

**APPENDIX A**

**AIR QUALITY**



**APPENDIX A-1**  
**CONSTRUCTION EMISSIONS**



**Appendix A-1**  
**CONSTRUCTION EMISSIONS - MARSH LANDING GENERATING STATION CONSTRUCTION**

Contra Costa County, California

<b>Construction Emissions tons/yr</b>	<b>CO</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>NO<sub>x</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>SO<sub>x</sub></b>	<b>ROG<sup>1</sup></b>
Workers Commute	15.49	1430.89	0.08	0.20	1.54	0.12	0.08	0.01	1.55
Material Delivery	0.10	18.60	8.55E-04	5.08E-04	0.18	6.84E-03	5.99E-03	2.14E-04	0.02
Rail Delivery	0.01	2.34	6.96E-05	2.32E-05	0.04	1.37E-03	1.26E-03	2.31E-05	2.21E-03
<b>Total</b>	<b>15.60</b>	<b>1451.84</b>	<b>0.08</b>	<b>0.20</b>	<b>1.76</b>	<b>0.13</b>	<b>0.08</b>	<b>0.01</b>	<b>1.57</b>

**Appendix A-1  
WORKER VEHICLE EXHAUST - MARSH LANDING GENERATING STATION CONSTRUCTION**

Contra Costa County, California

**Transportation Information**

- Average Number of Construction Workers (per month) =	216
- Average Miles Per Trip (1-way) =	16.8
- Trips Per Month Per Worker =	66.44
- Total Miles Per Month =	241,368
- Total Miles Per Year =	2,896,417

**Comment**

- Information Provided By Applicant
- URBEMIS2007 default values for Contra Costa County
- Assumes 22 working days per month and 3.02 one-way trips per day. The trip rate is based on URBEMIS2007 value for General Light Industry
- Worst-case scenario; each worker drives his own car.

**DATA FROM EMFAC2007**

Vehicle Description	Vehicle Miles Traveled per Day	Tons Per Day									
		CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>	
Light Duty Automobile (LDA)	13,268,000	61.54	5880.00	0.56	--	5.32	0.48	0.28	0.06	6.59	
Light Duty Trucks (LDT)	9,048,000	54.84	4930.00	0.45	--	6.01	0.44	0.28	0.05	5.20	

**Note:**

- Emission factors for on-road vehicles are based on results from Emfac Emissions Model 2007 Version 2.3 (BURDEN output). The values are the projected values for the LDA and LDT (Both Class I and II) vehicles within Costa Contra County in 2009. PM<sub>10</sub> and PM<sub>2.5</sub> values include brake wear and tire wear.
- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).
- N<sub>2</sub>O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.3 (March 2007), Table C.5 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for gasoline fueled light duty automobiles and trucks.

**CALCULATION OF EMISSION FACTOR**

Vehicle Description	Pounds per Mile									
	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>	
Light Duty Automobile (LDA)	9.28E-03	8.86E-01	8.44E-06	1.08E-04	8.02E-04	7.24E-05	4.22E-05	9.04E-06	9.93E-04	
Light Duty Trucks (LDT)	1.21E-02	1.09E+00	9.95E-05	1.68E-04	1.33E-03	9.73E-05	6.19E-05	1.11E-05	1.15E-03	
<b>Fleet Average Emission Factor</b>	<b>1.07E-02</b>	<b>9.88E-01</b>	<b>5.40E-05</b>	<b>1.38E-04</b>	<b>1.07E-03</b>	<b>8.48E-05</b>	<b>5.20E-05</b>	<b>1.00E-05</b>	<b>1.07E-03</b>	

**Note:**

- The values are based on above tons/day and miles traveled. The average emission factor is based on the assumption from URBEMIS2007 that the worker vehicle fleet mix will consist of 50% LDA and 50% LDT.

**WORKER VEHICLE EMISSIONS - CONSTRUCTION**

Worker Vehicle Fleet Mix	Tons Emitted Per Year									
	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>	
Worker Vehicle Fleet Mix	15.5	1,430.9	0.1	0.2	1.5	0.1	0.1	0.0	1.6	

**Note:**

<sup>1</sup> Assuming ROG<sub>s</sub> are equivalent to VOC<sub>s</sub>

**Appendix A-1**  
**CONSTRUCTION DELIVERY TRUCK EXHAUST - MARSH LANDING GENERATING STATION CONSTRUCTION**

Contra Costa County, California

**Transportation Information**

- No. of Vehicle Trips =	16
- Average Miles Per Trip (1-way) =	24
- Total Miles Per Year =	9,216

**Comment**

- Information provided by applicant in AFC table 7.10-10
- Distance to transport construction material from Port of Stockton to Project Site
- Worst case scenario calculated from average miles per trip, max. no. of vehicle trips per month

**DATA FROM EMFAC2007**

Equipment Description	Vehicle Miles Traveled per Day	Tons Per Day								
		CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
Heavy-Heavy Duty Diesel Truck	431,000	4.75	870.00	0.04	0.02	8.40	0.32	0.28	0.01	0.74

**Note:**

- Emission factors for on-road, heavy-heavy-duty vehicles are based on results from Emfac Emissions Model 2007 Version 2.3. The values are the projected values for the HHDT vehicles within Contra Costa County in the respective year. PM10 and PM2.5 values include break wear and tire wear.
- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).
- N<sub>2</sub>O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.4 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for heavy heavy duty diesel fueled trucks.

**CALCULATION OF EMISSION FACTOR**

Equipment Description	Pounds per Mile									
	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>	
Heavy-Heavy Duty Diesel Truck 2007	2.20E-02	4.04E+00	1.86E-04	1.10E-04	3.90E-02	1.48E-03	1.30E-03	4.64E-05	3.43E-03	

**Note:**

- The following equation was used to obtain the emission factors:

$$EF = ER / VMT * 2000$$

Where: EF= emission factor in pounds per mile

ER = Emission Rate in tons per day

VMT = Average vehicle miles traveled per day by heavy-heavy duty trucks

**CONSTRUCTION DELIVERY TRUCK EMISSIONS**

Equipment Description	Tons Emitted Per Year									
	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>	
Heavy-Heavy Duty Diesel Truck	0.10	18.60	8.55E-04	5.08E-04	0.18	6.84E-03	5.99E-03	2.14E-04	0.02	

**Note:**

- The following equation was used to obtain the emission factors:

$$M = EF * D / 2000$$

Where: M = Mass emissions rate from refinery related activities in tons per year

EF= emission factor in pounds per mile

D = Distance traveled by trucks to the refinery in miles per year.

<sup>1</sup> Assuming ROG's are equivalent to VOCs

**Appendix A-1  
CONSTRUCTION DELIVERY RAIL EMISSIONS - MARSH LANDING GENERATING STATION CONSTRUCTION**

Contra Costa County, California

**Assumptions**

Average Round Trip Distance Traveled per Locomotive = 424 miles/locomotive

**Reference:** National Transportation Statistics for Locomotives, 2008 ([http://www.bts.gov/publications/national\\_transportation\\_statistics](http://www.bts.gov/publications/national_transportation_statistics))

Rail-cars per Locomotive =	62	rail-cars
Average Miles Traveled Per Locomotive =	69,900	miles/yr
Average Fuel Consumed Per Locomotive =	176,600	gallon/yr
Locomotive Fuel Efficiency =	0.13	mile/gal

**Calculations For Locomotives in Motion**

**Reference:** EPA's Technical Highlights: Emission Factors for Locomotives , 1997

**EMISSION FACTORS (g/gal, except SO<sub>x</sub>)**

Year	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
2012	27.4	10084.0	0.30	0.10	158.5	5.6	5.152	15.0	8.9
2011	27.4	10084.0	0.30	0.10	161.0	5.7	5.2	15.0	9.1
2010	27.4	10084.0	0.30	0.10	163.0	5.7	5.2	15.0	9.1
2009	27.4	10084.0	0.30	0.10	168.3	5.9	5.4	15.0	9.4

**Note:**

- PM<sub>2.5</sub> emission factors were determined by multiplying PM<sub>10</sub> numbers by a "PM<sub>2.5</sub> fraction of PM<sub>10</sub>" value. Fractional values for PM<sub>2.5</sub> were taken from the SCAQMD guidance: Final - Methodology to Calculate PM<sub>2.5</sub> and PM<sub>2.5</sub> Significance Thresholds, October

- PM<sub>2.5</sub> Fraction of PM<sub>10</sub>, Train: 0.92

- California state regulation requires intrastate diesel-electric locomotives that operate 90 percent of the time in the state to use only California ultra low sulfur (15 parts per million) diesel fuel.

- Per EPA's Emission Facts <<http://www.epa.gov/otaq/climate/420f05001.pdf>>, CO<sub>2</sub> emissions from a gallon of diesel fuel are 10,084 g/gal diesel.

- CH<sub>4</sub> and N<sub>2</sub>O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.6 (Methane and Nitrous Oxide Emission Factors for Stationary Combustion by Sector and Fuel Type).

**Calculations**

# of Locomotives (Incremental) =	2	per year
# of Rail Cars =	2	per locomotive
Locomotive Fuel Efficiency =	0.13	mile/gal
Total Locomotive Distance Traveled =	847	mile/year
Locomotive Fuel Consumption =	6,519	gal/year
Average Density of Locomotive Diesel (taken from msds) =	7.32	lb/gallon
Total Weight of Locomotive Fuel =	47,693.40	lb/yr

**MOBILE MASS EMISSION (tons/year)**

Year	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
2012	0.20	72.46	2.16E-03	7.19E-04	1.14	0.04	0.04	7.15E-04	0.06
2011	0.20	72.46	2.16E-03	7.19E-04	1.16	0.04	0.04	7.15E-04	0.07
2010	0.20	72.46	2.16E-03	7.19E-04	1.17	0.04	0.04	7.15E-04	0.07
2009	0.20	72.46	2.16E-03	7.19E-04	1.21	0.04	0.04	7.15E-04	0.07

**Appendix A-1  
CONSTRUCTION DELIVERY RAIL EMISSIONS - MARSH LANDING GENERATING STATION CONSTRUCTION**

Contra Costa County, California

**Calculations For Locomotives in Idle Mode**

**References:** NOx and PM10 Emission Factors from EPA's Technical Highlights: Guidance for Quantifying and Using Long Duration Switch Yard Locomotive Idling Emission Reductions in State Implementation Plans, January 2004. ROG and CO Emission Factors from Sierra Research Group: Development of Railroad Emissions Methodology Development, June 2004

**EMISSION FACTORS (g/hr, except SOx)**

Year	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
NA	492	40336	1.20E+00	4.00E-01	620	32	29	15	478

**Note:**

- PM<sub>2.5</sub> emission factors were determined by multiplying PM<sub>10</sub> numbers by a "PM<sub>2.5</sub> fraction of PM<sub>10</sub>" value. Fractional values for PM<sub>2.5</sub> were taken from the SCAQMD guidance: Final - Methodology to Calculate PM<sub>2.5</sub> and PM<sub>2.5</sub> Significance Thresholds, October
- PM<sub>2.5</sub> Fraction of PM<sub>10</sub>, Train: 0.92
- California state regulation requires intrastate diesel-electric locomotives that operate 90 percent of the time in the state to use only California ultra low sulfur (15 parts per million) diesel fuel.
- Per EPA's Emission Facts <<http://www.epa.gov/otaq/climate/420f05001.pdf>>, CO<sub>2</sub> emissions from a gallon of diesel fuel are 10,084 g/gal diesel. This factor was multiplied by fuel consumed per idle hour to get a factor in units of gal/hr
- CH<sub>4</sub> and N<sub>2</sub>O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.6 (Methane and Nitrous Oxide Emission Factors for Stationary Combustion by Sector and Fuel Type). The CH<sub>4</sub> and N<sub>2</sub>O emission factors are multiplied by the fuel consumed per idle hours to get

**Calculations**

# of idling events per year =	2	per year
Idling time per event=	60	min
Total idling time per year =	2	hr
Fuel consumed per idle hour = **	4	gal/hr
Average Density of Locomotive Diesel (taken from msds) =	7.32	lb/gallon
Total Weight of Locomotive Fuel (idle) =	58.53	lb/yr

\*\* Based on switcher idling information on EPAs web page: <http://www.epa.gov/smartway/idlingimpacts.htm>

**IDLE MASS EMISSION (tons/year)**

Year	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
NA	1.08E-03	0.09	2.65E-06	8.82E-07	1.37E-03	7.05E-05	6.49E-05	8.77E-07	1.05E-03

**Total Emissions**

**TOTAL MASS EMISSION (tons/year)**

Year	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
NA	0.20	72.55	2.16E-03	7.19E-04	1.21	0.04	0.04	7.15E-04	0.07

**TOTAL MASS EMISSION FOR MLGS (tons/year)**

Year	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
NA	0.01	2.34	6.96E-05	2.32E-05	0.04	1.37E-03	1.26E-03	2.31E-05	2.21E-03

**Note:**

<sup>1</sup> Assuming ROGs are equivalent to VOCs



**APPENDIX A-2**  
**OPERATIONAL EMISSIONS**



**Appendix A-2**  
**OPERATION EMISSIONS - MARSH LANDING GENERATING STATION**

Contra Costa County, California

<b>Construction Emissions tons/yr</b>	<b>CO</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>NO<sub>x</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>SO<sub>x</sub></b>	<b>ROG<sup>1</sup></b>
Operation Staff Commute	1.37	151.23	0.01	0.02	0.14	0.01	0.01	1.51E-03	0.14
Aqueous Ammonia Delivery	0.54	117.57	4.01E-03	3.20E-03	0.94	0.04	0.03	1.34E-03	0.09
<b>Total</b>	<b>1.91</b>	<b>268.80</b>	<b>0.02</b>	<b>0.02</b>	<b>1.07</b>	<b>0.05</b>	<b>0.04</b>	<b>2.84E-03</b>	<b>0.22</b>

**Appendix A-2  
OPERATION STAFF VEHICLE EXHAUST - MARSH LANDING GENERATING STATION**

Contra Costa County, California

<b>Transportation Information</b>		<b>Comment</b>
- Average Number of Plant Operators (per month) =	8	- Information Provided By Applicant in Table 2.8-1
- Average Number of Other Plant Personnel (per month)	12	- Information Provided By Applicant in Table 2.8-1
- Average Miles Per Trip (1-way) =	16.8	- URBEMIS2007 default values for Contra Costa County
- Trips Per Month Per Plant Operator =	90.6	- Assumes 30 working days per month for plant operators and 22 working days per month for other plant personnel. Assumes 3.02 one-way trips per day. The trip rate is based on URBEMIS2007 value for General Light Industry
- Trips Per Month Per Other Plant Personnel =	66.44	
- Total Miles Per Month =	25,571	
- Total Miles Per Year =	306,851	- Worst-case scenario; each worker drives his own car.

**DATA FROM EMFAC2007**

<b>Vehicle Description</b>	<b>Vehicle Miles Traveled per Day</b>	<b>Tons Per Day</b>								
		<b>CO</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>NO<sub>x</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>SO<sub>x</sub></b>	<b>ROG<sup>1</sup></b>
Light Duty Automobile (LDA)	13,697,000	50.32	6030.00	0.47	--	4.32	0.50	0.29	0.06	5.33
Light Duty Trucks (LDT)	9,203,000	48.18	5020.00	0.41	--	5.23	0.45	0.30	0.05	4.75

**Note:**

- Emission factors for on-road vehicles are based on results from Emfac Emissions Model 2007 Version 2.3. The values are the projected values for the LDA and LDT (Both Class I and II) vehicles within Costa Contra County in 2009. PM<sub>10</sub> values include brake wear and tire wear
- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).
- N<sub>2</sub>O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.3 (March 2007), Table C.5 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for gasoline fueled light duty automobiles and trucks.

**CALCULATION OF EMISSION FACTOR**

<b>Vehicle Description</b>	<b>Pounds per Mile</b>								
	<b>CO</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>NO<sub>x</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>SO<sub>x</sub></b>	<b>ROG<sup>1</sup></b>
Light Duty Automobile (LDA)	7.35E-03	8.80E-01	6.86E-05	1.08E-04	6.31E-04	7.30E-05	4.23E-05	8.76E-06	7.78E-04
Light Duty Trucks (LDT)	1.05E-02	1.09E+00	8.91E-05	1.68E-04	1.14E-03	9.78E-05	6.52E-05	1.09E-05	1.03E-03
<b>Fleet Average Emission Factor</b>	<b>8.91E-03</b>	<b>9.86E-01</b>	<b>7.89E-05</b>	<b>1.38E-04</b>	<b>8.84E-04</b>	<b>8.54E-05</b>	<b>5.38E-05</b>	<b>9.81E-06</b>	<b>9.05E-04</b>

**Note:**

- The values are based on above tons/day and miles traveled. The average emission factor is based on the assumption from URBEMIS2007 that the worker vehicle fleet mix will consist of 50% LDA and 50% LDT.

**OPERATIONS STAFF VEHICLE EMISSIONS - CONSTRUCTION**

<b>Worker Vehicle Fleet Mix</b>	<b>Tons Emitted Per Year</b>								
	<b>CO</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O</b>	<b>NO<sub>x</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>SO<sub>x</sub></b>	<b>ROG<sup>1</sup></b>
<b>Worker Vehicle Fleet Mix</b>	1.37	151.23	0.01	0.02	0.14	0.01	0.01	1.51E-03	0.14

**Note:**

- <sup>1</sup> Assuming ROGs are equivalent to VOCs

**Appendix A-2**  
**AQUEOUS AMMONIA DELIVERY TRUCK EXHAUST - MARSH LANDING GENERATING STATION**

Contra Costa County, California

**Transportation Information**

- No. of Ammonia Delivery Trips/ mo. =	10
- No. of Misc. Delivery Trips/ mo. =	10
- Average Miles Per Ammonia Delivery Trip from Dixon, CA (1-way) =	30.5
- Average Miles Per Ammonia Delivery Trip from La Mirada, CA (1-way) =	352.68
- Average Miles Per Misc. Delivery Trip (1-way) =	50
- Total Miles Per Year =	57,982

**Comment**

- Information provided by applicant in Section 7.12.2.2 shows an maximum of 120 1-way vehicle trips per year.

- Worst case scenario, assuming 2 one-way trips per delivery. Assuming half of the ammonia delivery comes from Dixon, CA and other half from La Mirada, Ca

**DATA FROM EMFAC2007**

Equipment Description	Vehicle Miles Traveled per Day	Tons Per Day								
		CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
Heavy-Heavy Duty Diesel Truck	434,000	4.04	880.00	0.03	0.02	7.02	0.27	0.23	0.01	0.64

**Note:**

- Emission factors for on-road, heavy-heavy-duty vehicles are based on results from Emfac Emissions Model 2007 Version 2.3. The values are the projected values for the HHDV vehicles within Contra Costa County in the respective year. PM10 values include brake wear and tire wear.

- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).

- N<sub>2</sub>O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.4 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for heavy heavy duty diesel fueled trucks.

**CALCULATION OF EMISSION FACTOR**

Equipment Description	Pounds per Mile								
	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
Heavy-Heavy Duty Diesel Truck 2007	1.86E-02	4.06E+00	1.38E-04	1.10E-04	3.24E-02	1.24E-03	1.06E-03	4.61E-05	2.95E-03

**Note:**

- The following equation was used to obtain the emission factors:

$$EF = ER / VMT * 2000$$

Where: EF= emission factor in pounds per mile  
 ER = Emission Rate in tons per day  
 VMT = Average vehicle miles traveled per day by heavy-heavy duty trucks

**AQUEOUS AMMONIA DELIVERY TRUCK EMISSIONS**

Equipment Description	Tons Emitted Per Year								
	CO	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	ROG <sup>1</sup>
Heavy-Heavy Duty Diesel Truck	0.54	117.57	0.00	0.00	0.94	0.04	0.03	1.34E-03	0.09

**Note:**

- The following equation was used to obtain the emission factors:

$$M = EF * D / 2000$$

Where: M = Mass emissions rate from refinery related activities in tons per year  
 EF= emission factor in pounds per mile  
 D = Distance traveled by trucks to the refinery in miles per year.

<sup>1</sup> Assuming ROG's are equivalent to VOCs



## **APPENDIX A-3**

### **ESTIMATED EMISSIONS DATA FROM SIEMENS**



# SIEMENS

## Project x - Total Estimated Startup and Shutdown Emissions

SGT6-5000F in Flex Plant 10 Combined Cycle Operation on Natural Gas @ 62 °F and 41 °F

Mode	~ Time (minutes)	Total Emissions per Event (pounds)				Fuel Usage (lbs)
		NO <sub>x</sub>	CO	VOC	PM	
Startup on Natural Gas @ 62 °F	12	24	259	12	3	23,029
Shutdown on Natural Gas @ 62 °F	7	10	131	5	1	6,239
Startup on Natural Gas @ 41 °F	12	25	267	13	3	24,173
Shutdown on Natural Gas @ 41 °F	7	10	135	5	1	6,525

### General Notes

- 1.) All data is ESTIMATED, NOT guaranteed and is for ONE unit.
- 2.) Gas fuel must be in compliance with Siemens fuel specifications.
- 3.) Emissions are at the HRSG exhaust stack outlet and exclude ambient air contributions.
- 4.) Emissions are based on new and clean conditions.
- 5.) Please be advised that the information contained in this transmittal has been prepared and is being transmitted per customer request specifically for information purposes only. Such information is not intended to be used for evaluation of plant design and/or performance relative to contractual commitments. Data included in any permit application or Environmental Impact Statement is strictly the customer's responsibility. Siemens is available to review permit application data upon request.

### Startup Emissions Notes

- 1.) Estimated startup (SU) data are from gas turbine (GT) ignition through 100% GT load plus 10 minutes.
- 2.) Estimated SU and shutdown (SD) data are based on the assumed times noted above and will be higher for longer times.
- 3.) Estimated SU and SD data are based on the ambient temperatures noted above and will be higher at lower ambient temperatures.
- 4.) NO<sub>x</sub> emissions assume SCR is not in operation (no removal).
- 5.) CO emissions assume 20% removal from ignition to 100% GT load and 90% removal from 100% GT load on.
- 6.) SU assumes 5 minutes from turning gear to synchronization.
- 7.) SD assumes 100% load to FSNL with no cooldown at FSNL.
- 8.) Operator actions do not extend startup or shutdown.
- 9.) It is assumed that there is no restriction from the interconnected utility for loading the GT from synchronization to 100% load within the SU times considered.

# SIEMENS

## Total Estimated Startup and Shutdown Emissions and Fuel Use SGT6-5000F(4) 9 ppm ULN in Simple Cycle Operation at 59 °F on Natural Gas

Mode	~ Time (minutes)	Total Pounds per Event				
		NO <sub>x</sub>	CO	VOC	PM	Fuel Use
Startup	11	12	213	11	1	6,638
Shutdown	6	10	110	5	1	5,905

### General Notes

- 1.) All data is ESTIMATED, NOT guaranteed and is for ONE unit.
- 2.) Gas fuel must be in compliance with Siemens fuel specifications.
- 3.) Emissions are at the exhaust stack outlet and exclude ambient air contributions.
- 4.) Emissions are based on new and clean conditions.
- 5.) NO<sub>x</sub> as NO<sub>2</sub>.
- 6.) VOC consist of total hydrocarbons excluding methane and ethane and are expressed in terms of methane (CH<sub>4</sub>).
- 7.) Particulates are per US EPA Method 5/202 (front and back half).
- 8.) Estimated fuel use data is based on a heating value of 22,356 Btu/lb<sub>m</sub> (HHV) and will be different for different heating values.
- 9.) Please be advised that the information contained in this transmittal has been prepared and is being transmitted per customer request specifically for information purposes only. Such information is not intended to be used for evaluation of plant design and/or performance relative to contractual commitments. Data included in any permit application or Environmental Impact Statement is strictly the customer's responsibility. Siemens is available to review permit application data upon request.

### Startup Emissions Notes

- 1.) Estimated startup (SU) data are from gas turbine (GT) ignition through 100% load.
- 2.) Estimated SU and shutdown (SD) data are based on the assumed times noted above and will be higher for longer times.
- 3.) Estimated SU and SD data are based on the ambient temperature noted above and will be higher at lower ambient temperatures.
- 4.) Total SU time includes 5 minutes from turning gear to synchronization.
- 5.) SD assumes 100% load to FSNL with no cooldown at FSNL.
- 6.) Continuous Emissions Monitoring System (CEMS) may calculate emissions differently.
- 7.) Operator actions do not extend startup or shutdown.
- 8.) It is assumed that there is no restriction from the interconnected utility for loading the GT from synchronization to 100% load within the SU times considered.