

## **Appendix E**

### **Air Quality Background Information for Construction and Operational Emissions**

# USAF Air Conformity Applicability Model

## Emissions Summary Information

Scenario: WFF LREA - Alt 1 w/ HIF

Installation: LANGLEY AFB

## Emissions Summary Report For 2009

SOURCE CATEGORY	Emissions, Ton/Year					
	CO	NOX	SO2	VOC	PM10	PM2.5
<b>Area Sources</b>						
Other Phase I Const. - Grading Ops.	0.00	0.00	0.00	0.00	19.48	0.00
Other Phase II Const. - Acres Paved	0.00	0.00	0.00	0.00	0.00	0.00
Other Phase II Const. - Mobile Equip.	1.66	3.96	0.49	0.36	0.32	0.00
Other Phase II Const. - Non-Res. Arch. Ctgs.	0.00	0.00	0.00	0.07	0.00	0.00
Other Phase II Const. - Res. Arch. Ctgs.	0.00	0.00	0.00	0.00	0.00	0.00
Other Phase II Const. - Stationary Equip.	11.26	0.29	0.01	0.42	0.01	0.00
Other Phase II Const. - Workers Trips	0.18	0.01	0.00	0.01	0.00	0.00
Other Phase I Const. - Grading Equip.	0.18	0.66	0.07	0.07	0.05	0.00
Total	13.27	4.93	0.57	0.94	19.87	0.00
<b>Grand Total</b>	13.27	4.93	0.57	0.94	19.87	0.00

# USAF Air Conformity Applicability Model

## Emissions Summary Information

Scenario: WFF LREA - Alt 1 w/ HIF

Installation: LANGLEY AFB

## Emissions Summary Report For 2010

SOURCE CATEGORY	Emissions, Ton/Year					
	CO	NOX	SO2	VOC	PM10	PM2.5
<b>Area Sources</b>						
Other Phase II Const. - Workers Trips	0.26	0.01	0.00	0.01	0.00	0.00
Other Phase II Const. - Acres Paved	0.00	0.00	0.00	0.00	0.00	0.00
Other Phase II Const. - Mobile Equip.	2.39	5.70	0.70	0.52	0.46	0.00
Other Phase II Const. - Non-Res. Arch. Ctgs.	0.00	0.00	0.00	0.12	0.00	0.00
Other Phase II Const. - Stationary Equip.	16.21	0.42	0.02	0.61	0.01	0.00
Other Phase II Const. - Res. Arch. Ctgs.	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total</b>	<b>18.86</b>	<b>6.13</b>	<b>0.73</b>	<b>1.26</b>	<b>0.47</b>	<b>0.00</b>
<b>Point Sources</b>						
Other Const. - Facility Heating	0.04	0.05	0.00	0.00	0.00	0.00
<b>Total</b>	<b>0.04</b>	<b>0.05</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>Grand Total</b>	<b>18.90</b>	<b>6.18</b>	<b>0.73</b>	<b>1.26</b>	<b>0.48</b>	<b>0.00</b>

# USAF Air Conformity Applicability Model

## Emissions Summary Information

Scenario: WFF LREA - Alt 1 w/ HIF

Installation: LANGLEY AFB

## Emissions Summary Report For 2011

SOURCE CATEGORY	Emissions, Ton/Year					
	CO	NOX	SO2	VOC	PM10	PM2.5
<b>Point Sources</b>						
Other Const. - Facility Heating	0.09	0.11	0.00	0.01	0.01	0.00
Total	0.09	0.11	0.00	0.01	0.01	0.00
<b>Grand Total</b>	0.09	0.11	0.00	0.01	0.01	0.00

# USAF Air Conformity Applicability Model

## Emissions Summary Information

Scenario: WFF LREA - Alt 1 w/ HIF

Installation: LANGLEY AFB

## Emissions Summary Report For 2012

SOURCE CATEGORY	Emissions, Ton/Year					
	CO	NOX	SO2	VOC	PM10	PM2.5
<b>Area Sources</b>						
Other Phase I Const. - Grading Equip.	0.04	0.16	0.02	0.02	0.01	0.00
Other Phase I Const. - Grading Ops.	0.00	0.00	0.00	0.00	4.73	0.00
Other Phase II Const. - Acres Paved	0.00	0.00	0.00	0.00	0.00	0.00
Other Phase II Const. - Mobile Equip.	2.55	6.08	0.75	0.56	0.49	0.00
Other Phase II Const. - Non-Res. Arch. Ctgs.	0.00	0.00	0.00	0.16	0.00	0.00
Other Phase II Const. - Res. Arch. Ctgs.	0.00	0.00	0.00	0.00	0.00	0.00
Other Phase II Const. - Stationary Equip.	17.28	0.45	0.02	0.65	0.01	0.00
Other Phase II Const. - Workers Trips	0.27	0.01	0.00	0.01	0.00	0.00
<b>Total</b>	<b>20.14</b>	<b>6.70</b>	<b>0.79</b>	<b>1.39</b>	<b>5.25</b>	<b>0.00</b>
<b>Point Sources</b>						
Other Const. - Facility Heating	0.09	0.11	0.00	0.01	0.01	0.00
<b>Total</b>	<b>0.09</b>	<b>0.11</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>	<b>0.00</b>
<b>Grand Total</b>	<b>20.23</b>	<b>6.81</b>	<b>0.79</b>	<b>1.40</b>	<b>5.26</b>	<b>0.00</b>

# USAF Air Conformity Applicability Model

## Emissions Summary Information

Scenario: WFF LREA - Alt 1 w/ HIF

Installation: LANGLEY AFB

## Emissions Summary Report For 2013

SOURCE CATEGORY	Emissions, Ton/Year					
	CO	NOX	SO2	VOC	PM10	PM2.5
<b>Point Sources</b>						
Other Const. - Facility Heating	0.14	0.18	0.00	0.01	0.01	0.00
Total	0.14	0.18	0.00	0.01	0.01	0.00
<b>Grand Total</b>	0.14	0.18	0.00	0.01	0.01	0.00

# USAF Air Conformity Applicability Model

## Emissions Summary Information

Scenario: WFF LREA - Alt 2

Installation: LANGLEY AFB

## Emissions Summary Report For 2009

SOURCE CATEGORY	Emissions, Ton/Year					
	CO	NOX	SO2	VOC	PM10	PM2.5
<b>Area Sources</b>						
Other Phase II Const. - Workers Trips	0.04	0.00	0.00	0.00	0.00	0.00
Other Phase I Const. - Grading Ops.	0.00	0.00	0.00	0.00	15.02	0.00
Other Phase II Const. - Acres Paved	0.00	0.00	0.00	0.00	0.00	0.00
Other Phase II Const. - Mobile Equip.	0.38	0.91	0.11	0.08	0.07	0.00
Other Phase II Const. - Non-Res. Arch. Ctgs.	0.00	0.00	0.00	0.03	0.00	0.00
Other Phase II Const. - Res. Arch. Ctgs.	0.00	0.00	0.00	0.00	0.00	0.00
Other Phase I Const. - Grading Equip.	0.14	0.51	0.05	0.05	0.04	0.00
Other Phase II Const. - Stationary Equip.	2.58	0.07	0.00	0.10	0.00	0.00
<b>Total</b>	<b>3.14</b>	<b>1.49</b>	<b>0.17</b>	<b>0.26</b>	<b>15.14</b>	<b>0.00</b>
<b>Grand Total</b>	<b>3.14</b>	<b>1.49</b>	<b>0.17</b>	<b>0.26</b>	<b>15.14</b>	<b>0.00</b>

# USAF Air Conformity Applicability Model

## Emissions Summary Information

Scenario: WFF LREA - Alt 2

Installation: LANGLEY AFB

## Emissions Summary Report For 2010

SOURCE CATEGORY	Emissions, Ton/Year					
	CO	NOX	SO2	VOC	PM10	PM2.5
<b>Area Sources</b>						
Other Phase II Const. - Mobile Equip.	1.71	4.08	0.50	0.37	0.33	0.00
Other Phase II Const. - Non-Res. Arch. Ctgs.	0.00	0.00	0.00	0.12	0.00	0.00
Other Phase II Const. - Res. Arch. Ctgs.	0.00	0.00	0.00	0.00	0.00	0.00
Other Phase II Const. - Stationary Equip.	11.60	0.30	0.02	0.43	0.01	0.00
Other Phase II Const. - Workers Trips	0.18	0.01	0.00	0.01	0.00	0.00
Other Phase II Const. - Acres Paved	0.00	0.00	0.00	0.00	0.00	0.00
Total	13.49	4.39	0.52	0.94	0.34	0.00
<b>Point Sources</b>						
Other Const. - Facility Heating	0.01	0.01	0.00	0.00	0.00	0.00
Total	0.01	0.01	0.00	0.00	0.00	0.00
<b>Grand Total</b>	13.50	4.40	0.52	0.94	0.34	0.00



# USAF Air Conformity Applicability Model

## Emissions Summary Information

Scenario: WFF LREA - Alt 2

Installation: LANGLEY AFB

## Emissions Summary Report For 2011

SOURCE CATEGORY	Emissions, Ton/Year					
	CO	NOX	SO2	VOC	PM10	PM2.5
<b>Point Sources</b>						
Other Const. - Facility Heating	0.05	0.06	0.00	0.00	0.00	0.00
Total	0.05	0.06	0.00	0.00	0.00	0.00
<b>Grand Total</b>	0.05	0.06	0.00	0.00	0.00	0.00

Commonwealth of Virginia  
 Department of Environmental Quality

Registration#: 40909  
 Plant Name: US NASA - Wallops Island  
 Physical Location: Island Facility  
 Mailing Address: NASA GSFC Wallops Flight Facility  
 Building F-160, Room C-166  
 Wallops Island, VA 23337 5099

Annual Update for Calendar Year: 2007

Region: TRO  
 County: Accomack County  
 Plant ID: 00031  
 Contact Person: Mitchell, Joel (Joe)  
 Telephone: (757)824-1127  
 Employees: 100  
 Principal Product: space launch  
 SIC: 9661 NAICS: 927110  
 Inspector: Williams, Willis  
 Classification: Synthetic Minor

Summary Data for Calendar Year: ~~2006~~ 2007

Sk	Pt	Seg	Segment Description	SCC	Annual Thruput	Units	Sulfur	Ash	Heat Content (mmBtu/SCC unit)	Overall Effic	Primary Control Equip	Secondary Control Equip	% Annual Thruput												Operating Schedule			% Space Heat			Stack Parameters			Plume HI	Elevation (ft)
													Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	HR	DY	WK	HR	Yr	HI	HI	Dia (ft)		
1	1	1	#2 OIL/ALL BOILERS & FURN	10200503	1426	1000 Gallons Burned	.3	0	138					40	20	10	30	24	7	3000	99.9	20	2	350	6500	7									
1	1	2	PROPANE/ALL FURNACES	10201002	145	1000 Gallons Burned	.1	0	91.5					40	20	10	30	24	7	3000	99.9	20	2	350	6500	7									
1	1	3	OFF-SPEC JET FUEL/ALL BOILERS	10200503	0	1000 Gallons Burned	.5		127					40	20	10	30	24	7	3000	99.9	20	2	350	6500	7									
1	2	1	#2 OIL/DIESEL GEN'S & PUMP	20200102	1.8	1000 Gallons Burned	.3	0	138					25	25	25	25	1	1	300	0	10	2	700	5000	7									
1	2	2	OFF-SPEC JET FUEL/DIESEL GENERATORS	10200503	0	1000 Gallons Burned	.5		127					25	25	25	25	1	1	300	0	10	2	700	5000	7									
1	3	1	PAINT BOOTH BLDG X-30	40200110	28.5	Gallons of Coating	0	0	0					25	25	25	25	8	5	400	0	15	2	80	1000	7									

Date : 12/19/2007 09:20 AM

Commonwealth of Virginia  
Department of Environmental Quality  
Annual Update for Calendar Year: 2007

Registration#: 40217  
Plant Name: NASA Wallops  
Physical Location: NASA Wallops  
Mailing Address: NASA GSFC Wallops Flight Facility  
Building F-160, Room C-166  
Wallops Island, VA 22337 5089

Region: TRO  
County: Accomack County  
Plant ID: 00006  
Contact Person: Mitchell, Joel (Jee)  
Telephone: (757)824-1127  
Employee: 900  
Principal Product: research  
SIC: 8711 NAICS: 828110  
Inspector: Williams, Willis  
Classification: Synthetic Minor

Summary Data for Calendar Year: ~~2006~~ 2007

Slk	Pl	Seg	Segment Description	SCC	Annual Thrupt	Units	% Sulfur	% Ash	Heat Content (mmbtu/ SCC unit)	% Overall Effic	Primary Control Equip	Secondary Control Equip	% Annual Thrupt												Operating Schedule			Stack Parameters			Plume Ht (ft)	Plume Elevation (ft)
													Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Hr	Dy	Wk	Hr	Space Ht (ft)		
1	1	1	DB-208 C-BROOKS 600/#6	10300402	205.85	1000 Gallons Burned	5	5	150				22	72	5	1	24	7	8760	99.9	65	2	475	12700	30							
1	1	2	DB-208 C-BROOKS 600/#2	10300501	1.98	1000 Gallons Burned	3	0	140				22	72	5	1	24	7	8760	99.9	65	2	475	12700	30							
2	3	1	DB-210 C-BROOKS/#6-OIL	10300402	152.76	1000 Gallons Burned	5	5	150				54	1	1	44	24	7	8760	99.9	65	2	475	12700	30							
3	2	2	DB-210 C-BROOKS/#2-OIL	10300501	1.0	1000 Gallons Burned	5	0	140				54	1	1	44	24	7	8760	99.9	65	2	475	12700	30							
4	1	1	DB-211 C-BROOKS/#6	10300402	182.2	1000 Gallons Burned	5	5	150				2	2	2	56	40	24	7	8760	99.9	65	3	240	12700	30						
4	2	2	DB-211 C-BROOKS/#2	10300501	4.36	1000 Gallons Burned	5	0	140				2	2	2	56	40	24	7	8760	99.9	65	3	240	12700	30						
5	1	1	ALL OTHER #2 OIL BOILERS/HEATERS	10300501	149.68	1000 Gallons Burned	3	0	140				40	25	10	25	24	7	8760	99.9	15	1.1	400	1140	30							
5	2	2	ALL #2 OIL EMERGENCY GENERATORS & PUMPS	20100102	10.21	1000 Gallons Burned	3	0	140				40	25	10	25	24	7	8760	99.9	15	1.1	400	1140	30							





Sally Atkins/Herndon/URSCorp  
06/16/2009 03:45 PM

To "Bundick, Joshua A. (GSFC-250.0)"  
<Joshua.A.Bundick@nasa.gov>  
cc Mike\_Kendall@URSCorp.com, "Silbert, Shari A.  
(GSFC-200.C)[EGG]" <shari.a.silbert@nasa.gov>,  
Suzanne\_Richert@URSCorp.com, vijay\_apte@urscorp.c  
bcc  
Subject Re: Heat Loads. 

Here you go

This e-mail and any attachments contain URS Corporation confidential information that may be proprietary or privileged. If you receive this message in error or are not the intended recipient, you should not retain, distribute, disclose or use any of this information and you should destroy the e-mail and any attachments or copies.

"Bundick, Joshua A. (GSFC-250.0)" <Joshua.A.Bundick@nasa.gov>



"Bundick, Joshua A. (GSFC-250.0)"  
<Joshua.A.Bundick@nasa.gov>  
01/26/2009 10:59 AM

To <Suzanne\_Richert@URSCorp.com>,  
<Mike\_Kendall@URSCorp.com>,  
<Sally\_Atkins@URSCorp.com>, <vijay\_apte@urscorp.com>  
cc "Silbert, Shari A. (GSFC-200.C)[EGG]"  
<shari.a.silbert@nasa.gov>  
Subject Heat Loads.

FYI- estimated heat load of Payload Fueling Building-1.7Million BTU/Hour  
Heat load of Payload Processing Building (20% larger)-2.04 Million BTU/Hour

Assume size/layout of Fueling building is that shown in the email I sent last week.  
Assume the Processing Building would be similar to WFF building H-100, but 20 percent larger.

Please let me know if you need more.

Josh

---

Josh Bundick  
Environmental Office  
NASA Wallops Flight Facility  
Code 250.W, Building F-160, Room W160  
Wallops Island, VA 23337

Phone: (757) 824-2319  
Fax: (757) 824-1819  
Email: [Joshua.A.Bundick@nasa.gov](mailto:Joshua.A.Bundick@nasa.gov)

Disclaimer: The views and opinions expressed herein are my own and do not necessarily state or reflect those of NASA or the United States Government, nor do they represent the official position of NASA.

## NASA Wallops Island EA - ACAM Data Entry Summary

Note: ACAM Output Reports state Langley AFB but it is for NASA Wallops Island

Results reported in the tables in Section 4 of EA added Construction Activities emissions from ACAM (except facility heating emissions) to Stationary Sources emissions calculated using an Excel spreadsheet.

### Alternative 1

Facility	HIF	PPF	PPF	Pad A-0	Transportation	Boat Dock Mod
Building Square Footage (ft <sup>3</sup> ) <sup>a</sup>	26,000	7,500	12,000	5,000	0	0
Area Graded (acres)	6.80	1.10	4.10	6.40	2.70	0.10
Grading Duration (days) <sup>b</sup>	30	30	30	30	90	30
Area Paved (acres)	0.25	0.30	1.80	2.20	2.60	0.00
Construction Duration (days) <sup>c</sup>	335	335	335	335	90	180
Construction Start	Aug-09	Mar-12	Mar-12	Nov-09	Nov-09	Nov-09

<sup>a</sup> From Josh Bundick, NASA, e-mail attachment, dated 1/26/09.

<sup>b</sup> Grading duration of 30 days assumed for building projects and 90 days for transportation projects.

<sup>c</sup> Construction phase duration of 335 days assumed for building projects and 90 days for transportation projects.

## NASA Wallops Island EA - ACAM Data Entry Summary

### Alternative 2

Facility	V-45	Pad A-0	Transportation	Boat Dock Mod
Building Square Footage (ft <sup>3</sup> ) <sup>a</sup>	11,000	5,000	0	0
Area Graded (acres)	1.90	6.40	2.70	0.10
Grading Duration (days) <sup>b</sup>	30	30	90	30
Area Paved (acres)	1.40	2.20	2.60	0.00
Construction Duration (days) <sup>c</sup>	335	335	90	180
Construction Start	Nov-09	Nov-09	Nov-09	Nov-09

<sup>a</sup> From Josh Bundick, NASA, e-mail attachment, dated 1/26/09. Except V-45 size from his email dated 8/6/09.

<sup>b</sup> Grading duration of 30 days assumed for building projects and 90 days for transportation projects.

<sup>c</sup> Construction phase duration of 335 days assumed for building projects and 90 days for transportation projects.

NASA Wallops Island EA - Potential to Emit

Boilers and Furnaces	HIF	PPF	Pad A-0	Transportation	Boat Dock Mod	TOTAL
Heat Load (MMBtu/hr)	1.5*	1.7*	2.04*	0*	0*	3.74
Potential Fuel Use (gal/yr) <sup>†</sup>	0.00	108701	130441	0.00	0.00	239142

Emissions from No. 2 Oil Combustion in Boilers and Furnaces

Pollutant	Emission Factor <sup>‡</sup>	Emission Factor Units	Emissions (tpy)
CO	5	lb/1000 gal	0.60
NOX	20	lb/1000 gal	2.39
SO2	2.13	lb/1000 gal	0.25
VOC	0.34	lb/1000 gal	0.04
PM10	1.08	lb/1000 gal	0.13
PM2.5	0.83	lb/1000 gal	0.10

Emergency Generators

3 generators x 500 hours operation per year (ea.)	=	1,500 hr/yr
x 1502 hp <sup>§</sup>	=	2,253,000 hp-hr/yr
x 7000 Btu/hp-hr x 1 MMBtu/1,000,000 Btu	=	15,771 MMBtu/yr

Emissions from Diesel-Fired Emergency Generators

Pollutant	Emission Factor <sup>‡</sup>	Emission Factor Units	Emissions (tpy)
CO	2.8	lb/hr	2.10
NOX	19.33	lb/hr	14.50
SO2	0.015	lb/MMBtu	0.12
VOC	0.34	lb/hr	0.26
PM10	0.24	lb/hr	0.18
PM2.5	0.24	lb/hr	0.18

Total Project PTE

Pollutant	Emissions (tpy)
CO	2.70
NOX	16.89
SO2	0.37
VOC	0.30
PM10	0.31
PM2.5	0.28

\* From Sully Atkins e-mail attachment, dated 3/3/2009.

<sup>†</sup> Boiler fuel use calculated based on 8760 hours of operation per year at full load.

<sup>‡</sup> Emission factors from EPA 40 CFR, Section 1.3, Tables 1.3-1 (NOX, CO, SO2), 1.3-3 (VOC), 1.3-7 (PM10, PM2.5). NMFCO factor from Table 1.3-3 used to represent VOC. No. 2 oil sulfur content of 0.015% assumed. (9/98)

<sup>§</sup> Horsepower rating of 1502 for a Caterpillar C32 DITA engine conservatively assumed for generators. Gen Set Package Performance Data [DM7714], February 28, 2008.

<sup>¶</sup> Not to exceed emission factors from Gen Set Package Performance Data [DM7714] used for CO, NOX, VOC and particulate (February 28, 2008). Total HC factor used for VOC. All PM assumed to be PM2.5. SO2 emission factor from EPA 40 CFR, Section 1.4, Table 1.4-1, (10/98). Assumes diesel sulfur content of 0.015%.

**\*NOTE: ONLY USE CALCULATIONS BELOW THIS LINE**

**Alternative 1**

**Emissions from LPG Commercial Boilers - HIF**

Pollutant	Factor	Units	PTE Emissions (TPY)	Estimated Actuals (TPY)
PM filterable	0.2	lb/1000 gal	0.01	0.00
PM condensable	0.5	lb/1000 gal	0.02	0.00
PM total	0.7	lb/1000 gal	0.03	0.01
SO2	0	lb/1000 gal	0.00	0.00
NOx	13	lb/1000 gal	0.62	0.09
N2O	0.9	lb/1000 gal	0.04	0.01
CO2	12,500	lb/1000 gal	593.45	89.92
CO	7.5	lb/1000 gal	0.36	0.05
TOC	1	lb/1000 gal	0.05	0.01
CH4	0.2	lb/1000 gal	0.01	0.00

PTE Fuel Use (gallons): 95,912  
Assuming 15% use (gallons): 14,387

**Emissions from No. 2 Oil Combustion in Boilers and Furnaces - PPF and PFF**

Pollutant	Emission Factor <sup>‡</sup>	Emission Factor Units	PTE Emissions (tpy)	Estimated Actuals (tpy)
CO	5	lb/1000 gal	0.60	0.09
NOX	20	lb/1000 gal	2.39	0.36
SO2	2.13	lb/1000 gal	0.25	0.04
VOC	0.34	lb/1000 gal	0.04	0.01
PM10	1.08	lb/1000 gal	0.13	0.02
PM2.5	0.83	lb/1000 gal	0.10	0.01

PTE Fuel Use (gallons): 230,142  
Assuming 15% use (gallons): 35,871

**2 generators, one at PPF, one at PFF, none at HIF**

**Emergency Generators (PTE)**

2 generators x 500 hours operation per year (ea.)	=	1,000 hr/yr
x 1502 hp <sup>§</sup>	=	1,502,000 hp-hr/yr
x 7000 Btu/hp-hr x 1 MMBtu/1,000,000 Btu	=	10,514 MMBtu/yr

**SUMMARY:**

**Alternative 1 w/ HIF** \*HIF will have heat pumps & Cooling tower; water will be heated via 1,500 MBH Propane Boiler  
\*HIF will have no back-up generator. PPF and PFF are assumed to have equivalent gensets and fuel oil boilers just to be safe

Pollutant	2009	2010	2011	2012	2013	2014
CO	None	22.48	0.05	0.05	0.17	0.28
NOX	None	0.0016	0.09	0.09	0.78	1.42
SO2	None	0.0030	0.00	0.00	0.02	0.05
VOC	None	0.0018	0.01	0.01	0.02	0.03
PM10	None	0.0013	0.01	0.01	0.02	0.04
PM2.5	None	0.0013	0.01	0.01	0.02	0.03

**PTE**

Pollutant	PTE (tpy)
CO	2.36
NOX	12.68
SO2	0.33
VOC	0.26
PM10	0.28
PM2.5	0.25

**Emergency Generators (Actuals)**

2 generators x 500 hours operation per year (ea.)	=	100 hr/yr
x 1502 hp <sup>§</sup>	=	150,200 hp-hr/yr
x 7000 Btu/hp-hr x 1 MMBtu/1,000,000 Btu	=	1,051 MMBtu/yr

**Alternative 2**

**Emissions from No. 2 Oil Combustion in Boilers and Furnaces - V-45 (PPF Equivalent)**

Pollutant	Emission Factor <sup>‡</sup>	Emission Factor Units	PTE Emissions (tpy)	Estimated Actuals
CO	5	lb/1000 gal	0.60	0.05
NOX	20	lb/1000 gal	2.39	0.20
SO2	2.13	lb/1000 gal	0.25	0.02
VOC	0.34	lb/1000 gal	0.04	0.00
PM10	1.08	lb/1000 gal	0.13	0.01
PM2.5	0.83	lb/1000 gal	0.10	0.01

PTE Fuel Use (gallons): 130,441  
Assuming 15% use (gallons): 19,566

**One Generator (V-45 addition)**

**Emergency Generators (PTE)**

1 generators x 500 hours operation per year (ea.)	=	500 hr/yr
x 1502 hp <sup>§</sup>	=	751,000 hp-hr/yr
x 7000 Btu/hp-hr x 1 MMBtu/1,000,000 Btu	=	5,257 MMBtu/yr

**SUMMARY:**

**Alternative 2** \* 1 generator for V-45; 1 fuel oil boiler for V-45 equivalent heat of PPF

Pollutant	2009	2010	2011	2012	2013	2014
CO	None	0.0297	0.12	Same	Same	Same
NOX	None	0.1697	0.68			
SO2	None	0.0062	0.02			
VOC	None	0.0030	0.01			
PM10	None	0.0041	0.02			
PM2.5	None	0.0035	0.01			

**PTE**

Pollutant	PTE (tpy)
CO	1.30
NOX	7.22
SO2	0.29
VOC	0.13
PM10	0.19
PM2.5	0.16

**Emergency Generators (Actuals)**

1 generators x 500 hours operation per year (ea.)	=	50 hr/yr
x 1502 hp <sup>§</sup>	=	75,100 hp-hr/yr
x 7000 Btu/hp-hr x 1 MMBtu/1,000,000 Btu	=	526 MMBtu/yr