Appendix D
Supporting Emissions Calculations

Table D-1: Facility Wide Potential-to-Emit (PTE) Summary
Project ASCENT PSD Air Permit Application

				Criteria Pollutants (tons/yr)								HAPS (tons/yr)	CO_2e (tons/yr)
Emissions Area	**Equipment Type**	**Fuel**	**Size (MMBtu/hr)**	**Nitrogen Oxides (NO_x)**	**Carbon Monoxide (CO)**	**Sulfur Dioxide (SO_2)**	**Volatile Organic Compounds (VOC)**	**Particulate Matter (PM)**	**Particulate Matter (PM10)**	**Particulate Matter (PM2.5)**	**Lead**		
Ethane Cracker	**Pyrolysis Furnaces – Normal Operation (5)**	NG & TG	397	521	107	9.97	26.1	79.5	79.5	79.5	8.31E-03	31.6	569,577
	Pyrolysis Furnaces – Stand-by / Decoking Operation (1)	NG & TG	119.04	31.3	6.41	0.598	1.56	15.6	15.57	15.57	4.98E-04	1.89	36,815
	Thermal Oxidizer Burner	NG	130	22.8	22.8	0.33	3.07	1.11	4.29	4.29	2.79E-04	1.06	67,127
	Cracker Process - Oxidizer	NG	n/a	-	-	-	20.2	-	-	-	-	2.70	489,307
	Main Flare Pilot (2)	NG	0.82	0.244	1.31	0.002	0.019	0.069	0.069	0.069	1.76E-06	0.007	425
	Ethylene Storage Flare Pilot (2)	NG	0.40	0.119	0.641	0.001	0.009	0.033	0.033	0.033	8.59E-07	0.003	207
	Cracker Storage Flare Pilot (2)	NG	0.40	0.119	0.641	0.001	0.009	0.033	0.033	0.033	8.59E-07	0.003	207
	Oxygen Flare Pilot (2)	NG	0.20	0.060	0.321	0.001	0.005	0.017	0.017	0.017	4.29E-07	0.002	104
	Ethane Cracker Plant Fugitives	n/a	n/a	-	-	-	121	-	-	-	-	-	3,033
Polyethylene Plants	**RTO Burner**	NG	20	3.50	7.21	0.052	0.472	0.170	0.660	0.660	4.29E-05	0.163	10,367
	PE Process – Oxidizer	NG	n/a		-	-	13.1	-	-	-	-	-	1,632
	PE Plants Fugitives and Vent	n/a	n/a	-	-	-	208	-	-	-	-	8.77	891
	Low Pressure Flare Pilot (2)	NG	0.40	0.119	0.641	0.001	0.009	0.033	0.033	0.033	8.59E-07	0.003	207
	Catalyst Activator	NG	10	2.15	3.61	0.026	0.236	0.085	0.330	0.330	2.15E-05	0.082	5,184
	Material Handling	n/a	n/a	-	-	-	-	11.9	11.9	11.9	-	-	-
Support Utilities	**Auxiliary Boilers (2)**	NG	206	36.1	63.2	1.06	2.35	3.75	3.75	3.75	8.85E-04	3.36	213,563
	GE 7EA Gas Turbine	NG	943	31.7	51.3	14.0	44.0	21.0	21.0	21.0	-	4.24	576,624
	HRSG Duct Burner	NG	346	28.1	28.1	0.891	8.17	2.9	11.4	11.4	7.43E-04	2.82	336,053
	Wastewater Treatment Plant	n/a	n/a	-	-	-	1.69	-	-	-	-	1.69	-
	Loading Racks	n/a	n/a	-	-	-	11.0	-	-	-	-	2.69	-
	Storage Tanks Total	n/a	n/a	-	-	-	2.81	-	-	-	-	0.828	-
	Emergency Generators (9)	ULSD	varied	14.22	7.80	1.05	0.344	0.474	0.534	0.534	-	0.006	572
	Fire Water Pumps (3)	ULSD	varied	0.310	0.269	0.035	0.022	0.017	0.022	0.022	-	4.83E-04	19.6
	Cooling Tower	n/a	n/a	-	-	-	67.5	5.02	4.64	0.123	-	-	-
Total tons per year (TPY)				**692**	**301**	**28.1**	**532**	**142**	**154**	**149**	**0.011**	**61.9**	**2,311,914**

Notes:

1. CO2 equivalents (CO2e) calculated according to the following formula and conversions.

   $CO_2e = \Sigma ERi * GWPi$

   CO2e = Aggregate CO2 equivalent emission for all green house gases

   ERi = mass emission rate of greenhouse gas species "i"

   GWPi = Greenhouse warming potential as provided by Table A-1 Subpart A of 40 CFR Part 98

   CO2 GWP = 1

   CH4 GWP = 25

   N2O GW = 298

2. Potential emissions for the pyrolysis furnaces assumes five (5) furnaces at normal continuous operation (8,760 hrs/yr) and one furnace on continuous hot standby (8,760 hr/yr, 30% load) plus PM and CO_2e emissions from decoking events.
3. Assume PM emissions are filterable, PM10 are filterable plus condensable, PM2.5 are filterable plus condensable. PM/PM10/PM2.5 emissions are inclusive of emissions from sulfuric acid mist.

Table D-2A: Emission Factors - Cracker Furnaces
Project ASCENT PSD Air Permit Application

Criteria Pollutants	Emission Factor	Units	Source Information[1]
NO_x	**0.060**	**lb/MMBtu**	*Emission factors from furnace design firm*
CO	**0.0123**	**lb/MMBtu**	*Emission factors from furnace design firm*
SO_2	0.60	lb/mmscf	*Table 1.4-2*
VOC	**0.003**	**lb/MMBtu**	*Emission factors from furnace design firm*
PM[2]	**0.009**	**lb/MMBtu**	*Emission factors from furnace design firm*
PM10	**0.009**	**lb/MMBtu**	*Emission factors from furnace design firm*
PM2.5	**0.009**	**lb/MMBtu**	*Emission factors from furnace design firm*
Lead	0.0005	lb/mmscf	*Table 1.4-2*
Primary GHGs			
CO_2	**65.1**	**lb/MMBtu**	*Emission factors from furnace design firm*
CH_4	2.30	lb/mmscf	*Table 1.4-2*
N_2O	0.64	lb/mmscf	*Table 1.4-2 (Conrolled Low-Nox Burner)*
HAPs - Organic Compounds			
2-Methylnaphthalene	2.40E-05	lb/mmscf	*Table 1.4-3*
3-Methylchloranthrene	1.80E-06	lb/mmscf	*Table 1.4-3*
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/mmscf	*Table 1.4-3*
Acenaphthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Acenaphthylene	1.80E-06	lb/mmscf	*Table 1.4-3*
Anthracene	2.40E-06	lb/mmscf	*Table 1.4-3*
Benz(a)anthracene	1.80E-06	lb/mmscf	*Table 1.4-3*
Benzene	2.10E-03	lb/mmscf	*Table 1.4-3*
Benzo(a)pyrene	1.20E-06	lb/mmscf	*Table 1.4-3*
Benzo(b)fluoranthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Benzo(g,h,i)perylene	1.20E-06	lb/mmscf	*Table 1.4-3*
Benzo(k)fluoranthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Chrysene	1.80E-06	lb/mmscf	*Table 1.4-3*
Dibenzo(a,h)anthracene	1.20E-06	lb/mmscf	*Table 1.4-3*
Dichlorobenzene	1.20E-03	lb/mmscf	*Table 1.4-3*
Fluoranthene	3.00E-06	lb/mmscf	*Table 1.4-3*
fluorene	2.80E-06	lb/mmscf	*Table 1.4-3*
Formaldehyde	7.50E-02	lb/mmscf	*Table 1.4-3*
Hexane	1.80E+00	lb/mmscf	*Table 1.4-3*
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/mmscf	*Table 1.4-3*
Naphthalene	6.10E-04	lb/mmscf	*Table 1.4-3*
Phenanathrene	1.70E-05	lb/mmscf	*Table 1.4-3*
Pyrene	5.00E-06	lb/mmscf	*Table 1.4-3*
Toluene	3.40E-03	lb/mmscf	*Table 1.4-3*
HAPs - Metals			
Arsenic	2.00E-04	lb/mmscf	*Table 1.4.4*
Barium	4.40E-03	lb/mmscf	*Table 1.4.4*
Beryllium	1.20E-05	lb/mmscf	*Table 1.4.4*
Cadmium	1.10E-03	lb/mmscf	*Table 1.4.4*
Chromium	1.40E-03	lb/mmscf	*Table 1.4.4*
Cobalt	8.40E-05	lb/mmscf	*Table 1.4.4*
Copper	8.50E-04	lb/mmscf	*Table 1.4.4*
Manganese	3.80E-04	lb/mmscf	*Table 1.4.4*
Mercury	2.60E-04	lb/mmscf	*Table 1.4.4*
Molybdenum	1.10E-03	lb/mmscf	*Table 1.4.4*
Nickel	2.10E-03	lb/mmscf	*Table 1.4.4*
Selenium	2.40E-05	lb/mmscf	*Table 1.4.4*
Vanadium	2.30E-03	lb/mmscf	*Table 1.4.4*
Zinc	2.90E-03	lb/mmscf	*Table 1.4.4*

Notes:
(1) Table 1.4 refers to EPA AP-42 Chapter 1 (External Combustion Sources) Section 4 (Natural Gas) Boilers >100 MMBtu/hr Post-NSPS Natural Gas Boiler Emission Factors
(2) All PM assumed to be less than 1.0 micrometer

Table D-2B: Emission Factors - Auxiliary Boilers and Cracker Thermal Oxidizer
Project ASCENT PSD Air Permit Application

Criteria Pollutants	Emission Factor	Units	Source Information[1]
NO_x (Aux Boilers only)	**0.020**	**lb/MMBtu**	***BACT Determination***
CO (Aux Boilers only)	**0.035**	**lb/MMBtu**	***BACT Determination***
PM (Aux Boilers only)	**0.002**	**lb/MMBtu**	***BACT Determination***
VOC (Aux Boilers only)	**0.0013**	**lb/MMBtu**	***BACT Determination***
NO_x (Thermal Oxidizer only)	**0.040**	**lb/MMBtu**	***BACT Determination***
CO (Thermal Oxidizer only)	**0.040**	**lb/MMBtu**	***BACT Determination***
SO_2	0.60	lb/mmscf	*Table 1.4-2*
VOC	5.50	lb/mmscf	*Table 1.4-2*
PM -Total	7.60	lb/mmscf	*Table 1.4-2*
PM -Consesable	5.70	lb/mmscf	*Table 1.4-2*
PM - Filterable	1.90	lb/mmscf	*Table 1.4-2*
Lead	0.0005	lb/mmscf	*Table 1.4-2*
Primary GHGs			
CO_2	120,000	lb/mmscf	*Table 1.4-2*
CH_4	2.30	lb/mmscf	*Table 1.4-2*
N_2O	0.64	lb/mmscf	*Table 1.4-2(Controlled - Low Nox Burners)*
HAPs - Organic Compounds			
2-Methylnaphthalene	2.40E-05	lb/mmscf	*Table 1.4-3*
3-Methylchloranthrene	1.80E-06	lb/mmscf	*Table 1.4-3*
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/mmscf	*Table 1.4-3*
Acenaphthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Acenaphthylene	1.80E-06	lb/mmscf	*Table 1.4-3*
Anthracene	2.40E-06	lb/mmscf	*Table 1.4-3*
Benz(a)anthracene	1.80E-06	lb/mmscf	*Table 1.4-3*
Benzene	1.80E-06	lb/mmscf	*Table 1.4-3*
Benzo(a)pyrene	1.20E-06	lb/mmscf	*Table 1.4-3*
Benzo(b)fluoranthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Benzo(g,h,i)perylene	1.20E-06	lb/mmscf	*Table 1.4-3*
Benzo(k)fluoranthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Chrysene	1.80E-06	lb/mmscf	*Table 1.4-3*
Dibenzo(a,h)anthracene	1.20E-06	lb/mmscf	*Table 1.4-3*
Dichlorobenzene	1.20E-03	lb/mmscf	*Table 1.4-3*
Fluoranthene	3.00E-06	lb/mmscf	*Table 1.4-3*
fluorene	2.80E-06	lb/mmscf	*Table 1.4-3*
Formaldehyde	7.50E-02	lb/mmscf	*Table 1.4-3*
Hexane	1.80E+00	lb/mmscf	*Table 1.4-3*
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/mmscf	*Table 1.4-3*
Naphthalene	6.10E-04	lb/mmscf	*Table 1.4-3*
Phenanathrene	1.70E-05	lb/mmscf	*Table 1.4-3*
Pyrene	5.00E-06	lb/mmscf	*Table 1.4-3*
Toluene	3.40E-03	lb/mmscf	*Table 1.4-3*
HAPs - Metals			
Arsenic	2.00E-04	lb/mmscf	*Table 1.4.4*
Barium	4.40E-03	lb/mmscf	*Table 1.4.4*
Beryllium	1.20E-05	lb/mmscf	*Table 1.4.4*
Cadmium	1.10E-03	lb/mmscf	*Table 1.4.4*
Chromium	1.40E-03	lb/mmscf	*Table 1.4.4*
Cobalt	8.40E-05	lb/mmscf	*Table 1.4.4*
Copper	8.50E-04	lb/mmscf	*Table 1.4.4*
Manganese	3.80E-04	lb/mmscf	*Table 1.4.4*
Mercury	2.60E-04	lb/mmscf	*Table 1.4.4*
Molybdenum	1.10E-03	lb/mmscf	*Table 1.4.4*
Nickel	2.10E-03	lb/mmscf	*Table 1.4.4*
Selenium	2.40E-05	lb/mmscf	*Table 1.4.4*
Vanadium	2.30E-03	lb/mmscf	*Table 1.4.4*
Zinc	2.90E-03	lb/mmscf	*Table 1.4.4*

Notes:
(1) Table 1.4 refers to EPA AP-42 Chapter 1 (External Combustion Sources) Section 4 (Natural Gas) Boilers >100 MMBtu/hr Post-NSPS Natural Gas Boiler Emission Factors
(2) All PM assumed to be less than 1.0 micrometer

Table D-2C: Emission Factors - Regenerative Thermal Oxidizer, Flares, and Catalyst Activator
Project ASCENT PSD Air Permit Application

Criteria Pollutants	Emission Factor	Units	Source Information[1]
NO_x (Flares only)	**0.068**	**lb/MMBtu**	***BACT Determination***
CO (Flares only)	**0.366**	**lb/MMBtu**	***BACT Determination***
PM (Flares only)	**0.019**	**lb/MMBtu**	***BACT Determination***
NO_x (RTO only)	**0.040**	**lb/MMBtu**	***BACT Determination***
CO (RTO only)	**0.040**	**lb/MMBtu**	***BACT Determination***
NO_x	50	lb/mmscf	*Table 1.4-1 (LNB)*
CO	84	lb/mmscf	*Table 1.4-1 (uncontrolled)*
SO_2	0.60	lb/mmscf	*Table 1.4-2*
VOC	5.5	lb/mmscf	*Table 1.4-2*
PM[2] (total)	7.60	lb/mmscf	*Table 1.4-2*
PM (condensable)	5.70	lb/mmscf	*Table 1.4-2*
PM (Filterable)	1.90	lb/mmscf	*Table 1.4-2*
Lead	0.0005	lb/mmscf	*Table 1.4-2*
Primary GHGs			
CO_2	120,000	lb/mmscf	*Table 1.4-2*
CH_4	2.30	lb/mmscf	*Table 1.4-2*
N_2O	2.20	lb/mmscf	*Table 1.4-2 (uncontrolled)*
HAPs - Organic Compounds			
2-Methylnaphthalene	2.40E-05	lb/mmscf	*Table 1.4-3*
3-Methylchloranthrene	1.80E-06	lb/mmscf	*Table 1.4-3*
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/mmscf	*Table 1.4-3*
Acenaphthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Acenaphthylene	1.80E-06	lb/mmscf	*Table 1.4-3*
Anthracene	2.40E-06	lb/mmscf	*Table 1.4-3*
Benz(a)anthracene	1.80E-06	lb/mmscf	*Table 1.4-3*
Benzene	2.10E-03	lb/mmscf	*Table 1.4-3*
Benzo(a)pyrene	1.20E-06	lb/mmscf	*Table 1.4-3*
Benzo(b)fluoranthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Benzo(g,h,i)perylene	1.20E-06	lb/mmscf	*Table 1.4-3*
Benzo(k)fluoranthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Chrysene	1.80E-06	lb/mmscf	*Table 1.4-3*
Dibenzo(a,h)anthracene	1.20E-06	lb/mmscf	*Table 1.4-3*
Dichlorobenzene	1.20E-03	lb/mmscf	*Table 1.4-3*
Fluoranthene	3.00E-06	lb/mmscf	*Table 1.4-3*
fluorene	2.80E-06	lb/mmscf	*Table 1.4-3*
Formaldehyde	7.50E-02	lb/mmscf	*Table 1.4-3*
Hexane	1.80E+00	lb/mmscf	*Table 1.4-3*
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/mmscf	*Table 1.4-3*
Naphthalene	6.10E-04	lb/mmscf	*Table 1.4-3*
Phenanathrene	1.70E-05	lb/mmscf	*Table 1.4-3*
Pyrene	5.00E-06	lb/mmscf	*Table 1.4-3*
Toluene	3.40E-03	lb/mmscf	*Table 1.4-3*
HAPs - Metals			
Arsenic	2.00E-04	lb/mmscf	*Table 1.4.4*
Barium	4.40E-03	lb/mmscf	*Table 1.4.4*
Beryllium	1.20E-05	lb/mmscf	*Table 1.4.4*
Cadmium	1.10E-03	lb/mmscf	*Table 1.4.4*
Chromium	1.40E-03	lb/mmscf	*Table 1.4.4*
Cobalt	8.40E-05	lb/mmscf	*Table 1.4.4*
Copper	8.50E-04	lb/mmscf	*Table 1.4.4*
Manganese	3.80E-04	lb/mmscf	*Table 1.4.4*
Mercury	2.60E-04	lb/mmscf	*Table 1.4.4*
Molybdenum	1.10E-03	lb/mmscf	*Table 1.4.4*
Nickel	2.10E-03	lb/mmscf	*Table 1.4.4*
Selenium	2.40E-05	lb/mmscf	*Table 1.4.4*
Vanadium	2.30E-03	lb/mmscf	*Table 1.4.4*
Zinc	2.90E-03	lb/mmscf	*Table 1.4.4*

Notes:
(1)Table 1.4 refers to EPA AP-42 Chapter 1 (External Combustion Sources) Section 4 (Natural Gas) Boilers <100 MMBtu/hr Post-NSPS Natural Gas Boiler Emission Factors
(2) All PM assumed to be less than 1.0 micrometer

Table D-2D: Emission Factors - HRSG Duct Burner
Project ASCENT PSD Air Permit Application

Criteria Pollutants	Emission Factor	Units	Source Information[1]
NO_x	**0.093**	**lb/MMBtu**	*Emission factors from vendor*
CO	**0.093**	**lb/MMBtu**	*Emission factors from vendor*
SO_2	0.60	lb/mmscf	*Table 1.4-2*
VOC	5.50	lb/mmscf	*Table 1.4-2*
PM^2 (total)	7.60	lb/mmscf	*Table 1.4-2*
PM (condensable)	5.70	lb/mmscf	*Table 1.4-2*
PM (Filterable)	1.90	lb/mmscf	*Table 1.4-2*
Lead	0.0005	lb/mmscf	*Table 1.4-2*
Primary GHGs			
CO_2	**219.24**	**lb/MMBtu**	*Emission factors from vendor*
CH_4	**0.093**	**lb/MMBtu**	*Emission factors from vendor*
N_2O	0.64	lb/mmscf	*Table 1.4-2*
HAPs - Organic Compounds			
2-Methylnaphthalene	2.40E-05	lb/mmscf	*Table 1.4-3*
3-Methylchloranthrene	1.80E-06	lb/mmscf	*Table 1.4-3*
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/mmscf	*Table 1.4-3*
Acenaphthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Acenaphthylene	1.80E-06	lb/mmscf	*Table 1.4-3*
Anthracene	2.40E-06	lb/mmscf	*Table 1.4-3*
Benz(a)anthracene	1.80E-06	lb/mmscf	*Table 1.4-3*
Benzene	2.10E-03	lb/mmscf	*Table 1.4-3*
Benzo(a)pyrene	1.20E-06	lb/mmscf	*Table 1.4-3*
Benzo(b)fluoranthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Benzo(g,h,i)perylene	1.20E-06	lb/mmscf	*Table 1.4-3*
Benzo(k)fluoranthene	1.80E-06	lb/mmscf	*Table 1.4-3*
Chrysene	1.80E-06	lb/mmscf	*Table 1.4-3*
Dibenzo(a,h)anthracene	1.20E-06	lb/mmscf	*Table 1.4-3*
Dichlorobenzene	1.20E-03	lb/mmscf	*Table 1.4-3*
Fluoranthene	3.00E-06	lb/mmscf	*Table 1.4-3*
fluorene	2.80E-06	lb/mmscf	*Table 1.4-3*
Formaldehyde	7.50E-02	lb/mmscf	*Table 1.4-3*
Hexane	1.80E+00	lb/mmscf	*Table 1.4-3*
Indeno(1,2,3-cd)pyrene	1.80E-06	lb/mmscf	*Table 1.4-3*
Naphthalene	6.10E-04	lb/mmscf	*Table 1.4-3*
Phenanathrene	1.70E-05	lb/mmscf	*Table 1.4-3*
Pyrene	5.00E-06	lb/mmscf	*Table 1.4-3*
Toluene	3.40E-03	lb/mmscf	*Table 1.4-3*
HAPs - Metals			
Arsenic	2.00E-04	lb/mmscf	*Table 1.4.4*
Barium	4.40E-03	lb/mmscf	*Table 1.4.4*
Beryllium	1.20E-05	lb/mmscf	*Table 1.4.4*
Cadmium	1.10E-03	lb/mmscf	*Table 1.4.4*
Chromium	1.40E-03	lb/mmscf	*Table 1.4.4*
Cobalt	8.40E-05	lb/mmscf	*Table 1.4.4*
Copper	8.50E-04	lb/mmscf	*Table 1.4.4*
Manganese	3.80E-04	lb/mmscf	*Table 1.4.4*
Mercury	2.60E-04	lb/mmscf	*Table 1.4.4*
Molybdenum	1.10E-03	lb/mmscf	*Table 1.4.4*
Nickel	2.10E-03	lb/mmscf	*Table 1.4.4*
Selenium	2.40E-05	lb/mmscf	*Table 1.4.4*
Vanadium	2.30E-03	lb/mmscf	*Table 1.4.4*
Zinc	2.90E-03	lb/mmscf	*Table 1.4.4*

Notes:
(1) EPA AP 42 Chapter 1 (External Combustion Sources) Section 4 (Natural Gas) Boilers >100 MMBtu/hr Post-NSPS Natural Gas Boiler Emission Factors
(2) All PM assumed to be less than 1.0 micrometer

Table D-2E: Emission Factors - Gas Turbine
Project ASCENT PSD Air Permit Application

Criteria Pollutants	Emission Factor		Source Information[1]
NO_x	**3.84E-02**	**lb/MMBtu**	***Emission factors from vendor***
CO	**6.21E-02**	**lb/MMBtu**	***Emission factors from vendor***
SO_x	3.40E-03	lb/MMBtu	*Table 3.1-2a*
PM^2	**0.005**	**lb/MMBtu**	***BACT Determination***
CO_2	**138.7**	**lb/MMBtu**	***Emission factors from vendor***
CH4	**1.07E-02**	**lb/MMBtu**	***Emission factors from vendor***
VOC	**1.07E-02**	**lb/MMBtu**	***Emission factors from vendor***
N_2O	3.00E-03	lb/MMBtu	*Table 3.1-2a*
HAPs			
Benzene	1.20E-05	lb/MMBtu	*Table 3.1-3*
Toluene	1.30E-04	lb/MMBtu	*Table 3.1-3*
Xylenes	6.40E-05	lb/MMBtu	*Table 3.1-3*
1,3-Butadiene	4.30E-07	lb/MMBtu	*Table 3.1-3*
Formaldehyde	7.10E-04	lb/MMBtu	*Table 3.1-3*
Acetaldehyde	4.00E-05	lb/MMBtu	*Table 3.1-3*
Acrolein	6.40E-06	lb/MMBtu	*Table 3.1-3*
Naphthalene	1.30E-06	lb/MMBtu	*Table 3.1-3*
PAH	2.20E-06	lb/MMBtu	*Table 3.1-3*
Ethylbenzene	3.20E-05	lb/MMBtu	*Table 3.1-3*
Propylene Oxided	2.90E-05	lb/MMBtu	*Table 3.1-3*

Notes:
(1) AP 42 Chapter 3 (Stationary Internal Combustion Sources) Section 1 (Stationary Gas Turbines)
(1) Emission Factors are based on combustion turbines using water-steam injection
(2) PM=PM10=PM2.5

Table D-2F: Emission Factors - Emergency Engines <600 hp-hr
Project ASCENT PSD Air Permit Application

Criteria Pollutants	Emission Factor	Units	Source Information[1]
NO_x (Emergency generators)	**0.0066**	**lb/hp-hr**	***40 CFR 89.112 Table 1***
CO (Emergency generators)	**0.0057**	**lb/hp-hr**	***40 CFR 89.112 Table 1***
SO_x	2.90E-01	lb/MMBtu	*Table 3.3-1*
PM (Emergency generators)[2]	**0.00033**	**lb/hp-hr**	***40 CFR 89.112 Table 1***
PM Condensable	0.00004	**lb/hp-hr**	*Table 3.4-2 & 40 CFR 89.112 Table 1 (Ratio)*
CO_2	1.64E+02	lb/MMBtu	*Table 3.3-1*
Aldehydes	7.00E-02	lb/MMBtu	*Table 3.3-1*
TOC	3.60E-01	lb/MMBtu	*Table 3.3-1*
HAPs			
Benzene	9.33E-04	lb/MMBtu	*Table 3.3-2*
Toluene	4.09E-04	lb/MMBtu	*Table 3.3-2*
Xylenes	2.85E-04	lb/MMBtu	*Table 3.3-2*
1,3-Butadiene	3.91E-05	lb/MMBtu	*Table 3.3-2*
Formaldehyde	1.18E-03	lb/MMBtu	*Table 3.3-2*
Acetaldehyde	7.67E-04	lb/MMBtu	*Table 3.3-2*
Acrolein	9.25E-05	lb/MMBtu	*Table 3.3-2*
Naphthalene	8.48E-05	lb/MMBtu	*Table 3.3-2*
Acenaphthylene	5.06E-06	lb/MMBtu	*Table 3.3-2*
Acenaphthene	1.42E-06	lb/MMBtu	*Table 3.3-2*
Fluorene	2.92E-05	lb/MMBtu	*Table 3.3-2*
Phenanthrene	2.94E-05	lb/MMBtu	*Table 3.3-2*
Anthracene	1.87E-06	lb/MMBtu	*Table 3.3-2*
Fluoranthene	7.61E-06	lb/MMBtu	*Table 3.3-2*
Pyrene	4.78E-06	lb/MMBtu	*Table 3.3-2*
Benzo(a)anthracene	1.68E-06	lb/MMBtu	*Table 3.3-2*
Chrysene	3.53E-07	lb/MMBtu	*Table 3.3-2*
Benzo(b)fluoranthene	9.91E-08	lb/MMBtu	*Table 3.3-2*
Benzo(k)fluoranthene	1.55E-07	lb/MMBtu	*Table 3.3-2*
Benzo(a)pyrene	1.88E-07	lb/MMBtu	*Table 3.3-2*
Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu	*Table 3.3-2*
Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu	*Table 3.3-2*
Benzo(g,h,l)perylene	4.89E-07	lb/MMBtu	*Table 3.3-2*
TOTAL PAH	1.68E-04	lb/MMBtu	*Table 3.3-2*

Notes:
(1) AP-42 Chapter 1 Section 3, 40 CFR 89.112 , and 60.4202
(2) PM=PM10=PM2.5

Table D-2G: Emission Factors - Emergency Engines >600 hp-hr
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Criteria Pollutants	Emission Factor	Units	Source Information[1]
NO_x	**0.01058**	**lb/hp-hr**	***40 CFR 89.112 Table 1***
NO_x (firewater pumps)	**0.0066**	**lb/hp-hr**	***40 CFR 60.4202***
CO	**0.00573**	**lb/hp-hr**	***40 CFR 89.112 Table 1***
CO (firewater pumps)	**0.0057**	**lb/hp-hr**	***40 CFR 60.4202***
SO_x	0.303	lb/MMBtu	*Table 3.4-1*
PM^2	**0.00033**	**lb/hp-hr**	***40 CFR 89.112 Table 1***
PM (firewater pumps)	**0.00033**	**lb/hp-hr**	***40 CFR 60.4202***
PM Condensable	0.00004	lb/hp-hr	*Table 3.4-2 & 40 CFR 89.112 Table 1 or 40 CFR 60.4202 (Ratio)*
CO_2	1.65E+02	lb/MMBtu	*Table 3.4-1*
Aldehydes	--	lb/MMBtu	-
TOC	9.00E-02	lb/MMBtu	*Table 3.4-1*
HAPs			
Benzene	7.76E-04	lb/MMBtu	*Table 3.4-3*
Toluene	2.81E-04	lb/MMBtu	*Table 3.4-3*
Xylenes	1.93E-04	lb/MMBtu	*Table 3.4-3*
1,3-Butadiene	--	lb/MMBtu	
Formaldehyde	7.89E-05	lb/MMBtu	*Table 3.4-3*
Acetaldehyde	2.52E-05	lb/MMBtu	*Table 3.4-3*
Acrolein	7.88E-06	lb/MMBtu	*Table 3.4-3*
Naphthalene	1.30E-04	lb/MMBtu	*Table 3.4-4*
Acenaphthylene	9.23E-06	lb/MMBtu	*Table 3.4-4*
Acenaphthene	4.68E-06	lb/MMBtu	*Table 3.4-4*
Fluorene	1.28E-05	lb/MMBtu	*Table 3.4-4*
Phenanthrene	4.08E-05	lb/MMBtu	*Table 3.4-4*
Anthracene	1.23E-06	lb/MMBtu	*Table 3.4-4*
Fluoranthene	4.03E-06	lb/MMBtu	*Table 3.4-4*
Pyrene	3.71E-06	lb/MMBtu	*Table 3.4-4*
Benzo(a)anthracene	6.22E-07	lb/MMBtu	*Table 3.4-4*
Chrysene	1.53E-06	lb/MMBtu	*Table 3.4-4*
Benzo(b)fluoranthene	1.11E-06	lb/MMBtu	*Table 3.4-4*
Benzo(k)fluoranthene	2.18E-07	lb/MMBtu	*Table 3.4-4*
Benzo(a)pyrene	2.57E-07	lb/MMBtu	*Table 3.4-4*
Indeno(1,2,3-cd)pyrene	4.14E-07	lb/MMBtu	*Table 3.4-4*
Dibenz(a,h)anthracene	3.46E-07	lb/MMBtu	*Table 3.4-4*
Benzo(g,h,I)perylene	5.56E-07	lb/MMBtu	*Table 3.4-4*
TOTAL PAH	2.12E-04	lb/MMBtu	*Table 3.4-4*

Notes:
(1) AP-42 Chapter 1 Section 3 and 40 CFR 89.112
(2) PM=PM10=PM2.5

Table D-3: External Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications					Criteria Pollutants (tons/yr)								
Emission Unit No.	Equipment Name	Fuel	Size (MMBtu/hr)	Max Operating Schedule[2] (hrs/yr)	Nitrogen Oxides (NO_x)	Carbon Monoxide (CO)	Sulfur Dioxide (SO_2)	Volatile Organic Compounds (VOC)	PM (Total)	PM (Condensable)	PM (Filterable)	Particulate Matter (PM10)	Particulate Matter (PM2.5)
Boilers >100 MMBtu/hr													
EC-PF-101	**Cracker Furnace #1**	Mix (NG &TG)	396.8	8,760	104	21.4	1.99	5.21	15.6	-	15.64	15.6	15.6
EC-PF-102	**Cracker Furnace #2**	Mix (NG &TG)	396.8	8,760	104	21.4	1.99	5.21	15.6	-	15.64	15.6	15.6
EC-PF-103	**Cracker Furnace #3**	Mix (NG &TG)	396.8	8,760	104	21.4	1.99	5.21	15.6	-	15.64	15.6	15.6
EC-PF-104	**Cracker Furnace #4**	Mix (NG &TG)	396.8	8,760	104	21.4	1.99	5.21	15.6	-	15.64	15.6	15.6
EC-PF-105	**Cracker Furnace #5**	Mix (NG &TG)	396.8	8,760	104	21.4	1.99	5.21	15.6	-	15.64	15.6	15.6
EC-PF-106	**Cracker Furnace #6**	Mix (NG &TG)	119	8,760	31.3	6.41	0.598	1.56	4.69	-	4.69	4.69	4.69
SU-GT-102	**HRSG Duct Burner**	Natural gas	346	8,760	28.1	28.1	0.891	8.17	11.3	8.47	2.82	11.3	11.29
SU-AB-101	**Aux Boiler #1**	Natural gas	206	8,760	18.0	31.6	0.531	1.17	1.80	-	1.80	1.80	1.80
SU-AB-102	**Aux Boiler #2**	Natural gas	206	8,760	18.0	31.6	0.531	1.17	1.80	-	1.80	1.80	1.80
EC-TO-101	**Thermal Oxidizer Burner**	Natural gas	130	8,760	22.8	22.8	0.335	3.07	4.24	3.18	1.06	4.24	4.24
Boilers < 100 MMBtu/hr													
PC-TO-102	**RTO Burner**	Natural gas	20	8,760	3.50	7.21	0.052	0.472	0.653	0.490	0.163	0.653	0.653
EC-FL-101	**Main Flare Pilot[4]**	Natural gas	0.82	8,760	0.244	1.31	0.002	0.019	0.068	-	0.07	0.068	0.068
EC-FL-102	**Ethylene Storage Flare Pilot[4]**	Natural gas	0.40	8,760	0.119	0.641	0.001	0.009	0.033	-	0.03	0.033	0.033
EC-FL-103	**Cracker Storage Flare Pilot[4]**	Natural gas	0.40	8,760	0.119	0.64	0.001	0.009	0.033	-	0.03	0.033	0.033
EC-FL-104	**Oxygen Flare[4]**	Natural gas	0.20	8,760	0.060	0.321	0.001	0.005	0.017	-	0.02	0.017	0.017
PB-FL-105	**Low Pressure Flare Pilot[4]**	Natural gas	0.40	8,760	0.119	0.641	0.001	0.009	0.033	-	0.03	0.033	0.033
PA-CA-101	**Catalyst Activator**	Natural gas	10	8,760	2.15	3.61	0.026	0.236	0.326	0.245	0.082	0.326	0.326

Notes:

(1) Cracker Furnace fuel is mixture of natural gas and recyled tail gas

(2) Continuous Max Operating Schedule is equal to 8760 hours per year

(2) Assume 5 furnaces simultaneously firied at a combined rate of 1,984 MMBtu/hr for 8760 hr/yr

(2) Assume 1 furnace on hot stand-by or on decoking operations 864 hr/yr

(3) Assume PM = PM10 = PM2.5

(3) Vendor emission factors/BACT emissison factors for PM do not break down filterable and condensable fractions. Assumed all PM = PM filterable

(4) Each Flare MMBtu/hr rating, accounts for duplicate pilots for backup and emergencies

HRSG Emission Contorls

SCR (80% Eff of NOx) 0.2

Oxidation Catalyst (80% Eff of CO) 0.2

Fuel Heating Values:

Cracker Fuel Gas Heating Values

523 Btu/scf

Natural Gas Fuel Heating Values

1020 Btu/scf

Table D-3: External Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications					Primary GHGs (tons/yr)			Total HAPs (tons/yr)	HAPs - Organic Compounds (tons/yr)				
Emission Unit No.	Equipment Name	Fuel	Size (MMBtu/hr)	Lead	Carbon Dioxide (CO_2)	Methane (CH_4)	Nitrous Oxide (N_2O)		2-Methylnaphthalene	3-Methylchloranthrene	7,12-Dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene
Boilers >100 MMBtu/hr													
EC-PF-101	**Cracker Furnace #1**	Mix (NG &TG)	396.8	1.66E-03	113,091	7.64	2.13	6.31	7.98E-05	5.98E-06	5.32E-05	5.98E-06	5.98E-06
EC-PF-102	**Cracker Furnace #2**	Mix (NG &TG)	396.8	1.66E-03	113,091	7.64	2.13	6.31	7.98E-05	5.98E-06	5.32E-05	5.98E-06	5.98E-06
EC-PF-103	**Cracker Furnace #3**	Mix (NG &TG)	396.8	1.66E-03	113,091	7.64	2.13	6.31	7.98E-05	5.98E-06	5.32E-05	5.98E-06	5.98E-06
EC-PF-104	**Cracker Furnace #4**	Mix (NG &TG)	396.8	1.66E-03	113,091	7.64	2.13	6.31	7.98E-05	5.98E-06	5.32E-05	5.98E-06	5.98E-06
EC-PF-105	**Cracker Furnace #5**	Mix (NG &TG)	396.8	1.66E-03	113,091	7.64	2.13	6.31	7.98E-05	5.98E-06	5.32E-05	5.98E-06	5.98E-06
EC-PF-106	**Cracker Furnace #6**	Mix (NG &TG)	119	4.98E-04	33,927	2.29	0.64	1.89	2.39E-05	1.79E-06	1.60E-05	1.79E-06	1.79E-06
SU-GT-102	**HRSG Duct Burner**	Natural gas	346	7.43E-04	332,258	140	0.95	2.82	3.57E-05	2.67E-06	2.38E-05	2.67E-06	2.67E-06
SU-AB-101	**Aux Boiler #1**	Natural gas	206	4.42E-04	106,151	2.03	1.95	1.68	2.12E-05	1.59E-06	1.42E-05	1.59E-06	1.59E-06
SU-AB-102	**Aux Boiler #2**	Natural gas	206	4.42E-04	106,151	2.03	1.95	1.68	2.12E-05	1.59E-06	1.42E-05	1.59E-06	1.59E-06
EC-TO-101	**Thermal Oxidizer Burner**	Natural gas	130	2.79E-04	66,988	1.28	0.36	1.06	1.34E-05	1.00E-06	8.93E-06	1.00E-06	1.00E-06
Boilers < 100 MMBtu/hr													
PC-TO-102	**RTO Burner**	Natural gas	20	4.29E-05	10,305.88	0.1975	0.1889	0.163	2.06E-06	1.55E-07	1.37E-06	1.55E-07	1.55E-07
EC-FL-101	**Main Flare Pilot[4]**	Natural gas	0.82	1.76E-06	422.54	0.0081	0.0077	0.007	8.45E-08	6.34E-09	5.63E-08	6.34E-09	6.34E-09
EC-FL-102	**Ethylene Storage Flare Pilot[4]**	Natural gas	0.40	8.59E-07	206.12	0.0040	0.0038	0.003	4.12E-08	3.09E-09	2.75E-08	3.09E-09	3.09E-09
EC-FL-103	**Cracker Storage Flare Pilot[4]**	Natural gas	0.40	8.59E-07	206.12	0.0040	0.0038	0.003	4.12E-08	3.09E-09	2.75E-08	3.09E-09	3.09E-09
EC-FL-104	**Oxygen Flare[4]**	Natural gas	0.20	4.29E-07	103.06	0.0020	0.0019	0.002	2.06E-08	1.55E-09	1.37E-08	1.55E-09	1.55E-09
PB-FL-105	**Low Pressure Flare Pilot[4]**	Natural gas	0.40	8.59E-07	206.12	0.0040	0.0038	0.003	4.12E-08	3.09E-09	2.75E-08	3.09E-09	3.09E-09
PA-CA-101	**Catalyst Activator**	Natural gas	10	2.15E-05	5,152.94	0.0988	0.0945	0.082	1.03E-06	7.73E-08	6.87E-07	7.73E-08	7.73E-08

Notes:

(1) Cracker Furnace fuel is mixture of natural gas and recyled tail gas

(2) Continuous Max Operating Schedule is equal to 8760 hours per year

(2) Assume 5 furnaces simultaneously firied at a combined rate of 1,984 MMBtu/hr for 8760 hr/yr

(2) Assume 1 furnace on hot stand-by or on decoking operations 864 hr/yr

(3) Assume PM = PM10 = PM2.5

(3) Vendor emission factors/BACT emissison factors for PM do not break down filterable and condensable fractions. Assumed all PM = PM filterable

(4) Each Flare MMBtu/hr rating, accounts for duplicate pilots for backup and emergencies

HRSG Emission Contorls

SCR (80% Eff of NOx)	0.2
Oxidation Catalyst (80% Eff of CO)	0.2

Fuel Heating Values:

Cracker Fuel Gas Heating Values

523 Btu/scf

Natural Gas Fuel Heating Values

1020 Btu/scf

Table D-3: External Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications				HAPs - Organic Compounds (tons/yr)									
Emission Unit No.	Equipment Name	Fuel	Size (MMBtu/hr)	Anthracene	Benz(a)anthracene	Benzene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Dichlorobenzene
Boilers >100 MMBtu/hr													
EC-PF-101	**Cracker Furnace #1**	Mix (NG &TG)	396.8	7.98E-06	5.98E-06	6.98E-03	3.99E-06	5.98E-06	3.99E-06	5.98E-06	5.98E-06	3.99E-06	3.99E-03
EC-PF-102	**Cracker Furnace #2**	Mix (NG &TG)	396.8	7.98E-06	5.98E-06	6.98E-03	3.99E-06	5.98E-06	3.99E-06	5.98E-06	5.98E-06	3.99E-06	3.99E-03
EC-PF-103	**Cracker Furnace #3**	Mix (NG &TG)	396.8	7.98E-06	5.98E-06	6.98E-03	3.99E-06	5.98E-06	3.99E-06	5.98E-06	5.98E-06	3.99E-06	3.99E-03
EC-PF-104	**Cracker Furnace #4**	Mix (NG &TG)	396.8	7.98E-06	5.98E-06	6.98E-03	3.99E-06	5.98E-06	3.99E-06	5.98E-06	5.98E-06	3.99E-06	3.99E-03
EC-PF-105	**Cracker Furnace #5**	Mix (NG &TG)	396.8	7.98E-06	5.98E-06	6.98E-03	3.99E-06	5.98E-06	3.99E-06	5.98E-06	5.98E-06	3.99E-06	3.99E-03
EC-PF-106	**Cracker Furnace #6**	Mix (NG &TG)	119	2.39E-06	1.79E-06	2.09E-03	1.20E-06	1.79E-06	1.20E-06	1.79E-06	1.79E-06	1.20E-06	1.20E-03
SU-GT-102	**HRSG Duct Burner**	Natural gas	346	3.57E-06	2.67E-06	3.12E-03	1.78E-06	2.67E-06	1.78E-06	2.67E-06	2.67E-06	1.78E-06	1.78E-03
SU-AB-101	**Aux Boiler #1**	Natural gas	206	2.12E-06	1.59E-06	1.86E-03	1.06E-06	1.59E-06	1.06E-06	1.59E-06	1.59E-06	1.06E-06	1.06E-03
SU-AB-102	**Aux Boiler #2**	Natural gas	206	2.12E-06	1.59E-06	1.86E-03	1.06E-06	1.59E-06	1.06E-06	1.59E-06	1.59E-06	1.06E-06	1.06E-03
EC-TO-101	**Thermal Oxidizer Burner**	Natural gas	130	1.34E-06	1.00E-06	1.00E-06	6.70E-07	1.00E-06	6.70E-07	1.00E-06	1.00E-06	6.70E-07	6.70E-04
Boilers < 100 MMBtu/hr													
PC-TO-102	**RTO Burner**	Natural gas	20	2.06E-07	1.55E-07	1.80E-04	1.03E-07	1.55E-07	1.03E-07	1.55E-07	1.55E-07	1.03E-07	1.03E-04
EC-FL-101	**Main Flare Pilot[4]**	Natural gas	0.82	8.45E-09	6.34E-09	7.39E-06	4.23E-09	6.34E-09	4.23E-09	6.34E-09	6.34E-09	4.23E-09	4.23E-06
EC-FL-102	**Ethylene Storage Flare Pilot[4]**	Natural gas	0.40	4.12E-09	3.09E-09	3.61E-06	2.06E-09	3.09E-09	2.06E-09	3.09E-09	3.09E-09	2.06E-09	2.06E-06
EC-FL-103	**Cracker Storage Flare Pilot[4]**	Natural gas	0.40	4.12E-09	3.09E-09	3.61E-06	2.06E-09	3.09E-09	2.06E-09	3.09E-09	3.09E-09	2.06E-09	2.06E-06
EC-FL-104	**Oxygen Flare[4]**	Natural gas	0.20	2.06E-09	1.55E-09	1.80E-06	1.03E-09	1.55E-09	1.03E-09	1.55E-09	1.55E-09	1.03E-09	1.03E-06
PB-FL-105	**Low Pressure Flare Pilot[4]**	Natural gas	0.40	4.12E-09	3.09E-09	3.61E-06	2.06E-09	3.09E-09	2.06E-09	3.09E-09	3.09E-09	2.06E-09	2.06E-06
PA-CA-101	**Catalyst Activator**	Natural gas	10	1.03E-07	7.73E-08	9.02E-05	5.15E-08	7.73E-08	5.15E-08	7.73E-08	7.73E-08	5.15E-08	5.15E-05

Notes:

(1) Cracker Furnace fuel is mixture of natural gas and recyled tail gas

(2) Continuous Max Operating Schedule is equal to 8760 hours per year

(2) Assume 5 furnaces simultaneously firied at a combined rate of 1,984 MMBtu/hr for 8760 hr/yr

(2) Assume 1 furnace on hot stand-by or on decoking operations 864 hr/yr

(3) Assume PM = PM10 = PM2.5

(3) Vendor emission factors/BACT emissison factors for PM do not break down filterable and condensable fractions. Assumed all PM = PM filterable

(4) Each Flare MMBtu/hr rating, accounts for duplicate pilots for backup and emergencies

HRSG Emission Contorls

SCR (80% Eff of NOx) 0.2

Oxidation Catalyst (80% Eff of CO) 0.2

Fuel Heating Values:

Cracker Fuel Gas Heating Values

523 Btu/scf

Natural Gas Fuel Heating Values

1020 Btu/scf

Table D-3: External Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications				HAPs - Organic Compounds (tons/yr)									HAPs(tons/yr)
Emission Unit No.	Equipment Name	Fuel	Size (MMBtu/hr)	Fluoranthene	fluorene	Formaldehyde	Hexane	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanathrene	Pyrene	Toluene	Arsenic
Boilers >100 MMBtu/hr													
EC-PF-101	**Cracker Furnace #1**	Mix (NG &TG)	396.8	9.97E-06	9.30E-06	2.49E-01	5.98E+00	5.98E-06	2.03E-03	5.65E-05	1.66E-05	1.13E-02	6.65E-04
EC-PF-102	**Cracker Furnace #2**	Mix (NG &TG)	396.8	9.97E-06	9.30E-06	2.49E-01	5.98E+00	5.98E-06	2.03E-03	5.65E-05	1.66E-05	1.13E-02	6.65E-04
EC-PF-103	**Cracker Furnace #3**	Mix (NG &TG)	396.8	9.97E-06	9.30E-06	2.49E-01	5.98E+00	5.98E-06	2.03E-03	5.65E-05	1.66E-05	1.13E-02	6.65E-04
EC-PF-104	**Cracker Furnace #4**	Mix (NG &TG)	396.8	9.97E-06	9.30E-06	2.49E-01	5.98E+00	5.98E-06	2.03E-03	5.65E-05	1.66E-05	1.13E-02	6.65E-04
EC-PF-105	**Cracker Furnace #5**	Mix (NG &TG)	396.8	9.97E-06	9.30E-06	2.49E-01	5.98E+00	5.98E-06	2.03E-03	5.65E-05	1.66E-05	1.13E-02	6.65E-04
EC-PF-106	**Cracker Furnace #6**	Mix (NG &TG)	119	2.99E-06	2.79E-06	7.48E-02	1.79E+00	1.79E-06	6.08E-04	1.69E-05	4.98E-06	3.39E-03	1.99E-04
SU-GT-102	**HRSG Duct Burner**	Natural gas	346	4.46E-06	4.16E-06	1.11E-01	2.67E+00	2.67E-06	9.06E-04	2.53E-05	7.43E-06	5.05E-03	2.97E-04
SU-AB-101	**Aux Boiler #1**	Natural gas	206	2.65E-06	2.48E-06	6.63E-02	1.59E+00	1.59E-06	5.40E-04	1.50E-05	4.42E-06	3.01E-03	1.77E-04
SU-AB-102	**Aux Boiler #2**	Natural gas	206	2.65E-06	2.48E-06	6.63E-02	1.59E+00	1.59E-06	5.40E-04	1.50E-05	4.42E-06	3.01E-03	1.77E-04
EC-TO-101	**Thermal Oxidizer Burner**	Natural gas	130	1.67E-06	1.56E-06	4.19E-02	1.00E+00	1.00E-06	3.41E-04	9.49E-06	2.79E-06	1.90E-03	1.12E-04
Boilers < 100 MMBtu/hr													
PC-TO-102	**RTO Burner**	Natural gas	20	2.58E-07	2.40E-07	6.44E-03	1.55E-01	1.55E-07	5.24E-05	1.46E-06	4.29E-07	2.92E-04	1.72E-05
EC-FL-101	**Main Flare Pilot[4]**	Natural gas	0.82	1.06E-08	9.86E-09	2.64E-04	6.34E-03	6.34E-09	2.15E-06	5.99E-08	1.76E-08	1.20E-05	7.04E-07
EC-FL-102	**Ethylene Storage Flare Pilot[4]**	Natural gas	0.40	5.15E-09	4.81E-09	1.29E-04	3.09E-03	3.09E-09	1.05E-06	2.92E-08	8.59E-09	5.84E-06	3.44E-07
EC-FL-103	**Cracker Storage Flare Pilot[4]**	Natural gas	0.40	5.15E-09	4.81E-09	1.29E-04	3.09E-03	3.09E-09	1.05E-06	2.92E-08	8.59E-09	5.84E-06	3.44E-07
EC-FL-104	**Oxygen Flare[4]**	Natural gas	0.20	2.58E-09	2.40E-09	6.44E-05	1.55E-03	1.55E-09	5.24E-07	1.46E-08	4.29E-09	2.92E-06	1.72E-07
PB-FL-105	**Low Pressure Flare Pilot[4]**	Natural gas	0.40	5.15E-09	4.81E-09	1.29E-04	3.09E-03	3.09E-09	1.05E-06	2.92E-08	8.59E-09	5.84E-06	3.44E-07
PA-CA-101	**Catalyst Activator**	Natural gas	10	1.29E-07	1.20E-07	3.22E-03	7.73E-02	7.73E-08	2.62E-05	7.30E-07	2.15E-07	1.46E-04	8.59E-06

Notes:

(1) Cracker Furnace fuel is mixture of natural gas and recyled tail gas

(2) Continuous Max Operating Schedule is equal to 8760 hours per year

(2) Assume 5 furnaces simultaneously firied at a combined rate of 1,984 MMBtu/hr for 8760 hr/yr

(2) Assume 1 furnace on hot stand-by or on decoking operations 864 hr/yr

(3) Assume PM = PM10 = PM2.5

(3) Vendor emission factors/BACT emissison factors for PM do not break down filterable and condensable fractions. Assumed all PM = PM filterable

(4) Each Flare MMBtu/hr rating, accounts for duplicate pilots for backup and emergencies

HRSG Emission Contorls

SCR (80% Eff of NOx) 0.2

Oxidation Catalyst (80% Eff of CO) 0.2

Fuel Heating Values:

Cracker Fuel Gas Heating Values

523 Btu/scf

Natural Gas Fuel Heating Values

1020 Btu/scf

Table D-3: External Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications				HAPs - Metals (tons/yr)									
Emission Unit No.	Equipment Name	Fuel	Size (MMBtu/hr)	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Manganese	Mercury	Molybdenum	Nickel
Boilers >100 MMBtu/hr													
EC-PF-101	**Cracker Furnace #1**	Mix (NG &TG)	396.8	1.46E-02	3.99E-05	3.66E-03	4.65E-03	2.79E-04	2.82E-03	1.26E-03	8.64E-04	3.66E-03	6.98E-03
EC-PF-102	**Cracker Furnace #2**	Mix (NG &TG)	396.8	1.46E-02	3.99E-05	3.66E-03	4.65E-03	2.79E-04	2.82E-03	1.26E-03	8.64E-04	3.66E-03	6.98E-03
EC-PF-103	**Cracker Furnace #3**	Mix (NG &TG)	396.8	1.46E-02	3.99E-05	3.66E-03	4.65E-03	2.79E-04	2.82E-03	1.26E-03	8.64E-04	3.66E-03	6.98E-03
EC-PF-104	**Cracker Furnace #4**	Mix (NG &TG)	396.8	1.46E-02	3.99E-05	3.66E-03	4.65E-03	2.79E-04	2.82E-03	1.26E-03	8.64E-04	3.66E-03	6.98E-03
EC-PF-105	**Cracker Furnace #5**	Mix (NG &TG)	396.8	1.46E-02	3.99E-05	3.66E-03	4.65E-03	2.79E-04	2.82E-03	1.26E-03	8.64E-04	3.66E-03	6.98E-03
EC-PF-106	**Cracker Furnace #6**	Mix (NG &TG)	119	4.39E-03	1.20E-05	1.10E-03	1.40E-03	8.37E-05	8.47E-04	3.79E-04	2.59E-04	1.10E-03	2.09E-03
SU-GT-102	**HRSG Duct Burner**	Natural gas	346	6.54E-03	1.78E-05	1.63E-03	2.08E-03	1.25E-04	1.26E-03	5.65E-04	3.86E-04	1.63E-03	3.12E-03
SU-AB-101	**Aux Boiler #1**	Natural gas	206	3.89E-03	1.06E-05	9.73E-04	1.24E-03	7.43E-05	7.52E-04	3.36E-04	2.30E-04	9.73E-04	1.86E-03
SU-AB-102	**Aux Boiler #2**	Natural gas	206	3.89E-03	1.06E-05	9.73E-04	1.24E-03	7.43E-05	7.52E-04	3.36E-04	2.30E-04	9.73E-04	1.86E-03
EC-TO-101	**Thermal Oxidizer Burner**	Natural gas	130	2.46E-03	6.70E-06	6.14E-04	7.82E-04	4.69E-05	4.75E-04	2.12E-04	1.45E-04	6.14E-04	1.17E-03
Boilers < 100 MMBtu/hr													
PC-TO-102	**RTO Burner**	Natural gas	20	3.78E-04	1.03E-06	9.45E-05	1.20E-04	7.21E-06	7.30E-05	3.26E-05	2.23E-05	9.45E-05	1.80E-04
EC-FL-101	**Main Flare Pilot[4]**	Natural gas	0.82	1.55E-05	4.23E-08	3.87E-06	4.93E-06	2.96E-07	2.99E-06	1.34E-06	9.16E-07	3.87E-06	7.39E-06
EC-FL-102	**Ethylene Storage Flare Pilot[4]**	Natural gas	0.40	7.56E-06	2.06E-08	1.89E-06	2.40E-06	1.44E-07	1.46E-06	6.53E-07	4.47E-07	1.89E-06	3.61E-06
EC-FL-103	**Cracker Storage Flare Pilot[4]**	Natural gas	0.40	7.56E-06	2.06E-08	1.89E-06	2.40E-06	1.44E-07	1.46E-06	6.53E-07	4.47E-07	1.89E-06	3.61E-06
EC-FL-104	**Oxygen Flare[4]**	Natural gas	0.20	3.78E-06	1.03E-08	9.45E-07	1.20E-06	7.21E-08	7.30E-07	3.26E-07	2.23E-07	9.45E-07	1.80E-06
PB-FL-105	**Low Pressure Flare Pilot[4]**	Natural gas	0.40	7.56E-06	2.06E-08	1.89E-06	2.40E-06	1.44E-07	1.46E-06	6.53E-07	4.47E-07	1.89E-06	3.61E-06
PA-CA-101	**Catalyst Activator**	Natural gas	10	1.89E-04	5.15E-07	4.72E-05	6.01E-05	3.61E-06	3.65E-05	1.63E-05	1.12E-05	4.72E-05	9.02E-05

Notes:

(1) Cracker Furnace fuel is mixture of natural gas and recyled tail gas

(2) Continuous Max Operating Schedule is equal to 8760 hours per year

(2) Assume 5 furnaces simultaneously firied at a combined rate of 1,984 MMBtu/hr for 8760 hr/yr

(2) Assume 1 furnace on hot stand-by or on decoking operations 864 hr/yr

(3) Assume PM = PM10 = PM2.5

(3) Vendor emission factors/BACT emissison factors for PM do not break down filterable and condensable fractions. Assumed all PM = PM filterable

(4) Each Flare MMBtu/hr rating, accounts for duplicate pilots for backup and emergencies

HRSG Emission Contorls

SCR (80% Eff of NOx) 0.2

Oxidation Catalyst (80% Eff of CO) 0.2

Fuel Heating Values:

Cracker Fuel Gas Heating Values

523 Btu/scf

Natural Gas Fuel Heating Values

1020 Btu/scf

Table D-3: External Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications				HAPs - Metals (tons/yr)		
Emission Unit No.	Equipment Name	Fuel	Size (MMBtu/hr)	Selenium	Vanadium	Zinc
Boilers >100 MMBtu/hr						
EC-PF-101	Cracker Furnace #1	Mix (NG &TG)	396.8	7.98E-05	7.64E-03	9.64E-03
EC-PF-102	Cracker Furnace #2	Mix (NG &TG)	396.8	7.98E-05	7.64E-03	9.64E-03
EC-PF-103	Cracker Furnace #3	Mix (NG &TG)	396.8	7.98E-05	7.64E-03	9.64E-03
EC-PF-104	Cracker Furnace #4	Mix (NG &TG)	396.8	7.98E-05	7.64E-03	9.64E-03
EC-PF-105	Cracker Furnace #5	Mix (NG &TG)	396.8	7.98E-05	7.64E-03	9.64E-03
EC-PF-106	Cracker Furnace #6	Mix (NG &TG)	119	2.39E-05	2.29E-03	2.89E-03
SU-GT-102	HRSG Duct Burner	Natural gas	346	3.57E-05	3.42E-03	4.31E-03
SU-AB-101	Aux Boiler #1	Natural gas	206	2.12E-05	2.03E-03	2.57E-03
SU-AB-102	Aux Boiler #2	Natural gas	206	2.12E-05	2.03E-03	2.57E-03
EC-TO-101	Thermal Oxidizer Burner	Natural gas	130	1.34E-05	1.28E-03	1.62E-03
Boilers < 100 MMBtu/hr						
PC-TO-102	RTO Burner	Natural gas	20	2.06E-06	1.98E-04	2.49E-04
EC-FL-101	Main Flare Pilot[4]	Natural gas	0.82	8.45E-08	8.10E-06	1.02E-05
EC-FL-102	Ethylene Storage Flare Pilot[4]	Natural gas	0.40	4.12E-08	3.95E-06	4.98E-06
EC-FL-103	Cracker Storage Flare Pilot[4]	Natural gas	0.40	4.12E-08	3.95E-06	4.98E-06
EC-FL-104	Oxygen Flare[4]	Natural gas	0.20	2.06E-08	1.98E-06	2.49E-06
PB-FL-105	Low Pressure Flare Pilot[4]	Natural gas	0.40	4.12E-08	3.95E-06	4.98E-06
PA-CA-101	Catalyst Activator	Natural gas	10	1.03E-06	9.88E-05	1.25E-04

Notes:

(1) Cracker Furnace fuel is mixture of natural gas and recyled tail gas

(2) Continuous Max Operating Schedule is equal to 8760 hours per year

(2) Assume 5 furnaces simultaneously firied at a combined rate of 1,984 MMBtu/hr for 8760 hr/yr

(2) Assume 1 furnace on hot stand-by or on decoking operations 864 hr/yr

(3) Assume PM = PM10 = PM2.5

(3) Vendor emission factors/BACT emissison factors for PM do not break down filterable and condensable fractions. Assumed all PM = PM filterable

(4) Each Flare MMBtu/hr rating, accounts for duplicate pilots for backup and emergencies

HRSG Emission Contorls

SCR (80% Eff of NOx) 0.2

Oxidation Catalyst (80% Eff of CO) 0.2

Fuel Heating Values:

Cracker Fuel Gas Heating Values

523 Btu/scf

Natural Gas Fuel Heating Values

1020 Btu/scf

Table D-4A: Particulate Matter Emissions - Pyrolysis Furnaces, Decoking Operations
Project ASCENT PSD Air Permit Application

Emissions Calculated as:
PTE (PM) = (lb. PM/decoke)*(# decokes/yr)*(ton/2000lb) = TPY

Emission Unit No.	Equipment Name	lb PM/decoke[1]	# decoke/yr[2]	PM (tpy)[3]	PM10 (tpy)	PM2.5 (tpy)
EC-PF-101	**Cracker Furnace #1**	300	12	1.8	1.8	1.8
EC-PF-102	**Cracker Furnace #2**	300	12	1.8	1.8	1.8
EC-PF-103	**Cracker Furnace #3**	300	12	1.8	1.8	1.8
EC-PF-104	**Cracker Furnace #4**	300	12	1.8	1.8	1.8
EC-PF-105	**Cracker Furnace #5**	300	12	1.8	1.8	1.8
EC-PF-106	**Cracker Furnace #6**	300	12	1.8	1.8	1.8
Total				**11**	**10.8**	**10.8**

Notes:
(1) Estimate of 300 pounds of PM per furnace per decoking event was estimated based on review of permitted facilities.
(2) Potential decoking events per furnace based on 12 per year. Actual events occur every 60-70 days per year.
(3) Assumed all PM is less than 2.5 microns.

Table D-4B: Greenhouse Gas Emissions - Pyrolysis, Decoking Operations
Project ASCENT PSD Air Permit Application

Emissions Calculated as:
PTE (CO_2) = (lb. C/decoke)*(# decokes/yr) * (44 lb mole CO2*/12 lb mole C)*(% Conversion) *(ton/2000lb) = TPY

Emission Unit No.	Equipment Name	lb C/decoke[1]	# decoke/yr[2]	Max Conversion To CO2 (%)[3]	CO2 (tpy)	CO2e (tpy)[4]
EC-PF-101	**Cracker Furnace #1**	20,000	12	100%	440	440
EC-PF-102	**Cracker Furnace #2**	20,000	12	100%	440	440
EC-PF-103	**Cracker Furnace #3**	20,000	12	100%	440	440
EC-PF-104	**Cracker Furnace #4**	20,000	12	100%	440	440
EC-PF-105	**Cracker Furnace #5**	20,000	12	100%	440	440
EC-PF-106	**Cracker Furnace #6**	20,000	12	100%	440	440
Total					**2,640**	**2,640**

Notes:
(1) Pounds of coke per furnace conservatively estimated to be approx. 20,000 per deocking event
(2) Potential decoking events per furnace based on 12 per year. Actual events occur every 60-70 days per year.
(3) All coke material assumed to be oxidized to CO2
(4) CO2 equivalents (CO2e) calculated according to the following formula and conversions.

CO2e = ΣERi * GWPi
CO2e = Aggregate CO2 equivalent emission for all green house gases
ERi = mass emission rate of greenhouse gas species "i"
GWPi = Greenhouse warming potential as provided by Table A-1 Subpart A of 40 CFR Part 98

CO2 GWP =	1
CH4 GWP =	25
N2O GW =	298

Table D-5: Stationary Internal Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications							
Emission Unit No.	**Equipment Name**	**Location**	**Fuel [2]**	**Size (kW)**	**Size (Hp)**	**Size MMBtu/hr**	**Max Operating Schedule (hr/yr)[1]**
Cogeneration							
SU-GT-101	**GE 7EA Gas Turbine**	**Power Plant**	NG	n/a	n/a	943	8,760
Engines (>600 Hp)							
SU-EG-101	**Emergency Generator - Cracker Plant**	**Cracker Plant**	ULSD	2800	3755	10	100
SU-EG -102	**Emergency Generator - PE Plant A**	**PE Plant A**	ULSD	2800	3755	10	100
SU-EG-103	**Emergency Generator - PE Plant C**	**PE Plant C**	ULSD	2800	3755	10	100
SU-EG-104	**Emergency Generator - PE Plant B**	**PE Plant B**	ULSD	2800	3755	10	100
SU-EG-105	**Emergency Generator - Utility #1**	**Utility**	ULSD	2800	3755	10	100
SU-EG-106	**Emergency Generator - Utility #2**	**Utility**	ULSD	2800	3755	10	100
SU-EG-107	**Emergency Generator - WWTP**	**WWTP**	ULSD	2800	3755	10	100
SU-FP-101	**Firewater Pump #1**	**Various**	ULSD	485	650	2	100
SU-FP-102	**Firewater Pump #2**	**Various**	ULSD	485	650	2	100
SU-FP-103	**Firewater Pump #3**	**Various**	ULSD	485	650	2	100
Engines (<600 Hp)							
SU-EG-108	**Emergency Generator - Cooling Water**	**Cooling Water Area**	ULSD	350	469	1	100
SU-EG-109	**Emergency Generator - Product Storage**	**Product Storage**	ULSD	350	469	1	100

Notes:

(1) Continuous Max Operating Schedule is equal to 8760 hours per year

(1) Emergency Generators and Firewater Pumps Max Operating Schedule is 100 hours per year

(2) Assume Ultra Low sulfur fuel - 15ppm

(3) Assume all PM is less than 2.5 microns

(4) For EGs, TOC is by weight 9% methane and 91% nonmethane.

Gas Turbine Emission Controls

SCR (80% Eff)	0.2
Oxidation Catalyst (80% Eff)	0.2

Conversions:

1 kW=	1.34102209	hp
1 hp-hr (electric) =	0.002545458	MMBtu/hr
1 lb =	453.592	grams

Table D-5: Stationary Internal Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications					Criteria and GHG Pollutants (tons/yr)					
Emission Unit No.	Equipment Name	Location	Fuel [2]	Size (kW)	Nitrogen Oxides (NO_x)	Carbon Monoxide (CO)	Sulfur Dioxide (SO_2)	Volatile Organic Compounds (VOC)	Particulate Matter - Filterable	Particulate Matter - Condensable
Cogeneration										
SU-GT-101	**GE 7EA Gas Turbine**	**Power Plant**	NG	n/a	31.7	51.3	14.0	44.0	20.6	-
Engines (>600 Hp)										
SU-EG-101	**Emergency Generator - Cracker Plant**	**Cracker Plant**	ULSD	2800	1.987	1.076	0.145	0.043	0.062	0.008
SU-EG -102	**Emergency Generator - PE Plant A**	**PE Plant A**	ULSD	2800	1.987	1.076	0.145	0.043	0.062	0.008
SU-EG-103	**Emergency Generator - PE Plant C**	**PE Plant C**	ULSD	2800	1.987	1.076	0.145	0.043	0.062	0.008
SU-EG-104	**Emergency Generator - PE Plant B**	**PE Plant B**	ULSD	2800	1.987	1.076	0.145	0.043	0.062	0.008
SU-EG-105	**Emergency Generator - Utility #1**	**Utility**	ULSD	2800	1.987	1.076	0.145	0.043	0.062	0.008
SU-EG-106	**Emergency Generator - Utility #2**	**Utility**	ULSD	2800	1.987	1.076	0.145	0.043	0.062	0.008
SU-EG-107	**Emergency Generator - WWTP**	**WWTP**	ULSD	2800	1.987	1.076	0.145	0.043	0.062	0.008
SU-FP-101	**Firewater Pump #1**	**Various**	ULSD	485	0.215	0.1864	0.025	0.007	0.011	0.001
SU-FP-102	**Firewater Pump #2**	**Various**	ULSD	485	0.215	0.1864	0.025	0.007	0.011	0.001
SU-FP-103	**Firewater Pump #3**	**Various**	ULSD	485	0.215	0.1864	0.025	0.007	0.011	0.001
Engines (<600 Hp)										
SU-EG-108	**Emergency Generator - Cooling Water**	**Cooling Water Area**	ULSD	350	0.155	0.135	0.017	0.022	0.008	0.001
SU-EG-109	**Emergency Generator - Product Storage**	**Product Storage**	ULSD	350	0.155	0.135	0.017	0.022	0.008	0.001

Notes:

(1) Continuous Max Operating Schedule is equal to 8760 hours per year

(1) Emergency Generators and Firewater Pumps Max Operating Schedule is 100 hours per year

(2) Assume Ultra Low sulfur fuel - 15ppm

(3) Assume all PM is less than 2.5 microns

(4) For EGs, TOC is by weight 9% methane and 91% nonmethane.

Gas Turbine Emission Controls

SCR (80% Eff)	0.2
Oxidation Catalyst (80% Eff)	0.2

Conversions:

1 kW=	1.34102209	hp
1 hp-hr (electric) =	0.002545458	MMBtu/hr
1 lb =	453.592	grams

Table D-5: Stationary Internal Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications					Criteria and GHG Pollutants (tons/yr)					
Emission Unit No.	Equipment Name	Location	Fuel [2]	Size (kW)	PM10 - Total	PM2.5 - Total	Carbon Dioxide (CO_2)	Nitrous Oxide (N_2O)	Methane[4]	Total HAPs (tons/yr)
Cogeneration										
SU-GT-101	**GE 7EA Gas Turbine**	**Power Plant**	NG	n/a	20.6	20.6	572,834	12.4	44.0	4.24
Engines (>600 Hp)										
SU-EG-101	**Emergency Generator - Cracker Plant**	**Cracker Plant**	ULSD	2800	0.070	0.070	78.9	-	3.87E-03	8.53E-04
SU-EG -102	**Emergency Generator - PE Plant A**	**PE Plant A**	ULSD	2800	0.070	0.070	78.9	-	3.87E-03	8.53E-04
SU-EG-103	**Emergency Generator - PE Plant C**	**PE Plant C**	ULSD	2800	0.070	0.070	78.9	-	3.87E-03	8.53E-04
SU-EG-104	**Emergency Generator - PE Plant B**	**PE Plant B**	ULSD	2800	0.070	0.070	78.9	-	3.87E-03	8.53E-04
SU-EG-105	**Emergency Generator - Utility #1**	**Utility**	ULSD	2800	0.070	0.070	78.9	-	3.87E-03	8.53E-04
SU-EG-106	**Emergency Generator - Utility #2**	**Utility**	ULSD	2800	0.070	0.070	78.9	-	3.87E-03	8.53E-04
SU-EG-107	**Emergency Generator - WWTP**	**WWTP**	ULSD	2800	0.070	0.070	78.9	-	3.87E-03	8.53E-04
SU-FP-101	**Firewater Pump #1**	**Various**	ULSD	485	0.012	0.012	13.7	-	6.70E-04	1.48E-04
SU-FP-102	**Firewater Pump #2**	**Various**	ULSD	485	0.012	0.012	13.7	-	6.70E-04	1.48E-04
SU-FP-103	**Firewater Pump #3**	**Various**	ULSD	485	0.012	0.012	13.7	-	6.70E-04	1.48E-04
Engines (<600 Hp)										
SU-EG-108	**Emergency Generator - Cooling Water**	**Cooling Water Area**	ULSD	350	0.009	0.009	9.80	-	1.94E-03	2.41E-04
SU-EG-109	**Emergency Generator - Product Storage**	**Product Storage**	ULSD	350	0.009	0.009	9.80	-	1.94E-03	2.41E-04

Notes:

(1) Continuous Max Operating Schedule is equal to 8760 hours per year

(1) Emergency Generators and Firewater Pumps Max Operating Schedule is 100 hours per year

(2) Assume Ultra Low sulfur fuel - 15ppm

(3) Assume all PM is less than 2.5 microns

(4) For EGs, TOC is by weight 9% methane and 91% nonmethane.

Gas Turbine Emission Controls

SCR (80% Eff)	0.2
Oxidation Catalyst (80% Eff)	0.2

Conversions:

1 kW=	1.34102209	hp
1 hp-hr (electric) =	0.002545458	MMBtu/hr
1 lb =	453.592	grams

Table D-5: Stationary Internal Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications					HAPs (tons/yr)					
Emission Unit No.	Equipment Name	Location	Fuel [2]	Size (kW)	Benzene	Toluene	Xylenes	1,3-Butadiene	Formaldehyde	Acetaldehyde
Cogeneration										
SU-GT-101	GE 7EA Gas Turbine	Power Plant	NG	n/a	0.050	0.537	0.264	0.002	2.93	0.165
Engines (>600 Hp)										
SU-EG-101	Emergency Generator - Cracker Plant	Cracker Plant	ULSD	2800	3.71E-04	1.34E-04	9.22E-05	-	3.77E-05	1.20E-05
SU-EG -102	Emergency Generator - PE Plant A	PE Plant A	ULSD	2800	3.71E-04	1.34E-04	9.22E-05	-	3.77E-05	1.20E-05
SU-EG-103	Emergency Generator - PE Plant C	PE Plant C	ULSD	2800	3.71E-04	1.34E-04	9.22E-05	-	3.77E-05	1.20E-05
SU-EG-104	Emergency Generator - PE Plant B	PE Plant B	ULSD	2800	3.71E-04	1.34E-04	9.22E-05	-	3.77E-05	1.20E-05
SU-EG-105	Emergency Generator - Utility #1	Utility	ULSD	2800	3.71E-04	1.34E-04	9.22E-05	-	3.77E-05	1.20E-05
SU-EG-106	Emergency Generator - Utility #2	Utility	ULSD	2800	3.71E-04	1.34E-04	9.22E-05	-	3.77E-05	1.20E-05
SU-EG-107	Emergency Generator - WWTP	WWTP	ULSD	2800	3.71E-04	1.34E-04	9.22E-05	-	3.77E-05	1.20E-05
SU-FP-101	Firewater Pump #1	Various	ULSD	485	6.42E-05	2.33E-05	1.60E-05	-	6.53E-06	2.09E-06
SU-FP-102	Firewater Pump #2	Various	ULSD	485	6.42E-05	2.33E-05	1.60E-05	-	6.53E-06	2.09E-06
SU-FP-103	Firewater Pump #3	Various	ULSD	485	6.42E-05	2.33E-05	1.60E-05	-	6.53E-06	2.09E-06
Engines (<600 Hp)										
SU-EG-108	Emergency Generator - Cooling Water	Cooling Water Area	ULSD	350	5.57E-05	2.44E-05	1.70E-05	2.34E-06	7.05E-05	4.58E-05
SU-EG-109	Emergency Generator - Product Storage	Product Storage	ULSD	350	5.57E-05	2.44E-05	1.70E-05	2.34E-06	7.05E-05	4.58E-05

Notes:

(1) Continuous Max Operating Schedule is equal to 8760 hours per year

(1) Emergency Generators and Firewater Pumps Max Operating Schedule is 100 hours per year

(2) Assume Ultra Low sulfur fuel - 15ppm

(3) Assume all PM is less than 2.5 microns

(4) For EGs, TOC is by weight 9% methane and 91% nonmethane.

Gas Turbine Emission Controls

SCR (80% Eff)	0.2
Oxidation Catalyst (80% Eff)	0.2

Conversions:

1 kW=	1.34102209	hp
1 hp-hr (electric) =	0.002545458	MMBtu/hr
1 lb =	453.592	grams

Table D-5: Stationary Internal Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications					HAPs (tons/yr)					
Emission Unit No.	Equipment Name	Location	Fuel [2]	Size (kW)	Acrolein	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene
Cogeneration										
SU-GT-101	GE 7EA Gas Turbine	Power Plant	NG	n/a	0.026	0.005	-	-	-	-
Engines (>600 Hp)										
SU-EG-101	Emergency Generator - Cracker Plant	Cracker Plant	ULSD	2800	3.77E-06	6.21E-05	4.41E-06	2.24E-06	6.12E-06	1.95E-05
SU-EG -102	Emergency Generator - PE Plant A	PE Plant A	ULSD	2800	3.77E-06	6.21E-05	4.41E-06	2.24E-06	6.12E-06	1.95E-05
SU-EG-103	Emergency Generator - PE Plant C	PE Plant C	ULSD	2800	3.77E-06	6.21E-05	4.41E-06	2.24E-06	6.12E-06	1.95E-05
SU-EG-104	Emergency Generator - PE Plant B	PE Plant B	ULSD	2800	3.77E-06	6.21E-05	4.41E-06	2.24E-06	6.12E-06	1.95E-05
SU-EG-105	Emergency Generator - Utility #1	Utility	ULSD	2800	3.77E-06	6.21E-05	4.41E-06	2.24E-06	6.12E-06	1.95E-05
SU-EG-106	Emergency Generator - Utility #2	Utility	ULSD	2800	3.77E-06	6.21E-05	4.41E-06	2.24E-06	6.12E-06	1.95E-05
SU-EG-107	Emergency Generator - WWTP	WWTP	ULSD	2800	3.77E-06	6.21E-05	4.41E-06	2.24E-06	6.12E-06	1.95E-05
SU-FP-101	Firewater Pump #1	Various	ULSD	485	6.52E-07	1.08E-05	7.64E-07	3.87E-07	1.06E-06	3.38E-06
SU-FP-102	Firewater Pump #2	Various	ULSD	485	6.52E-07	1.08E-05	7.64E-07	3.87E-07	1.06E-06	3.38E-06
SU-FP-103	Firewater Pump #3	Various	ULSD	485	6.52E-07	1.08E-05	7.64E-07	3.87E-07	1.06E-06	3.38E-06
Engines (<600 Hp)										
SU-EG-108	Emergency Generator - Cooling Water	Cooling Water Area	ULSD	350	5.53E-06	5.07E-06	3.02E-07	8.48E-08	1.74E-06	1.76E-06
SU-EG-109	Emergency Generator - Product Storage	Product Storage	ULSD	350	5.53E-06	5.07E-06	3.02E-07	8.48E-08	1.74E-06	1.76E-06

Notes:

(1) Continuous Max Operating Schedule is equal to 8760 hours per year

(1) Emergency Generators and Firewater Pumps Max Operating Schedule is 100 hours per year

(2) Assume Ultra Low sulfur fuel - 15ppm

(3) Assume all PM is less than 2.5 microns

(4) For EGs, TOC is by weight 9% methane and 91% nonmethane.

Gas Turbine Emission Controls

SCR (80% Eff)	0.2
Oxidation Catalyst (80% Eff)	0.2

Conversions:

1 kW=	1.34102209	hp
1 hp-hr (electric) =	0.002545458	MMBtu/hr
1 lb =	453.592	grams

Table D-5: Stationary Internal Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications					HAPs (tons/yr)					
Emission Unit No.	Equipment Name	Location	Fuel [2]	Size (kW)	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene
Cogeneration										
SU-GT-101	**GE 7EA Gas Turbine**	**Power Plant**	NG	n/a	-	-	-	-	-	-
Engines (>600 Hp)										
SU-EG-101	**Emergency Generator - Cracker Plant**	**Cracker Plant**	ULSD	2800	5.88E-07	1.93E-06	1.77E-06	2.97E-07	7.31E-07	5.30E-07
SU-EG -102	**Emergency Generator - PE Plant A**	**PE Plant A**	ULSD	2800	5.88E-07	1.93E-06	1.77E-06	2.97E-07	7.31E-07	5.30E-07
SU-EG-103	**Emergency Generator - PE Plant C**	**PE Plant C**	ULSD	2800	5.88E-07	1.93E-06	1.77E-06	2.97E-07	7.31E-07	5.30E-07
SU-EG-104	**Emergency Generator - PE Plant B**	**PE Plant B**	ULSD	2800	5.88E-07	1.93E-06	1.77E-06	2.97E-07	7.31E-07	5.30E-07
SU-EG-105	**Emergency Generator - Utility #1**	**Utility**	ULSD	2800	5.88E-07	1.93E-06	1.77E-06	2.97E-07	7.31E-07	5.30E-07
SU-EG-106	**Emergency Generator - Utility #2**	**Utility**	ULSD	2800	5.88E-07	1.93E-06	1.77E-06	2.97E-07	7.31E-07	5.30E-07
SU-EG-107	**Emergency Generator - WWTP**	**WWTP**	ULSD	2800	5.88E-07	1.93E-06	1.77E-06	2.97E-07	7.31E-07	5.30E-07
SU-FP-101	**Firewater Pump #1**	**Various**	ULSD	485	1.02E-07	3.34E-07	3.07E-07	5.15E-08	1.27E-07	9.19E-08
SU-FP-102	**Firewater Pump #2**	**Various**	ULSD	485	1.02E-07	3.34E-07	3.07E-07	5.15E-08	1.27E-07	9.19E-08
SU-FP-103	**Firewater Pump #3**	**Various**	ULSD	485	1.02E-07	3.34E-07	3.07E-07	5.15E-08	1.27E-07	9.19E-08
Engines (<600 Hp)										
SU-EG-108	**Emergency Generator - Cooling Water**	**Cooling Water Area**	ULSD	350	1.12E-07	4.55E-07	2.86E-07	1.00E-07	2.11E-08	5.92E-09
SU-EG-109	**Emergency Generator - Product Storage**	**Product Storage**	ULSD	350	1.12E-07	4.55E-07	2.86E-07	1.00E-07	2.11E-08	5.92E-09

Notes:

(1) Continuous Max Operating Schedule is equal to 8760 hours per year

(1) Emergency Generators and Firewater Pumps Max Operating Schedule is 100 hours per year

(2) Assume Ultra Low sulfur fuel - 15ppm

(3) Assume all PM is less than 2.5 microns

(4) For EGs, TOC is by weight 9% methane and 91% nonmethane.

Gas Turbine Emission Controls

SCR (80% Eff)	0.2
Oxidation Catalyst (80% Eff)	0.2

Conversions:

1 kW=	1.34102209	hp
1 hp-hr (electric) =	0.002545458	MMBtu/hr
1 lb =	453.592	grams

Table D-5: Stationary Internal Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

Equipment Specifications					HAPs (tons/yr)					
Emission Unit No.	Equipment Name	Location	Fuel [2]	Size (kW)	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,I)perylene	Propylene Oxided
Cogeneration										
SU-GT-101	**GE 7EA Gas Turbine**	**Power Plant**	NG	n/a	-	-	-	-	-	0.120
Engines (>600 Hp)										
SU-EG-101	**Emergency Generator - Cracker Plant**	**Cracker Plant**	ULSD	2800	1.04E-07	1.23E-07	1.98E-07	1.65E-07	2.66E-07	-
SU-EG -102	**Emergency Generator - PE Plant A**	**PE Plant A**	ULSD	2800	1.04E-07	1.23E-07	1.98E-07	1.65E-07	2.66E-07	-
SU-EG-103	**Emergency Generator - PE Plant C**	**PE Plant C**	ULSD	2800	1.04E-07	1.23E-07	1.98E-07	1.65E-07	2.66E-07	-
SU-EG-104	**Emergency Generator - PE Plant B**	**PE Plant B**	ULSD	2800	1.04E-07	1.23E-07	1.98E-07	1.65E-07	2.66E-07	-
SU-EG-105	**Emergency Generator - Utility #1**	**Utility**	ULSD	2800	1.04E-07	1.23E-07	1.98E-07	1.65E-07	2.66E-07	-
SU-EG-106	**Emergency Generator - Utility #2**	**Utility**	ULSD	2800	1.04E-07	1.23E-07	1.98E-07	1.65E-07	2.66E-07	-
SU-EG-107	**Emergency Generator - WWTP**	**WWTP**	ULSD	2800	1.04E-07	1.23E-07	1.98E-07	1.65E-07	2.66E-07	-
SU-FP-101	**Firewater Pump #1**	**Various**	ULSD	485	1.80E-08	2.13E-08	3.43E-08	2.86E-08	4.60E-08	-
SU-FP-102	**Firewater Pump #2**	**Various**	ULSD	485	1.80E-08	2.13E-08	3.43E-08	2.86E-08	4.60E-08	-
SU-FP-103	**Firewater Pump #3**	**Various**	ULSD	485	1.80E-08	2.13E-08	3.43E-08	2.86E-08	4.60E-08	-
Engines (<600 Hp)										
SU-EG-108	**Emergency Generator - Cooling Water**	**Cooling Water Area**	ULSD	350	9.26E-09	1.12E-08	2.24E-08	3.48E-08	2.92E-08	-
SU-EG-109	**Emergency Generator - Product Storage**	**Product Storage**	ULSD	350	9.26E-09	1.12E-08	2.24E-08	3.48E-08	2.92E-08	-

Notes:

(1) Continuous Max Operating Schedule is equal to 8760 hours per year

(1) Emergency Generators and Firewater Pumps Max Operating Schedule is 100 hours per year

(2) Assume Ultra Low sulfur fuel - 15ppm

(3) Assume all PM is less than 2.5 microns

(4) For EGs, TOC is by weight 9% methane and 91% nonmethane.

Gas Turbine Emission Controls

SCR (80% Eff)	0.2
Oxidation Catalyst (80% Eff)	0.2

Conversions:

1 kW=	1.34102209	hp
1 hp-hr (electric) =	0.002545458	MMBtu/hr
1 lb =	453.592	grams

Table D-5: Stationary Internal Combustion Sources

Project ASCENT PSD Air Permit Application

Emissions Calculated as:

PTE = (Max Operating Schedule)*(Equipment Size)*(Emission Factor)

PTE = (hrs/yr)*(MMBtu/hr)*(lb/MMBtu)*(ton/2000 lb) = TPY

		Equipment Specifications			HAPs (tons/yr)	
Emission Unit No.	Equipment Name	Location	Fuel [2]	Size (kW)	Ethylbenzene	TOTAL PAH
Cogeneration						
SU-GT-101	**GE 7EA Gas Turbine**	**Power Plant**	NG	n/a	0.132	0.009
Engines (>600 Hp)						
SU-EG-101	**Emergency Generator - Cracker Plant**	**Cracker Plant**	ULSD	2800	-	1.01E-04
SU-EG -102	**Emergency Generator - PE Plant A**	**PE Plant A**	ULSD	2800	-	1.01E-04
SU-EG-103	**Emergency Generator - PE Plant C**	**PE Plant C**	ULSD	2800	-	1.01E-04
SU-EG-104	**Emergency Generator - PE Plant B**	**PE Plant B**	ULSD	2800	-	1.01E-04
SU-EG-105	**Emergency Generator - Utility #1**	**Utility**	ULSD	2800	-	1.01E-04
SU-EG-106	**Emergency Generator - Utility #2**	**Utility**	ULSD	2800	-	1.01E-04
SU-EG-107	**Emergency Generator - WWTP**	**WWTP**	ULSD	2800	-	1.01E-04
SU-FP-101	**Firewater Pump #1**	**Various**	ULSD	485	-	1.75E-05
SU-FP-102	**Firewater Pump #2**	**Various**	ULSD	485	-	1.75E-05
SU-FP-103	**Firewater Pump #3**	**Various**	ULSD	485	-	1.75E-05
Engines (<600 Hp)						
SU-EG-108	**Emergency Generator - Cooling Water**	**Cooling Water Area**	ULSD	350	-	1.00E-05
SU-EG-109	**Emergency Generator - Product Storage**	**Product Storage**	ULSD	350	-	1.00E-05

Notes:

(1) Continuous Max Operating Schedule is equal to 8760 hours per year

(1) Emergency Generators and Firewater Pumps Max Operating Schedule is 100 hours per year

(2) Assume Ultra Low sulfur fuel - 15ppm

(3) Assume all PM is less than 2.5 microns

(4) For EGs, TOC is by weight 9% methane and 91% nonmethane.

Gas Turbine Emission Controls

SCR (80% Eff)	0.2
Oxidation Catalyst (80% Eff)	0.2

Conversions:

1 kW=	1.34102209	hp
1 hp-hr (electric) =	0.002545458	MMBtu/hr
1 lb =	453.592	grams

Table D-6: Cracker Thermal Oxidizer Waste Combustion Emissions
Project ASCENT PSD Air Permit Application

Emissions Calculated as:
PTE (VOC) = (Waste Flow)*(Max Operating Schedule)*(1- Destruction Efficiency)
PTE (VOC) = (kg/hr)*(8760 hrs/yr)*(1- DRE)*(2.20 lb/kg)*(ton/2000 lb) = TPY

PTE (CO_2) = (Waste Flow)*(CO_2/VOC molar ratio)*(Max Operating Schedule)*(Destruction Efficiency)
PTE (CO_2) = (kg/hr)*(MW*mole CO2*/MW*mole VOC)*(DRE) *(2.20 lb/kg)*(8760hrs/yr)*(ton/2000lb) = TPY
Note: The {(molar ratio)(waste flow)} was calculated for each constituent and than added to other constituents for Total (CO2) emissions*

			Normal Flow	Wash Oil From CGC	Gasoline (pygas waste)	Water Peak
	Molecular Weights	Molar Ratio	*Continuous*	*Intermittent*	*Intermittent*	*Intermittent*
Hydrocarbon Constituents	**(g/mole)**	**Cn/CO_2**	**kg/hr**	**kg/hr**	**kg/hr**	**kg/hr**
C5s (e.g., Isopentane, pentane)	60	5	-	-	107	-
Benzene	78	6	-	-	221	-
Hexene	84	6	120	120	120	162
C6 (e.g., Hexane)	72	6	-	-	19	-
Toluene	92	7	-	-	27	-
C7s (e.g., Heptane)	84	7	-	-	5	-
Styrene	104	8	-	-	13	-
C8s (e.g, Xylenes)	96	8	-	-	1	-
C9s (e.g., Nonane)	108	9	-	-	0	-
C10s+ (e.g., Decane)	132	10	304	1,136	1,160	812
		Total Flow	424	1,256	1,673	974

	Normal Flow	(Wash Oil From CGC)	(gasoline max)	Water Peak
Totals Emissions	**tpy**	**tpy**	**tpy**	**tpy**
PTE (VOC)	**4.09**	**12.1**	**16.2**	**9.41**
PTE (CO_2)	**101,309**	**342,415**	**387,998**	**253,138**
VOC Emission Speciation				
C5s (e.g., Isopentane, pentane)	-	-	**1.03**	-
Benzene	-	-	**2.13**	-
Hexene	**1.16**	**1.16**	**1.16**	**1.57**
C6 (e.g., Hexane)	-	-	**0.182**	-
Toluene	-	-	**0.258**	-
C7s (e.g., Heptane)	-	-	**0.052**	-
Styrene	-	-	**0.125**	-
C8s (e.g, Xylenes)	-	-	**0.008**	-
C9s (e.g., Nonane)	-	-	**0.004**	-
C10s+ (e.g., Decane)	**2.93**	**11.0**	**11.2**	**7.84**

PTE (VOC)	**20.2**	**tons/yr**
PTE (CO2)	**489,307**	**tons/yr**
HAPS =	**2.70**	**tons/yr**

Notes:
Assume organic waste constituents oxidized to CO2 (i.e. CO2 and VOC only products)
Destruction Efficiency:
Cracker Thermal Oxidizer efficiency = 0.999
Conversions:
1 year = 8760 hr
1 kg = 2.20462 lb
MW CO2 = 44 g/mole

Table D-7: Regenerative Thermal Oxidizer (RTO) Waste Combustion Emissions
Project ASCENT PSD Air Permit Application

Emissions Calculated as:
PTE (VOC) = (Waste Flow)*(Max Operating Schedule)*(1- Destruction Efficiency)
PTE (VOC) = (kg/hr)*(8760 hrs/yr)*(1- DRE)*(2.20 lb/kg)*(ton/2000 lb) = TPY

PTE (CO_2) = (Waste Flow)*(CO_2/VOC molar ratio)*(Max Operating Schedule)*(Destruction Efficiency)
PTE (CO_2) = (kg/hr)*(MW*mole CO2*/MW*mole VOC)*(DRE) *(2.20 lb/kg)*(8760hrs/yr)*(ton/2000lb) = TPY
Note: The {(molar ratio)(waste flow)} was calculated for each constituent and than added to other constituents for Total (CO2) emissions*

			Flow 1 & Flow 2 Mixture
	Molecular Weights	**Molar Ratio**	*Continuous*
Hydrocarbon Constituents	**(g/mole)**	**Cn/CO_2**	**kg/hr**
Ethylene	28	2	124
HC+	13	1	12.3
Iso-Dodecane (C12H26)	170	12	0.170
		total flow	136

Totals Emissions	**Flow 1 & Flow 2 Mixture**
	tpy
PTE (VOC)	**13.1**
PTE (CO_2)	**1,632**
VOC Emission Speciation	
Ethylene	**11.9**
HC+	**1.19**
Iso-Dodecane (C12H26)	**0.016**

Notes:
Assume organic waste constituents oxidized to CO2 (i.e. CO2 and VOC only products)
Emissions only generated from hydrocarbon constituents (i.e. water does not contribute to VOC or CO2 emissions)

Destruction Efficiency:
Cracker Thermal Oxidizer efficiency = 0.999
RTO efficiency = 0.99

Conversions:
1 year = 8760 hr
1 kg = 2.20462 lb
MW CO2 = 44 g/mole

Table D-8: Sulfuric Acid Mist (SAM) Emissions
Project ASCENT PSD Air Permit Application

Equipment Specifications					Sulfric Acid Mist (SAM)	
Emission Unit No.	Equipment Name	Fuel[1]	Size (MMBtu/hr)	Max Operating Schedule[2] (hrs/yr)	SAM (lb/hr)	SAM (tpy)
SU-GT-102	HRSG Duct Burner	Natural gas	346	8,760	1.09	0.120
SU-GT-101	GE 7EA Gas Turbine	NG	943	8,760	2.98	0.328
EC-PF-101	Cracker Furnace #1	Mix (NG &TG)	396.8	8,760	2.43	0.267
EC-PF-102	Cracker Furnace #2	Mix (NG &TG)	396.8	8,760	2.43	0.267
EC-PF-103	Cracker Furnace #3	Mix (NG &TG)	396.8	8,760	2.43	0.267
EC-PF-104	Cracker Furnace #4	Mix (NG &TG)	396.8	8,760	2.43	0.267
EC-PF-105	Cracker Furnace #5	Mix (NG &TG)	396.8	8,760	2.43	0.267
EC-PF-106	Cracker Furnace #6	Mix (NG &TG)	119.04	8,760	0.729	0.080
SU-AB-101	Aux Boiler #1	Natural gas	206	8,760	0.651	0.072
SU-AB-102	Aux Boiler #2	Natural gas	206	8,760	0.651	0.072
EC-TO-101	Thermal Oxidizer Burner	Natural gas	130	8,760	0.411	0.045
PC-TO-102	RTO Burner	Natural gas	20	8,760	0.063	0.007
EC-FL-101	Main Flare Pilot	Natural gas	0.82	8,760	0.003	0.0003
EC-FL-102	Ethylene Storage Flare Pilot	Natural gas	0.40	8,760	0.001	0.0001
EC-FL-103	Cracker Storage Flare Pilot	Natural gas	0.40	8,760	0.001	0.0001
EC-FL-104	Oxygen Flare	Natural gas	0.20	8,760	0.001	0.0001
PB-FL-105	Low Pressure Flare Pilot	Natural gas	0.40	8,760	0.001	0.0001
PA-CA-101	Catalyst Activator	Natural gas	10	8,760	0.032	0.0035
SU-EG-101	Emergency Generator - Cracker Plant	ULSD	9.6	100	0.030	0.003
SU-EG -102	Emergency Generator - PE Plant A	ULSD	9.6	100	0.030	0.003
SU-EG-103	Emergency Generator - PE Plant C	ULSD	9.6	100	0.030	0.003
SU-EG-104	Emergency Generator - PE Plant B	ULSD	9.6	100	0.030	0.003
SU-EG-105	Emergency Generator - Utility #1	ULSD	9.6	100	0.030	0.003
SU-EG-106	Emergency Generator - Utility #2	ULSD	9.6	100	0.030	0.003
SU-EG-107	Emergency Generator - WWTP	ULSD	9.6	100	0.030	0.003
SU-FP-101	Firewater Pump #1	ULSD	1.7	100	0.005	0.001
SU-FP-102	Firewater Pump #2	ULSD	1.7	100	0.005	0.001
SU-FP-103	Firewater Pump #3	ULSD	1.7	100	0.005	0.001
SU-EG-108	Emergency Generator - Cooling Water	ULSD	1.2	100	0.004	0.0004
SU-EG-109	Emergency Generator - Product Storage	ULSD	1.2	100	0.004	0.0004
				Total	19.0	2.09

Notes

SAM emissions are captured in the summary table under PM/PM10/PM2.5

Assumptions

1 year =	8760	hr
1 kg =	2.20462	lb
32	MW of S	
98.01	MW H2SO4	
0.02	gr/scf (maximum short-term sulfur content of natural gas)	
0.0022	gr/scf (annual average sulfur content of natural gas)	
1020	Btu/scf (heating value of natural gas)	
526	Btu/scf (heating value of cracker fuel gas)	
1000000	Btu/MMBtu	
7000	gr/lb	
0.36825	lbmole SO3/lbmole S	
1	lbmole H2SO4/lbmole SO3	

Table D-9: Ethane Cracker Plant Fugitive Emissions
Project ASCENT PSD Air Permit Application

Emissions Calculated as:
PTE = (Emission Factor)*(No. of units)*(Control Efficiency)
PTE = (kg/hr/no.)*(no.)*(1-CE)*(2.20 lb/kg)*(ton/2000 lb)*(8760hrs/yr) = TPY

Emission Origin	Equipment Type	Service	No.[1]	Emission Factor (kg/hr/no.)[2]	Control Efficiency[5]	VOC (tpy)
Valves						
		Gas	34	0.00597	.97	0.059
		Light Liquid	72	0.00403	.97	0.084
	Control Valves	Heavy Liquid	0	0.00023	0	0
		Gas	55	0.00597	.97	0.095
		light Liquid	54	0.00403	.97	0.063
	Automated Isolation Valve	Heavy Liquid	0	0.00023	0	0
		Gas	3750	0.00597	.97	6.49
		Light Liquid	1250	0.00403	.97	1.46
	Manual Isolation Valve	Heavy Liquid	0	0.00023	0	0
			17	0.104	.97	0.512
			90	0.104	.97	2.71
	Pressure Relief Valves	All	0	0.104	.97	0.0
	Valve Total					**11.5**
Seals						
			0	0.0199	.75	0
			13	0.0199	.75	0.625
			0	0.0199	.75	0
			4	0.0199	.75	0.192
			0	0.0199	.75	0
		Light Liquid	3	0.0199	.75	0.144
	Pump Seals	Heavy Liquid	0	0.00862	0	0
			3	0.228	.75	1.65
	Compressor Seals	Gas	8	0.228	.75	4.40
	Seal Total					**7.02**
Connections/Lines						
	Connectors	All	8300	0.00183	.30	103
	Open Ended Lines	All	0	0.0017	.97	0
			0	0.015	.97	0
			3	0.015	.97	0.013
	Sampling Connections	All	31	0.015	.97	0.135
	Connections/Lines Total					**103**

Total (tpy)	**121**
CO2e (tpy) [4]	**3,033**

Notes:
(1) n° of equipment assessed only considering the ones in VOC service (e.g.: for Ethylene Plant the typical organic material not VOC are: methane and ethane); concentration of VOC is conservatively assumed as 100%
(1) For Pressure Relief valves and for pump seal, the spare equipment are not included since not in service
(1) n° of Open ended lines not evaluated since for them a Control efficiency is always 1 since blind, cap , ... are in place; thus emission shall not be considered
(2) Continuous operation (8760 hrs/yr) has been conservatively assumed for each component
(3) Emission factor and control efficiencies are based on EPA Protocol for Equipment Leak Emission Estimates (SOCMI).
(4)CO2e estimates - For purposes of emission estimation only, conservatively assumes total VOC fugitives to be 100% GHG (methane) with a GWP = 25
(5) Control Efficiencies based on TCEQ Leak Detection and Repair Program (28VHP)
Conversions:

1 year =	8760	hr
1 kg =	2.20462	lb

Table D-10: Polyethylene Plants (PE) Fugitives and Flare Emissions
Project ASCENT PSD Air Permit Application

Emissions Calculated as:
PTE = (Flow Rate)*(Control Efficiency)
PTE = (kg/hr)*(1-CE)*(2.20 lb/kg)*(ton/2000 lb)*(8760hrs/yr) = TPY
* Calculated for each constituent

Emission Origin	Source	Frequency	Duration	Destination	Pre Control Flow	Post Control Flow	Breakdown		Post Control	Post Control
PE Plant A					(kg/hr)	(kg/hr)	Constituent	Fraction	kg/hr	tpy
Catalyst Activator filter (1)	S-2003	Intermittent	-	atmosphere	2	2				
							Methanol	0.2	0.40	0.220
							Acetic Acid	0.2	0.40	0.220
							Butene	0.2	0.40	0.220
							Methyl Acetate	0.2	0.40	0.220
							Acetone	0.2	0.40	0.220
Catalyst Activator filter (2)	S-2003	Intermittent	-	atmosphere	1.25E-05	1.25E-05				
							Chromium	1.0	1.25E-05	6.89E-06
Cocatalyst transfer blowdown line	Sand Pit	Intermittent	-	atmosphere	240	240				
							Hexane	0.023	5.52	3.04
							Triethylborane	0.0002	0.048	0.026
							TRIETHYLALUMINUM	1.20E-05	0.003	0.002
							Mineral Oil	2.40E-05	0.006	0.003
Intermediate Treatment flash slurry sampler	S-3004	Intermittent	1 sampling every 2 hours	Flare	1.5	0.03				
							undefined HC	0.02	0.001	0.006
							inert hydrocarbon	0.98	0.029	0.284
Powder conveying package -suction of compressors	PK-4001	infrequent	-	atmosphere	2030	40.6				
							undefined HC	0.02	0.81	0.007
Powder conveying package -downstream discharge cooler	PK-4001	Continuous	-	Flare	1400	28				
							undefined HC	0.02	0.56	5.41
Solvent Recovery purge gas from condensate separator	V-5005	Continuous	-	Flare	979	19.58				
							ethylene	0.28	5.48	52.9
							ethane	0.1	1.96	18.9
							inert hydrocarbon	0.1	1.96	18.9
							methane	0.03	0.587	5.67
Separation and liquid deinventory	T-5004	Continuous	-	Flare	190	3.8				
							inert hydrocarbon	0.23	0.874	8.44
							Hexene	0.68	2.58	25.0
							Hxane	0.15	0.570	5.50
Treaters liquid deinventory	Treaters	Intermittent	-	Flare	12.9	0.259				
							undefined HC	1.0	0.259	0.143
Condenser	E-5011	Continuous	-	Flare	204	4.08				
							ethylene	0.59	2.41	23.2
							ethane	0.05	0.204	1.97
							inert hydrocarbon	0.04	0.163	1.58
							methane	0.09	0.367	3.55
Conveying N2 Return Line	Return Line	infrequent	-	atmosphere	15.06	15.06				
							undefined HC	1.0	15.1	8.30
PE Plant B					(kg/hr)	(kg/hr)	Constituent	%	kg/hr	tpy
Raw Material Supply and Purification	Fugitive Losses	Continuous	-	atmosphere	0.52	0.52				
							undefined HC	1.0	0.520	5.02
Ethylene Purification	Fugitive Losses	Continuous	-	atmosphere	0.125	0.125				
							undefined HC	1.0	0.125	1.21
Reaction Line No 1	Fugitive Losses	Continuous	-	atmosphere	0.407	0.407				
							undefined HC	1.0	0.407	3.93
Resin Degassing Line No 1	Fugitive Losses	Continuous	-	atmosphere	0.054	0.054				
							undefined HC	1.0	0.054	0.521
Vent Recovery Line No 1	Fugitive Losses	Continuous	-	atmosphere	0.169	0.169				
							undefined HC	1.0	0.169	1.63
Pelleting Line No 1	Resin Residual HC	Continuous	-	atmosphere	0.0015	0.0015				
							undefined HC	1.0	0.002	0.014
PE Plant C					(kg/hr)	(kg/hr)	Constituent	%	kg/hr	tpy
Stack for process gas (hyper compressor suction side)	off-gas	Discontinuous	-	atmosphere	0.07	0.07				
							undefined HC	0.02	0.001	0.014
							Ethylene	0.98	0.069	0.662
Stack for process gas (hyper compressor discharge side)	off-gas	Discontinuous	-	atmosphere	0.07	0.07				
							undefined HC	0.02	0.001	0.014
							Ethylene	0.98	0.069	0.662
Reactor blow down drum	Fugitive Losses	Discontinuous	-	atmosphere	1.036	1.036				
							undefined HC	0.02	0.021	0.200
							Ethylene	0.98	1.02	9.80

Notes:
(1) For purposes of CO2e emission estimation only, conservatively assumes total undefined HC fugitives to be methane with a GWP = 25
Conversions:
1 kg = 2.20462 lb
Assumptions
Flare Efficiency = 0.98
Continuous = 8760 hours /yr
intermittent 500 hours /yr
Infrequent 8 hours /yr
Ideal Gas Behavior
Density of Air at atmospheric pressure 101.325 kPa (101325 Pa) and 0 degC can be calculated as:
density = P/(RT)(1)
1.294 kg/m3

Total VOC (tpy)	208
Total Methane (tpy)	9.22
Total HAPs (tpy)	8.77
CO2e [1] (tpy)	660

Table D-11: Potential VOC Tank Emissions
Project ASCENT PSD Air Permit Application

Tank No.	Contents	VOC Standing Losses (tpy)	VOC Working Losses (tpy)	Total Uncontrolled VOCs (tpy)	Control Device	Control Efficiency	Total Controlled VOCs (tpy)
10-TK-1001	Ethylene storage tank	0	0	0	EC-FL-102	0.98	0
10-TK-1002A	Pygas storage tank	2.60	13.54	16.14	EC-FL-103	0.98	0.323
10-TK-1002B	Pygas storage tank	2.60	13.54	16.14	EC-FL-103	0.98	0.323
10-TK-1004A	Ethane storage bullet	0	0	0	EC-FL-102	0.98	0
10-TK-1004B	Ethane storage bullet	0	0	0	EC-FL-102	0.98	0
10-TK-1004C	Ethane storage bullet	0	0	0	EC-FL-102	0.98	0
10-TK-1005	Propylene storage bullet	0	0	0	EC-FL-102	0.98	0
10-TK-1032	Hexene-1 storage tank	8.56	43.4	51.9	EC-FL-103	0.98	1.04
10-TK-1033	Inert hydrocarbon storage tank	4.93	5.36	10.3	EC-FL-103	0.98	0.206
10-TK-1040A	Inert hydrocarbon storage sphere	0.0	0.0	0.0	EC-FL-102	0.98	0
10-TK-1040B	Inert hydrocarbon storage sphere	0.0	0.0	0.0	EC-FL-102	0.98	0
10-TK-1041A	Raw Mix C4s storage sphere	0.0	0.0	0.0	EC-FL-102	0.98	0
10-TK-1041B	Raw Mix C4s storage sphere	0.0	0.0	0.0	EC-FL-102	0.98	0
10-TK-1050	Comonomer storage tank	5.67	6.88	12.6	EC-FL-102	0.98	0.251
20-TK-2931	Spent caustic tank	4.82	28.10	32.9	EC-FL-103	0.98	0.659
20-TK-2942	Wash oil storage	0.058	0.151	0.209	EC-FL-103	0.98	0.004
20-TK-2951	Thermal Oxidizer Feed tank	0.002	0.009	0.010	EC-FL-103	0.98	0.0002
50-TK-1401	Inert hydrocarbon storage bullet	0	0	0	EC-FL-102	0.98	0
EG-TK-101	Diesel fuel tank	4.08E-04	1.69E-04	5.77E-04	None	0.00	5.77E-04
EG-TK-102	Diesel fuel tank	4.08E-04	1.69E-04	5.77E-04	None	0.00	5.77E-04
EG-TK-103	Diesel fuel tank	4.08E-04	1.69E-04	5.77E-04	None	0.00	5.77E-04
EG-TK-104	Diesel fuel tank	4.08E-04	1.69E-04	5.77E-04	None	0.00	5.77E-04
EG-TK-105	Diesel fuel tank	4.08E-04	1.69E-04	5.77E-04	None	0.00	5.77E-04
EG-TK-106	Diesel fuel tank	4.08E-04	1.69E-04	5.77E-04	None	0.00	5.77E-04
EG-TK-107	Diesel fuel tank	4.08E-04	1.69E-04	5.77E-04	None	0.00	5.77E-04
EG-TK-108	Diesel fuel tank	6.41E-05	2.39E-05	8.80E-05	None	0.00	8.80E-05
EG-TK-109	Diesel fuel tank	6.41E-05	2.39E-05	8.80E-05	None	0.00	8.80E-05
FP-TK-101	Diesel fuel tank	1.32E-04	3.21E-05	1.64E-04	None	0.00	1.64E-04
FP-TK-102	Diesel fuel tank	1.32E-04	3.21E-05	1.64E-04	None	0.00	1.64E-04
FP-TK-103	Diesel fuel tank	1.32E-04	3.21E-05	1.64E-04	None	0.00	1.64E-04
Total Emissions		29.3	111	140			2.81

Notes:

1. Assumed zero VOC emissions from cryogenic ethylene tank and pressurized storage bullets/spheres.

2. Pygas speciation derived from example MSDS and engineering assumptions.

3. Thermal oxizider feed and wash oil tank based on feed characteristics to the thermal oxidizer.

4. Spent caustic tank will contain organics from the process. Assumed similar profile to Raw Pygas for emissions.

5. Uncontrolled emissions based on TANKS 4.09D Software.

6. Emissions from 10-TK-1033 assumed to be isopentane for emissions purposes; other possible inerts include pentane.

7. Emissions from 10-TK-1050 assumed to be vinyl acetate for emissions purposes; other possible comonomers include acrylic acid or methyl acrylate.

8. Inerts from 10-TK-1040A, 10-TK-1040B, and 50-TK-1401 are equivalent to C4 (butene, isobutane) hydrocarbons.

9. Diesel fuel tank sizes based on typical tank size for corresponding internal combustion engine.

Table D-12: Potential HAP Tank Emissions
Project ASCENT PSD Air Permit Application

Tank No.	Contents	Benzene	Ethylbenzene	Hexane	Toluene	Xylenes	Styrene	Vinyl Acetate	Total Controlled HAPs (tpy)
10-TK-1001	Ethylene storage tank	-	-	-	-	-	-	-	0.00E+00
10-TK-1002A	Pygas storage tank	1.36E-01	2.46E-04	-	5.69E-03	2.05E-04	8.14E-04	-	1.43E-01
10-TK-1002B	Pygas storage tank	1.36E-01	2.46E-04	-	5.69E-03	2.05E-04	8.14E-04	-	1.43E-01
10-TK-1004A	Ethane storage bullet	-	-	-	-	-	-	-	0.00E+00
10-TK-1004B	Ethane storage bullet	-	-	-	-	-	-	-	0.00E+00
10-TK-1004C	Ethane storage bullet	-	-	-	-	-	-	-	0.00E+00
10-TK-1005	Propylene storage bullet	-	-	-	-	-	-	-	0.00E+00
10-TK-1032	Hexene-1 storage tank	-	-	-	-	-	-	-	0.00E+00
10-TK-1033	Inert hydrocarbon storage tank	-	-	-	-	-	-	-	0.00E+00
10-TK-1040A	Inert hydrocarbon storage sphere	-	-	-	-	-	-	-	0.00E+00
10-TK-1040B	Inert hydrocarbon storage sphere	-	-	-	-	-	-	-	0.00E+00
10-TK-1041A	Raw Mix C4s storage sphere	-	-	-	-	-	-	-	0.00E+00
10-TK-1041B	Raw Mix C4s storage sphere	-	-	-	-	-	-	-	0.00E+00
10-TK-1050	Comonomer storage tank	-	-	-	-	-	-	2.51E-01	2.51E-01
20-TK-2931	Spent caustic tank	2.77E-01	5.03E-04	-	1.16E-02	4.18E-04	1.66E-03	-	2.91E-01
20-TK-2942	Wash oil storage	-	-	-	-	-	-	-	0.00E+00
20-TK-2951	Thermal Oxidizer Feed tank	-	-	-	-	-	-	-	0.00E+00
50-TK-1401	Inert hydrocarbon storage bullet	-	-	-	-	-	-	-	0.00E+00
EG-TK-101	Diesel fuel tank	3.87E-06	1.26E-05	8.02E-06	3.86E-05	2.66E-05	-	-	8.96E-05
EG-TK-102	Diesel fuel tank	3.87E-06	1.26E-05	8.02E-06	3.86E-05	2.66E-05	-	-	8.96E-05
EG-TK-103	Diesel fuel tank	3.87E-06	1.26E-05	8.02E-06	3.86E-05	2.66E-05	-	-	8.96E-05
EG-TK-104	Diesel fuel tank	3.87E-06	1.26E-05	8.02E-06	3.86E-05	2.66E-05	-	-	8.96E-05
EG-TK-105	Diesel fuel tank	3.87E-06	1.26E-05	8.02E-06	3.86E-05	2.66E-05	-	-	8.96E-05
EG-TK-106	Diesel fuel tank	3.87E-06	1.26E-05	8.02E-06	3.86E-05	2.66E-05	-	-	8.96E-05
EG-TK-107	Diesel fuel tank	3.87E-06	1.26E-05	8.02E-06	3.86E-05	2.66E-05	-	-	8.96E-05
EG-TK-108	Diesel fuel tank	5.91E-07	1.92E-06	1.22E-06	5.88E-06	4.06E-06	-	-	1.37E-05
EG-TK-109	Diesel fuel tank	5.91E-07	1.92E-06	1.22E-06	5.88E-06	4.06E-06	-	-	1.37E-05
FP-TK-101	Diesel fuel tank	1.10E-06	3.57E-06	2.28E-06	1.09E-05	7.55E-06	-	-	2.54E-05
FP-TK-102	Diesel fuel tank	1.10E-06	3.57E-06	2.28E-06	1.09E-05	7.55E-06	-	-	2.54E-05
FP-TK-103	Diesel fuel tank	1.10E-06	3.57E-06	2.28E-06	1.09E-05	7.55E-06	-	-	2.54E-05
Total Emissions		0.548	0.001	0.0001	0.023	0.001	0.003	0.251	0.828

Notes:

1. HAP speciation for distillate fuel tanks based Section 114 Data, US EPA, August 16, 1993.

2. Pygas speciation derived from example MSDS and engineering assumptions.

3. Thermal oxizider feed and wash oil tank based on feed characteristics to the thermal oxidizer.

4. Spent caustic tank will contain organics from the process. Assumed similar profile to Raw Pygas for emissions.

5. Uncontrolled emissions based on TANKS 4.09D Software.

5. Emissions from Comonomer storage tank assumed to be vinyl acetate.

6. Inerts from 10-TK-1033, 10-TK-1040A, 10-TK-1040B, and 50-TK-1401 are equivalent to C4 (butene, isobutane) or C5 (pentane, isopentane) hydrocarbons.

7. Diesel fuel tank sizes based on typical tank size for corresponding internal combustion engine.

Table D-13: Potential VOC/HAP Transfer Rack Emissions
Project ASCENT PSD Air Permit Application

Tank No.	Contents	Loading Rack Activity	Throughput (gallons)	Control Device	Control Efficiency	Total Controlled VOCs (tpy)	Total Controlled HAPs (tpy)	Benzene	Ethylbenzene	Toluene	Xylenes	Styrene	Vinyl Acetate	Butadiene
10-TK-1001	Ethylene storage tank	None	98,014,383	EC-FL-102	0.98	0	0							
10-TK-1002A	Pygas storage tank	Truck/Rail Loading	9,785,222	EC-FL-103	0.98	0.408	0.263	0.204	0.004	0.031	0.004	0.020	-	-
10-TK-1002B	Pygas storage tank	Truck/Rail Loading	9,785,222	EC-FL-103	0.98	0.408	0.263	0.204	0.004	0.031	0.004	0.020	-	-
10-TK-1004A	Ethane storage bullet	None	460,586,681	EC-FL-102	0.98	0	0	-	-	-	-	-	-	-
10-TK-1004B	Ethane storage bullet	None	460,586,681	EC-FL-102	0.98	0	0	-	-	-	-	-	-	-
10-TK-1004C	Ethane storage bullet	None	460,586,681	EC-FL-102	0.98	0	0	-	-	-	-	-	-	-
10-TK-1005	Propylene storage bullet	Truck/Rail Loading	127,478,578	EC-FL-102	0.98	5.32	0	-	-	-	-	-	-	-
10-TK-1032	Hexene-1 storage tank	Truck/Rail Unloading	19,783,468	EC-FL-103	0.98	0.825	0	-	-	-	-	-	-	-
10-TK-1033	Inert hydrocarbon storage tank	Truck/Rail Unloading	671,082	EC-FL-103	0.98	0.028	0	-	-	-	-	-	-	-
10-TK-1040A	Inert hydrocarbon storage sphere	Truck/Rail Unloading	17,603,921	EC-FL-102	0.98	0.734	0	-	-	-	-	-	-	-
10-TK-1040B	Inert hydrocarbon storage sphere	Truck/Rail Unloading	17,603,921	EC-FL-102	0.98	0.734	0	-	-	-	-	-	-	-
10-TK-1041A	Raw Mix C4s storage sphere	Truck/Rail Loading	16,747,514	EC-FL-102	0.98	0.699	0.699	-	-	-	-	-	-	0.699
10-TK-1041B	Raw Mix C4s storage sphere	Truck/Rail Loading	16,747,514	EC-FL-102	0.98	0.699	0.699	-	-	-	-	-	-	0.699
10-TK-1050	Comonomer storage tank	Truck/Rail Unloading	5,283,442	EC-FL-102	0.98	0.220	0.220	-	-	-	-	-	0.220	-
20-TK-2931	Spent caustic tank	Truck/Rail Unloading	20,314,354	EC-FL-103	0.98	0.848	0.547	0.424	0.008	0.064	0.008	0.042	-	-
20-TK-2942	Wash oil storage	Truck/Rail Unloading	898,185	EC-FL-103	0.98	0.037	0	-	-	-	-	-	-	-
20-TK-2951	Thermal Oxidizer Feed tank	None	2,688,961	EC-FL-103	0.98	0	0	-	-	-	-	-	-	-
50-TK-1401	Inert hydrocarbon storage bullet	None	99,645	EC-FL-102	0.98	0	0	-	-	-	-	-	-	-
EG-TK-101	Diesel fuel tank	None	18,680	None	0.00	0	0	-	-	-	-	-	-	-
EG-TK-102	Diesel fuel tank	None	18,680	None	0.00	0	0	-	-	-	-	-	-	-
EG-TK-103	Diesel fuel tank	None	18,680	None	0.00	0	0	-	-	-	-	-	-	-
EG-TK-104	Diesel fuel tank	None	18,680	None	0.00	0	0	-	-	-	-	-	-	-
EG-TK-105	Diesel fuel tank	None	18,680	None	0.00	0	0	-	-	-	-	-	-	-
EG-TK-106	Diesel fuel tank	None	18,680	None	0.00	0	0	-	-	-	-	-	-	-
EG-TK-107	Diesel fuel tank	None	18,680	None	0.00	0	0	-	-	-	-	-	-	-
EG-TK-108	Diesel fuel tank	None	2,650	None	0.00	0	0	-	-	-	-	-	-	-
EG-TK-109	Diesel fuel tank	None	2,650	None	0.00	0	0	-	-	-	-	-	-	-
FP-TK-101	Diesel fuel tank	None	3,550	None	0.00	0	0	-	-	-	-	-	-	-
FP-TK-102	Diesel fuel tank	None	3,550	None	0.00	0	0	-	-	-	-	-	-	-
FP-TK-103	Diesel fuel tank	None	3,550	None	0.00	0	0	-	-	-	-	-	-	-
Total Emissions						11.0	2.69	0.832	0.017	0.125	0.017	0.083	0.220	1.40

Notes:

1. Loading rack emissions based on VOC control efficiency of 10 mg/L based on State of the Art Manual for Transfer Operations, NJDEP 1997.
2. The potential 10 mg/L is based on expected performance for a system with a minimum of 98% control efficency.
3. Assume two loading racks; one for unloading/loading operations associated with cold VOL storage controlled by EC-FL-102 and one for unloading/loading operations associated with warm VOL storage controlled by EC-FL-103.
4. Emissions from transfer of Raw Mix C4s assumed to be 100% Butadiene.
5. Emissions from Comonomer storage tank assumed to be vinyl acetate.
6. Breakdown of emissions from pygas storage and spent caustic based on speciation provided in Table D-19B.
7. Inert hydrocarbons from 10-TK-1033, 10-TK-1040A, 10-TK-1040B are equivalent to C4 (butene, isobutane) or C5 (pentane, isopentane) hydrocarbons.

Table D-14: PE Plant A Material Handling PM Emissions
Project ASCENT PSD Air Permit Application

	Composition			Discharge Quantity				
ID #	Substance	mg/Nm3	Kg/Nm3	Flow rate (Nm3/hr)	Frequency	Emissions (kg/yr)	Emissions (tpy)	Treatment/Disposal
2.3	Air or Nitrogen + Cr catalyst fines + traces of methanol, acetic acid, butene, acetone, methyl acetate	5	0.000005	271	Intermittent	0.676	0.001	Filtered by activator internal filter (S-2002A) and external guard filter (S-2003A)
2.4	Air or Nitrogen + CR catalyst fines	20	0.00002	525	Intermittent	5.25	0.006	Filtered by activator internal filter (S-2002A)
4.1	Nitrogen + PE fines + traces of HC	20	0.00002	1569	Intermittent	15.7	0.017	Vent filter S-6002 + guard filters S-4005A/B
4.2	Nitrogen + PE fines + traces of HC	20	0.00002	1082	Continuous (purge)	190	0.209	Vent filter S-6002 + guard filters S-4005A/B
6.1	Nitrogen + PE fines + traces of HC	20	0.00002	582	Intermittent	5.82	0.006	Powder feed silo vent filter S-6002
6.3	Air + Additive Fines	20	0.00002	940	Continuous	165	0.182	Filtered by additives vent filter S-6004
6.5A/B/C/D	N2 + additives fines	20	0.00002	70	Intermittent	0.700	0.001	Filtered by supported jet filters
6.6	N2 + PE fines	20	0.00002	890	Continuous	156	0.172	Filtered by extruder vent filter S-6003
6.7	N2 + PE fines	20	0.00002	890	Intermittent	8.90	0.01	Filtered by extruder vent filter S-6003
6.1	Wet Air + PE fines	20	0.00002	24500	Continuous	4292	4.73	Pellet dryer
6.11	Air + PE fines	20	0.00002	464	Continuous	81.3	0.090	Separation (low velocity vent stream)
7.1A/B	Air + PE fines	20	0.00002	15460	Continuous	2709	2.99	Separation (low velocity vent stream)
7.2	Air + PE fines	20	0.00002	11595	Continuous	2031.430	2.24	Separation (low velocity vent stream)
						Total (tpy) =	**10.6**	

Notes
1 kg = 2.20462 lb
Ideal Gas Behavior
Density of Air at atmospheric pressure 101.325 kPa (101325 Pa) and 0 degC can be calculated as:
density = P/(RT)(1)
1.294
Year-round operation if frequency is continous
8760
Intermittent/Infrequent/Emergency, use:
500
Assume PM=PM10=PM2.5

Table D-15: PE Plant B Material Handling PM Emissions
Project ASCENT PSD Air Permit Application

Emissions to atmosphere								
Area	**Source**	**Frequency**	**Frequency Units**	**Duration**	**Duration Units**	**Duration (hrs/occ)**	**PM (kg/hr)**	**Emissions per year (kg/yr)**
Part 4 - Reaction Line No 1	Reactor Seed Charging Vent	4	occ/yr	3	hr/occ	3	negligible	negligible
	Catalyst Vent Filter	600	occ/yr	10	min/occ	0.167	0.19	19
	Base Transfer Tank Vent	4	occ/yr	15	min/occ	0.25	negligible	negligible
	Catalyst Vent Filter	600	occ/yr	10	min/occ	0.167	0.19	19
Part 6 Resin Additive Handling Line No 1	Mastermix Resin Cooler Filter Vent	1667	occ/yr	1.5	hr/occ	1.5	0.092	230
	Mastermix Bag Dump Station Filter Vent	220	occ/yr	0.5	hr/occ	0.5	0.14	15.4
	Solid Additive Drum Dump Station Filter Vent	220	occ/yr	0.5	hr/occ	0.5	0.14	15.4
	Mixer Feed Hopper Vent Filter Vent	Continuous		8760	hr/yr	8760	0.013	114
Part 7 - Pelleting Line No 1	Pellet Dryer Vent	Continuous		8760	hr/yr	8760	0.034	298
							Total (kg/yr)	*711*
							Total (tpy)	**0.783**

Notes:
Assume PM=PM10=PM2.5
1 kg = 2.20462 lb

Table D-16: PE Plant C Material Handling PM Emissions
Project ASCENT PSD Air Permit Application

No.	Source	Flow	Estimated Yearly quantity	Quantity	Calcul./estimated fraction	Calculated yearly quantity (kg/yr)
9	Reactor blow down drum	Intermittent	61	ton/yr	0.50%	305
17	Exhaust Fan	Intermittent	3,070,000	Nm3/yr	20 mg/m3	87.4

Notes:
305 kg/yr comes from 61 metric tons/year x 0.5%
Ideal Gas Behavior
Density of Air at atmospheric pressure 101.325
density = P/(RT)(1)
1.294
Assume PM=PM10=PM2.5
1 kg = 2.2046 lb

total (tpy)	**0.433**

Table D-17A: Cooling Tower Projected Actual Emissions Summary
Project ASCENT PSD Air Permit Application

Water Circulation Rate (Q):	366,803	gpm	*Provided by Technip (Etileno XXI Project)*
Cycles of Concentration :	5	cycles	*Assumed maximum, average = 5 cycles*
TDS in Make Up:	250	mg/l or ppmw	*See Note 1*
Number of cells (outlet fans):	21	cells	*Provided by Technip (Etileno XXI Project)*
Drift Rate:[2]	0.0005	percent of Q	*Per Project Ascent BACT requirement*
PM10 Fraction:	0.923		*See worksheet "CT Input"*
PM2.5 Fraction:	0.024		*See worksheet "CT Input"*
Operation:	8,760	hrs/yr	

TDS in Circulation:

250 mg/l * 5 cycles = 1,250 mg/l

Recirculating Rate Conversions:

366,803 gal/min * 60 min/hr = 22,008,169 gal/hr

22,008,169 gal/hr * 8.34 lb/gal = 183,548,132 lb/hr

Total Drift Calculation:

183,548,132 lb recirc/hr * 0.001/100 lb drift/lb recirc = 917.7 lb drift/hr

Drift Particulate Matter Calculation (TDS = 1,250 ppm)

917.7 lb drift/hr * 1,250/1,000,000 lb PM/lb drift = 1.15 lb PM/hr

= 5.02 tpy PM

Calculated PM10 Fraction= 92.3%

1.147 lb PM/hr * 0.923 = 1.06 lb PM10/hr

1.059 lb PM/hr * 8,760/2000 hr-ton/yr-lb = 4.64 ton PM10/yr

Calculated PM2.5 Fraction= 2.44%

1.147 lb PM/hr * 0.024 = 0.028 lb PM2.5/hr

0.02803 lb PM/hr * 8,760/2,000 hr-ton/yr-lb = 0.123 ton PM2.5/yr

Calculated VOC Emissions =

0.7 lb VOC[3]/10^6 gal * 22.008 10^6 gal/hr = 15.4 lb VOC/hr

= 67.5 ton VOC/yr

Notes:
(1) Based on the data from 2012 Ohio River Valley Water Sanitation Compact (http://www.ohiowea.org/docs/ORSANCO_mar_2013.pdf)
(2) Emissions BACT Control: Drift Elimintoary <0.0005 drift loss
(3) VOC emission factor from AP-42 5.1-2 (controlled)
Reference: For Cooling Tower Emission worksheet - http://www.gewater.com/handbook/cooling_water_systems/ch_31_open.jsp

Table D-17B: Cooling Tower Emission Input Table
Project ASCENT PSD Air Permit Application

TDS= 250 mg/l (copied from "PM - Cooling Tower" worksheet)

EPRI Droplet Diameter (µm) [1]	Droplet Volume (µm3)	Droplet Mass (µg)	Particle Mass (Solids) (µg)	Solid Particle Volume (µm3)	Solid Particle Diameter (µm)	EPRI % Mass Smaller [1]	PM10 % Mass Smaller	PM2.5 % Mass Smaller
10	523.60	5.24E-04	1.31E-07	0.06	0.48	0		
20	4,188.79	4.19E-03	1.05E-06	0.48	0.97	0.196		
30	14,137.17	1.41E-02	3.53E-06	1.61	1.45	0.226		
40	33,510.32	3.35E-02	8.38E-06	3.81	1.94	0.514		
50	65,449.85	6.54E-02	1.64E-05	7.44	2.42	1.816		2.443
60	113,097.34	1.13E-01	2.83E-05	12.85	2.91	5.702		
70	179,594.38	1.80E-01	4.49E-05	20.41	3.39	21.348		
90	381,703.51	3.82E-01	9.54E-05	43.38	4.36	49.812		
110	696,909.97	6.97E-01	1.74E-04	79.19	5.33	70.509		
130	#########	1.15E+00	2.88E-04	130.72	6.30	82.023		
150	#########	1.77E+00	4.42E-04	200.81	7.27	88.012		
180	#########	3.05E+00	7.63E-04	347.00	8.72	91.032	92.298	
210	#########	4.85E+00	1.21E-03	551.03	10.17	92.468		
240	#########	7.24E+00	1.81E-03	822.53	11.62	94.091		
270	#########	1.03E+01	2.58E-03	1,171.14	13.08	94.689		
300	#########	1.41E+01	3.53E-03	1,606.50	14.53	96.288		
350	#########	2.24E+01	5.61E-03	2,551.06	16.95	97.011		
400	#########	3.35E+01	8.38E-03	3,807.99	19.37	98.34		
450	#########	4.77E+01	1.19E-02	5,421.92	21.80	99.071		
500	#########	6.54E+01	1.64E-02	7,437.48	24.22	99.071		
600	#########	1.13E+02	2.83E-02	12,851.97	29.06	100		

Data from "Calculating Realistic PM10 Emissions from Cooling Towers"

Table D-18: WWTP WATER9 Emissions
Project ASCENT PSD Air Permit Application

Emission Estimates (lb/hr)

Compound	Influent Concentration		CPI	DAF	Biotreatment	Total Emissions
	OWS Influent	OIF Basin				
	ppm	ppm	lb/hr	lb/hr	lb/hr	lb/hr
Benzene	10	100	1.38E-03	0.22	0.16	**0.39**
Oil (decane as surrogate)	--	150	0.01	1.03	0.03	**1.07**
Phenol	100	10	7.17E-07	7.40E-05	7.00E-06	**9.76E-05**
Sulfide	--	5	0.00	2.09E-14	1.57E-22	**2.09E-14**
PAH	1	--	2.23E-13	4.81E-10	2.36E-06	**4.95E-06**
Sulfate	--	12,000	0.00	5.01E-11	3.76E-19	**5.01E-11**
Total Emissions			**0.01**	**1.25**	**0.19**	**1.46**
Total VOCs			**1.38E-03**	**0.22**	**0.16**	**0.39**
Total HAPs			**1.38E-03**	**0.22**	**0.16**	**0.39**

Compound is a HAP and a VOC
Compound is a HAP

Emission Estimates (tpy)

Compound	Influent Concentration		CPI	DAF	Biotreatment	Total Emissions
	OWS Influent	OIF Basin				
	ppm	ppm	tpy	tpy	tpy	tpy
Benzene	10	100	6.02E-03	0.96	0.69	1.69
Oil (decane as surrogate)	--	150	0.05	4.53	0.12	4.70
Phenol	100	10	3.14E-06	3.24E-04	3.07E-05	4.27E-04
Sulfide	--	5	0.00	9.14E-14	6.86E-22	9.14E-14
PAH	1	--	9.78E-13	2.11E-09	1.04E-05	2.17E-05
Sulfate	--	12,000	0.00	2.19E-10	1.65E-18	2.19E-10
Total Emissions			**0.05**	**5.49**	**0.81**	**6.39**
Total VOCs			**6.03E-03**	**0.96**	**0.69**	**1.69**
Total HAPs			**6.03E-03**	**0.96**	**0.69**	**1.69**

Compound is a HAP and a VOC
Compound is a HAP

Table D-19A Diesel Tank HAP Speciation
Project ASCENT PSD Air Permit Application

Pollutant	Emission Factor
Benzene	0.67%
Ethylbenzene	2.18%
Hexane	1.39%
Toluene	6.68%
Xylenes	4.61%

Notes:

(1) HAP speciation for distillate fuel tanks based Section 114 Data, US EPA, August 16, 1993.

Table D-19B: Raw Py Gas Breakdown
Project ASCENT PSD Air Permit Application

Pollutant	Percent
Benzene	50
Toluene	7.5
Styrene	5
Xylene	1
Ethylbenzene	1
Decane	28
Isopentane	7.5
Total	100

Notes:
(1) Assumed Breakdown based on research of Material Safety Data Sheets for Pygas.
(2) MSDS provided including number of mixed carbons but an assumed pollutant was expected to estimate emissions (e.g., C5s = Isopentane).
(3) Spent caustic tank assumed to have same breakdown of pollutants.

Table D-20 Facility Wide HAP Potential Emissions
Project ASCENT PSD Air Permit Application

Hazardous Air Pollutant	Fuel Combustion	Tanks (tpy)	Loading Racks (tpy)	Waste Combustion (tpy)	WWTP (tpy)	Fugitives (tpy)	Total (tpy)
1,3-Butadiene	3.56E-03	-	-	-	-	-	3.56E-03
2-Methylnaphthalene	5.18E-04	-	-	-	-	-	5.18E-04
3-Methylchloranthrene	3.88E-05	-	-	-	-	-	3.88E-05
7,12-Dimethylbenz(a)anthracene	3.45E-04	-	-	-	-	-	3.45E-04
Acenaphthene	7.28E-05	-	-	-	-	-	5.58E-05
Acenaphthylene	1.06E-04	-	-	-	-	-	7.26E-05
Anthracene	6.10E-05	-	-	-	-	-	5.64E-05
Acetaldehyde	3.31E-01	-	-	-	-	-	0.165
Acrolein	5.29E-02	-	-	-	-	-	0.026
Benz(a)anthracene	4.37E-05	-	-	-	-	-	4.13E-05
Benzene	0.149	0.548	0.832	2.13	1.69	-	5.30
Benzo(a)pyrene	2.78E-05	-	-	-	-	-	2.68E-05
Benzo(b)fluoranthene	4.68E-05	-	-	-	-	-	4.28E-05
Benzo(g,h,i)perylene	3.00E-05	-	-	-	-	-	2.79E-05
Benzo(k)fluoranthene	4.04E-05	-	-	-	-	-	3.96E-05
Butadiene	-	-	1.40	-	-	-	1.40
Chrysene	4.99E-05	-	-	-	-	-	4.44E-05
Dibenzo(a,h)anthracene	2.85E-05	-	-	-	-	-	2.72E-05
Dichlorobenzene	2.59E-02	-	-	-	-	-	0.026
Ethylbenzene	2.64E-01	0.001	0.017	-	-	-	0.150
Fluoranthene	9.55E-05	-	-	-	-	-	8.01E-05
Fluorene	1.59E-04	-	-	-	-	-	1.10E-04
Formaldehyde	7.48E+00	-	-	-	-	-	4.55
Hexane	3.88E+01	6.54E-05	-	0.182	-	8.55	47.5
Indeno(1,2,3-cd)pyrene	4.19E-05	-	-	-	-	-	4.03E-05
Naphthalene	2.48E-02	-	-	-	-	-	0.019
Methanol	0.00E+00	-	-	-	-	0.220	2.20E-01
Phenanathrene	6.67E-04	-	-	-	-	-	5.17E-04
Phenol	0.00E+00	-	-	-	4.27E-04	-	4.27E-04
Propylene Oxided	2.39E-01	-	-	-	-	-	0.120
Pyrene	1.36E-04	-	-	-	-	-	1.22E-04
Styrene	-	0.003	0.083	0.125	-	-	0.211
Toluene	1.15E+00	0.023	0.125	0.258	-	-	1.02
Vinyl Acetate	0.00E+00	0.251	0.220	-	-	-	0.472
Arsenic	4.31E-03	-	-	-	-	-	4.31E-03
Barium	9.49E-02	-	-	-	-	-	0.095
Beryllium	2.59E-04	-	-	-	-	-	2.59E-04
Cadmium	2.37E-02	-	-	-	-	-	0.024
Chromium	3.02E-02	-	-	-	-	6.89E-06	0.030
Cobalt	1.81E-03	-	-	-	-	-	1.81E-03
Copper	1.83E-02	-	-	-	-	-	0.018
Manganese	8.19E-03	-	-	-	-	-	8.19E-03
Mercury	5.61E-03	-	-	-	-	-	5.61E-03
Molybdenum	2.37E-02	-	-	-	-	-	0.024
Nickel	4.53E-02	-	-	-	-	-	0.045
Selenium	5.18E-04	-	-	-	-	-	5.18E-04
Vanadium	4.96E-02	-	-	-	-	-	0.050
Xylenes	5.30E-01	1.04E-03	1.66E-02	7.72E-03	-	-	0.290
Zinc	6.25E-02	-	-	-	-	-	0.063
TOTAL PAH	1.97E-02	-	-	-	2.17E-05	-	9.89E-03
	Total HAPS (tpy)						**61.9**

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	10-TK-1002
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Vertical Fixed Roof Tank
Description:	Raw Py Gas

Tank Dimensions

Shell Height (ft):	36.01
Diameter (ft):	40.03
Liquid Height (ft) :	36.01
Avg. Liquid Height (ft):	18.00
Volume (gallons):	338,923.00
Turnovers:	28.87
Net Throughput(gal/yr):	9,785,222.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	5.36
Radius (ft) (Dome Roof)	40.03

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

10-TK-1002 - Vertical Fixed Roof Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Py Gas	All	56.67	51.31	62.04	55.00	1.5454	1.3434	1.7680	75.1954			91.82	
Benzene						1.0642	0.9131	1.2354	78.1100	0.5000	0.4204	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Decane (-n)						0.0309	0.0273	0.0350	142.2900	0.2800	0.0068	142.29	Option 1: VP50 = .026411 VP60 = .033211
Ethylbenzene						0.0966	0.0797	0.1165	106.1700	0.0100	0.0008	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Isopentane						9.3012	8.1662	10.5197	72.1500	0.0750	0.5512	72.15	Option 1: VP50 = 7.889 VP60 = 10.005
Styrene						0.0639	0.0526	0.0771	104.1500	0.0500	0.0025	104.15	Option 2: A=7.14, B=1574.51, C=224.09
Toluene						0.2974	0.2504	0.3517	92.1300	0.0750	0.0176	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylenes (mixed isomers)						0.0803	0.0662	0.0971	106.1700	0.0100	0.0006	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

10-TK-1002 - Vertical Fixed Roof Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Py Gas	27,074.09	5,202.59	32,276.68
Benzene	11,382.52	2,187.28	13,569.80
Toluene	477.17	91.69	568.86
Styrene	68.30	13.12	81.42
Xylenes (mixed isomers)	17.18	3.30	20.49
Ethylbenzene	20.66	3.97	24.63
Isopentane	14,922.88	2,867.60	17,790.48
Decane (-n)	185.38	35.62	221.00

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	10-TK-1032
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Vertical Fixed Roof Tank
Description:	Hexene

Tank Dimensions

Shell Height (ft):	43.96
Diameter (ft):	57.74
Liquid Height (ft) :	43.96
Avg. Liquid Height (ft):	22.00
Volume (gallons):	861,206.00
Turnovers:	22.28
Net Throughput(gal/yr):	19,783,468.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.80
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

10-TK-1032 - Vertical Fixed Roof Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Hexene	All	56.67	51.31	62.04	55.00	2.1878	1.9044	2.5050	84.1800			84.18	

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

10-TK-1032 - Vertical Fixed Roof Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Hexene	86,748.85	17,116.74	103,865.59

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	10-TK-1033
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Vertical Fixed Roof Tank
Description:	Isopentane

Tank Dimensions

Shell Height (ft):	24.11
Diameter (ft):	17.88
Liquid Height (ft) :	24.11
Avg. Liquid Height (ft):	12.00
Volume (gallons):	45,296.00
Turnovers:	14.82
Net Throughput(gal/yr):	671,082.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	2.40
Radius (ft) (Dome Roof)	17.88

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

10-TK-1033 - Vertical Fixed Roof Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Isopentane	All	56.67	51.31	62.04	55.00	9.3012	8.1662	10.5197	72.1500			72.15	Option 1: VP50 = 7.889 VP60 = 10.005

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

10-TK-1033 - Vertical Fixed Roof Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Isopentane	10,722.67	9,863.41	20,586.08

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	10-TK-1050
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Vertical Fixed Roof Tank
Description:	Vinyl Acetate

Tank Dimensions

Shell Height (ft):	43.96
Diameter (ft):	57.74
Liquid Height (ft) :	43.96
Avg. Liquid Height (ft):	22.00
Volume (gallons):	861,206.00
Turnovers:	6.13
Net Throughput(gal/yr):	5,283,442.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.80
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

10-TK-1050 - Vertical Fixed Roof Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Vinyl acetate	All	56.67	51.31	62.04	55.00	1.2709	1.0875	1.4796	86.0900			86.09	Option 2: A=7.21, B=1296.13, C=226.66

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

10-TK-1050 - Vertical Fixed Roof Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Vinyl acetate	13,763.47	11,344.80	25,108.27

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	20-TK-2931
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Vertical Fixed Roof Tank
Description:	Spent Caustic

Tank Dimensions

Shell Height (ft):	30.02
Diameter (ft):	57.74
Liquid Height (ft) :	30.02
Avg. Liquid Height (ft):	15.00
Volume (gallons):	588,062.00
Turnovers:	34.54
Net Throughput(gal/yr):	20,314,354.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.80
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

20-TK-2931 - Vertical Fixed Roof Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Py Gas	All	56.67	51.31	62.04	55.00	1.5454	1.3434	1.7680	75.1954			91.82	
Benzene						1.0642	0.9131	1.2354	78.1100	0.5000	0.4204	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Decane (-n)						0.0309	0.0273	0.0350	142.2900	0.2800	0.0068	142.29	Option 1: VP50 = .026411 VP60 = .033211
Ethylbenzene						0.0966	0.0797	0.1165	106.1700	0.0100	0.0008	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Isopentane						9.3012	8.1662	10.5197	72.1500	0.0750	0.5512	72.15	Option 1: VP50 = 7.889 VP60 = 10.005
Styrene						0.0639	0.0526	0.0771	104.1500	0.0500	0.0025	104.15	Option 2: A=7.14, B=1574.51, C=224.09
Toluene						0.2974	0.2504	0.3517	92.1300	0.0750	0.0176	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylenes (mixed isomers)						0.0803	0.0662	0.0971	106.1700	0.0100	0.0006	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

20-TK-2931 - Vertical Fixed Roof Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Py Gas	56,206.46	9,649.60	65,856.06
Benzene	23,630.39	4,056.90	27,687.29
Toluene	990.61	170.07	1,160.69
Styrene	141.78	24.34	166.13
Xylenes (mixed isomers)	35.67	6.12	41.80
Ethylbenzene	42.89	7.36	50.25
Isopentane	30,980.26	5,318.73	36,298.99
Decane (-n)	384.85	66.07	450.92

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	20-TK-2942
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Vertical Fixed Roof Tank
Description:	Wash Oil Tank

Tank Dimensions

Shell Height (ft):		30.02
Diameter (ft):		17.72
Liquid Height (ft) :		36.09
Avg. Liquid Height (ft):		15.00
Volume (gallons):		55,359.00
Turnovers:		16.22
Net Throughput(gal/yr):		898,185.00
Is Tank Heated (y/n):	N	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone	
Height (ft)		0.55
Slope (ft/ft) (Cone Roof)		0.06

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

20-TK-2942 - Vertical Fixed Roof Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Wash Oil	All	56.67	51.31	62.04	55.00	0.1534	0.1534	0.1534	91.9006			91.90	

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

20-TK-2942 - Vertical Fixed Roof Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Wash Oil	301.44	115.57	417.02

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	20-TK-2951
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Vertical Fixed Roof Tank
Description:	Thermal Oxidizer Feed Tank

Tank Dimensions

Shell Height (ft):	36.09
Diameter (ft):	40.35
Liquid Height (ft) :	36.09
Avg. Liquid Height (ft):	18.00
Volume (gallons):	345,287.00
Turnovers:	7.79
Net Throughput(gal/yr):	2,688,961.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	5.41
Radius (ft) (Dome Roof)	40.35

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

20-TK-2951 - Vertical Fixed Roof Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Thermal Ox Normal Feed	All	56.67	51.31	62.04	55.00	0.2498	0.2498	0.2498	58.3248			58.32	

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

20-TK-2951 - Vertical Fixed Roof Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Thermal Ox Normal Feed	932.88	747.72	1,680.59

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	EG-TK-LG
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Horizontal Tank
Description:	2800 kW Generator Tank

Tank Dimensions

Shell Length (ft):		25.40
Diameter (ft):		5.86
Volume (gallons):		5,124.00
Turnovers:		3.65
Net Throughput(gal/yr):		18,680.00
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):	N	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

EG-TK-LG - Horizontal Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	56.67	51.31	62.04	55.00	0.0058	0.0048	0.0070	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

EG-TK-LG - Horizontal Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.34	0.82	1.15

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	EG-TK-SM
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Horizontal Tank
Description:	350 kW Generator Tank

Tank Dimensions

Shell Length (ft):		15.20
Diameter (ft):		3.00
Volume (gallons):		767.00
Turnovers:		3.46
Net Throughput(gal/yr):		2,650.00
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):	N	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

EG-TK-SM - Horizontal Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	56.67	51.31	62.04	55.00	0.0058	0.0048	0.0070	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

EG-TK-SM - Horizontal Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.05	0.13	0.18

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	FP-TK-SM
City:	Washington
State:	West Virginia
Company:	ASCENT
Type of Tank:	Horizontal Tank
Description:	485 kW Fire Pump Tank

Tank Dimensions

Shell Length (ft):		15.20
Diameter (ft):		4.30
Volume (gallons):		884.00
Turnovers:		4.02
Net Throughput(gal/yr):		3,550.00
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):	N	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

FP-TK-SM - Horizontal Tank
Washington, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	56.67	51.31	62.04	55.00	0.0058	0.0048	0.0070	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

FP-TK-SM - Horizontal Tank
Washington, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.06	0.26	0.33

TANKS 4.0.9d
Emissions Report - Summary Format
Total Emissions Summaries - All Tanks in Report

Emissions Report for: Annual

Tank Identification				Losses (lbs)
10-TK-1002	ASCENT	Vertical Fixed Roof Tank	Washington, West Virginia	32,276.68
10-TK-1032	ASCENT	Vertical Fixed Roof Tank	Washington, West Virginia	103,865.59
10-TK-1033	ASCENT	Vertical Fixed Roof Tank	Washington, West Virginia	20,586.08
10-TK-1050	ASCENT	Vertical Fixed Roof Tank	Washington, West Virginia	25,108.27
20-TK-2931	ASCENT	Vertical Fixed Roof Tank	Washington, West Virginia	65,856.06
20-TK-2942	ASCENT	Vertical Fixed Roof Tank	Washington, West Virginia	417.02
20-TK-2951	ASCENT	Vertical Fixed Roof Tank	Washington, West Virginia	1,680.59
EG-TK-LG	ASCENT	Horizontal Tank	Washington, West Virginia	1.15
EG-TK-SM	ASCENT	Horizontal Tank	Washington, West Virginia	0.18
FP-TK-SM	ASCENT	Horizontal Tank	Washington, West Virginia	0.33