissions after engine startup. The facility is conservatively assumed to have 20 cold starts per generator per year. Please see "Black-Puff Emissions" tab for cold-start factor calculation.
11. Cold-start DPM emission is not taken into account in the emission factor (lb/Mgal), but it is calculated in the annual emission rate conservatively assuming 20 cold starts per generator per year (1 per month and 4 additional for maintenance events if needed). Each cold start is assumed to be 1 minute.
Sample calculation below:

$$DPM\left(\frac{lb}{hr}\right) \times \left(Annual\ Operational\ Hr - \frac{\#of\ cold\ starts}{60\ min}\right) + DPM\left(\frac{lb}{hr}\right) \times Cold\ Start\ Factor \times \left(\frac{\#of\ cold\ starts}{60\ min}\right)$$

Diesel Generator Cold-Start Emission Adjustment Factor

To account for slightly higher emissions during the first minute of each engine cold startup, a "black-puff" emission factor is calculated and used to scale up the particulate matter (PM) and hydrocarbons (HC) emission factor based on California Energy Commission's (CEC) report, Air Quality Implications of Backup Generators in California (Miller and Lents 2005)[1]. As shown in Figure 1 below, during the first 14 seconds after a cold start, the volatile organic compound (VOC) concentration spiked to a maximum value of 900 parts per million (ppm) before dropping back to the steady-state exhaust concentration of 30 ppm.

The CEC was unable to measure the time trend of diesel exhaust particulate matter (DEEP) concentrations during the first several seconds after a cold start. It is assumed that DEEP (same as PM emission in this calculation workbook) would exhibit the same concentration-versus-time trend as VOC emissions (also referred to as HC) based on their similar emission rate versus operating load trends from manufacturer specifications and observation of a "black-puff" from the exhaust stack during engine cold startups.

Adjustment Factor Calculation

As shown in Figure 1 below, the VOC spike was observed 15 seconds after the cold-start and reached a concentration of 900 ppm. The triangular area under the curve is calculated as follows:

$$\frac{15\ seconds\ \times\ 900\ ppm}{2} = 6{,}750\ (ppm - seconds)$$

The steady-state VOC concentration is 30 ppm, therefore, the 1-minute steady-state period area under the curve is calculated as follows:

$$(60\ seconds - 15\ seconds) \times 30\ ppm = 1{,}350\ (ppm - seconds)$$

Therefore, the cold-start emission factor for the first minute after engine cold startup is estimated as follows:

$$\frac{6{,}750\ (ppm - seconds) + 1{,}350\ (ppm - seconds)}{30\ ppm\ \times 60\ seconds} = 4.5$$

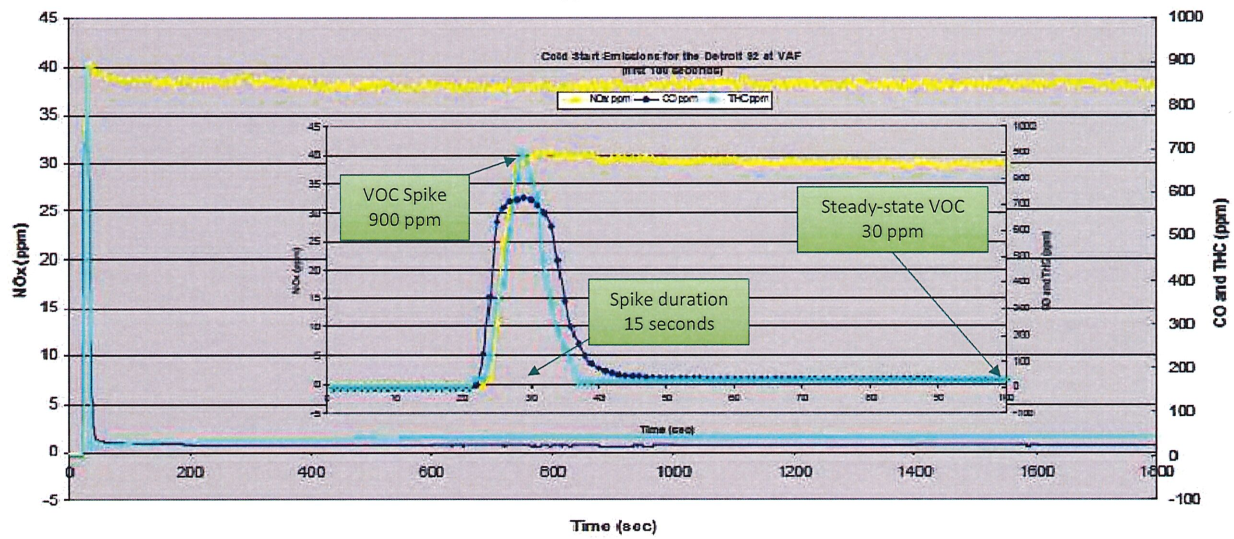


Figure A-1: Cold Start Emissions

Notes:

1. Miller, J.W., and J.M. Lents. 2005. Air Quality Implications of Backup Generators in California - Volume Two: Emission Measurements from Controlled and Uncontrolled Backup Generators. Publication No. CEC-500-2005-049. University of California, Riverside, for the California Energy Commission, Public Interest Energy Research Program. July.

APPENDIX B OREGON DEQ FORM AQ405

AQ405CAO Form - Version 1.53
4/5/2019

Facility Information	
Facility Name	QTS Investment Properties Hillsboro, LLC
Facility Address	4950 NE Huffman Street
City	Hillsboro
Zip Code	97124
Source Number (for existing sources)	N/A
Facility Contact	William Fowler
Phone Number	804-952-8421

INSTRUCTIONS:

- **Toxic Emissions Unit and Stack/Fugitive ID:** use IDs consistent with permit identifiers if applicable.
- **Activity Units/Type:** where possible, maintain consistency with permitted/reported Units/Type.
- **Max Daily Activity:** for semi-continuous/batch processes this value should account for co-occurring activities, process and/or maintenance, that would account for the potential maximum emissions activities for this pollutant.
  - **Actual:** values should be based on the last full year reported to DEQ or estimates of normal activity (new sources).
  - **Capacity:** maximum activity value achievable with 100% operational up-time for this unit.
  - **Requested PTE:** values that a source is requesting to be permitted on that differ from "Actuals" and "Capacity".

AQ405CAO Form - Version 1.53
4/5/2019

Emissions Unit Information			Stack/Fugitive Information		Activity Information							
							Annual - Chronic [units/year]			Max Daily - Acute [units/day]		
Toxics Emissions Unit ID	Unit Description	Control Device[s]	Emission Type (e.g. Point or Fugitive)	Stack or Fugitive ID	Units (e.g. hours operation, tons material, gallons)	Description/Type	Actual	Requested PTE	Capacity	Actual	Requested PTE	Capacity
TEU-1	Widget Maker 1 (EXAMPLE)	Widget Waste RCO	Point	ST-1	tons	Input Material X	100	140	200	0.3	0.5	0.8
TEU-1	GEN-01: MTU 16V4000G84S 2,250 kWe Emergency Generator	N/A	Point	ST-1	gallons	Diesel Fuel No. 2	4472	16300	16300	13	3260	3260
TEU-2	GEN-02: MTU 16V4000G84S 2,250 kWe Emergency Generator	N/A	Point	ST-2	gallons	Diesel Fuel No. 2	4472	16300	16300	13	3260	3260
TEU-3	GEN-03: MTU 16V4000G84S 2,250 kWe Emergency Generator	N/A	Point	ST-3	gallons	Diesel Fuel No. 2	4472	16300	16300	13	3260	3260
TEU-4	GEN-04: MTU 16V4000G84S 2,250 kWe Emergency Generator	N/A	Point	ST-4	gallons	Diesel Fuel No. 2	4472	16300	16300	13	3260	3260

INSTRUCTIONS:
- **CAS:** either use the drop-down provided or simply cut and paste each pollutant CAS number emitted by the referenced TEU.
- **Chemical Name:** if a CAS number is entered in *Column B, Column C* should perform a lookup from the DEQ Air Toxics list; alternatively, simply cut and paste the chemical names that correspond to the CAS numbers in *Column B* if applicable.
- **Control Efficiency:** enter the pollutant specific control efficiency - this should include all capture and removal process efficiencies applicable to each individual pollutant.
- **EF Values:** provide emission factors for Annual and Max Daily conditions; if Annual and Max Daily EF values are equivalent, please enter value in Annual (*Column F*).
- **Emission Factor Information Reference/Notes:** provide EF references (e.g. Source Tests, AP-42, Engineering Estimates, etc) as well as any additional notes (e.g. control efficiencies).
- **Calculated Emissions:** follow guidance in "*Form Instructions*" worksheet for specific formulas.

AQ405CAO Form - Version 1.53
4/5/2019

Toxic Emissions Unit ID	Pollutant Information		Control Efficiency	Emission Factor Information				Calculated Emissions					
				EF Values		Units	Reference/Notes	Annual - Chronic [lb/yr]			Max Daily - Acute [lb/day]		
	CAS	Chemical Name		Annual - Chronic	Max Daily - Acute			Actual	Requested PTE	Capacity	Actual	Requested PTE	Capacity
TEU-1	61-82-5	Amitrole	97.50%	2.5		lb/ton	Annual and max daily EF values are the same for this TEU and its pollutant	6.25	8.75	12.5	0.01875	0.03125	0.05
TEU-1	7440-38-2	Arsenic and compounds	0.00%	0.1		lb/ton	The control efficiency does not apply to this pollutant	10	14	20	0.03	0.05	0.08
TEU-1	71-43-2	Benzene	0.00%	0.1863	0.1863	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.8331336	3.03669	3.03669	0.002282558	0.607338	0.607338
TEU-1	106-99-0	1,3-Butadiene	0.00%	0.2174	0.2174	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.9722128	3.54362	3.54362	0.002663597	0.708724	0.708724
TEU-1	50-32-8	Benzo[a]pyrene	0.00%	0.000035466	0.000035466	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.000158604	0.000578096	0.000578096	4.34531E-07	0.000115619	0.000115619
TEU-1	7440-43-9	Cadmium and compounds	0.00%	0.0015	0.0015	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.006708	0.02445	0.02445	1.83781E-05	0.00489	0.00489
TEU-1	50-00-0	Formaldehyde	0.00%	1.7261	1.7261	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	7.7191192	28.13543	28.13543	0.021148272	5.627086	5.627086
TEU-1	18540-29-9	Chromium VI, chromate, and dichromate particul	0.00%	0.0001	0.0001	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0004472	0.00163	0.00163	1.22521E-06	0.000326	0.000326
TEU-1	7440-38-2	Arsenic and compounds	0.00%	0.0016	0.0016	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0071552	0.02608	0.02608	1.96033E-05	0.005216	0.005216
TEU-1	7439-92-1	Lead and compounds	0.00%	0.0083	0.0083	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0371176	0.13529	0.13529	0.000101692	0.027058	0.027058
TEU-1	7440-02-0	Nickel and compounds		0.0039	0.0039	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0174408	0.06357	0.06357	4.7783E-05	0.012714	0.012714
TEU-1	107-02-8	Acrolein		0.0339	0.0339	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1516008	0.55257	0.55257	0.000415345	0.110514	0.110514
TEU-1	7664-41-7	Ammonia		0.8	0.8	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	3.5776	13.04	13.04	0.009801644	2.608	2.608
TEU-1		Polycyclic aromatic hydrocarbons (PAHs)	0.00%	0.0362	0.0362	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1618864	0.59006	0.59006	0.000443524	0.118012	0.118012
TEU-1	91-20-3	Naphthalene	0.00%	0.0197	0.0197	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0880984	0.32111	0.32111	0.000241365	0.064222	0.064222
TEU-1	75-07-0	Acetaldehyde	0.00%	0.7833	0.7833	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	3.5029176	12.76779	12.76779	0.009597035	2.553558	2.553558
TEU-1	7440-50-8	Copper and compounds	0.00%	0.0041	0.0041	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0183352	0.06683	0.06683	5.02334E-05	0.013366	0.013366
TEU-1	100-41-4	Ethyl benzene	0.00%	0.0109	0.0109	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0487448	0.17767	0.17767	0.000133547	0.035534	0.035534
TEU-1	110-54-3	Hexane	0.00%	0.0269	0.0269	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1202968	0.43847	0.43847	0.00032958	0.087694	0.087694
TEU-1	7647-01-0	Hydrochloric acid	0.00%	0.1863	0.1863	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.8331336	3.03669	3.03669	0.002282558	0.607338	0.607338
TEU-1	7439-96-5	Manganese and compounds	0.00%	0.0031	0.0031	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0138632	0.05053	0.05053	3.79814E-05	0.010106	0.010106
TEU-1	7439-97-6	Mercury and compounds	0.00%	0.002	0.002	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.008944	0.0326	0.0326	2.45041E-05	0.00652	0.00652
TEU-1	7782-49-2	Selenium and compounds	0.00%	0.0022	0.0022	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0098384	0.03586	0.03586	2.69545E-05	0.007172	0.007172
TEU-1	108-88-3	Toluene	0.00%	0.1054	0.1054	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.4713488	1.71802	1.71802	0.001291367	0.343604	0.343604
TEU-1	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p-	0.00%	0.0424	0.0424	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1896128	0.69112	0.69112	0.000519487	0.138224	0.138224
TEU-1		Diesel Particulate Matter	0.00%	68.81179463	68.81179463	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	307.7263456	289.0095374	289.0095374	0.843085878	224.3264505	224.3264505
TEU-2	71-43-2	Benzene	0.00%	0.1863	0.1863	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.8331336	3.03669	3.03669	0.002282558	0.607338	0.607338
TEU-2	106-99-0	1,3-Butadiene	0.00%	0.2174	0.2174	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.9722128	3.54362	3.54362	0.002663597	0.708724	0.708724
TEU-2	50-32-8	Benzo[a]pyrene	0.00%	0.000035466	0.000035466	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.000158604	0.000578096	0.000578096	4.34531E-07	0.000115619	0.000115619
TEU-2	7440-43-9	Cadmium and compounds	0.00%	0.0015	0.0015	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.006708	0.02445	0.02445	1.83781E-05	0.00489	0.00489
TEU-2	50-00-0	Formaldehyde	0.00%	1.7261	1.7261	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	7.7191192	28.13543	28.13543	0.021148272	5.627086	5.627086
TEU-2	18540-29-9	Chromium VI, chromate, and dichromate particul	0.00%	0.0001	0.0001	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0004472	0.00163	0.00163	1.22521E-06	0.000326	0.000326
TEU-2	7440-38-2	Arsenic and compounds	0.00%	0.0016	0.0016	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0071552	0.02608	0.02608	1.96033E-05	0.005216	0.005216
TEU-2	7439-92-1	Lead and compounds	0.00%	0.0083	0.0083	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0371176	0.13529	0.13529	0.000101692	0.027058	0.027058
TEU-2	7440-02-0	Nickel and compounds	0.00%	0.0039	0.0039	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0174408	0.06357	0.06357	4.7783E-05	0.012714	0.012714
TEU-2	107-02-8	Acrolein	0.00%	0.0339	0.0339	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1516008	0.55257	0.55257	0.000415345	0.110514	0.110514
TEU-2	7664-41-7	Ammonia	0.00%	0.8	0.8	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	3.5776	13.04	13.04	0.009801644	2.608	2.608
TEU-2		Polycyclic aromatic hydrocarbons (PAHs)	0.00%	0.0362	0.0362	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1618864	0.59006	0.59006	0.000443524	0.118012	0.118012
TEU-2	91-20-3	Naphthalene	0.00%	0.0197	0.0197	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0880984	0.32111	0.32111	0.000241365	0.064222	0.064222
TEU-2	75-07-0	Acetaldehyde	0.00%	0.7833	0.7833	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	3.5029176	12.76779	12.76779	0.009597035	2.553558	2.553558
TEU-2	7440-50-8	Copper and compounds	0.00%	0.0041	0.0041	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0183352	0.06683	0.06683	5.02334E-05	0.013366	0.013366
TEU-2	100-41-4	Ethyl benzene	0.00%	0.0109	0.0109	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0487448	0.17767	0.17767	0.000133547	0.035534	0.035534
TEU-2	110-54-3	Hexane	0.00%	0.0269	0.0269	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1202968	0.43847	0.43847	0.00032958	0.087694	0.087694
TEU-2	7647-01-0	Hydrochloric acid	0.00%	0.1863	0.1863	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.8331336	3.03669	3.03669	0.002282558	0.607338	0.607338
TEU-2	7439-96-5	Manganese and compounds	0.00%	0.0031	0.0031	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0138632	0.05053	0.05053	3.79814E-05	0.010106	0.010106
TEU-2	7439-97-6	Mercury and compounds	0.00%	0.002	0.002	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.008944	0.0326	0.0326	2.45041E-05	0.00652	0.00652
TEU-2	7782-49-2	Selenium and compounds	0.00%	0.0022	0.0022	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0098384	0.03586	0.03586	2.69545E-05	0.007172	0.007172
TEU-2	108-88-3	Toluene	0.00%	0.1054	0.1054	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.4713488	1.71802	1.71802	0.001291367	0.343604	0.343604
TEU-2	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p-	0.00%	0.0424	0.0424	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1896128	0.69112	0.69112	0.000519487	0.138224	0.138224
TEU-2		Diesel Particulate Matter	0.00%	68.81179463	68.81179463	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	307.7263456	289.0095374	289.0095374	0.843085878	224.3264505	224.3264505
TEU-3	71-43-2	Benzene	0.00%	0.1863	0.1863	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.8331336	3.03669	3.03669	0.002282558	0.607338	0.607338
TEU-3	106-99-0	1,3-Butadiene	0.00%	0.2174	0.2174	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.9722128	3.54362	3.54362	0.002663597	0.708724	0.708724
TEU-3	50-32-8	Benzo[a]pyrene	0.00%	0.000035466	0.000035466	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.000158604	0.000578096	0.000578096	4.34531E-07	0.000115619	0.000115619
TEU-3	7440-43-9	Cadmium and compounds	0.00%	0.0015	0.0015	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.006708	0.02445	0.02445	1.83781E-05	0.00489	0.00489
TEU-3	50-00-0	Formaldehyde	0.00%	1.7261	1.7261	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	7.7191192	28.13543	28.13543	0.021148272	5.627086	5.627086
TEU-3	18540-29-9	Chromium VI, chromate, and dichromate particul	0.00%	0.0001	0.0001	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0004472	0.00163	0.00163	1.22521E-06	0.000326	0.000326
TEU-3	7440-38-2	Arsenic and compounds	0.00%	0.0016	0.0016	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0071552	0.02608	0.02608	1.96033E-05	0.005216	0.005216
TEU-3	7439-92-1	Lead and compounds	0.00%	0.0083	0.0083	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0371176	0.13529	0.13529	0.000101692	0.027058	0.027058
TEU-3	7440-02-0	Nickel and compounds	0.00%	0.0039	0.0039	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0174408	0.06357	0.06357	4.7783E-05	0.012714	0.012714
TEU-3	107-02-8	Acrolein	0.00%	0.0339	0.0339	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1516008	0.55257	0.55257	0.000415345	0.110514	0.110514
TEU-3	7664-41-7	Ammonia	0.00%	0.8	0.8	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	3.5776	13.04	13.04	0.009801644	2.608	2.608
TEU-3		Polycyclic aromatic hydrocarbons (PAHs)	0.00%	0.0362	0.0362	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1618864	0.59006	0.59006	0.000443524	0.118012	0.118012
TEU-3	91-20-3	Naphthalene	0.00%	0.0197	0.0197	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0880984	0.32111	0.32111	0.000241365	0.064222	0.064222
TEU-3	75-07-0	Acetaldehyde	0.00%	0.7833	0.7833	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	3.5029176	12.76779	12.76779	0.009597035	2.553558	2.553558
TEU-3	7440-50-8	Copper and compounds	0.00%	0.0041	0.0041	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0183352	0.06683	0.06683	5.02334E-05	0.013366	0.013366
TEU-3	100-41-4	Ethyl benzene	0.00%	0.0109	0.0109	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0487448	0.17767	0.17767	0.000133547	0.035534	0.035534
TEU-3	110-54-3	Hexane	0.00%	0.0269	0.0269	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1202968	0.43847	0.43847	0.00032958	0.087694	0.087694
TEU-3	7647-01-0	Hydrochloric acid	0.00%	0.1863	0.1863	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.8331336	3.03669	3.03669	0.002282558	0.607338	0.607338
TEU-3	7439-96-5	Manganese and compounds	0.00%	0.0031	0.0031	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0138632	0.05053	0.05053	3.79814E-05	0.010106	0.010106
TEU-3	7439-97-6	Mercury and compounds	0.00%	0.002	0.002	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.008944	0.0326	0.0326	2.45041E-05	0.00652	0.00652
TEU-3	7782-49-2	Selenium and compounds	0.00%	0.0022	0.0022	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0098384	0.03586	0.03586	2.69545E-05	0.007172	0.007172
TEU-3	108-88-3	Toluene	0.00%	0.1054	0.1054	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.4713488	1.71802	1.71802	0.001291367	0.343604	0.343604
TEU-3	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p-	0.00%	0.0424	0.0424	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1896128	0.69112	0.69112	0.000519487	0.138224	0.138224
TEU-3		Diesel Particulate Matter	0.00%	68.81179463	68.81179463	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	307.7263456	289.0095374	289.0095374	0.843085878	224.3264505	224.3264505

Toxic Emissions Unit ID	Pollutant Information		Control Efficiency	Emission Factor Information				Calculated Emissions					
				EF Values		Units	Reference/Notes	Annual - Chronic [lb/yr]			Max Daily - Acute [lb/day]		
	CAS	Chemical Name		Annual - Chronic	Max Daily - Acute			Actual	Requested PTE	Capacity	Actual	Requested PTE	Capacity
TEU-4	71-43-2	Benzene	0.00%	0.1863	0.1863	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.8331336	3.03669	3.03669	0.002282558	0.607338	0.607338
TEU-4	106-99-0	1,3-Butadiene	0.00%	0.2174	0.2174	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.9722128	3.54362	3.54362	0.002663597	0.708724	0.708724
TEU-4	50-32-8	Benzo[a]pyrene	0.00%	0.000035466	0.000035466	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.000158604	0.000578096	0.000578096	4.34531E-07	0.000115619	0.000115619
TEU-4	7440-43-9	Cadmium and compounds	0.00%	0.0015	0.0015	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.006708	0.02445	0.02445	1.83781E-05	0.00489	0.00489
TEU-4	50-00-0	Formaldehyde	0.00%	1.7261	1.7261	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	7.7191192	28.13543	28.13543	0.021148272	5.627086	5.627086
TEU-4	18540-29-9	Chromium VI, chromate, and dichromate particula	0.00%	0.0001	0.0001	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0004472	0.00163	0.00163	1.22521E-06	0.000326	0.000326
TEU-4	7440-38-2	Arsenic and compounds	0.00%	0.0016	0.0016	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0071552	0.02608	0.02608	1.96033E-05	0.005216	0.005216
TEU-4	7439-92-1	Lead and compounds	0.00%	0.0083	0.0083	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0371176	0.13529	0.13529	0.000101692	0.027058	0.027058
TEU-4	7440-02-0	Nickel and compounds	0.00%	0.0039	0.0039	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0174408	0.06357	0.06357	4.7783E-05	0.012714	0.012714
TEU-4	107-02-8	Acrolein	0.00%	0.0339	0.0339	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1516008	0.55257	0.55257	0.000415345	0.110514	0.110514
TEU-4	7664-41-7	Ammonia	0.00%	0.8	0.8	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	3.5776	13.04	13.04	0.009801644	2.608	2.608
TEU-4		Polycyclic aromatic hydrocarbons (PAHs)	0.00%	0.0362	0.0362	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1618864	0.59006	0.59006	0.000443524	0.118012	0.118012
TEU-4	91-20-3	Naphthalene	0.00%	0.0197	0.0197	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0880984	0.32111	0.32111	0.000241365	0.064222	0.064222
TEU-4	75-07-0	Acetaldehyde	0.00%	0.7833	0.7833	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	3.5029176	12.76779	12.76779	0.009597035	2.553558	2.553558
TEU-4	7440-50-8	Copper and compounds	0.00%	0.0041	0.0041	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0183352	0.06683	0.06683	5.02334E-05	0.013366	0.013366
TEU-4	100-41-4	Ethyl benzene	0.00%	0.0109	0.0109	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0487448	0.17767	0.17767	0.000133547	0.035534	0.035534
TEU-4	110-54-3	Hexane	0.00%	0.0269	0.0269	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1202968	0.43847	0.43847	0.00032958	0.087694	0.087694
TEU-4	7647-01-0	Hydrochloric acid	0.00%	0.1863	0.1863	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.8331336	3.03669	3.03669	0.002282558	0.607338	0.607338
TEU-4	7439-96-5	Manganese and compounds	0.00%	0.0031	0.0031	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0138632	0.05053	0.05053	3.79814E-05	0.010106	0.010106
TEU-4	7439-97-6	Mercury and compounds	0.00%	0.002	0.002	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.008944	0.0326	0.0326	2.45041E-05	0.00652	0.00652
TEU-4	7782-49-2	Selenium and compounds	0.00%	0.0022	0.0022	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.0098384	0.03586	0.03586	2.69545E-05	0.007172	0.007172
TEU-4	108-88-3	Toluene	0.00%	0.1054	0.1054	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.4713488	1.71802	1.71802	0.001291367	0.343604	0.343604
TEU-4	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p->	0.00%	0.0424	0.0424	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	0.1896128	0.69112	0.69112	0.000519487	0.138224	0.138224
TEU-4		Diesel Particulate Matter	0.00%	68.81179463	68.81179463	lb/1000 gal	EFs from SCAQMD Supporting Documentation, Table B-2	307.7263456	289.0095374	289.0095374	0.843085878	224.3264505	224.3264505

APPENDIX C ENGINE MANUFACTURER SPECIFICATIONS AND SUPPORTING INFORMATION

DIESEL GENERATOR SET
MTU 16V4000 DS2250

2250 kWe / 60 Hz / Standby
380 - 13.8kV

Reference MTU 16V4000 DS2250 (2045 kWe) for Prime Rating Technical Data

SYSTEM RATINGS

Standby

Voltage (L-L)	380V	480V*	600V	4160V	12470V	13200V	13800V
Phase	3	3	3	3	3	3	3
PF	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Hz	60	60	60	60	60	60	60
kW	2250	2250	2250	2250	2250	2250	2250
kVA	2812	2812	2812	2812	2812	2812	2812
Amps	4273	3383	2706	390	130	123	117
skVA@30% Voltage Dip	3625	8400	3900	5000	4120	4120	4900
Generator Model	1020FDL1102	744RSL4058	1020FDS1120	744FSM4376	1020FDH1246	1020FDH1244	1020FDH1246
Temp Rise	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C
Connection	6 LEAD WYE	4 LEAD WYE	6 LEAD WYE	6 LEAD WYE	6 LEAD WYE	6 LEAD WYE	6 LEAD WYE

* UL 2200 Offered

CERTIFICATIONS AND STANDARDS

// **Emissions -** EPA Tier 2 Certified

// **Generator set is designed and manufactured in facilities certified to standards ISO 9001:2008 and ISO 14001:2004**

// **Seismic Certification - Optional**
- IBC Certification
- OSHPD Pre-Approval

// **UL 2200 Listed - Optional**

// **Performance Assurance Certification (PAC)**
- Generator Set Tested to ISO 8528-5 for Transient Response
- Verified product design, quality and performance integrity
- All engine systems are prototype and factory tested

// **Power Rating**
- Accepts Rated Load in One Step Per NFPA 110
- Permissible average power output during 24 hours of operation is approved up to 85%.

STANDARD FEATURES*

- // MTU Onsite Energy is a single source supplier
- // Global Product Support
- // 2 Year Standard Warranty
- // 16V4000 Diesel Engine
  - 76.3 Liter Displacement
  - Common Rail Fuel Injection
  - 4-Cycle
- // Complete Range of Accessories
- // Generator
  - Brushless, Rotating Field Generator
  - 2/3 Pitch Windings
  - PMG (Permanent Magnet Generator) supply to regulator
  - 300% Short Circuit Capability
- // Digital Control Panel(s)
  - UL Recognized, CSA Certified, NFPA 110
  - Complete System Metering
  - LCD Display
- // Cooling System
  - Integral Set-Mounted
  - Engine-Driven Fan

STANDARD EQUIPMENT*

// Engine

Air Cleaners
Oil Pump
Oil Drain Extension and S/O Valve
Full Flow Oil Filter
Closed Crankcase Ventilation
Jacket Water Pump
Inter Cooler Water Pump
Thermostats
Blower Fan and Fan Drive
Radiator - Unit Mounted
Electric Starting Motor - 24V
Governor - Electronic Isochronous
Base - Structural Steel
SAE Flywheel and Bell Housing
Charging Alternator - 24V
Battery Box and Cables
Flexible Fuel Connectors
Flexible Exhaust Connection
EPA Certified Engine

// Generator

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
Self-Ventilated and Drip-Proof
Superior Voltage Waveform
Digital, Solid State, Volts-per-Hertz Regulator
No Load to Full Load Regulation
Brushless Alternator with Brushless Pilot Exciter
4 Pole, Rotating Field
130 °C Max. Standby Temperature Rise
1 Bearing, Sealed
Flexible Coupling
Full Amortisseur Windings
125% Rotor Balancing
3-Phase Voltage Sensing
±0.25% Voltage Regulation
100% of Rated Load - One Step
5% Max. Total Harmonic Distortion

// Digital Control Panel(s)

Digital Metering
Engine Parameters
Generator Protection Functions
Engine Protection
CANBus ECU Communications
Windows®-Based Software
Multilingual Capability
Remote Communications to RDP-110 Remote Annunciator
Programmable Input and Output Contacts
UL Recognized, CSA Certified, CE Approved
Event Recording
IP 54 Front Panel Rating with Integrated Gasket
NFPA110 Compatible

* Represents standard product only. Consult Factory/MTU Onsite Energy Distributor for additional configurations.

APPLICATION DATA

// Engine

Manufacturer	MTU
Model	16V4000G84S
Type	4-Cycle
Arrangement	16-V
Displacement: L (in^3)	76.3 (4,656)
Bore: cm (in)	17 (6.69)
Stroke: cm (in)	21 (8.27)
Compression Ratio	16.5:1
Rated RPM	1,800
Engine Governor	Electronic Isochronous (ADEC)
Max. Power: kWm (bhp)	2,500 (3,353)
Speed Regulation	±0.25%
Air Cleaner	Dry

// Liquid Capacity (Lubrication)

Total Oil System: L (gal)	300 (79.3)
Engine Jacket Water Capacity: L (gal)	175 (46.2)
After Cooler Water Capacity: L (gal)	50 (13.2)
System Coolant Capacity: L (gal)	547 (145)

// Electrical

Electric Volts DC	24
Cold Cranking Amps Under -17.8 °C (0 °F)	2,800

// Fuel System

Fuel Supply Connection Size	-16 JIC 37° Female 1" NPT Adapter Provided
Fuel Return Connection Size	-16 JIC 37° Female 1" NPT Adapter Provided
Max. Fuel Lift: m (ft)	1 (3)
Recommended Fuel	Diesel #2
Total Fuel Flow: L/hr (gal/hr)	1,200 (317)

// Fuel Consumption

At 100% of Power Rating: L/hr (gal/hr)	617 (163)
At 75% of Power Rating: L/hr (gal/hr)	467 (123)
At 50% of Power Rating: L/hr (gal/hr)	325 (86)

// Cooling - Radiator System

Ambient Capacity of Radiator: °C (°F)	40 (104)
Max. Restriction of Cooling Air: Intake and Discharge Side of Rad.: kPa (in. H_20)	0.12 (0.5)
Water Pump Capacity: L/min (gpm)	1,350 (357)
After Cooler Pump Capacity: L/min (gpm)	583 (154)
Heat Rejection to Coolant: kW (BTUM)	930 (52,888)
Heat Rejection to After Cooler: kW (BTUM)	680 (38,671)
Heat Radiated to Ambient: kW (BTUM)	206 (11,711)
Fan Power: kW (hp)	95.4 (128)

// Air Requirements

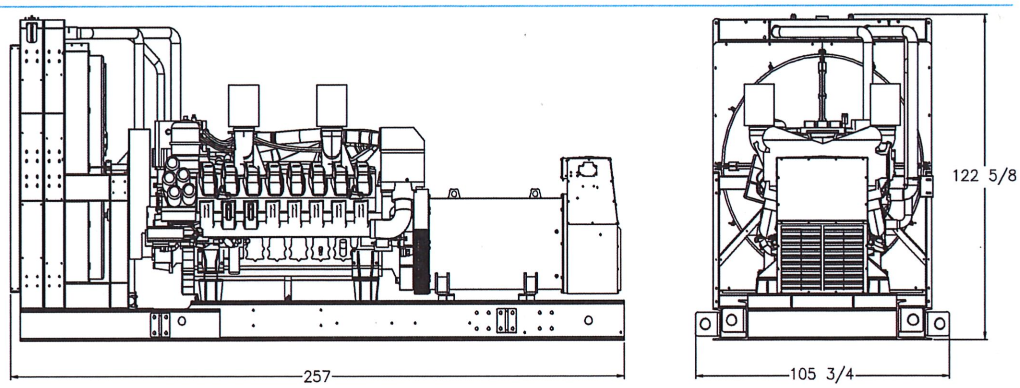
Aspirating: *m^3/min (SCFM)	192 (6,780)
Air Flow Required for Rad. Cooled Unit: *m^3/min (SCFM)	2,053 (72,500)
Remote Cooled Applications; Air Flow Required for Dissipation of Radiated Generator Set Heat for a Max. of 25 °F Rise: *m^3/min (SCFM)	752 (26,412)

* Air density = 1.184 kg/m^3 (0.0739 lbm/ft^3)

// Exhaust System

Gas Temp. (Stack): °C (°F)	505 (941)
Gas Volume at Stack Temp: m^3/min (CFM)	504 (17,799)
Max. Allowable Back Pressure: kPa (in. H_20)	8.5 (34.1)

WEIGHTS AND DIMENSIONS



Drawing above for illustration purposes only, based on standard open power 480 volt generator set. Lengths may vary with other voltages. Do not use for installation design. See website for unit specific template drawings.

System	Dimensions (L x W x H)	Weight (less tank)
Open Power Unit (OPU)	6,528 x 2,686 x 3,115 mm (257 x 105.7 x 122.6 in)	16,429 kg (36,220 lb)

Weights and dimensions are based on open power units and are estimates only. Consult the factory for accurate weights and dimensions for your specific generator set.

SOUND DATA

Unit Type	Standby Full Load
Level 0: Open Power Unit dB(A)	98.7

Sound data is provided at 7 m (23 ft). Generator set tested in accordance with ISO 8528-10 and with infinite exhaust.

EMISSIONS DATA

NO_x + NMHC	CO	PM
5.07	0.52	0.04

All units are in g/hp-hr and shown at 100% load (not comparable to EPA weighted cycle values).
Emission levels of the engine may vary with ambient temperature, barometric pressure, humidity, fuel type and quality, installation parameters, measuring instrumentation, etc. The data was obtained in compliance with US EPA regulations. The weighted cycle value (not shown) from each engine is guaranteed to be within the US EPA Standards.

RATING DEFINITIONS AND CONDITIONS

// Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. No overload capability for this rating. Ratings are in accordance with ISO 8528-1, ISO 3046-1, BS 5514, and AS 2789. Average load factor: ≤ 85%.

// Deration Factor:
Altitude: Consult your local MTU Onsite Energy Power Generation Distributor for altitude derations.
Temperature: Consult your local MTU Onsite Energy Power Generation Distributor for temperature derations.

C/F = Consult Factory/MTU Onsite Energy Distributor
N/A = Not Available

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	16V4000G84S				
Rated power [kW]	2500				
Rated speed [rpm]	1800				
Application group	3D				
Emission Stage/Optimisation	EPA Stationary EMERG T2 (40CFR60)				
Test cycle	D2				
Data Set No.	XZ59554101095				
Data Set Basis	EPA Stationary EMERG T2 (40CFR60)				
Fuel sulphur content [ppm]	8,1				

Inhalt *content*	Notiz *Note*	Seite *Page*	Buchstabe/Revision *change index*
Emissions Daten Blatt (EDS) *emission Data Sheet (EDS)*	O2 gem. *O2 meas.*	2	
Not to exceed Werte *Not to exceed values*	O2 gem. *O2 meas.*	3	

Unterschriftenweg	EDS erstellt	TETC Teamleiter	TET Leiter Org.-Einheit	Baureihen - Teamleiter	Baureihen Leiter Org.-Einheit	Freigabe im Windchill
Datum	07.06.2018	-	-	07.06.2018	07.06.2018	07.06.2018
Org.-Einheit	TETE	-	-	TKFV1	TKF	TKM
Name	T.Lenhof	-	-	Dr. Kneifel	Dr. Baumgarten	Link

MTU Friedrichshafen GmbH

WORD	Datum/ Date	Name
Erstell. Drawn	12.02.2018 13:49:48	link
Bearb. Change	14.06.2018 11:06:11	link
Inhalt Content	07.06.2018	Lenhof
Gepr. Checked	14.06.2018 11:06:11	baumgart en

Motortyp / Engine Type: **16V4000G84S**

Projekt-/Auftrags-Nr. Project/Order No.

Verwendbar f.Typ Applicable to Model

Format/Size **A3**

Material-Nr./Material No. **EDS 4000 1234**

Benennung/ Title

EMISSIONSDATENBLATT

EMISSION DATA SHEET

Zeichnungs-Nr./Drawing No. **ZNG00013267**

Beschreibung/Description

Blatt/ Sheet **1** von/of **3**

Aenderungsbeschreibung/Description of Revision: Freigabe

Kommt vor/Frequency

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-.3	PR030109	Freigegeben

Revision *Change index*					

Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	16V4000G84S				
Application group	3D				
Emission Stage/Optimisation	EPA Stationary EMERG T2 (40CFR60)				
Test cycle	D2				
fuel sulphur content [ppm]	8,1				
mg/mN³ values base on residual oxygen value of [%]	measured				

*Engine raw emissions**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/Pcycle)	[-]	1	0,75	0,50	0,25	0,10			
Power	[kW]	2498	1872	1250	624	250			
Speed (n/nN)	[-]	1	1	1	1	1			
Speed	[rpm]	1800	1800	1801	1801	1801			
Exhaust temperature after turbine	[°C]	501	424	373	335	240			
Exhaust massflow	[kg/h]	14327	13109	11239	8380	5530			
Exhaust back pressure (static)	[mbar]	88	69	48	26	11			
NOx	[g/kWh]	6,5	5,7	4,4	3,0	8,3			
	[mg/mN³]	1533	1076	639	286	483			
CO	[g/kWh]	1,0	0,8	0,7	1,3	4,2			
	[mg/mN³]	244	168	113	131	257			
HC	[g/kWh]	0,17	0,26	0,39	0,80	1,63			
	[mg/mN³]	42	53	61	82	101			
O2	[%]	10,1	12,4	14,1	15,9	17,7			
Particulate measured	[g/kWh]	0,06	0,12	0,12	0,32	0,76			
	[mg/mN³]	15	24	19	33	47			
Particulate calculated	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-			
FSN	[-]	0,6	0,7	0,3	0,7	0,4			
NO/NO2**	[-]	-	-	-	-	-			
CO2	[g/kWh]	659,6	665,6	713,0	854,0	1044,0			
	[mg/mN³]	164166	133820	110475	87696	64408			
SO2	[g/kWh]	0,003	0,003	0,004	0,004	0,005			
	[mg/mN³]	0,8	0,7	0,6	0,5	0,3			
CH2O	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			

* Emission data measurement procedures are consistent with the respective emission evaluation process. Noncertified engines are measured to sales data (TVU/TEN) standard conditions.
These boundary conditions might not be representative for detailed dimensioning of exhaust gas aftertreatment, in this case it is recommended to contact the responsible department for more information.
Measurements are subject to variation. The nominal emission data shown is subject to instrumentation, measurement, facility, and engine-to-engine variations.
All data applies to an engine in new condition and were measured after combined exhaust streams. Over extended operating time deterioration may occur which might have an impact on emission. Exhaust temperature depends on engine ambient conditions.

** No standard test. To be measured on demand.

MTU Friedrichshafen GmbH	WORD	Datum/ Date	Name	Projekt-/Auftrags-Nr. Project/Order No. / Verwendbar f.Typ Applicable to Model — Format/Size A3
	Erstell. Drawn	12.02.2018 13:49:48	link	Material-Nr./Material No. EDS 4000 1234
	Bearb. Change	14.06.2018 11:06:11	link	
	Inhalt Content	07.06.2018	Lenhof	Benennung/ Title
	Gepr. Checked	14.06.2018 11:06:11	baumgarten	EMISSIONSDATENBLATT
	Motortyp / Engine Type 16V4000G84S			EMISSION DATA SHEET

Aenderungsbeschreibung/Description of Revision | Kommt vor/Frequency
Freigabe

Zeichnungs-Nr./Drawing No. ZNG00013267

Beschreibung/Description

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-.3	PR030109	Freigegeben

Revision *Change index*					

Motordaten
engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	16V4000G84S				
Application group	3D				
Emission Stage/Optimisation	EPA Stationary EMERG T2 (40CFR60)				
Test cycle	D2				
fuel sulphur content [ppm]	8,1				
mg/mN³ values base on residual oxygen value of [%]	measured				

Not to exceed Values*

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/Pcycle)	[-]	1	0,75	0,50	0,25				
Power	[kW]	2498	1872	1250	624				
Speed (n/nN)	[-]	1	1	1	1				
Speed	[rpm]	1800	1800	1801	1801				
Exhaust back pressure (static)	[mbar]	88	69	48	26				
NOx	[g/kWh]	8,5	7,4	5,7	4,5				
	[mg/mN³]	1993	1399	831	429				
CO	[g/kWh]	1,7	1,4	1,4	2,6				
	[mg/mN³]	415	286	215	262				
HC	[g/kWh]	0,29	0,45	0,74	1,60				
	[mg/mN³]	71	90	116	164				
O2	[%]	10,1	12,4	14,1	15,9				
Particulate measured	[g/kWh]	0,09	0,19	0,18	0,48				
	[mg/mN³]	23	39	28	50				
CH2O	[g/kWh]	-	-	-	-				
	[mg/mN³]	-	-	-	-				

* Calculated values are not proven by tests and therefore the accuracy cannot be guaranteed.
Emissions data measurement procedures are consistent with those described in the applicable rules and standards.
The NOx, CO, HC and PM emission data tabulated here were taken from a single new engine under the test conditions shown above and are valid for the following conditions:

- Ambient air pressure 1 bar
- Air intake temperature approx. 25°C
- Rel. Humidity 30%-60%
- New Engine
- New standard- air filter
- Exhaust gas back pressure according the given value in this EDS
- Fuel according to EN 590 or US EPA 40CFR89
- Coolant and Lubricants according MTU Fuels and Lubricants Specification
- measured after combined exhaust streams.

The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on single operating points and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle. Emissions data may vary depending on the type of exhaust gas aftertreatment that may be installed on the engine, therefore it is suggested that the engine manufacturer be contacted directly for further information.
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. Over time deterioration may occur which may have an impact on emission levels. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.
MTU Friedrichshafen GmbH has made efforts to ensure that the information in this data sheet is accurate, but reserves the right to amend specifications and information without notice and without obligation or liability. No liability for any errors, facts or opinions is accepted. Customers must satisfy themselves as to the suitability of this product for their application. No responsibility for any loss as a result of any person placing reliance on any material contained in this data sheet will be accepted.

GASEOUS EMISSIONS DATA MEASUREMENTS ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII FOR MEASURING HC, CO, PM, AND NOX.

Locality	Agency	Regulation	Tier/Stage	Max. Limit G/(kW -HR)	T2	T3
U.S. (INCL CALIF)	EPA	Stationary	Emergency Stationary Tier 2 (>560kW) Tier 3 (<560kW)	NOx+ NMHC:	6,4	4,0
				CO:	3,5	3,5
				PM:	0,20	0,20

** No standard test. To be measured on demand.

MTU Friedrichshafen GmbH	WORD	Datum/ Date	Name
	Erstell. Drawn	12.02.2018 13:49:48	link
	Bearb. Change	14.06.2018 11:06:11	link
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	Gepr. Checked	14.06.2018 11:06:11	baumgarten
	Motortyp / Engine Type: 16V4000G84S		

Projekt-/Auftrags-Nr. Project/Order No.
Verwendbar f.Typ Applicable to Model
Format/Size: A3
Material-Nr./Material No.: EDS 4000 1234
Benennung/ Title: EMISSIONSDATENBLATT
EMISSION DATA SHEET

Aenderungsbeschreibung/Description of Revision: Freigabe
Kommt vor/Frequency

Zeichnungs-Nr./Drawing No.: ZNG00013267
Beschreibung/Description

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-.3	PR030109	Freigegeben

Table B-2: DEFAULT EF FOR DIESEL / DISTILLATE OIL FUEL COMBUSTION (LB / 1000 GAL)

SOURCE: External Combustion Equipment (Boiler, Oven, Dryer, Furnace, Heater, Afterburner)

TAC Code	POLLUTANT	CAS NO.	ALL SIZES
2	Benzene	71432	0.0044
4	1,3-Butadiene	106990	0.0148
5	Cadmium	7440439	0.0015
12	Formaldehyde	50000	0.3506
13	Hexavalent chromium	18540299	0.0001
14	Arsenic	7440382	0.0016
15	Lead	7439921	0.0083
17	Nickel	7440020	0.0039
19	Total PAHs (excluding Naphthalene)	1151	0.0445
19	Naphthalene	91203	0.0053
29	Acetaldehyde	75070	0.3506
30	Acrolein	107028	0.3506
32	Ammonia*	7664417	2.9000
36	Copper	7440508	0.0041
40	Ethyl Benzene	100414	0.0002
44	Hexane	110543	0.0035
46	Hydrogen chloride	7647010	0.1863
49	Manganese	7439965	0.0031
50	Mercury	7439976	0.0020
64	Selenium	7782492	0.0022
68	Toluene	108883	0.0044
70	Xylenes	1330207	0.0016

SOURCE: Stationary and Portable Internal Combustion Engines (ICE)

TAC Code	POLLUTANT	CAS NO.	ALL SIZES
2	Benzene	71432	0.1863
4	1,3-Butadiene	106990	0.2174
5	Cadmium	7440439	0.0015
12	Formaldehyde	50000	1.7261
13	Hexavalent chromium	18540299	0.0001
14	Arsenic	7440382	0.0016
15	Lead	7439921	0.0083
17	Nickel	7440020	0.0039
19	Naphthalene	91203	0.0197
19	PAHs (excluding Naphthalene)	1151	0.0362
29	Acetaldehyde	75070	0.7833
30	Acrolein	107028	0.0339
32	Ammonia*	7664417	2.9000
36	Copper	7440508	0.0041
40	Ethyl Benzene	100414	0.0109
44	Hexane	110543	0.0269
46	Hydrogen Chloride	7647010	0.1863
49	Manganese	7439965	0.0031
50	Mercury	7439976	0.0020
64	Selenium	7782492	0.0022
68	Toluene	108883	0.1054
70	Xylenes	1330207	0.0424
72	Diesel exhaust particulates	9901	33.5000

SOURCE: Turbines

TAC Code	POLLUTANT	CAS NO.	ALL SIZES
2	Benzene	71432	0.1863
4	1,3-Butadiene	106990	0.2174
5	Cadmium	7440439	0.0015
12	Formaldehyde	50000	1.7261
13	Hexavalent chromium	18540299	0.0001
14	Arsenic	7440382	0.0016
15	Lead	7439921	0.0083
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***This value corresponds to equipment with SNCR, for equipment with SCR substitute listed value by 1.4 lbs/1000 gal, and for equipment without SNCR or SCR by 0.8 lbs/1000 gal.**

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