

Braganza, Bonnie

From: Don DiCristofaro <DDiCristofaro@enernoc.com>
Sent: Tuesday, September 30, 2014 12:56 PM
To: Braganza, Bonnie
Cc: Joseph M. Rodriguez
Subject: RE: Sandia - Tanks
Attachments: Estimated Emissions from 12,000 Gal Tank - Sandia Casino.pdf

Bonnie,

Although I like the IEPA software for its ease of use, I am not sure what it is based on. The AQMD document was excellent so I made the calculations based on that.

The total loss from the 12,000 gallon tank is estimated to only be 0.18 tpy. See the attached as my backup.

I am working on your other requests. Regarding the three older generators, are you saying the emissions should be based on 300 hours (200 hours for DR and 100 hours for testing/maintenance)?

Don

From: Braganza, Bonnie [mailto:Braganza.Bonnie@epa.gov]
Sent: Monday, September 29, 2014 3:54 PM
To: Don DiCristofaro
Subject: RE: Sandia - Tanks

These are fixed roof tanks. Correct? Not sure if they are submerged fill?

Use AP -42<http://www.epa.gov/ttnchie1/ap42/ch07/final/c07s01.pdf>

It appears that the tank calculations are not a problem with AP-42. Or try using the attached document.

Also the TCEQ website has information as well. See the attached documents. You will need to calculate the emissions based on short term emission rates- The pumping rate to the tanks, the existing pump rate to the generators?

I believe it will be less than .1 tpy using this website, which EPA has not endorsed.

. <http://www.epa.state.il.us/air/aer/calculate/tanks.html>

Let me know if I can be of assistance

Bonnie Braganza P.E.
Air Permits
US Environmental Protection Agency
Region 6
1445 Ross Ave, Dallas TX 75202
214-665-7340

From: Don DiCristofaro [<mailto:DDiCristofaro@enernoc.com>]
Sent: Monday, September 29, 2014 2:27 PM

To: Braganza, Bonnie
Cc: Joseph M. Rodriguez
Subject: RE: Sandia - Tanks

Bonnie – The estimated tank emissions is a problem. EPA no longer maintains the software TANKS which was how in the past I would calculate tank emissions. I would have to work through AP-42 which for tanks is no simple task. Do you have a workable version of TANKS? I tried to provide information in the filing that could be used to run TANKS. Don

From: Braganza, Bonnie [<mailto:Braganza.Bonnie@epa.gov>]
Sent: Monday, September 29, 2014 3:24 PM
To: Don DiCristofaro
Subject: Sandia

I did not see any estimate of tank emissions with the new additions. Please give me some estimate. Thank you. Does the total diesel fuel appear to be correct for all the tanks estimated at 457,812 gallons per year?

Don: Additional information request.

1. According to an email from Robert Rodriguez, the DR requirement is 200 hours per year per turbine. He had me correct it in the 2012 documents I sent him.

Also since they will only be used for 200 hours per year and 100 hours per year for testing, please adjust the emissions for these 3 engines. See attachment.

I cannot write a permit with hourly restrictions for testing and a contradictory emission level.

2. For the new NSR construction application, please fill out the current emissions and the allowable. The allowable will be based on testing and operations of 200 hours per year for the generators- or as indicated in the letter filed with EPA.
3. Are the PM emissions for each pollutant of PM, PM₁₀, and PM_{2.5} or is it the total PM emissions?
4. What is the driver for the fuel pump? Electric Power or diesel ?

Thank you

Bonnie Braganza P.E.
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Facility Emissions Analysis - Potential

Sandia Resort and Casino
30 Rainbow Road NE
Albuquerque, NM 87113-2156

Source	Make	Model	Size (hp)	Size (kW)	Fuel	Fuel Use (gph or scfh)	Heat Input (mmBtu/hr)	Emissions (lb/hr)								Potential Emissions (tpy)													
								NOx	CO	SO2	PM	PM2.5	PM10	VOC	Pb	Hours	NOx	CO	SO2	PM	PM2.5	PM10	VOC	Pb	Fluorides	H2SO4	H2S	TRS	
Generator #1	Detroit Diesel	DDC 16V-4000	133.2	2935	2190 Diesel	133.2	17.98	44.65	55.00	0.03	2.59	2.59	2.59	6.28	0	8760	195.55	240.90	1.19E-01	11.34	11.34	11.34	27.49	0	0	0	0	0	0
Generator #2	Detroit Diesel	DDC 16V-4000	133.2	2935	2190 Diesel	133.2	17.98	44.65	55.00	0.03	2.59	2.59	2.59	6.28	0	8760	195.55	240.90	1.19E-01	11.34	11.34	11.34	27.49	0	0	0	0	0	0
Generator #3	Detroit Diesel	MTV 1000	1676	1250	Diesel	100.0	13.50	40.22	9.22	0.02	1.17	1.17	1.17	1.18	0	8760	176.18	40.37	8.96E-02	5.14	5.14	5.14	5.18	0	0	0	0	0	0
Generator #4 (NEW)	Caterpillar	C175-20	5646	4000	Diesel	274.6	37.07	83.52	7.98	0.06	0.69	0.69	0.69	0.78	0	8760	365.82	34.95	2.46E-01	3.02	3.02	3.02	3.42	0	0	0	0	0	0
Generator #5 (NEW)	Caterpillar	C175-20	5646	4000	Diesel	274.6	37.07	83.52	7.98	0.06	0.69	0.69	0.69	0.78	0	8760	365.82	34.95	2.46E-01	3.02	3.02	3.02	3.42	0	0	0	0	0	0
Boiler #1					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #2					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #3					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #4					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #5					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #6					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #7					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #8					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #9					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #10					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #11					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #12					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #13					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #14					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	1.54E-02	1.54E-02	1.54E-02	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.07	0.07	0.07	0.02	2.13E-06	0	0	0	0	0
Boiler #15					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	1.54E-02	1.54E-02	1.54E-02	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.07	0.07	0.07	0.02	2.13E-06	0	0	0	0	0
Boiler #16					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	1.54E-02	1.54E-02	1.54E-02	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.07	0.07	0.07	0.02	2.13E-06	0	0	0	0	0
Boiler #17					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	1.54E-02	1.54E-02	1.54E-02	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.07	0.07	0.07	0.02	2.13E-06	0	0	0	0	0
TOTAL																	1312.18	603.22	0.90	35.00	35.00	35.00	67.72	6.63E-05	0.00	0.00	0.00	0.00	

Notes:
Fuel Use for Generators #1 and 2 from manufacturer's data sheet. Fuel Use for Generator #3 estimated as 0.08*KW. Estimated Heat Input = gal/hr * 135,000 Btu/gal
Engine rating conservatively assumes 100% load.

Emission Factors:

Emergency Generators	Generators #1-2		Generator #3		Generators #4 and 5	
	Source: Manufacturer		Source: EPA AP-42, Fifth Edition, October, 1996		Source: Manufacturer	
	Detroit Diesel DDC 16V4000				Caterpillar	
	T1637K36-G80				C175-20	
	g/hp-hr		Diesel > 600 hp		lb/hr	
NOx	6.9		lb/hp-hr		83.52	
VOC	0.97				0.78	
CO	8.5				7.98	
PM, PM2.5, PM10	0.4				0.69	
			lb/mmBtu			
			SOx		Use AP-42	
			0.001515 Assumes 0.0015% sulfur			
			Pb		0	
			Flourides		0	
			H2SO4		0	
			H2S		0	
			TRS		0	

Boilers
Source: EPA AP-42, Fifth Edition, October, 1996, Tables 1.4-1 and 1.4-2 for Small Boilers (< 100 mmBtu/hr)

	lb/10^6 scf
NOx	100
VOC	5.5
CO	84
PM, PM2.5, PM10	7.6
SOx	0.6
Pb	0.0005
Flourides	0
H2SO4	0
H2S	0
TRS	0

Hazardous Air Pollutant (HAP) Analysis for One Engine

Source: EPA AP-42, Tables 3.4-3 and 3.4-4, Engines > 600 hp

	PTE (8,760 hours)		
	lb/mmBtu	lb/hr	lbs
Benzene	7.76E-04	1.40E-02	122.2
Toluene	2.81E-04	5.05E-03	44.3
Xylenes	1.93E-04	3.47E-03	30.4
Propylene	2.79E-03	5.02E-02	439.5
Formaldehyde	7.89E-05	1.42E-03	12.4
Acetaldehyde	2.52E-05	4.53E-04	4.0
Acrolein	7.88E-06	1.42E-04	1.2
Total PAH	2.12E-04	3.81E-03	33.4

Facility Emissions Analysis - Allowable

Sandia Resort and Casino
30 Rainbow Road NE
Albuquerque, NM 87113-2156

Source	Make	Model	Size (hp)	Size (kW)	Fuel	Fuel Use (gph or scfh)	Heat Input (mmBtu/hr)	Emissions (lb/hr)							Proposed Allowable Emissions (tpy)														
								NOx	CO	SO2	PM	PM2.5	PM10	VOC	Pb	Hours	NOx	CO	SO2	PM	PM2.5	PM10	VOC	Pb	Fluorides	H2SO4	H2S	TRS	
Generator #1	Detroit Diesel	DDC 16V-4000	2935	2190	Diesel	133.2	17.98	44.65	55.00	0.03	2.59	2.59	2.59	6.28	0	500	11.16	13.75	6.81E-03	0.65	0.65	0.65	1.57	0	0	0	0	0	0
Generator #2	Detroit Diesel	DDC 16V-4000	2935	2190	Diesel	133.2	17.98	44.65	55.00	0.03	2.59	2.59	2.59	6.28	0	500	11.16	13.75	6.81E-03	0.65	0.65	0.65	1.57	0	0	0	0	0	0
Generator #3	Detroit Diesel	MTV 1000	1676	1250	Diesel	100.0	13.50	40.22	9.22	0.02	1.17	1.17	1.17	1.18	0	500	10.06	2.30	5.11E-03	0.29	0.29	0.29	0.30	0	0	0	0	0	0
SUBTOTAL																	32.38	29.80	0.02	1.59	1.59	1.59	3.43						
Generator #4 (NEW)	Caterpillar	C175-20	5646	4000	Diesel	274.6	37.07	83.52	7.98	0.06	0.69	0.69	0.69	0.78	0	100	4.18	0.40	2.81E-03	0.03	0.03	0.03	0.04	0	0	0	0	0	0
Generator #5 (NEW)	Caterpillar	C175-20	5646	4000	Diesel	274.6	37.07	83.52	7.98	0.06	0.69	0.69	0.69	0.78	0	100	4.18	0.40	2.81E-03	0.03	0.03	0.03	0.04	0	0	0	0	0	0
SUBTOTAL																	8.35	0.80	0.01	0.07	0.07	0.07	0.08						
Boiler #1					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #2					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #3					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #4					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #5					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #6					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #7					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #8					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #9					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #10					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #11					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #12					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #13					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0	0
Boiler #14					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	7.38E-03	7.38E-03	7.38E-03	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.03	0.03	0.03	0.02	2.13E-06	0	0	0	0	0
Boiler #15					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	7.38E-03	7.38E-03	7.38E-03	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.03	0.03	0.03	0.02	2.13E-06	0	0	0	0	0
Boiler #16					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	7.38E-03	7.38E-03	7.38E-03	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.03	0.03	0.03	0.02	2.13E-06	0	0	0	0	0
Boiler #17					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	7.38E-03	7.38E-03	7.38E-03	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.03	0.03	0.03	0.02	2.13E-06	0	0	0	0	0
SUBTOTAL																	13.26	11.13	0.08	1.01	1.01	1.01	0.73	0.00					
TOTAL																	53.99	41.74	0.10	2.66	2.66	2.66	4.24	6.63E-05	0.00	0.00	0.00	0.00	

Notes:
Fuel Use for Generators #1 and 2; 4 and 6 from manufacturer's data sheet. Fuel Use for Generator #3 estimated as 0.08*kW. Estimated Heat Input = gal/hr * 135,000 Btu/gal
Engine rating conservatively assumes 100% load.

Emission Factors:

Emergency Generators	Generators #1-2		Generator #3		Generators #4 and 5	
	Source: Manufacturer		Source: EPA AP-42, Fifth Edition, October, 1996		Source: Manuracturer	
	Detroit Diesel DDC 16V4000				Caterpillar	
	T1637K36-G80				C175-20	
	g/hp-hr		Diesel > 600 hp		lb/hr	
NOx	6.9		lb/hp-hr		83.52	
VOC	0.97				0.78	
CO	8.5				7.98	
PM, PM2.5, PM10	0.4				0.69	
			lb/mmBtu			
SOx	Use AP-42		SOx		Use AP-42	
			0.001515 Assumes 0.0015% sulfur			
			Pb		0	
			Flourides		0	
			H2SO4		0	
			H2S		0	
			TRS		0	

Boilers
Source: EPA AP-42, Fifth Edition, October, 1996, Tables 1.4-1 and 1.4-2 for Small Boilers (< 100 mmBtu/hr)

	lb/10^6 scf
NOx	100
VOC	5.5
CO	84
PM, PM2.5, PM10	7.6
SOx	0.6
Pb	0.0005
Flourides	0
H2SO4	0
H2S	0
TRS	0

Hazardous Air Pollutant (HAP) Analysis for One Engine
Source: EPA AP-42, Tables 3.4-3 and 3.4-4, Engines > 600 hp

	PTE (8,760 hours)		
	lb/mmBtu	lb/hr	lbs
Benzene	7.76E-04	1.40E-02	122.2
Toluene	2.81E-04	5.05E-03	44.3
Xylenes	1.93E-04	3.47E-03	30.4
Propylene	2.79E-03	5.02E-02	439.5
Formaldehyde	7.89E-05	1.42E-03	12.4
Acetaldehyde	2.52E-05	4.53E-04	4.0
Acrolein	7.88E-06	1.42E-04	1.2
Total PAH	2.12E-04	3.81E-03	33.4

Facility Emissions Analysis - Allowable

Sandia Resort and Casino
30 Rainbow Road NE
Albuquerque, NM 87113-2156

Source	Make	Model	Size (hp)	Size (kW)	Fuel	Fuel Use (gph or scfh)	Heat Input (mmBtu/hr)	Emissions (lb/hr)								Hours	Proposed Allowable Emissions (tpy)								Pb	Fluorides	H2SO4	H2S	TRS			
								NOx	CO	SO2	PM	PM2.5	PM10	VOC	Pb		NOx	CO	SO2	PM	PM2.5	PM10	VOC	Pb								
Generator #1	Detroit Diesel	DDC 16V-4000	2935	2190	Diesel	133.2	17.98	44.65	55.00	0.03	2.59	2.59	2.59	6.28	0	200	4.46	5.50	2.72E-03	0.26	0.26	0.26	0.63	0	0	0	0	0				
Generator #2	Detroit Diesel	DDC 16V-4000	2935	2190	Diesel	133.2	17.98	44.65	55.00	0.03	2.59	2.59	2.59	6.28	0	200	4.46	5.50	2.72E-03	0.26	0.26	0.26	0.63	0	0	0	0	0				
Generator #3	Detroit Diesel	MTV 1000	1676	1250	Diesel	100.0	13.50	40.22	9.22	0.02	1.17	1.17	1.17	1.18	0	200	4.02	0.92	2.05E-03	0.12	0.12	0.12	0.12	0	0	0	0	0				
SUBTOTAL																	12.95	11.92	0.01	0.63	0.63	0.63	1.37									
Generator #4 (NEW)	Caterpillar	C175-20	5646	4000	Diesel	274.6	37.07	83.52	7.98	0.06	0.69	0.69	0.69	0.78	0	100	4.18	0.40	2.81E-03	0.03	0.03	0.03	0.04	0	0	0	0	0				
Generator #5 (NEW)	Caterpillar	C175-20	5646	4000	Diesel	274.6	37.07	83.52	7.98	0.06	0.69	0.69	0.69	0.78	0	100	4.18	0.40	2.81E-03	0.03	0.03	0.03	0.04	0	0	0	0	0				
SUBTOTAL																	8.35	0.80	0.01	0.07	0.07	0.07	0.08									
Boiler #1					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #2					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #3					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #4					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #5					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #6					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #7					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #8					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #9					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #10					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #11					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #12					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #13					Natural Gas	2029.4	2.07	0.20	0.17	1.22E-03	1.54E-02	1.54E-02	1.54E-02	1.12E-02	1.01E-06	8760	0.89	0.75	5.33E-03	0.07	0.07	0.07	0.05	4.44E-06	0	0	0	0				
Boiler #14					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	7.38E-03	7.38E-03	7.38E-03	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.03	0.03	0.03	0.02	2.13E-06	0	0	0	0				
Boiler #15					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	7.38E-03	7.38E-03	7.38E-03	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.03	0.03	0.03	0.02	2.13E-06	0	0	0	0				
Boiler #16					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	7.38E-03	7.38E-03	7.38E-03	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.03	0.03	0.03	0.02	2.13E-06	0	0	0	0				
Boiler #17					Natural Gas	970.6	0.99	0.10	0.08	5.82E-04	7.38E-03	7.38E-03	7.38E-03	5.34E-03	4.85E-07	8760	0.43	0.36	2.55E-03	0.03	0.03	0.03	0.02	2.13E-06	0	0	0	0				
SUBTOTAL																	13.26	11.13	0.08	1.01	1.01	1.01	0.73	0.00								
TOTAL																	34.56	23.85	0.09	1.71	1.71	1.71	2.18	6.63E-05	0.00	0.00	0.00	0.00				

Notes:
Fuel Use for Generators #1 and 2; 4 and 6 from manufacturer's data sheet. Fuel Use for Generator #3 estimated as 0.08*kW. Estimated Heat Input = gal/hr * 135,000 Btu/gal
Engine rating conservatively assumes 100% load.

Emission Factors:

Emergency Generators	Generators #1-2		Generator #3		Generators #4 and 5	
	Source: Manufacturer		Source: EPA AP-42, Fifth Edition, October, 1996		Source: Manuracturer	
	Detroit Diesel DDC 16V4000				Caterpillar	
	T1637K36-G80				C175-20	
	g/hp-hr		Diesel > 600 hp		lb/hr	
NOx	6.9		lb/hp-hr		83.52	
VOC	0.97		7.05E-04		0.78	
CO	8.5		5.50E-03		7.98	
PM, PM2.5, PM10	0.4		0.0007		0.69	

SOx	Use AP-42	SOx	0.001515	Assumes 0.0015% sulfur	Use AP-42
Pb					0
Flourides					0
H2SO4					0
H2S					0
TRS					0

Boilers
Source: EPA AP-42, Fifth Edition, October, 1996, Tables 1.4-1 and 1.4-2 for Small Boilers (< 100 mmBtu/hr)

	lb/10^6 scf
NOx	100
VOC	5.5
CO	84
PM, PM2.5, PM10	7.6
SOx	0.6
Pb	0.0005
Flourides	0
H2SO4	0
H2S	0
TRS	0

Hazardous Air Pollutant (HAP) Analysis for One Engine

Source: EPA AP-42, Tables 3.4-3 and 3.4-4, Engines > 600 hp

	PTE (8,760 hours)		
	lb/mmBtu	lb/hr	lbs
Benzene	7.76E-04	1.40E-02	122.2
Toluene	2.81E-04	5.05E-03	44.3
Xylenes	1.93E-04	3.47E-03	30.4
Propylene	2.79E-03	5.02E-02	439.5
Formaldehyde	7.89E-05	1.42E-03	12.4
Acetaldehyde	2.52E-05	4.53E-04	4.0
Acrolein	7.88E-06	1.42E-04	1.2
Total PAH	2.12E-04	3.81E-03	33.4