APPENDIX II-B

OPERATIONAL EMISSION CALCULATIONS

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APPENDIX II-B
OPERATIONAL EMISSION CALCULATIONS
List of Tables

Table 1
Daily Operational Criteria Pollutant Emissions, Interim Phase I

Source	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOX (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)
On-Site Emissions						
Stationary Sources						
Ethanol Loading Rack Process Stream Components Fugitive VOC	0.0	--	--	--	--	--
Gasoline Storage Tank Process Stream Components Fugitive VOC	0.0	--	--	--	--	--
Gasoline Storage Tank Fugitive VOC	0.0	--	--	--	--	--
Thermal Oxidizer Combustion	8.1	26.7	48.6	0.3	2.4	2.4
Stationary Source Total	**8.1**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Other On-Site Sources						
Tanker Truck Fugitive VOC	41.8	--	--	--	--	--
On-Site Total	**49.9**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Off-Site Emissions						
Tanker Truck Exhaust	7.4	29.7	90.1	0.1	4.4	3.8
Tanker Truck Fugitive Particulate Matter	--	--	--	--	1.6	0.0
Off-Site Total	**7.4**	**29.7**	**90.1**	**0.1**	**6.0**	**3.8**
Daily Total (a)	**57.2**	**56.4**	**138.7**	**0.4**	**8.4**	**6.2**
Offset Requirements (b)[1]	0.0	N.R.	48.6	0.3	N.R.	N.R.
Emissions following Offsets (a-b)	**57.2**	**56.4**	**90.1**	**0.1**	**8.4**	**6.2**
SCAQMD Significance Threshold	55	550	55	150	150	55
Significant?	YES	NO	YES	NO	NO	NO

[1] VOC offsets are required by Rule 1303 for the gasoline storage tank and associated components at a ratio of 1.2-to-1 and will be provided by the project proponent. NOx and SOx RTCs are required by Regulation XX for the thermal oxidizer and will be provided by the project proponent.

N.R. = Offsets not required

Table 2
Daily Operational Criteria Pollutant Emissions, Interim Phase II

Source	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOX (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)
On-Site Emissions						
Stationary Sources						
Ethanol Loading Rack Process Stream Components Fugitive VOC	8.2	--	--	--	--	--
Gasoline Storage Tank Process Stream Components Fugitive VOC	0.0	--	--	--	--	--
Gasoline Storage Tank Fugitive VOC	0.0	--	--	--	--	--
Thermal Oxidizer Combustion	22.8	26.7	48.6	0.3	2.4	2.4
Stationary Source Total	**31.0**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Other On-Site Sources						
Tanker Truck Fugitive VOC	117.4	--	--	--	--	--
On-Site Total	**148.5**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Off-Site Emissions						
Tanker Truck Exhaust	20.4	82.4	249.4	0.3	12.1	10.4
Tanker Truck Fugitive Particulate Matter	--	--	--	--	4.4	0.0
Off-Site Total	**20.4**	**82.4**	**249.4**	**0.3**	**16.5**	**10.4**
Daily Total (a)	**168.8**	**109.1**	**298.0**	**0.6**	**18.9**	**12.8**
Offset Requirements (b)[1]	0.0	N.R.	48.6	0.3	N.R.	N.R.
Emissions following Offsets (a-b)	**168.8**	**109.1**	**249.4**	**0.3**	**18.9**	**12.8**
SCAQMD Significance Threshold	55	550	55	150	150	55
Significant?	YES	NO	YES	NO	NO	NO

[1] VOC offsets are required by Rule 1303 for the gasoline storage tank and associated components at a ratio of 1.2-to-1 and will be provided by the project proponent. NOx and SOx RTCs are required by Regulation XX for the thermal oxidizer and will be provided by the project proponent.

N.R. = Offsets not required

Table 3
Daily Operational Criteria Pollutant Emissions, Full Operation

Source	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOX (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)
On-Site Emissions						
Stationary Sources						
Ethanol Loading Rack Process Stream Components Fugitive VOC	8.2	--	--	--	--	--
Gasoline Storage Tank Process Stream Components Fugitive VOC	0.3	--	--	--	--	--
Gasoline Storage Tank Fugitive VOC	10.1	--	--	--	--	--
Thermal Oxidizer Combustion	22.8	26.7	48.6	0.3	2.4	2.4
Stationary Source Total	**41.5**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Other On-Site Sources						
Tanker Truck Fugitive VOC	117.4	--	--	--	--	--
On-Site Total	**158.9**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Off-Site Emissions						
Tanker Truck Exhaust	20.4	82.4	249.4	0.3	12.1	10.4
Tanker Truck Fugitive Particulate Matter	--	--	--	--	4.4	0.0
Off-Site Total	**20.4**	**82.4**	**249.4**	**0.3**	**16.5**	**10.4**
Daily Total (a)	**179.3**	**109.1**	**298.0**	**0.6**	**18.9**	**12.8**
Offset Requirements (b)[1]	12.5	N.R.	48.6	0.3	N.R.	N.R.
Emissions following Offsets (a-b)	**166.8**	**109.1**	**249.4**	**0.3**	**18.9**	**12.8**
SCAQMD Significance Threshold	55	550	55	150	150	55
Significant?	YES	NO	YES	NO	NO	NO

[1] VOC offsets are required by Rule 1303 for the gasoline storage tank and associated components at a ratio of 1.2-to-1 and will be provided by the project proponent. NOx and SOx RTCs are required by Regulation XX for the thermal oxidizer and will be provided by the project proponent.

N.R. = Offsets not required

Table 4
Total Project Emissions (Construction plus Incremental Operation)

Implementation Phase	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOX (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)
Operational Interim Phase I						
Maximum Daily Construction Emissions	124.9	387.7	745.2	1.0	103.0	39.1
Maximum Daily Operational Emissions	57.2	56.4	90.1	0.1	8.4	6.2
Total Maximum Daily Emissions	**182.1**	**444.1**	**835.3**	**1.1**	**111.3**	**45.3**
Operational Interim Phase II						
Maximum Daily Construction Emissions	74.8	220.9	417.5	0.6	58.1	22.4
Maximum Daily Operational Emissions	168.8	109.1	249.4	0.3	18.9	12.8
Total Maximum Daily Emissions	**243.6**	**329.9**	**666.9**	**0.9**	**77.0**	**35.2**
Final Project						
Maximum Daily Operational Emissions	166.8	109.1	249.4	0.3	18.9	12.8
Total Maximum Daily Emissions	**166.8**	**109.1**	**249.4**	**0.3**	**18.9**	**12.8**
Peak Daily Emissions	**243.6**	**444.1**	**835.3**	**1.1**	**111.3**	**45.3**
SCAQMD Significance Threshold	55	550	55	150	150	55
Significant?	YES	NO	YES	NO	NO	NO

Shell Carson Facility Ethanol (E10) Project

Table 5
New Ethanol Loading Rack Fugitive Component VOC Emissions
Operational Interim Phase II and Full Operations

Component	Quantity to to be Installed	VOC Emission Factor (lb/yr)[a]	VOC Emissions (lb/yr)[b]
Valves (bellows seal)	35	0.0	0.0
Pumps (light liquid)	2	46.8	93.6
Valves (light liquid)	15	4.5	67.5
Fittings (flanges, etc.)	402	7.0	2,814.0
Valves (gas/vapor)	6	4.5	27.0
Compressors	0	9.1	0.0
Drains	0	9.1	0.0
Pressure Relief Valves	1	0.0	0.0
Total (lb/yr)			**3,002.1**
Total (lb/day)[c]			**8.2**

[a] Based on CAPCOA correlation equations and a screening value of 500 ppmv

[b] Emissions [lb/yr] = Emission factor [lb/yr] x Quantity to be installed

[c] Emissions [lb/day] = Emission [lb/yr] / 365 [days/yr]

Table 6
New Gasoline Storage Tank Fugitive Component VOC Emissions
Full Operations

Component	Quantity to to be Installed	VOC Emission Factor (lb/yr)[a]	VOC Emissions (lb/yr)[b]
Valves (bellows seal)	0	0.0	0.0
Pumps (light liquid)	0	46.8	0.0
Valves (light liquid)	10	4.5	45.0
Fittings (flanges, etc.)	11	7.0	76.9
Valves (gas/vapor)	0	4.5	0.0
Compressors	0	9.1	0.0
Drains	0	9.1	0.0
Pressure Relief Valves	0	0.0	0.0
Total (lb/yr)			**121.9**
Total (lb/day)[c]			**0.3**

[a] Based on CAPCOA correlation equations and a screening value of 500 ppmv

[b] Emissions [lb/yr] = Emission factor [lb/yr] x Quantity to be installed

[c] Emissions [lb/day] = Emission [lb/yr] / 365 [days/yr]

Table 7
Loading Rack Thermal Oxidizer Emissions
Operational Interim Phase I

Item	Value
Peak Daily Ethanol Loading Increase	
Baseline average daily loading (bbl/day)	25,344
Project Phase I maximum daily loading (bbl/day)	35,000
Increase in total daily loading (bbl/day)[a]	9,656
Increase in total daily loading (1,000 gal/day)[b]	406
Peak Daily Heat Input Increase	
Baseline average daily operating time (hrs/day)	6.0
Project maximum daily operating time (hrs/day)	24.0
Increase in maximum daily operating time (hrs/day)[c]	18.0
Hourly oxidizer capacity (MMBtu/hr)	18.0
Increase in maximum daily heat input (MMBtu/day)[d]	324.0
Emissions	
CO emission factor (lb/MMBtu)[e]	0.082
VOC emission factor (lb/1,000 gal. loaded)[g]	0.020
NOx emission factor (lb/MMBtu)[g]	0.15
SOx emission factor (lb/MMBtu)[f]	0.00081
SOx emission factor (lb/MMBbl loaded)[i]	0.66
PM10 emission factor (lb/MMBtu)[e]	0.0075
PM2.5 emission factor (lb/MMBtu)[e]	0.0075
CO emissions (lb/day)[j]	**26.7**
VOC emissions (lb/day)[j]	**8.1**
NOx emissions (lb/day)[j]	**48.6**
SOx emissions (lb/day)[j]	**0.3**
PM10 emissions (lb/day)[j]	**2.4**
PM2.5 emissions (lb/day)[j]	**2.4**

[a] Increase in max. daily loading [bbl/day] = Project max. [bbl/day] - Baseline avg. [bbl/day]

[b] Increase in max. loading [1,000 gal/day] = Increase in max. [bbl/day] x 42 [gal/bbl] / 1,000

[c] Increase in max. operating time [hrl/day] = Project max. [hrl/day] - Baseline avg. [hr/day]

[d] Increase in max. heat input [MMBtul/day] = Oxidizer cap. [MMBtu/hr] x Increase in max. op. time [hr/day]

[e] SCAQMD EF for Ext. Combustion-NG Other, converted to lbs/mmbtu

[f] 0.83 lbs/mmscf, RECLAIM EF listed in the permit, converted to lbs/mmbtu

[g] Proposed BACT limit

[h] Thermal oxidizer vendor guarantee

[i] Based on sulfur content in cargo tank vapors

[j] Emissions [lb/day] = Emission factor [lb/MMBtu] x Increase in max. daily heat input [MMBtu/day]

Table 8
Loading Rack Thermal Oxidizer Emissions
Operational Interim Phase II and Full Operation

Item	Value
Peak Daily Ethanol Loading Increase	
Baseline average daily loading (bbl/day)	25,344
Project maximum daily loading (bbl/day)	52,500
Increase in total daily loading (bbl/day)[a]	27,156
Increase in total daily loading (1,000 gal/day)[b]	1,141
Peak Daily Heat Input Increase	
Baseline average daily operating time (hrs/day)	6.0
Project maximum daily operating time (hrs/day)	24.0
Increase in maximum daily operating time (hrs/day)[c]	18.0
Hourly oxidizer capacity (MMBtu/hr)	18.0
Increase in maximum daily heat input (MMBtu/day)[d]	324.0
Emissions	
CO emission factor (lb/MMBtu)[e]	0.082
VOC emission factor (lb/1,000 gal. loaded)[g]	0.020
NOx emission factor (lb/MMBtu)[g]	0.15
SOx emission factor (lb/MMBtu)[f]	0.00081
SOx emission factor (lb/MMBbl loaded)[i]	0.66
PM10 emission factor (lb/MMBtu)[e]	0.0075
PM2.5 emission factor (lb/MMBtu)[e]	0.0075
CO emissions (lb/day)[j]	**26.7**
VOC emissions (lb/day)[j]	**22.8**
NOx emissions (lb/day)[j]	**48.6**
SOx emissions (lb/day)[j]	**0.3**
PM10 emissions (lb/day)[j]	**2.4**
PM2.5 emissions (lb/day)[j]	**2.4**

[a] Increase in max. daily loading [bbl/day] = Project max. [bbl/day] - Baseline avg. [bbl/day]

[b] Increase in max. loading [1,000 gal/day] = Increase in max. [bbl/day] x 42 [gal/bbl] / 1,000

[c] Increase in max. operating time [hrl/day] = Project max. [hrl/day] - Baseline avg. [hr/day]

[d] Increase in max. heat input [MMBtuI/day] = Oxidizer cap. [MMBtu/hr] x Increase in max. op. time [hr/day]

[e] SCAQMD EF for Ext. Combustion-NG Other, converted to lbs/mmbtu

[f] 0.83 lbs/mmscf, RECLAIM EF listed in the permit, converted to lbs/mmbtu

[g] Proposed BACT limit

[h] Thermal oxidizer vendor guarantee

[i] Based on sulfur content in cargo tank vapors

[j] Emissions [lb/day] = Emission factor [lb/MMBtu] x Increase in max. daily heat input [MMBtu/day]

Table 9
Tanker Truck Fugitive VOC Emissions from Loading
Operational Interim Phase I

Item	Value
Emission Factor	
Saturation Factor (S)	1.0
True Vapor Pressure (P) (psia)	8.2
Vapor Molecular Weight (M) (lb/lb-mole)	66.0
Temperature (T) (deg. Rankine)	524.0
Vapor VOC concentration (lb/1,000 gal)[a]	12.87
Leak Rate (percent)[b]	0.8%
Emission Factor (lb/1,000 gal)[c]	0.103
Peak Daily Ethanol Loading Increase	
Baseline average daily loading (bbl/day)	25,344
Project Phase I maximum daily loading (bbl/day)	35,000
Increase in total maximum daily loading (bbl/day)[d]	9,656
Increase in total maximum daily loading (1,000 gal/day)[e]	406
VOC Emissions (lb/day)[f]	**41.8**

[a] VOC concentration [lb/1,000 gal] = 12.46 x S x P x M / T, from Equation 1, AP-42
   Section 5.2

[b] From AP-42 Section 5.2

[c] Emission factor [lb/1,000 gal] = VOC conc. [lb/1,000gal] x Leak rate [%] / 100

[d] Increase in max. daily loading [bbl/day] = Project max. [bbl/day] - Baseline avg. [bbl/day]

[e] Increase in max. loading [1,000 gal/day] = Increase in max. [bbl/day] x 42 [gal/bbl] / 1,000

[f] VOC emissions [lb/day] = Increase in daily loading [1,000 gal/day] x Emission factor [lb/1,000 gal]

Table 10
Tanker Truck Fugitive VOC Emissions from Loading
Operational Interim Phase II and Full Operation

Item	Value
Emission Factor	
Saturation Factor (S)	1.0
True Vapor Pressure (P) (psia)	8.2
Vapor Molecular Weight (M) (lb/lb-mole)	66.0
Temperature (T) (deg. Rankine)	524.0
Vapor VOC concentration (lb/1,000 gal)[a]	12.87
Leak Rate (percent)[b]	0.8%
Emission Factor (lb/1,000 gal)[c]	0.103
Peak Daily Ethanol Loading Increase	
Baseline average daily loading (bbl/day)	25,344
Project total maximum daily loading (bbl/day)	52,500
Increase in total maximum daily loading (bbl/day)[d]	27,156
Increase in total maximum daily loading (1,000 gal/day)[e]	1,141
VOC Emissions (lb/day)[f]	**117.4**

[a] VOC concentration [lb/1,000 gal] = 12.46 x S x P x M / T, from Equation 1, AP-42

Section 5.2

[b] From AP-42 Section 5.2

[c] Emission factor [lb/1,000 gal] = VOC conc. [lb/1,000gal] x Leak rate [%] / 100

[d] Increase in max. daily loading [bbl/day] = Project max. [bbl/day] - Baseline avg. [bbl/day]

[e] Increase in max. loading [1,000 gal/day] = Increase in max. [bbl/day] x 42 [gal/bbl] / 1,000

[f] VOC emissions [lb/day] = Increase in daily loading [1,000 gal/day] x Emission factor [lb/1,000 gal]

Table 11
Tanker Truck Exhaust and Fugitive Particulate Matter Emissions
Operational Interim Phase I

Item	Value
Increase in Maximum Daily Tanker Truck Travel	
Project Phase I maximum daily loading (bbl/day)	35,000
Tanker truck capacity (bbl)	190
Project total maximum daily number of trucks[a]	184
Baseline average daily number of trucks	132
Increase in maximum daily number of trucks[b]	52
Average daily round-trip mileage (miles/truck)	56
Increase in maximum daily total miles (miles/day)[c]	**2,912**
Peak Daily Tanker Truck Exhaust Emissions	
VOC emission factor (lb/mi)[d]	0.002528
CO emission factor (lb/mi)[d]	0.010215
NOx emission factor (lb/mi)[d]	0.030924
SOx emission factor (lb/mi)[d]	4.04E-05
PM10 emission factor (lb/mi)[d]	0.001496
PM2.5 emission factor (lb/mi)[d]	0.001294
VOC emissions (lb/day)[e]	**7.4**
CO emissions (lb/day)[e]	**29.7**
NOx emissions (lb/day)[e]	**90.1**
SOx emissions (lb/day)[e]	**0.1**
PM10 emissions (lb/day)[e]	**4.4**
PM2.5 emissions (lb/day)[e]	**3.8**
Peak Daily Tanker Truck Fugitive Particulate Matter Emissions	
Road silt loading (g/m^2)[f]	0.037
On-Road average vehicle weight (tons)[f]	2.7
PM10 emission factor (lb/mi)[g]	0.000551
PM2.5 emission factor (lb/mi)[g]	0
PM10 emissions (lb/day)[e]	**1.6**
PM2.5 emissions (lb/day)[e]	**0.0**

[a] Project maximum daily trucks [trucks/day] = Max. Volume loaded [bb/day] / Truck cap. [bbl/truck]

[b] Increase in max. daily trusks [trucks/day] = Project max. trucks [trucks/day] - Baseline avg. trucks [trucks/day]

[c] Increase in max. daily miles [mi/day] = Increase in max. trucks [trucks/day] x Daily round trip dist. [mil./truck]

[d] Emission factors for calendar year 2012 for on-road motor vehicles in the SCAQMD jurisdiction,
downloaded from http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html

[e] Emissions [lb/day] = Emission factor [lb/mi] x Increase in max. daily miles [mi/day]

[f] Paved road silt loading and avg. vehicle weight from ARB Emission Inventory Methodology 7.9,
Entrained Paved Road Dust (1997) for local roads, http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9.pdf

[g] EF equations (from AP-42 Section 13.2.1):

$EF = k_p \, (sL/2)^{0.65} \, (W/3)^{1.5} - C$

Constants:

k_p =	0.016	(Particle size multiplier for PM10)
	0.0024	(Particle size multiplier for PM2.5)
C =	0.00047	(Exhaust, brake wear and tire wear adjustment, PM10)
	0.00036	(Exhaust, brake wear and tire wear adjustment, PM2.5)

Table 12
Tanker Truck Exhaust and Fugitive Particulate Matter Emissions
Operational Interim Phase II and Full Operation

Item	Value
Increase in Maximum Daily Tanker Truck Travel	
Project total maximum daily loading (bbl/day)	52,500
Tanker truck capacity (bbl)	190
Project total maximum daily number of trucks[a]	276
Baseline average daily number of trucks	132
Increase in maximum daily number of trucks[b]	144
Average daily round-trip mileage (miles/truck)	56
Increase in maximum daily total miles (miles/day)[c]	**8,064**
Peak Daily Tanker Truck Exhaust Emissions	
VOC emission factor (lb/mi)[d]	0.002528
CO emission factor (lb/mi)[d]	0.010215
NOx emission factor (lb/mi)[d]	0.030924
SOx emission factor (lb/mi)[d]	4.04E-05
PM10 emission factor (lb/mi)[d]	0.001496
PM2.5 emission factor (lb/mi)[d]	0.001294
VOC emissions (lb/day)[e]	**20.4**
CO emissions (lb/day)[e]	**82.4**
NOx emissions (lb/day)[e]	**249.4**
SOx emissions (lb/day)[e]	**0.3**
PM10 emissions (lb/day)[e]	**12.1**
PM2.5 emissions (lb/day)[e]	**10.4**
Peak Daily Tanker Truck Fugitive Particulate Matter Emissions	
Road silt loading (g/m^2)[f]	0.037
On-Road average vehicle weight (tons)[f]	2.7
PM10 emission factor (lb/mi)[g]	0.000551
PM2.5 emission factor (lb/mi)[g]	0
PM10 emissions (lb/day)[e]	**4.4**
PM2.5 emissions (lb/day)[e]	**0.0**

[a] Project maximum daily trucks [trucks/day] = Max. Volume loaded [bb/day] / Truck cap. [bbl/truck]

[b] Increase in max. daily trusks [trucks/day] = Project max. trucks [trucks/day] - Baseline avg. trucks [trucks/day]

[c] Increase in max. daily miles [mi/day] = Increase in max. trucks [trucks/day] x Daily round trip dist. [mil./truck]

[d] Emission factors for calendar year 2011 for on-road motor vehicles in the SCAQMD jurisdiction,
   downloaded from http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html

[e] Emissions [lb/day] = Emission factor [lb/mi] x Increase in max. daily miles [mi/day]

[f] Paved road silt loading and avg. vehicle weight from ARB Emission Inventory Methodology 7.9,
   Entrained Paved Road Dust (1997) for local roads, http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9.pdf

[g] EF equations (from AP-42 Section 13.2.1):

$EF = k_p (sL/2)^{0.65} (W/3)^{1.5} - C$

Constants:

k_p =	0.016	(Particle size multiplier for PM10)
	0.0024	(Particle size multiplier for PM2.5)
C =	0.00047	(Exhaust, brake wear and tire wear adjustment, PM10)
	0.00036	(Exhaust, brake wear and tire wear adjustment, PM2.5)

Table 13
New Gasoline Storage Tank Emissions, Full Operation

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

Identification
User Identification:	734 (DEFR)
City:	Long Beach
State:	CA
Company:	Eqiulon Enterprises LLC
Type of Tank:	Domed External Floating Roof Tank
Description:	Carson Terminal. New gasoline tank.

Tank Dimensions
Diameter (ft):	160.00
Volume (gallons):	6,636,000.00
Turnovers:	72.00

Paint Characteristics
Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition	Good

Roof Characteristics
Type:	Pontoon
Fitting Category	Detail

Tank Construction and Rim-Seal System
Construction:	Welded
Primary Seal:	Mechanical Shoe
Secondary Seal	Rim-mounted

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Unbolted Cover, Gasketed	1
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Sock	22
Roof Leg (3-in. Diameter)/Adjustable, Center Area, Sock	41
Ladder Well (36-in. Diam.)/Sliding Cover, Gasketed	1
Slotted Guide-Pole/Sample Well/Gask. Sliding Cover, w. Float, Wiper	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	2

Meterological Data used in Emissions Calculations: Long Beach, California (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format

file://C:\Program Files\Tanks409d\summarydisplay.htm   1/27/2009

Table 13
New Gasoline Storage Tank Emissions, Full Operation

Liquid Contents of Storage Tank

734 (DEFR) - Domed External Floating Roof Tank
Long Beach, CA

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Shell Gasoline <= 8.2 TVP (for permitting)	All	66.43	60.99	71.87	64.33	8.2000	N/A	N/A	66.0000			82.50	Option 1: VP60 = 8.2 VP70 = 8.2
1,2,4-Trimethylbenzene						0.0263	N/A	N/A	120.1900	0.0240	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3922	N/A	N/A	78.1100	0.0120	0.0025	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4382	N/A	N/A	84.1600	0.0024	0.0005	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1353	N/A	N/A	106.1700	0.0120	0.0002	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.2563	N/A	N/A	86.1700	0.0130	0.0045	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isopropyl benzene						0.0610	N/A	N/A	120.2000	0.0015	0.0000	120.20	Option 2: A=6.93666, B=1460.793, C=207.78
Methyl alcohol						1.7607	N/A	N/A	32.0400	0.0014	0.0004	32.04	Option 2: A=7.897, B=1474.08, C=229.13
Naphthalene						0.0033	N/A	N/A	128.2000	0.0030	0.0000	128.20	Option 2: A=7.3729, B=1968.36, C=222.61
Styrene						0.0897	N/A	N/A	104.1500	0.0008	0.0000	104.15	Option 2: A=7.14, B=1574.51, C=224.09
Toluene						0.4021	N/A	N/A	92.1300	0.0600	0.0037	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						9.7603	N/A	N/A	65.8130	0.7999	0.9868	79.37	
Xylenes (mixed isomers)						0.1129	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11

Table 13
New Gasoline Storage Tank Emissions, Full Operation

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TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

734 (DEFR) - Domed External Floating Roof Tank
Long Beach, CA

Annual Emission Calcaulations

Rim Seal Losses (lb):	1,274.5851
Seal Factor A (lb-mole/ft-yr):	0.6000
Seal Factor B (lb-mole/ft-yr (mph)^n):	0.4000
Average Wind Speed (mph):	0.0000
Seal-related Wind Speed Exponent:	1.0000
Value of Vapor Pressure Function:	0.2012
Vapor Pressure at Daily Average Liquid	
Surface Temperature (psia):	8.2000
Tank Diameter (ft):	160.0000
Vapor Molecular Weight (lb/lb-mole):	66.0000
Product Factor:	1.0000
Withdrawal Losses (lb):	512.9118
Annual Net Throughput (gal/yr.):	477,792,000.0000
Shell Clingage Factor (bbl/1000 sqft):	0.0015
Average Organic Liquid Density (lb/gal):	5.1000
Tank Diameter (ft):	160.0000
Roof Fitting Losses (lb):	1,888.7757
Value of Vapor Pressure Function:	0.2012
Vapor Molecular Weight (lb/lb-mole):	66.0000
Product Factor:	1.0000
Tot. Roof Fitting Loss Fact.(lb-mole/yr):	142.2600
Average Wind Speed (mph):	0.0000
Total Losses (lb):	3,676.2726

Roof Fitting/Status	Quantity	KFa(lb-mole/yr)	Roof Fitting Loss Factors KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	21.2431
Automatic Gauge Float Well/Unbolted Cover, Gasketed	1	4.30	17.00	0.38	57.0908
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1	0.47	0.02	0.97	6.2402
Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Sock	22	1.20	0.14	0.65	350.5109
Roof Leg (3-in. Diameter)/Adjustable, Center Area, Sock	41	0.49	0.16	0.14	266.7335
Ladder Well (36-in. Diam.)/Sliding Cover, Gasketed	1	56.00	0.00	0.00	743.5080
Slotted Guide-Pole/Sample Well/Gask. Sliding Cover, w. Float, Wiper	1	21.00	7.90	1.80	278.8155
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	2	6.20	1.20	0.94	164.6339

file://C:\Program Files\Tanks409d\summarydisplay.htm   1/27/2009

Table 13
New Gasoline Storage Tank Emissions, Full Operation

TANKS 4.0 Report

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

Emissions Report for: Annual

734 (DEFR) - Domed External Floating Roof Tank
Long Beach, CA

Components	Losses(lbs)				
	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Shell Gasoline <= 8.2 TVP (for permitting)	1,274.59	512.91	1,888.78	0.00	3,676.27
1,2,4-Trimethylbenzene	0.12	12.31	0.18	0.00	12.61
Xylenes (mixed isomers)	1.54	35.90	2.28	0.00	39.72
Benzene	3.25	6.15	4.81	0.00	14.21
Cyclohexane	0.67	1.23	0.99	0.00	2.90
Ethylbenzene	0.32	6.15	0.47	0.00	6.94
Hexane (-n)	5.70	6.67	8.45	0.00	20.81
Isopropyl benzene	0.02	0.77	0.03	0.00	0.81
Methyl alcohol	0.48	0.72	0.71	0.00	1.91
Naphthalene	0.00	1.54	0.00	0.00	1.54
Styrene	0.01	0.40	0.02	0.00	0.43
Toluene	4.69	30.77	6.95	0.00	42.41
Unidentified Components	1,257.80	410.29	1,863.90	0.00	3,531.98

Table 13
New Gasoline Storage Tank Emissions, Full Operation

Table 13
New Gasoline Storage Tank Emissions, Full Operation

Table 14
Truck Exhaust and Fugitive Particulate Matter Emissions
Including Storage Tank Waste Disposal in 20 Years

Item	Value
Increase in Maximum Daily Tanker Truck Travel	
Project total maximum daily loading (bbl/day)	52,500
Tanker truck capacity (bbl)	190
Project total maximum daily number of trucks[a]	276
Baseline average daily number of trucks	132
Increase in maximum daily number of trucks[b]	144
Average daily round-trip mileage (miles/truck)	56
Increase in maximum daily total miles (miles/day)[c]	**8,064**
Maximum Daily Waste Truck Mileage	
Maximum daily number of trucks (trucks/day)	21
Round-trip mileage (miles/truck)	384
Maximum daily total miles (miles/truck)	**8,064**
Total Daily Mileage (miles/day)	**16,128**
Daily Truck Exhaust Emissions	
VOC emission factor (lb/mi)[d]	0.000772
CO emission factor (lb/mi)[d]	0.004203
NOx emission factor (lb/mi)[d]	0.00899
SOx emission factor (lb/mi)[d]	3.95E-05
PM10 emission factor (lb/mi)[d]	0.000467
PM2.5 emission factor (lb/mi)[d]	0.000346
VOC emissions (lb/day)[e]	**12.4**
CO emissions (lb/day)[e]	**67.8**
NOx emissions (lb/day)[e]	**145.0**
SOx emissions (lb/day)[e]	**0.6**
PM10 emissions (lb/day)[e]	**7.5**
PM2.5 emissions (lb/day)[e]	**5.6**
Peak Daily Truck Fugitive Particulate Matter Emissions	
Road silt loading (g/m^2)[f]	0.037
On-Road average vehicle weight (tons)[f]	2.7
PM10 emission factor (lb/mi)[g]	0.000551
PM2.5 emission factor (lb/mi)[g]	0
PM10 emissions (lb/day)[e]	**8.9**
PM2.5 emissions (lb/day)[e]	**0.0**
Total PM10 Emissions (lb/day)	**16.4**
Total PM2.5 Emissions (lb/day)	**5.6**
Daily Truck Emissions for Initial Full Operation	
VOC emissions (lb/day)	**20.4**
CO emissions (lb/day)	**82.4**
NOx emissions (lb/day)	**249.4**
SOx emissions (lb/day)	**0.3**
PM10 emissions (lb/day)	**16.5**
PM2.5 emissions (lb/day)	**10.4**

[a] Project maximum daily trucks [trucks/day] = Max. Volume loaded [bb/day] / Truck cap. [bbl/truck]

[b] Increase in max. daily trusks [trucks/day] = Project max. trucks [trucks/day] - Baseline avg. trucks [trucks/day]

[c] Increase in max. daily miles [mi/day] = Increase in max. trucks [trucks/day] x Daily round trip dist. [mil./truck]

[d] Emission factors for calendar year 2026 for on-road motor vehicles in the SCAQMD jurisdiction,
   downloaded from http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html

[e] Emissions [lb/day] = Emission factor [lb/mi] x Increase in max. daily miles [mi/day]

[f] Paved road silt loading and avg. vehicle weight from ARB Emission Inventory Methodology 7.9,
   Entrained Paved Road Dust (1997) for local roads, http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9.pdf

[g] EF equations (from AP-42 Section 13.2.1):

$EF = k_p \, (sL/2)^{0.65} \, (W/3)^{1.5} - C$

Constants:

k_p =	0.016	(Particle size multiplier for PM10)
	0.0024	(Particle size multiplier for PM2.5)
C =	0.00047	(Exhaust, brake wear and tire wear adjustment, PM10)
	0.00036	(Exhaust, brake wear and tire wear adjustment, PM2.5)

Table 15
Operational Greenhouse Gas Emissions Summary

Source	CO_2e (MT/yr)
Thermal Oxidizer[a]	5,326.0
Tanker Truck Exhaust[b]	5,644.3
Electrical Power Use	1,230.7
Total	**12,201.0**

[a] Thermal oxidizer limited to 5,402 hours/year of operation

[b] Tanker truck loading limited to 16,425,000 bbl/year

Table 16
Loading Rack Thermal Oxidizer Greenhouse Gas Emissions

Item	Value
Emissions from Vapor Combustion	
Saturation Factor (S)	1.0
True Vapor Pressure (P) (psia)	5.27
Vapor Molecular Weight (M) (lb/lb-mole)	66.0
Temperature (T) (deg. Rankine)	524.0
Vapor VOC concentration (lb/1,000 gal)[a]	8.27
Vapor Carbon Fraction[b]	0.88
Carbon Emission Factor (lb/1,000 gal)[c]	7.278
Ratio CO_2 to C[d]	3.667
CO_2 Emission Factor (lb/1,000 gal)[e]	26.687
Baseline average daily loading (bbl/day)	25,344
Baseline anualized loading (bbl/year)[f]	9,250,560
Project annual average daily loading (bbl/day)	52,500
Project annual loading (bbl/year)[f]	19,162,500
Increase in annual loading (bbl/year)[g]	9,911,940
Increase in annual loading (1,000 gal/year)[h]	416,301
Increase in CO_2 Emissions (lb/year)[i]	11,109,726
Increase in CO_2 Emissions (kg/day)[j]	5,039,372
Increase in Annual CO_2 Emissions (MT/yr)	**5,039.4**
Emissions from Natural Gas Combustion	
Natural Gas Use (scf/bbl)[k]	0.53
Increase in Annual Natural Gas Use (scf/year)[l]	5,253,328
Natural Gas HHV (MMBtu/scf)[m]	1.028E-03
Increase in Annual NG Heat Input (MMBtu/year)[n]	5,400.4
Natural Gas CO_2 Emission Factor (kg CO_2/MMBtu)[m]	53.02
Natural Gas CH_4 Emission Factor (kg CH_4/MMBtu)[o]	1.00E-03
Natural Gas N_2O Emission Factor (kg N_2O/MMBtu)[o]	1.00E-04
Increase in Natural Gas Annual CO_2 Emissions (MT/year)[p]	286.3
Increase in Natural Gas Annual CH_4 Emissions (MT/year)[p]	5.4E-03
Increase in Natural Gas Annual N_2O Emissions (MT/year)[p]	5.4E-04
Increase in Natural Gas GHG Emissions (MT CO_2e/year)[q]	**286.6**
Total Emissions	
Total Increase in GHG Emissions (MT CO_2e/year)[r]	**5,326.0**

[a] VOC concentration [lb/1,000 gal] = 12.46 x S x P x M / T, from Equation 1, AP-42 Section 5.2

[b] From Properties of Fuels (DOE), downloaded from http://www.afdc.energy.gov/afdc/pdfs/fueltable.pdf

[c] Emission factor [lb/1,000 gal] = VOC conc. [lb/1,000gal] x Vapor carbon conc. [unitless]

[d] Ratio CO_2 to C [unitless] = CO_2 MW (lb/lb-mole) / C MW [lb/lb-mole] = 44 / 12

[e] CO_2 emission factor [lb/1,000 gal] = Carbon emission factor [lb/1,000 gal] x Ratio CO_2 to C [unitless]

[f] Annual loading [bbl/year] = Average daily loading [bbl/day] x 365 [days/year]

[g] Increase in annual loading [bbl/year] = Project annual loading [bbl/year] - Baseline annual loading [bbl/year]

[h] Increase in annual loading [1,000 gal/year] = Increase in annual [bbl/year] x 42 [gal/bbl] / 1,000

[i] Increase in CO_2 emissions [lb/year] = Increase in annual loading [1,000 gal/year] x CO_2 emission factor [lb/1,000 gal]

[i] Increase in CO_2 emissions [kg/year] = Increase in annual CO2 wmissions [lb/year] x 453.6 [g/lb] / 1,000 [g/kg]

[k] Natural gas use [scf/bbl] = Total NG use from April 2008 through March 2010 [sfc] / Total NG use from April 2008 through March 2010
Total ethanol loaded from April 2008 through March 2010 = 6,862,419 [scf] / 12,854,311 [bbl]

[l] Increase in annual natural gas use [scf/year] = Natural gas use [scf/bbl] x Increase in annual loading [bbl/year]

[m] From Table C-1 to Subpart C of 40 CFR Part 98

[n] Increase in annual NG heat input [MMBtu/year] = Increase in NG use [scf/year] x NG HHV [MMBtu/scf]

[o] From Table C-2 to Subpart C of 40 CFR Part 98

[p] Increase in annual emissions [MT/year] = Increase in natural gas heat input [MMBtu/year] x Emission factor [kg/MMBtu] / 1,000 [kg/MT]

[q] Emissions [MT CO_2e] = CO_2 emissions [MT] + 21 x CH_4 emisisons [MT] + 310 x N_2O emisisons [MT]

[r] Total increase in GHG emissions [MT CO2e/year] = Increase in annual emissions from vapor combustion [MT CO_2/year] +
Increase in annual emissions from NG combustion [MT CO_2e/year]

Table 17
Tanker Truck Exhaust Greenhouse Gas Emissions

Item	Value
Increase in Annual Tanker Truck Travel	
Project annual loading (bbl/year)	19,162,500
Tanker truck capacity (bbl)	190
Project annual number of trucks (trucks/year)[a]	100,855
Baseline average daily number of trucks (trucks/day)	132
Annualized baseline average number of trucks (trucks/year)[b]	48,180
Increase in annual number of trucks (trucks/year)[c]	52,675
Average daily round-trip mileage (miles/truck)	56
Increase in annual total miles (miles/year)[d]	2,949,800
GHG Emissions Calculation	
CO_2 emission factor (lb/mi)[e]	4.22
CH_4 emission factor (lb/mi)[e]	0.0001165
CO_2 emissions (MT/yr)[f]	5,641.0
CH_4 emissions (MT/yr)[f]	0.2
GHG emissions (MT CO_2e/yr)[g]	**5,644.3**

[a] Project annual number of trucks [trucks/year] = Project annual loading [bbl/year] / Truck cap. [bbl/truck]
  trucks [trucks/day] x 365 [days/year]

[b] Annualized baseline average number of trucks [trucks/year] = Baseline average daily number
  of trucks [trucks/day] x 365 [days/year]

[c] Increase in annual number of trucks [trucks/year] = Project maximum annual number of
  trucks [trucks/year] - Annualized baseline average number of trucks [trucks/year]

[d] Increase in annual total miles [mi/yr] = Increase in annual number of trucks [trucks/year] x
   Average round-trip mileage [miles/truck]

[e] Emission factors for calendar year 2011 for on-road motor vehicles in the SCAQMD jurisdiction,
  downloaded from http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html

[f] Emissions [MT/yr] = Emission factor [lb/mi] x Increase in annual miles [mi/yr] x 453.6 [g/lb] / 1,000,000 [g/MT]

[g] Emissions [MT CO_2e/yr] = CO_2 emissions [MT/yr] + 21 x CH_4 emisisons [MT/yr]

Table 18
Greenhouse Gas Emissions from Increased Electricity Use

Item	Value
Annual Heat Input Increase	
Increase in electricity use (kW)	480.0
Increase in annual electricity use (MWh)[a]	**4,204.8**
GHG Emissions Calculation	
CO_2 emission factor (lb/MWh)[b]	641.26
CH_4 emission factor (lb/MWh)[b]	0.029
N_2O emission factor (lb/MWh)[b]	0.011
CO_2 emissions (MT/yr)[c]	1,223.1
CH_4 emissions (MT/yr)[c]	0.1
N_2O emissions (MT/yr)[c]	0.0
GHG emissions (MT CO_2e/yr)[d]	**1,230.7**

[a] Increase in ann. electricity use [MWh] = Increae in elec. use [kW] x 8,760 [hr/yr] / 1,000 [kWh/MWh]

[b] Default values from California Emission Estimator Model (CalEEMod, April 2011) for Southern California Edison

[c] Emissions [MT/yr] = Emission factor [lb/MWh] x Increase in ann. elec. [MWh/yr] x 453.6 [g/lb] / 1,000,000 [g/MT]

[d] Emissions [MT CO_2e/yr] = CO_2 emissions [MT/yr] + 21 x CH_4 emisisons [MT/yr]

Table 19
Operational Greenhouse Gas Emissions Summary (Mitigated)

Source	CO_2e (MT/yr)
Thermal Oxidizer[a]	4,149.2
Tanker Truck Exhaust[b]	4,409.2
Electrical Power Use	1,230.7
Total	**9,789.2**

[a] Thermal oxidizer limited to 5,402 hours/year of operation

[b] Tanker truck loading limited to 16,425,000 bbl/year

Table 20
Loading Rack Thermal Oxidizer Greenhouse Gas Emissions (Mitigated)

Item	Value
Emissions from Vapor Combustion	
Saturation Factor (S)	1.0
True Vapor Pressure (P) (psia)	5.27
Vapor Molecular Weight (M) (lb/lb-mole)	66.0
Temperature (T) (deg. Rankine)	524.0
Vapor VOC concentration (lb/1,000 gal)[a]	8.27
Vapor Carbon Fraction[b]	0.88
Carbon Emission Factor (lb/1,000 gal)[c]	7.278
Ratio CO_2 to C[d]	3.667
CO_2 Emission Factor (lb/1,000 gal)[e]	26.687
Baseline average daily loading (bbl/day)	25,344
Baseline anualized loading (bbl/year)[f]	9,250,560
Project annual average daily loading (bbl/day)	46,500
Project annual loading (bbl/year)[f]	16,972,500
Increase in annual loading (bbl/year)[g]	7,721,940
Increase in annual loading (1,000 gal/year)[h]	324,321
Increase in CO_2 Emissions (lb/year)[i]	8,655,081
Increase in CO_2 Emissions (kg/day)[j]	3,925,945
Increase in Annual CO_2 Emissions (MT/yr)	**3,925.9**
Emissions from Natural Gas Combustion	
Natural Gas Use (scf/bbl)[k]	0.53
Increase in Annual Natural Gas Use (scf/year)[l]	4,092,628
Natural Gas HHV (MMBtu/scf)[m]	1.028E-03
Increase in Annual NG Heat Input (MMBtu/year)[n]	4,207.2
Natural Gas CO_2 Emission Factor (kg CO_2/MMBtu)[m]	53.02
Natural Gas CH_4 Emission Factor (kg CH_4/MMBtu)[o]	1.00E-03
Natural Gas N_2O Emission Factor (kg N_2O/MMBtu)[o]	1.00E-04
Increase in Natural Gas Annual CO_2 Emissions (MT/year)[p]	223.1
Increase in Natural Gas Annual CH_4 Emissions (MT/year)[p]	4.2E-03
Increase in Natural Gas Annual N_2O Emissions (MT/year)[p]	4.2E-04
Increase in Natural Gas GHG Emissions (MT CO_2e/year)[q]	**223.3**
Total Emissions	
Total Increase in GHG Emissions (MT CO_2e/year)[r]	**4,149.2**

[a] VOC concentration [lb/1,000 gal] = 12.46 x S x P x M / T, from Equation 1, AP-42
Section 5.2

[b] From Properties of Fuels (DOE), downloaded from http://www.afdc.energy.gov/afdc/pdfs/fueltable.pdf

[c] Emission factor [lb/1,000 gal] = VOC conc. [lb/1,000gal] x Vapor carbon conc. [unitless]

[d] Ratio CO_2 to C [unitless] = CO_2 MW (lb/lb-mole) / C MW [lb/lb-mole] = 44 / 12

[e] CO_2 emission factor [lb/1,000 gal] = Carbon emission factor [lb/1,000 gal] x Ratio CO_2 to C [unitless]

[f] Annual loading [bbl/year] = Average daily loading [bbl/day] x 365 [days/year]

[g] Increase in annual loading [bbl/year] = Project annual loading [bbl/year] - Baseline annual loading [bbl/year]

[h] Increase in annual loading [1,000 gal/year] = Increase in annual [bbl/year] x 42 [gal/bbl] / 1,000

[i] Increase in CO_2 emissions [lb/year] = Increase in annual loading [1,000 gal/year] x CO_2 emission factor [lb/1,000 gal]

[i] Increase in CO_2 emissions [kg/year] = Increase in annual CO2 wmissions [lb/year] x 453.6 [g/lb] / 1,000 [g/kg]

[k] Natural gas use [scf/bbl] = Total NG use from April 2008 through March 2010 [sfc] / Total NG use from April 2008 through March 2010
Total ethanol loaded from April 2008 through March 2010 = 6,862,419 [scf] / 12,854,311 [bbl]

[l] Increase in annual natural gas use [scf/year] = Natural gas use [scf/bbl] x Increase in annual loading [bbl/year]

[m] From Table C-1 to Subpart C of 40 CFR Part 98

[n] Increase in annual NG heat input [MMBtu/year] = Increase in NG use [scf/year] x NG HHV [MMBtu/scf]

[o] From Table C-2 to Subpart C of 40 CFR Part 98

[p] Increase in annual emissions [MT/year] = Increase in natural gas heat input [MMBtu/year] x Emission factor [kg/MMBtu] / 1,000 [kg/MT]

[q] Emissions [MT CO_2e] = CO_2 emissions [MT] + 21 x CH_4 emisisons [MT] + 310 x N_2O emisisons [MT]

[r] Total increase in GHG emissions [MT CO2e/year] = Increase in annual emissions from vapor combustion [MT CO_2/year] +
    Increase in annual emissions from NG combustion [MT CO_2e/year]

Shell Carson Facility Ethanol (E10) Project

Table 21
Tanker Truck Exhaust Greenhouse Gas Emissions (Mitigated)

Item	Value
Increase in Annual Tanker Truck Travel	
Project annual loading (bbl/year)	16,972,500
Tanker truck capacity (bbl)	190
Project annual number of trucks (trucks/year)[a]	89,329
Baseline average daily number of trucks (trucks/day)	132
Annualized baseline average number of trucks (trucks/year)[b]	48,180
Increase in annual number of trucks (trucks/year)[c]	41,149
Average daily round-trip mileage (miles/truck)	56
Increase in annual total miles (miles/year)[d]	2,304,344
GHG Emissions Calculation	
CO_2 emission factor (lb/mi)[e]	4.22
CH_4 emission factor (lb/mi)[e]	0.0001165
CO_2 emissions (MT/yr)[f]	4,406.7
CH_4 emissions (MT/yr)[f]	0.1
GHG emissions (MT CO_2e/yr)[g]	**4,409.2**

[a] Project annual number of trucks [trucks/year] = Project annual loading [bbl/year] / Truck cap. [bbl/truck]
trucks [trucks/day] x 365 [days/year]

[b] Annualized baseline average number of trucks [trucks/year] = Baseline average daily number
of trucks [trucks/day] x 365 [days/year]

[c] Increase in annual number of trucks [trucks/year] = Project maximum annual number of
trucks [trucks/year] - Annualized baseline average number of trucks [trucks/year]

[d] Increase in annual total miles [mi/yr] = Increase in annual number of trucks [trucks/year] x
Average round-trip mileage [miles/truck]

[e] Emission factors for calendar year 2011 for on-road motor vehicles in the SCAQMD jurisdiction,
downloaded from http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html

[f] Emissions [MT/yr] = Emission factor [lb/mi] x Increase in annual miles [mi/yr] x 453.6 [g/lb] / 1,000,000 [g/MT]

[g] Emissions [MT CO_2e/yr] = CO_2 emissions [MT/yr] + 21 x CH_4 emisisons [MT/yr]

Table 22
Alternative 2 Total Project Emissions (Construction plus Incremental Operation)

Implementation Phase	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOX (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)
Operational Interim Phase I						
Maximum Daily Construction Emissions	124.9	387.7	745.2	1.0	103.0	39.1
Maximum Daily Operational Emissions	57.2	56.4	90.1	0.1	8.4	6.2
Total Maximum Daily Emissions	**182.1**	**444.1**	**835.3**	**1.1**	**111.3**	**45.3**
Operational Interim Phase II						
Maximum Daily Construction Emissions	94.6	314.2	630.6	0.8	90.5	34.5
Maximum Daily Operational Emissions	168.8	109.1	249.4	0.3	18.9	12.8
Total Maximum Daily Emissions	**263.4**	**423.3**	**879.9**	**1.2**	**109.4**	**47.3**
Final Project						
Maximum Daily Operational Emissions	166.6	109.1	249.4	0.3	18.9	12.8
Total Maximum Daily Emissions	**166.6**	**109.1**	**249.4**	**0.3**	**18.9**	**12.8**
Peak Daily Emissions	**263.4**	**444.1**	**879.9**	**1.2**	**111.3**	**47.3**
SCAQMD Significance Threshold	55	550	55	150	150	55
Significant?	YES	NO	YES	NO	NO	NO

Shell Carson Facility Ethanol (E10) Project

Source	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOX (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)
On-Site Emissions						
Stationary Sources						
Ethanol Loading Rack Process Stream Components Fugitive VOC	8.2	--	--	--	--	--
Gasoline Storage Tank Process Stream Components Fugitive VOC	1.0	--	--	--	--	--
Gasoline Storage Tank Fugitive VOC	10.1	--	--	--	--	--
Thermal Oxidizer Combustion	22.8	26.7	48.6	0.3	2.4	2.4
Stationary Source Total	**42.2**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Other On-Site Sources						
Tanker Truck Fugitive VOC	117.4	--	--	--	--	--
On-Site Total	**159.6**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Off-Site Emissions						
Tanker Truck Exhaust	20.4	82.4	249.4	0.3	12.1	10.4
Tanker Truck Fugitive Particulate Matter	--	--	--	--	4.4	0.0
Off-Site Total	**20.4**	**82.4**	**249.4**	**0.3**	**16.5**	**10.4**
Daily Total (a)	**180.0**	**109.1**	**298.0**	**0.6**	**18.9**	**12.8**
Offset Requirements (b)[1]	13.4	N.R.	48.6	0.3	N.R.	N.R.
Emissions following Offsets (a-b)	**166.6**	**109.1**	**249.4**	**0.3**	**18.9**	**12.8**
SCAQMD Significance Threshold	55	550	55	150	150	55
Significant?	YES	NO	YES	NO	NO	NO

[1] VOC offsets are required by Rule 1303 for the gasoline storage tank and associated components at a ratio of 1.2-to-1 and will be

provided by the project proponent. NOx and SOx RTCs are required by Regulation XX for the thermal oxidizer and will be

provided by the project proponent.

N.R. = Offsets not required

Table 24
Alternative 2 New Gasoline Storage Tank Fugitive Component VOC
Emissions Full Operations

Component	Quantity to to be Installed	VOC Emission Factor (lb/yr)[a]	VOC Emissions (lb/yr)[b]
Valves (bellows seal)	0	0.0	0.0
Pumps (light liquid)	1	46.8	46.8
Valves (light liquid)	16	4.5	72.0
Fittings (flanges, etc.)	34	7.0	237.7
Valves (gas/vapor)	0	4.5	0.0
Compressors	0	9.1	0.0
Drains	2	9.1	18.2
Pressure Relief Valves	1	0.0	0.0
Total (lb/yr)			**374.6**
Total (lb/day)[c]			**1.0**

[a] Based on CAPCOA correlation equations and a screening value of 500 ppmv

[b] Emissions [lb/yr] = Emission factor [lb/yr] x Quantity to be installed

[c] Emissions [lb/day] = Emission [lb/yr] / 365 [days/yr]

Table 25
Alternative 3 Total Project Emissions (Construction plus Incremental Operation)

Implementation Phase	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOX (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)
Operational Interim Phase I						
Maximum Daily Construction Emissions	114.9	343.9	640.8	0.9	87.7	33.5
Maximum Daily Operational Emissions	57.2	56.4	90.1	0.1	8.4	6.2
Total Maximum Daily Emissions	**172.1**	**400.4**	**730.8**	**1.0**	**96.1**	**39.6**
Operational Interim Phase II						
Maximum Daily Construction Emissions	66.0	180.5	323.9	0.4	47.6	18.0
Maximum Daily Operational Emissions	168.8	109.1	249.4	0.3	18.9	12.8
Total Maximum Daily Emissions	**234.9**	**289.5**	**573.3**	**0.8**	**66.5**	**30.9**
Final Project						
Maximum Daily Operational Emissions	168.8	109.1	249.4	0.3	18.9	12.8
Total Maximum Daily Emissions	**168.8**	**109.1**	**249.4**	**0.3**	**18.9**	**12.8**
Peak Daily Emissions	**234.9**	**400.4**	**730.8**	**1.0**	**96.1**	**39.6**
SCAQMD Significance Threshold	55	550	55	150	150	55
Significant?	YES	NO	YES	NO	NO	NO

Shell Carson Facility Ethanol (E10) Project

Table 26
Alternative 3 Peak Daily Operational Criteria Pollutant Emissions

Source	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOX (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)
On-Site Emissions						
Stationary Sources						
Ethanol Loading Rack Process Stream Components Fugitive VOC	8.2	--	--	--	--	--
Thermal Oxidizer Combustion	22.8	26.7	48.6	0.3	2.4	2.4
Stationary Source Total	**31.0**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Other On-Site Sources						
Tanker Truck Fugitive VOC	117.4	--	--	--	--	--
On-Site Total	**148.5**	**26.7**	**48.6**	**0.3**	**2.4**	**2.4**
Off-Site Emissions						
Tanker Truck Exhaust	20.4	82.4	249.4	0.3	12.1	10.4
Tanker Truck Fugitive Particulate Matter	--	--	--	--	4.4	0.0
Off-Site Total	**20.4**	**82.4**	**249.4**	**0.3**	**16.5**	**10.4**
Daily Total (a)	**168.8**	**109.1**	**298.0**	**0.6**	**18.9**	**12.8**
Offset Requirements (b)[1]	N.R.	N.R.	48.6	0.3	N.R.	N.R.
Emissions following Offsets (a-b)	**168.8**	**109.1**	**249.4**	**0.3**	**18.9**	**12.8**
SCAQMD Significance Threshold	55	550	55	150	150	55
Significant?	YES	NO	YES	NO	NO	NO

[1] VOC offsets are required by Rule 1303 for the gasoline storage tank and associated components at a ratio of 1.2-to-1 and will be provided by the project proponent. NOx and SOx RTCs are required by Regulation XX for the thermal oxidizer and will be provided by the project proponent.

N.R. = Offsets not required